BROWARD COUNTY P25 SYSTEM AND SERVICES MASTER AGREEMENT WITH MOTOROLA SOLUTIONS, INC.

This P25 System and Services Master Agreement (the "Agreement") is made and entered into by and between Broward County, a political subdivision of the State of Florida ("County"), and Motorola Solutions, Inc., a Delaware corporation registered to transact business in the State of Florida ("Provider" or "Motorola Solutions").

A. County issued solicitation RFP R1422515R1/P1 to provide a turnkey replacement of various communication subsystems operated by the County's Office of Regional Communications and Technology and integral to the public safety communications of Broward County and its municipalities. The RFP sought a new 700 MHz, P25 Phase II system to replace the County's existing 800 MHz SmartNet System, a new IP-based microwave system to replace the existing Tadiran 6 GHz system and providing backward compatibility for legacy circuits, civil work to support upgrades to new and existing radio sites, and P25 Phase II-compliant subscriber radios and maintenance available for purchase by entities in the Broward County public safety network.

B. County has met the requirements of Section 287.055, Florida Statutes, the Consultants' Competitive Negotiation Act, and County's Design-Build competitive procurement regulations, and has selected Provider and its Subcontractors to perform the services hereunder.

For good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

ARTICLE 1. DEFINITIONS

1.1 Authorized Third Party Users. All persons and entities that County authorizes to use the P25 System, which may include employees and contractors of Broward County, Broward Sheriff's Office, Broward School District, municipalities, law enforcement, fire rescue, emergency management, transportation, non-government aid or relief organizations, and federal agencies.

1.2 Board. The Board of County Commissioners of Broward County, Florida.

1.3 Business hours or business day. 7 a.m. to 7 p.m. Eastern Time during weekdays that are not County holidays and on which County has not otherwise declared its offices closed.

1.4 Change Order. A written document ordering a change in the Design Build Price or Design Build Time or a material change in the Design Build Work.

1.5 Contract Administrator. The Director of Office of Regional Communications and Technology or other person as designated in writing by the Director of the Office of Regional Communications and Technology for all or portions of this Agreement and the Services provided hereunder.

1.6 County Consultant. Mission Critical Partners, Inc. or any other entity designated by the Contract Administrator as employed by or under contract to County for the providing of consulting services in connection with the preparation of the Specifications and oversight of the performance of this Agreement.

1.7 DB-Firm. The Subcontractor providing the design-related and civil work required for the Project or as otherwise required under the Facilities and Infrastructure SOW. As of the Effective Date, the DB-Firm is Amec Foster Wheeler.

1.8 DB-Firm's Consultant (Engineer of Record). A registered engineer who is employed by or has contracted with DB-Firm to provide professional services for the design, permitting, and construction related professional services of the Project and who is licensed by the State of Florida to provide said professional services. The DB-Firm Consultant as of the Effective Date is Carrick Contracting Corporation.

1.9 Design Build Contract Documents. Collectively, this Agreement and its exhibits, attachments and forms, the RFP R1422515R1/P1 and Addenda, and Provider's responses thereto (as negotiated and accepted by County); the Specifications; design plans, specifications, and drawings which are to be developed, signed, and sealed by DB-Firm's Consultant; the record of the contract award by the Board of County Commissioners; the Performance Bond and Payment Bond; the Notice(s) to Proceed; the Purchase Order; and all agreed upon contract and design modifications issued after execution of this Agreement.

1.10 Design Build Price. The amount established in the Agreement as the total contract price for the Project, as may be amended by Change Order.

1.11 Design Build Time. The original time between commencement and completion for the Facilities and Infrastructure Work, in accordance with Exhibit A-2 and the Project Schedule set forth in Schedule 10, including any milestone dates, as may be amended by Change Order.

1.12 Design Build Work. The totality of the obligations, including design and construction and other services required by the Design Build Contract Documents, whether completed or partially completed, including all labor, materials, equipment, and services provided or to be provided by DB-Firm or Provider to fulfill the obligations hereunder for the Project.

1.13 Documentation. All manuals, user documentation, specifications, and other related materials pertaining to any portion of the P25 System and other hardware and software that Provider or its Subcontractor customarily furnishes to purchasers of such hardware or software. "Documentation" includes product and software documents that specify technical and performance features and capabilities, and the user, operation and training manuals for the Software (including all physical or electronic media upon which such information is provided).

1.14 Equipment. The hardware and other property being provided to County pursuant to this Agreement, including equipment with which or for which the Software and Documentation is licensed, and including any embedded software and firmware incorporated therein or customarily provided by Provider to purchasers of such equipment.

1.15 Field Order. A written order which orders minor changes or interpretations of the Contract Documents but which does not involve an increase in the Design Build Price or change

in the Design Build Time.

1.16 Final Completion. The date certified by DB-Firm's Consultant, and as finally determined by the Contract Administrator with concurrence by the County Consultant, upon which all conditions and requirements of any permits and regulatory agencies have been satisfied; any documents required by the Design Build Contract Documents have been received by the Contract Administrator; any other documents required to be provided by DB-Firm have been received by County; and the Design Build Work defined herein has been fully completed for the applicable Sites in accordance with the terms and conditions of the Design Build Contract Documents.

1.17 Open Source Software. Open Source Software is software with either freely obtainable source code, license for modification, or permission for free distribution.

1.18 Open Source Software License. The terms or conditions under which the Open Source Software is licensed by its copyright owner.

1.19 P25 System. All of the Software, Equipment, and other property identified in any Statement of Work, inclusive with all Services, being provided to County pursuant to this Agreement. The P25 System is comprised of three component systems: (1) the "Radio System," which constitutes the Software, Equipment and Services as stated in Exhibit A-1; (2) the Project, which constitutes the Design Build Work for the Facilities and Infrastructure system as stated in Exhibit A-2; and (3) the "Microwave System," which constitutes the Software, Equipment and Services as stated in Exhibit A-3.

1.20 Project. The design-build services to design, build, and install the necessary antenna towers, improvements, buildings, and other work as described in SOW A-2 or the Design Build Contract Documents.

1.21 Purchasing Director. The Broward County Director of Purchasing as appointed by the Broward County Administrator.

1.22 Security Vulnerability. A flaw or weakness in system security procedures, design, implementation, or internal controls that could be exercised (accidentally triggered or intentionally exploited) and result in a security breach such that data is compromised, manipulated or stolen or the system damaged.

1.23 Services. All required installation, integration, programming, configuration, customization, and enhancements of the P25 System or any component System thereof, together with necessary and appropriate consulting, training, and project management services, to meet County's ongoing needs in connection with the P25 System, as further specified in the Statements of Work that comprise Exhibit A.

1.24 Sites. The sites included in this Project as identified in Exhibit A-2 and as updated or amended by Change Order.

1.25 Software. All proprietary or third-party software or other intellectual property rights, including the Documentation for same, provided or licensed to County or third party users pursuant to this Agreement, including the computer programs (in machine readable object code form) provided pursuant to this Agreement or listed in Exhibit A and any subsequent updates, upgrades, releases, or enhancements thereto developed by Provider during the term of this

Agreement. "Software" includes software in object code format, and adaptations, translations, de-compilations, disassemblies, emulations, or derivative works of such software, and any modifications and new versions of the software provided pursuant to this Agreement, as well as any embedded software in the Equipment.

1.26 Specifications. The performance criteria developed by County Consultant that specifies the performance-based criteria for the P25 System or Project, including the description of work, standard specifications to be followed, technical requirements, management plans, Project schedule requirements, meetings and documentation requirements, design and survey requirements, provisions for utilities and coordination, permitting, maintenance-of-traffic, geotechnical investigations, environmental considerations, and construction operations, applicable to the Project or P25 System, as expressed in the RFP document, and include all implied requirements necessary to complete the Services and Design Build Work.

1.27 Subcontractor. A firm, partnership, corporation, independent contractor (including 1099 individuals), or combination thereof providing services to County through Provider for all or any portion of the Services or Project or who furnishes skills or materials worked into a special design according to the plans and specifications for such Services, but not those who merely furnish equipment or materials required by the plans and specifications. DB-Firm is included within the definition of Subcontractor.

1.28 Substantial Completion. That date, as certified by DB-Firm's Consultant and as finally determined by the Contract Administrator in its sole discretion, with concurrence from the County Consultant, the Design Build Work, or a portion thereof, is at a level of completion in substantial compliance with the Design Build Contract Documents such that all conditions of permits and regulatory agencies have been satisfied and County or its designee can enjoy use and operate it in all respects for its intended purpose.

1.29 Support and Maintenance Services. The maintenance and support required to maintain optimal performance of the applicable System as described in the Documentation and Exhibit C, as well as the support and maintenance services required for County to achieve and maintain optimal performance of the System.

1.30 Surety. The surety company or individual which is bound by the performance bond and payment bond with and for Provider who is primarily liable, and which surety company or individual is responsible for Provider's satisfactory performance of the Services and other work under the Agreement and for the payment of all debts pertaining thereto in accordance with Section 255.05, Florida Statutes, as applicable and as may be amended from time to time.

ARTICLE 2. EXHIBITS AND SCHEDULES

The following exhibits and schedules are attached hereto and incorporated into this Agreement:

Exhibit A Statements of Work
- **Exhibit A-1 Radio System SOW**
- **Exhibit A-2 Facilities and Infrastructure SOW**
- **Exhibit A-3 Microwave System SOW**

Exhibit A-4 Subscriber Equipment and Subscriber Equipment Maintenance
Exhibit A-5 Optional Services
Exhibit B Payment Schedule
Exhibit C Support and Maintenance Services
Exhibit D Insurance Coverages
Exhibit E Work Authorization Form
Exhibit F Additional Terms and Conditions for Project
Exhibit G Subcontractor Schedule and CBE Letters of Intent

Schedule 1 Software Schedule
Schedule 2 Equipment Schedule
Schedule 3 Training Plans
Schedule 4 Spares
Schedule 5 Interfaces and Alarms
Schedule 6 Quality Control Plan
Schedule 7 Block Diagrams
Schedule 8 Specifications
Schedule 9 Path Calculations and Profiles
Schedule 10 Project Schedule

If there is a conflict or inconsistency between any provision contained in Articles 1 - 14 and any provision contained in any of the Exhibits or Schedules, the provision of Articles 1 - 14 shall prevail and be given effect unless expressly stated to the contrary.

ARTICLE 3. SCOPE OF SERVICES & SOFTWARE LICENSE

3.1 Scope of Services. Provider, either directly or through an authorized Subcontractor, shall complete all Services required in this Agreement inclusive of the Exhibits. Unless stated otherwise in this Agreement, the work required of Provider includes all labor, materials and tasks, whether or not enumerated in the Agreement, that are such an inseparable part of the work expressly stated in the Agreement that exclusion thereof would render Provider's performance impractical, illogical, or unconscionable. The Services required under this Agreement is inclusive of the Services required for all three separate system components: the Radio System, the Project, and the Microwave System. Provider shall be responsible for scheduling and coordinating each of the components, with the approval of the Contract Administrator, to ensure timely, complete, and proper implementation of each of the component Systems as well as the P25 System as a whole.

3.1.1 Radio Services. Provider or its Subcontractor shall perform all work set forth in the Radio Services SOW (Exhibit A-1) for the installation and implementation of the Radio System. Provider shall provide all services as set forth in this Agreement for the Radio System, including all necessary, incidental, and related activities and services required by the Radio SOW.

3.1.2 DB-Firm Services. Provider shall perform, directly or through the DB-Firm or other Subcontractor, all work set forth in the Facilities and Infrastructure SOW (Exhibit A-2) for the design, build, and installation for the Project. For all Services relating to the Project or required pursuant to the Facilities and Infrastructure SOW (Exhibit A-2), Provider and its Subcontractors, including the DB-Firm, shall comply with the Additional Terms and Conditions for Project attached as Exhibit F hereto. Provider shall ensure that its DB-Firm shall provide all services as set forth in this Agreement for the Project, including all necessary, incidental, and related activities and services required by the Facilities and Infrastructure SOW and implicit in the completion of the Project.

3.1.2.1 Structural Integrity. Provider and its DB-Firm shall perform all Design Build Work so as not to harm the structural integrity of any existing structure or infrastructure within the Project or at the Sites, and so as to conform to the standards set forth in Exhibit A-2. Provider shall repair and restore to its original condition any area of damage caused by Provider or its Subcontractor's performance under this Agreement. County or the County Consultant may review the work performed by DB-Firm and to direct DB-Firm to take certain corrective action if, in the opinion of the Contract Administrator or the County Consultant, the structural integrity of any existing structure or infrastructure within the Project or at any Site is or will be harmed.

3.1.2.2 Title of Work. Title to Design Build Work accepted by County under this Agreement shall vest in County. Ownership of the equipment and materials presently existing at the Sites at the time of execution of this Agreement shall remain the property of County, even if it is replaced or its operation made unnecessary by the Design Build Work. Title to the Equipment and risk of loss will pass to County upon written acceptance by County. Title to Software will not pass to County at any time.

3.1.2.3 Drawings and Material Lists. Where applicable, shop drawings, prepared, signed and sealed by the DB-Firm's Consultant, and equipment lists shall be submitted, including manufacturer supplied descriptive and technical literature. Manufacturer supplied descriptive and technical material (catalog cut sheets and performance charts) for new major equipment items shall also be submitted with the drawing package. The submitted shop drawings shall contain complete wiring and piping schematics and routing and any other details required to demonstrate the units are maintainable and will function as required in the complete system.

3.1.2.4 Lands for Work. County shall provide, as may be indicated in the Design Build Contract Documents, the Sites upon which the Design Build Work is to be performed, including rights-of-way and easements for access thereto, and such other lands as are designated by County for the use of Provider or its Subcontractor. Provider or its Subcontractor shall provide, at no expense to County and without liability to County, any additional land and access thereto that may be required for temporary construction facilities, or for storage of materials. Provider shall furnish to County copies of written permission obtained from the owners of such land.

3.1.3 Microwave Services. Provider or its Subcontractor shall perform all work set forth in the Microwave SOW (Exhibit A-3) for the installation and implementation of the Microwave

System. Provider shall provide all services as set forth in this Agreement for the Microwave System, including all necessary, incidental, and related activities and services required by the Microwave SOW.

3.2 Level of Effort. The Statements of Work do not delineate every detail and minor work task required to be performed by the Provider or its Subcontractor to complete the P25 System or its components. If, during the course of the performance of the Services, Provider determines that work should be performed to complete the P25 System or any component thereof, which in Provider's or its Subcontractor's opinion is outside the level of effort originally anticipated, whether or not the Statement of Work identifies the work items, Provider shall notify the Contract Administrator in writing in a timely manner before proceeding with the work. If Provider or its Subcontractor proceeds with said work without notifying the Contract Administrator, said work shall be deemed to be within the original level of effort, whether or not specifically addressed in the Statement of Work. Notice to the Contract Administrator does not constitute authorization or approval by County to perform the work. Performance of work outside the originally anticipated level of effort without prior written County approval is at Provider's sole risk.

3.3 Key Personnel. County's selection of Provider to perform the Services hereunder was based, in part, on the Subcontractors and specific personnel included in Provider's response to the County's solicitation. Provider's Subcontractors as identified in its response to the County's solicitation or as identified in this Agreement (inclusive of the applicable Statements of Work) shall not be changed without the prior written consent of the Contract Administrator. In the event Provider alters its relationship with the DB-Firm or DB-Firm alters its relationship with DB-Firm's Consultant without the prior written consent of the Contract Administrator, such occurrence shall be deemed an event of default and County may, in its discretion, terminate this Agreement in whole or as to any Statement of Work for cause herein. If Provider is granted written consent by the Contract Administrator to change any Subcontractor or the DB-Firm's Consultant, any delay costs associated with such change shall be borne by Provider.

3.4 Support and Maintenance Services. For so long as requested by County, Provider shall provide Support and Maintenance Services for the P25 System at the rates set forth in the Payment Schedule to ensure the proper functioning and optimal performance of the P25 System as set forth in the Documentation pursuant to the terms of Exhibit C. For the first year following Final Acceptance, all Support and Maintenance Services for the P25 System are included at no additional cost. For subsequent years, Support and Maintenance Services for the applicable System shall be invoiced and paid in accordance with the Payment Schedule set forth in Exhibit B. County may elect to suspend, discontinue, or recommence Support and Maintenance Services for the P25 System or for any or all of the component Systems upon thirty (30) days' prior notice, with the applicable fees prorated for the applicable term, without reinstatement or other penalty.

3.5 License. Subject to County's compliance with the license terms of use set forth in this Agreement, Provider grants to County a perpetual, royalty-free, nonexclusive license, with no

geographical limitations, for the number of users set forth in this Agreement (including any applicable Work Authorization), to all Software included in the P25 System, including to any software embedded in or provided with the Equipment, for use solely for governmental or other noncommercial purposes, including on- and off-site access and use of the System by Authorized Third Party Users, including those persons or entities with which County may contract to operate the P25 System or components thereof and the offices of the County constitutional officers.

3.5.1 Authorized Users and Additional Licenses. Unless otherwise stated in Exhibit A (Statement of Work) or Schedule 1, County and any of its employees, agents, suppliers of services, or other Authorized Third Party Users shall have the right to concurrently operate and use the P25 System. If anything less than unlimited, concurrent use is expressly provided under this Agreement and additional licenses are required, County's Purchasing Director is authorized to execute a Work Authorization to purchase additional licenses for the fee specified in the Payment Schedule.

3.5.2 Additional Uses. County may, if required by reason of an emergency, disaster or operational need, or for testing of recovery resources, temporarily use the Software on recovery resources at no additional cost, including recovery resources that may not be owned by County. County may, at no additional cost, copy the Software for backup and archiving purposes for the purposes of support or maintenance by County or others hired by County to provide such support or maintenance. County may, at no additional cost, utilize a hosted environment, including without limitation through a third-party hosting provider, for all otherwise permitted uses of the Software.

3.5.3 Prohibited Uses. Except as otherwise provided for in this Agreement or required under Florida law, County shall not adapt, create derivative works, distribute, lease, lend, reproduce, publish, or license the Software to the general public or to third parties other than Authorized Third Party Users. County shall not modify, reverse engineer, disassemble, or decompile the Software or any portion thereof, except (a) to the extent expressly authorized in Exhibit A, in which event such authorized actions shall be deemed within the license grant of Section 3.5, or (b) to the extent permitted under any applicable open source license. County may not export the Software without complying with all applicable state and federal export laws. County will not transfer the Software to any third party (other than Authorized Third Party Users) without Motorola's prior written consent.

3.5.4 Ownership and Title. Motorola, its licensors, and its suppliers retain all of their proprietary rights in any form in and to the Software and Documentation, including, but not limited to, all rights in patents, patent applications, inventions, copyrights, trademarks, trade secrets, trade names, and other proprietary rights in or relating to the Software and Documentation (including any corrections, bug fixes, enhancements, updates, modifications, adaptations, translations, de-compilations, disassemblies, emulations to or derivative works from the Software or Documentation, whether made by Motorola or another party, or any improvements that result from Motorola's processes or, provision of information services). No rights are granted to County under this Agreement by implication, estoppel or otherwise, except

for those rights which are expressly granted to County in this Agreement. All intellectual property developed, originated, or prepared by Motorola in connection with providing the Software, Equipment, Documentation or related services, remains vested exclusively in Motorola, and County will not have any shared development or other intellectual property rights. The existence of a copyright notice on the Software will not be construed as an admission or presumption of publication of the Software or public disclosure of any trade secrets associated with the Software.

3.6 Updates, Upgrades and Releases. For the duration of this Agreement, Provider shall promptly provide to County, with advance notice and at no additional cost, any and all updates (including error corrections, bug fixes, security updates, and patches), upgrades, or new releases to the Software (as well as any firmware included with the Equipment), including all that Provider has made available to other licensees of all or part of the Software licensed pursuant hereto. All such updates, upgrades, and new releases shall remain the sole property of Provider and shall be deemed to be included within the scope of the license granted under this Agreement.

3.7 Compatibility. For the full term of this Agreement, Provider will ensure the continued compatibility of the Software and P25 System with all major releases, updates, or upgrades of any third party software used by County for access or operation of the P25 System. In the event Provider is not be able to support any third party software update, upgrade or new release that is not backwards compatible with the Software or the P25 System (or any component thereof), Provider shall use all reasonable efforts to resolve such issues and to provide optimal functionality of the Software and P25 System in accordance with this Agreement. If Provider is unable to provide continued optimal functionality of the Software and P25 System in accordance with this Agreement due to any applicable third party software release, update or upgrade, County shall be entitled to terminate the Agreement upon written notice with no further obligation to Provider.

3.8 Software Enhancements or Modifications. If requested by County and agreed to by Provider in an appropriate Work Authorization, Provider shall incorporate certain features and enhancements into the licensed Software. Any such request shall be formalized into a Statement of Work that shall define in detail the services to be performed, the financial terms, and the proposed project staffing and schedule. Any such Statement of Work shall be incorporated into a Work Authorization, to the extent permitted by Section 3.9 below, or otherwise into a proposed amendment to this Agreement.

3.9 Change of Scope Procedures. Provider acknowledges that Contract Administrator has no authority to make changes that would increase, decrease, or otherwise modify the scope of services to be provided under this Agreement, except as expressly provided herein. Contract Administrator may, from time to time, make changes to the Services or Design Build Work, including, but not limited to, the character and quantity of the Services or Design Build Work, as may be considered necessary or desirable in his or her sole discretion to complete fully and acceptably the proposed System or Design Build Work in a satisfactory manner. Provided such changes do not increase the cost to County, such changes may be documented between the Parties by execution of a Field Order or other writing in accordance with this Agreement (with

any decrease in charges to County credited against the next invoice, credited against other purchases with all applicable discounts and pricing incentives applied, or applied as the Parties otherwise agree). Unless otherwise expressly stated herein, any changes that increase cost to County must be documented by joint execution of a Change Order, Work Authorization, or amendment. Change Orders may only be used for the Project; Work Authorizations must be used for additional Services relating to the remainder of the P25 System.

3.9.1 Additional Services, Software or Equipment. To the extent any goods or services under this Agreement, or the quantity thereof, are identified as optional for County or set forth in SOW A-5 (collectively, "Optional Services"), County may select the type, amount, and timing of such goods or services pursuant to a Work Authorization executed by Provider and County pursuant to this Section, and provided that no such selection, when combined with those goods or services required under the Agreement, would result in a payment obligation exceeding the applicable maximum amount stated in Section 5.1. Notwithstanding anything to the contrary in the Agreement, Work Authorizations for Optional Services pursuant to this Section shall be executed on behalf of the County as follows: the Contract Administrator may execute Work Authorizations for which the cumulative total cost to County is less than $30,000.00; the Purchasing Director may execute Work Authorizations for which the cumulative total cost to the County is within the not-to-exceed amounts set forth in Section 5.1 (which amounts are acknowledged to be in excess of Purchasing Director's delegated authority under the Procurement Code, but are expressly authorized by the Board under this Agreement); any other Work Authorizations shall require Board approval. Subsequent to the full execution of any Work Authorization, the Contract Administrator will issue a Notice to Proceed for those authorized Optional Services. Provider shall not commence work on any Work Authorization until after receipt of the applicable Notice to Proceed.

3.9.2 Field Orders. The Contract Administrator shall have the right to approve and issue Field Orders setting forth written interpretations of the intent of the Design Build Contract Documents and ordering minor changes in Work execution, providing the Field Order involves no change in the Design Build Price or Design Build Time.

3.9.3 Change Orders. Changes in the quantity or character of the Design Build Work within the scope of the Project which are not properly the subject of Field Orders, including all changes resulting in changes in the Design Build Price or the Design Build Time, shall be authorized only by Change Orders approved in advance and issued in accordance with the provisions of the Broward County Procurement Code. Provider or DB-Firm shall not start work on any changes requiring an increase in the Design Build Price or the Design Build Time until a Change Order setting forth the adjustments is approved by the County. Upon receipt of a Change Order, Provider or DB-Firm shall promptly proceed with the Design Build Work set forth within the document.

3.9.4 In the event satisfactory adjustment cannot be reached for any item requiring a change in the Design Build Price or Design Build Time, and a Change Order has not been issued, County reserves the right at its sole option to either (a) terminate the Agreement as it applies to

the items in question and make such arrangements as may be deemed necessary to complete the disputed Design Build Work; or (b) submit the matter in dispute to County Administrator as set forth in Section 14.29 hereof. During the pendency of the dispute, and upon receipt of a Change Order approved by County, Provider and DB-Firm shall promptly proceed with the change in the Work involved and advise the Contract Administrator in writing within seven (7) calendar days of Provider's agreement or disagreement with the method, if any, provided in the Change Order for determining the proposed adjustment in the Design Build Price or Design Build Time.

3.9.5 On approval of any change increasing the Design Build Price, Provider shall ensure that the performance bond and payment bond are increased so that each reflects the Design Build Price as increased.

3.9.6 Under circumstances determined necessary by County, Change Orders may be issued unilaterally by County.

3.10 Value of Change Order Work.

3.10.1 The value of any Work covered by a Change Order or of any claim for an increase or decrease in the Design Build Price shall be determined in one of the following ways:

3.10.1.1 Where the Work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of items involved, subject to the provisions of Section 3.10.7.

3.10.1.2 By mutual acceptance of a lump sum which Provider and County acknowledge contains a component for overhead and profit.

3.10.1.3 On the basis of the "cost of work," determined as provided in Sections 3.10.2 and 3.10.3, plus a fee for overhead and profit which is determined as provided in Section 3.10.4.

If and to the extent Provider claims that any of the data or calculations included in the calculation of the modification to the Design Build Price (or any other pricing calculation under this Agreement) constitutes a trade secret under Florida law, including Florida Statutes Section 812.081, Provider shall provide the information to County for determination of price in accordance with, but shall also follow the procedures set forth in Section 9.2 as to the trade secret designation of the information.

3.10.2 The term "cost of work" means the sum of all direct costs necessarily incurred and paid by DB-Firm in the proper performance of the Design Build Work described in the Change Order. Except as otherwise may be agreed to in writing by County, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in Section 3.10.3:

3.10.2.1 Payroll costs for employees in the direct employ of DB-Firm in the performance of the Design Build Work described in the Change Order under schedules of job classifications agreed upon by County and DB-Firm. Payroll costs for employees not employed full time on the Design Build Work covered by the Change Order shall be apportioned on the basis of their time spent on the Design Build Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay application thereto. Such employees shall include superintendents and foremen at the site. The expenses of performing the Design Build Work after regular working hours, on Sunday or legal holidays, shall be included in the above to the extent authorized by County.

3.10.2.2 Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and manufacturers' field services required in connection therewith. All cash discounts shall accrue to DB-Firm unless County deposits funds with DB-Firm with which to make payments, in which case the cash discounts shall accrue to County. All trade discounts, rebates and refunds, and all returns from sale of surplus materials and equipment shall accrue to County, and DB-Firm shall make provisions so that they may be obtained. Rentals of all construction equipment and machinery and the parts thereof whether rented from DB-Firm or others in accordance with rental agreements approved by County and the costs of transportation, loading, unloading, installation, dismantling and removal thereof, all in accordance with the terms of said agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

3.10.2.3 Payments made to DB-Firm or other Subcontractors for work performed by Subcontractors. If required by County, DB-Firm shall obtain competitive bids from Subcontractors acceptable to DB-Firm and shall deliver such bids to County who will then determine which bids will be accepted. If the Subcontract provides that the Subcontractor is to be paid on the basis of cost of the work plus a fee, the Subcontractor's cost of the work shall be determined in the same manner as DB-Firm's cost of the work. All Subcontractors shall be subject to the other provisions of the Design Build Contract Documents insofar as applicable.

3.10.2.4 Supplemental costs including the following:

3.10.2.4.1 The proportion of necessary transportation, travel and subsistence expenses of DB-Firm's employees incurred in discharge of duties connected with the Work except for local travel to and from the site of the Design Build Work.

3.10.2.4.2 Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities

at the site and hand tools not owned by the workers, which are consumed in the performance of the Work, less market value of such items used but not consumed which remains the property of Provider or DB-Firm.

3.10.2.4.3 Sales, use, or similar taxes related to the Design Build Work, and for which DB-Firm is liable, imposed by any governmental authority.

3.10.2.4.4 Deposits lost for causes other than Provider's or DB-Firm's negligence; royalty payments and fees for permits and licenses.

3.10.2.4.5 The cost of utilities, fuel and sanitary facilities at the site.

3.10.2.4.6 Receipted minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.

3.10.2.4.7 Cost of premiums for additional bonds and insurance required because of changes in the Work.

3.10.3 The term "cost of the work" shall not include any of the following:

3.10.3.1 Payroll costs and other compensation of Provider's or DB-Firm's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, schedulers, estimators, lawyers, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks and other personnel employed by Provider or DB-Firm whether at the site or in its principal or a branch office for general administration of the Design Build Work are considered administrative costs covered by Provider's or DB-Firm's overhead.

3.10.3.2 Expenses of DB-Firm's principal and branch offices other than DB-Firm's office at the site.

3.10.3.3 Any part of DB-Firm's capital expenses, including interest on DB-Firm's capital employed for the Work and charges against DB-Firm for delinquent payments.

3.10.3.4 Cost of premiums for all bonds and for all insurance whether or not Provider or DB-Firm is required by the Design Build Contract Documents to purchase and maintain the same, except for additional bonds and insurance required because of the changes in the Design Build Work.

3.10.3.5 Costs due to the negligence or neglect of Provider or DB-Firm, any other Subcontractors, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of

defective Work, disposal of materials or equipment wrongly supplied and making good any damage to property.

3.10.3.6 Other overhead or general expense costs of any kind.

3.10.4 DB-Firm's fee allowed to DB-Firm for overhead and profit shall be determined as follows:

3.10.4.1 A mutually acceptable fixed fee; or

3.10.4.2 A fee based on the following percentages of the various portions of the cost of the work: For costs incurred under Sections 3.10.2.1 and 3.10.2.2, DB-Firm's fee shall not exceed ten percent (10%); For costs incurred under Section 3.10.2.3, DB-Firm's fee shall not exceed seven and one half percent (7.5%); and if a subcontract is on the basis of cost of the work plus a fee, the maximum allowable to the Subcontractor as a fee for overhead and profit shall not exceed ten percent (10%); and no fee shall be payable on the basis of costs itemized under Section 3.10.2.4 (except Section 3.10.2.4.3) and Section 3.10.3.

3.10.5 The amount of credit to be credited to County for any change which results in a net decrease in cost will be the amount of the actual net decrease. When both additions and credits are involved in any one change, the combined overhead and profit shall be figured on the basis of the net increase, if any; however, neither Provider nor DB-Firm shall be entitled to claim lost profits for any Design Build Work not performed.

3.10.6 Each Change Order must state within the body of the Change Order whether it is based upon unit price, negotiated lump sum, or "cost of the work." Provider will submit in a form acceptable to the Contract Administrator an itemized cost breakdown together with the supporting data. Breakdown shall list the quantities and unit prices for materials, labor, equipment and other items of cost. Whenever a change involves DB-Firm and one or more Subcontractors and the change is an increase in the Design Build Price, overhead and profit percentage for DB-Firm and each Subcontractor shall be itemized separately.

3.10.7 Where the quantity of any item of the Design Build Work that is covered by a unit price is increased or decreased by more than twenty percent (20%) from the quantity of such Design Build Work indicated in the Design Build Contract Documents, an appropriate Change Order shall be issued to adjust the unit price, if warranted.

3.10.8 Whenever a change in the Design Build Work is to be based on mutual acceptance of a lump sum, whether the amount is an addition, credit, or no change-in-cost, Provider shall submit an initial cost estimate acceptable to Contract Administrator.

3.11 Contract Administrator Authority. Unless otherwise expressly stated herein or in the applicable Procurement Code, Code of County Ordinances, or County Code of Administrative

Procedure, the Contract Administrator may act on behalf of County to exercise the authority and powers of County under this Agreement.

ARTICLE 4. TERM, TIME OF PERFORMANCE, ACCEPTANCE AND LIQUIDATED DAMAGES

4.1 Term. The Agreement shall become effective on the date it is fully executed by the parties (the "Effective Date"). The initial term of the Agreement shall be for a period of ten (10) years from the date of Final Acceptance (the "Initial Term").

4.2 Extensions. County shall have the option to renew this Agreement for two (2) additional five-year terms (each an "Extension Term") by sending notice thereof to Provider at least thirty (30) days prior to the expiration of the then-current term. The Purchasing Director is authorized to exercise this renewal option. In the event that unusual or exceptional circumstances, as determined in the sole discretion of the Purchasing Director, render the exercise of an extension not practicable or if no extension is available, and expiration of this Agreement would result in a gap in the provision of services necessary for the ongoing operations of the County, then this Agreement may be extended on the same terms and conditions by the Purchasing Director for period(s) not to exceed six (6) months in the aggregate.

4.3 Fiscal Year. The continuation of this Agreement beyond the end of any County fiscal year shall be subject to both the appropriation and the availability of funds, in accordance with Chapter 129, Florida Statutes.

4.4 Time for Performance. Time is of the essence for all performance required under this Agreement. Prior to the commencement of Services under any Statement of Work, County Contract Administrator will issue a Purchase Order for the "P25 System Initial Purchase Order Amount" per Exhibit B and a Notice to Proceed for the relevant Services (including, to the extent set forth in the applicable Statement of Work, Notices to Proceed for each phase or subpart). Unless otherwise specified in the applicable Notice to Proceed, the applicable work to be performed pursuant to any Notice to Proceed shall commence within ten (10) calendar days of the issuance date of the Notice to Proceed.

4.4.1. Project Schedule. Provider and its Subcontractors shall complete the Services for each System, including the P25 System as a whole, within the time periods specified in the Project Schedule (Schedule 10) for the applicable System, including any modifications thereto approved in writing by the Contract Administrator.

4.4.2. County Responsibilities. The Contract Administrator or County Consultant, as applicable, shall review the itemized deliverables and documents and respond in writing with any comment within the time set forth on the approved Project Schedule. The Contract Administrator or County Consultant shall give prompt written notice to Provider whenever the Contract Administrator observes or otherwise becomes aware of any development that affects the scope or timing of Provider's or DB-Firm's services or any defect in the work of Provider or DB-Firm. The Contract Administrator has the authority to stop the progress of the Services or

Work whenever, in the opinion of the Contract Administrator, such stoppage is necessary to insure proper execution of the Services or Work or in an emergency affecting public safety, life, the integrity of the Services or Work, or adjoining property.

4.4.3. Facilities and Infrastructure Phases. The Project is organized into phases as detailed in Exhibit A-2. All design related documents prepared by DB-Firm should be sufficiently complete and comprehensive that they can be reviewed and approved by the Contract Administrator and County Consultant with an initial submittal and a re-submittal, if necessary. If DB-Firm requires additional review by the Contract Administrator and County Consultant beyond the first re-submittal, County may charge Provider for the invoice cost from County Consultant (if any), which amounts shall be reimbursed to County within thirty (30) days of receipt of billing from County or credited against the next invoice, as elected by County Contract Administrator.

4.4.3.1. Notices to Proceed. Neither Provider nor DB-Firm will commence work on any Site or Phase unless and until County Contract Administrator issues a Notice to Proceed for that particular Site or Phase. Provider and DB-Firm must obtain and notify County of receipt of all required permits as a condition precedent to the issuance of a Notice to Proceed for any physical construction work on any Site. No physical construction work shall commence on the Project site(s) until the issuance of the appropriate Notice to Proceed.

4.4.3.2. Substantial Completion. When Provider and DB-Firm consider that the Work at any Site has reached Substantial Completion, Provider shall notify, in writing, the Contract Administrator that the Site is ready for inspection. The Contract Administrator and County Consultant shall inspect the Work at that Site within thirty (30) calendar days of notice by Provider. When the Contract Administrator and County Consultant, on the basis of such an inspection, determine that the Design Build Work at the Site is substantially complete, the Contract Administrator will then prepare a Certificate of Substantial Completion. The Certificate of Substantial Completion for each Site shall state the responsibilities of County and Provider for security, maintenance, utilities, damage to the work, and insurance. The Contract Administrator shall develop and DB-Firm shall review the list of all Work yet to be completed at that Site (the "Punch List") to satisfy the requirements of the Contract Documents for Final Completion and to make the work conform and acceptable per the terms of this Agreement. The failure to include on the Punch List any items of corrective work does not alter the responsibility of Provider to complete all of the Design Build Work in accordance with the Design Build Contract Documents. The Certificate of Substantial Completion for each Site shall be executed by the Contract Administrator, Provider, DB-Firm, and DB-Firm's Consultant indicating acceptance of the responsibilities assigned to each in the Certificate.

4.5 Preliminary and Final Acceptance of each System.

4.5.1. Preliminary Acceptance of each System. Within thirty (30) days following completion of installation and integration of each System, including the Radio System and the Microwave System, County shall conduct Preliminary Acceptance testing of the applicable System.

4.5.2. Final Acceptance of the P25 System. Within thirty (30) days following Preliminary Acceptance of all of the component System, including the Radio System and the Microwave System, as well as upon the County Contract Administrator's determination that each of the Sites required for the P25 System have achieved at least Substantial Completion, County shall conduct Final Acceptance testing of the P25 System.

4.5.3. Test Criteria. Both Preliminary Acceptance Testing and Final Acceptance Testing shall test the applicable System, with the assistance of its Enterprise Technology Services ("ETS") to the extent applicable under Broward County Administrative Code Section 22.148, to determine whether the System: (i) properly functions with any applicable operating software; (ii) provides the capabilities stated in this Agreement, the Documentation, and the applicable Specifications; and (iii) meets the Acceptance Criteria (if any) stated in the applicable Statement of Work or as otherwise agreed upon by the parties in writing. In the event of a conflict between the Acceptance Criteria and the Documentation, the Acceptance Criteria shall prevail.

4.5.4. Test Procedures. The testing period shall commence on the first business day after Provider informs County in writing that it has completed the Services required to be performed prior to testing and that the applicable System is ready for testing, and shall continue for a period of up to thirty (30) days. Unless otherwise set forth in the applicable Statement of Work, County shall notify Provider in writing of its Preliminary Acceptance, Final Acceptance, or rejection of the System, or any part thereof, within fifteen (15) days after the end of the testing period, as same may be extended or reset. If County rejects the applicable System, or any part thereof, County shall provide notice identifying the criteria for Preliminary Acceptance or Final Acceptance that the System failed to meet. Following such notice, Provider shall have thirty (30) days to (a) modify, repair, or replace the System or any portion thereof, or (b) otherwise respond to County's notice. If Provider modifies, repairs, or replaces the System or portion thereof, the testing period shall re-commence consistent with the procedures set forth above. In the event Provider fails to remedy the reason(s) for County's rejection of the System, or any part thereof, within ninety (90) days after County's initial notice of rejection, County may elect, in writing, to either accept the applicable System as it then exists or to reject the System. If County elects to reject the System, all sums paid by County for the applicable System shall be reimbursed to County by Provider within 15 days after such election is made. If County elects to accept the System as it then exists (partial acceptance), Provider shall continue to use its best efforts to remedy the items identified in the applicable notice of rejection for an additional period of time as approved by Contract Administrator. If, despite such continuing best efforts, Provider fails to remedy the issue(s) identified by County within a reasonable time as determined by County, then County shall be entitled to deduct from future sums due under the Agreement the value of the rejected portion of the System as mutually determined by the parties. If the parties cannot agree upon such value, County shall obtain a quotation from a third party for the price to remedy the items identified in the notice of rejection (or, if remedy is not commercially reasonable, to replace and provide a System that passes Final Acceptance testing) and Provider shall refund that amount to County within 15 days of notice of such rejection.

4.6 Final Completion of the Design Build Work. Upon receipt of written notice from Provider stating that all items on the Punch List have been completed or corrected for every Site, the Contract Administrator and County Consultant shall promptly inspect the Design Build Work. Successful resolution of the Punch List for all Sites is a condition precedent to Final Completion of the Design Build Work.

4.6.1. As to each Site. Upon receipt of written notice from DB-Firm and DB-Firm's Consultant that the Site is ready for final inspection and stating that the requirements of the Contract Documents have been performed, the Contract Administrator and County Consultant shall, within thirty (30) calendar days, make an inspection thereof. If the Contract Administrator, with concurrence from County Consultant, finds the Design Build Work acceptable for that Site, the requisite documents have been submitted, the requirements of the Design Build Contract Documents have been fully satisfied for that Site, and all conditions of the permits and regulatory agencies have been met, a Certificate of Final Completion shall be issued by the Contract Administrator for that Site for execution by Provider, DB-Firm and DB-Firm's Consultant.

4.6.2. As to the last Site. Upon receipt of written notice from DB-Firm and DB-Firm's Consultant that the Design Build Work at the final Site is ready for final inspection and acceptance, stating that the requirements of the Contract Documents have been performed, including successful completion of the Burn-in Period, the Contract Administrator and County Consultant shall, within thirty (30) calendar days, make an inspection thereof. If the Contract Administrator, with concurrence from County Consultant, finds the Design Build Work acceptable, the requisite documents have been submitted, the requirements of the Design Build Contract Documents have been fully satisfied, and all conditions of the permits and regulatory agencies have been met, a Certificate of Final Completion of the Design Build Work and a Final Certificate of Payment shall be issued by the Contract Administrator for execution by Provider, DB-Firm and DB-Firm's Consultant.

4.6.3. Warranties for each Site as required by the Design Build Contract Documents shall commence on the date of Final Completion of the Work (i.e., Final Completion of all Sites).

4.6.4. Before issuance of the Final Certificate for Payment, DB-Firm shall deliver to the Contract Administrator: a complete release of all claims arising out of this Agreement, or receipts in full in lieu thereof; an affidavit certifying that all suppliers and subcontractors have been paid in full and that all other indebtedness connected with the Work has been paid, or a consent of the surety to final payment; the final corrected as-built drawings; and the final bill of materials, if required, and invoice. The final payment package is to include the certification document titled "Final List of Non-Certified Subcontractors and Suppliers" Form, which must be signed and notarized by DB-Firm. A list of all non-certified sub-vendors used must be attached to this certified document.

4.6.5. If, after the Work has been substantially completed, Final Completion of the Work is materially delayed through no fault of Provider or the DB-Firm, and Contract Administrator so certifies, County shall, and without terminating this Agreement, make payment of the balance

due for that portion of the Work fully completed and accepted. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

4.6.6. The acceptance of final payment shall constitute a waiver of all claims by DB-Firm, except those previously made in strict accordance with the provisions hereof and identified by DB-Firm as unsettled at the time of the application for final payment.

4.7 Liquidated Damages. Liquidated damages are hereby fixed and agreed upon between the Parties as set below, recognizing the impossibility of precisely ascertaining the amount of damages that will be sustained by County as a consequence of such delay, and both Parties desiring to obviate any question of dispute concerning the amount of said damages and the cost and effect of the failure of Provider to complete each System, the inability to continue to operate and maintain each Site, and the failure to complete the P25 System on time. These amounts are not penalties but liquidated damages to County for its inability to obtain full beneficial use of the P25 System. For purposes of this paragraph, any delays caused by County prior to Final Acceptance or Final Completion shall extend the deadline for the affected System(s) by the same number of days as the delay caused by County. The liquidated damages stated herein are cumulative, unless waived by County Contract Administrator, and shall be continuing until remedied. The total liquidated damages charged to Provider under this Section 4.7 shall not exceed ten percent (10%) of the System Total as set forth on Exhibit B.

4.7.1. Damages for Failure to Achieve Substantial Completion. Upon failure of Provider to achieve Substantial Completion of any Site within the time periods specified in the applicable Project Schedule (plus approved extensions, if any), Provider shall pay to County liquidated damages in the amount of $250 for each calendar day after the time specified in the Project Schedule.

4.7.2. Operation and Maintenance of Sites During Construction. Upon failure of Provider to meet the operating and maintenance criteria set forth in Exhibit A-2 for any Site, Provider shall pay to County liquidated damages in the amount as stated in Exhibit A-2 (if none stated, then the amount of $100) for each occurrence or series of occurrences of operating or maintenance failure.

4.7.3. Damages for Failure to Achieve Milestones or Final Acceptance. If any System fails to achieve the milestones stated below, Provider shall pay to County liquidated damages in the amount of $2,500 for each calendar day by which the date of the achievement of the applicable milestone exceeds the applicable deadline.

4.7.3.1. Completion of FNE installation at all RF Sites: August 30, 2018
4.7.3.2. Commencement of 30 Day Operational Test: November 21, 2018
4.7.3.3. P25 System Final Acceptance: December 31, 2018

4.7.4. Deduction from Amounts Otherwise Due. County is authorized to deduct any liquidated damages due under this Agreement from monies due Provider for Services or other work under this Agreement or as much thereof as County may, in its sole option and discretion, deem just and reasonable.

4.8 Delivery. Provider shall deliver the Software and Equipment for each System within the time stated in the applicable Statement of Work. Transportation cost and risk, and the cost of delivery, assembly and installation, including any applicable taxes and all actions necessary to integrate the Equipment into County's existing system, shall be the responsibility of Provider, except to the extent (if any) expressly provided in the applicable Statement of Work.

4.9 Use of Completed Portions. County shall have the right at its sole option to take possession of and use any completed or partially completed portions of the Project. Such possession and use shall not be deemed an acceptance of any of the Work not completed in accordance with the Design Build Contract Documents. If such possession and use increases the cost of or delays the Work, DB-Firm shall be entitled to reasonable extra compensation or reasonable extension of time or both, as recommended by Consultant and approved by County.

4.9.1. In the event County takes possession of any completed or partially completed portions of the Project, the following shall occur:

4.9.1.1. County shall give notice to DB-Firm in writing at least thirty (30) calendar days prior to County's intended occupancy of a designated area.

4.9.1.2. DB-Firm shall complete to the point of Substantial Completion the designated area and request inspection and issuance of a Certificate of Substantial Completion from DB-Firm and DB-Firm's Consultant.

4.9.1.3. Upon issuance of a Certificate of Substantial Completion by DB-Firm and DB-Firm's Consultant, County will assume full responsibility for maintenance, utilities, subsequent damages of County and public, adjustment of insurance coverages and start of warranty for the occupied area.

4.9.1.4. DB-Firm shall complete all items noted on the Certificate of Substantial Completion within the time specified by DB-Firm's Consultant on the Certificate of Substantial Completion, as soon as possible and request final inspection and final acceptance of the portion of the Work occupied. Upon completion of final inspection and receipt of an application for final payment, DB-Firm's Consultant shall issue a Final Certificate of Payment relative to the occupied area.

4.9.2. If County finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion thereof, such occupancy or use shall not commence prior to a time mutually agreed upon by County and DB-Firm and to which the insurance company or companies providing the property insurance have consented by endorsement to the policy or policies. Insurance on the unoccupied or unused portion or portions shall not be canceled or

lapsed on account of such partial occupancy or use. Consent of DB-Firm and of the insurance company or companies to such occupancy or use shall not be unreasonably withheld.

4.10 Notification and Claim of Change of Design Build Time or Design Build Price.

4.10.1. Any claim for a change in the Design Build Time or Design Build Price shall be made by written notice delivered by Provider to the Contract Administrator within five (5) calendar days of the commencement of the event giving rise to the claim or knowledge by Provider or DB-Firm of the claim and the notice shall state the general nature and cause of the claim. Thereafter, within twenty (20) calendar days of the termination of the event giving rise to the claim or knowledge of the claim, written notice of the extent of the claim with supporting information and documentation shall be submitted to the Contract Administrator (hereinafter "Claim Notice"). The Claim Notice shall include Provider's or DB-Firm's written notarized certification that the adjustment claimed is the entire adjustment to which Provider or DB-Firm has reason to believe it is entitled as a result of the occurrence of said event. If the Contract Administrator and Provider cannot resolve a claim for changes in the Design Build Time or Design Build Price as set forth in a proper Claim Notice within twenty (20) calendar days after receipt by the Contract Administrator, then Provider shall submit the claim to County Administrator within five (5) calendar days from the date of impasse in accordance with Section 14.29. **IT IS EXPRESSLY AND SPECIFICALLY AGREED THAT ANY AND ALL CLAIMS FOR CHANGES TO THE DESIGN BUILD TIME OR DESIGN BUILD PRICE SHALL BE WAIVED IF NOT SUBMITTED IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF THIS SECTION.**

4.10.2. The Design Build Time will be extended in an amount equal to time lost on critical Work items due to delays beyond the control of and through no fault or negligence of Provider or DB-Firm if a claim is made therefore as provided in Section 4.10.1. Such delays shall include, but not be limited to, acts or neglect by any separate contractor employed by County, fires, floods, labor disputes, epidemics, abnormal weather conditions, or acts of God.

4.11 No Damages for Delay. No claim for damages or any claim, other than for an extension of time, shall be made or asserted against County by reason of any delays except as provided herein. Provider or DB-Firm shall not be entitled to an increase in the Design Build Price or payment or compensation of any kind from County for direct, indirect, consequential, impact or other costs, expenses or damages, including, but not limited to, costs of acceleration or inefficiency, arising because of delay, disruption, interference or hindrance from any cause whatsoever, whether such delay, disruption, interference or hindrance be reasonable or unreasonable, foreseeable or unforeseeable, or avoidable or unavoidable; provided, however, that this provision shall not preclude recovery of damages by Provider or DB-Firm for actual delays due solely to fraud, bad faith or active interference on the part of County. Otherwise, Provider and DB-Firm shall be entitled only to extensions of the Design Build Time as the sole and exclusive remedy for such resulting delay, in accordance with and to the extent specifically provided above.

4.12 Excusable Delay: Compensable and Non-Compensable.

4.12.1. Excusable Delay: Delay which extends the completion of the Work and which is caused by circumstances beyond the control of Provider or its Subcontractors is Excusable Delay. Provider is entitled to a time extension of the Design Build Time for each day the Work is delayed due to Excusable Delay. Provider shall document its claim for any time extensions as provided in Section 4.10 hereof. Failure of Provider to comply with Section 4.10 as to any particular event of delay shall be deemed conclusively to constitute a waiver, abandonment or relinquishment of any and all claims resulting from that particular event of delay.

4.12.2. Compensable Excusable Delay. Excusable Delay is only compensable when (i) the delay extends the Design Build Time, (ii) is caused by circumstances beyond the control of Provider or its Subcontractors, and (iii) is caused solely by fraud, bad faith, or active interference on the part of County or its agents. In no event shall Provider or DB-Firm be compensated for interim delays which do not extend the Design Build Time. Provider and DB-Firm shall only be entitled to direct costs for Compensable Excusable Delay. Direct costs recoverable by Provider or DB-Firm shall be limited to the actual additional costs allowed pursuant to Section 4.10 herein.

4.12.3. Non-Compensable Excusable Delay. When Excusable Delay is (i) caused by circumstances beyond the control of Provider or its Subcontractors, and is also caused by circumstances beyond the control of County, or (ii) is caused jointly or concurrently by Provider or its subcontractors, suppliers, or vendors and by County, then Provider shall be entitled only to a time extension and no further compensation for the delay.

ARTICLE 5. COMPENSATION

5.1 For the duration of the Agreement, County will pay Provider in accordance with the Payment Schedule (Exhibit B) up to the following maximum amount(s):

Services/Goods	Term	Not-To-Exceed Amount
P25 System Implementation (including Radio System, Microwave System, and Facilities and Infrastructure System)	From Effective Date to Final Acceptance	$30,400,000
Additional Training	Initial Term (10 years)	$200,000
Support and Maintenance Services	Initial Term (10 years)	$11,000,000
Optional renewal terms	First 5 year renewal term Second 5-year renewal term	$7,100,000 (includes $100,000.00 for additional training) $8,300,000 (includes $100,000.00 for additional training)

Services/Goods	Term	Not-To-Exceed Amount
Optional Services	Duration of the Agreement (inclusive of any renewals)	$2,500,000
TOTAL NOT TO EXCEED		**$59,500,000**

Payment shall be made only for work actually performed and completed pursuant to this Agreement or as otherwise set forth in Exhibit B (Payment Schedule), which amount shall be accepted by Provider as full compensation for all such work. Provider acknowledges that the amounts set forth herein are the maximum amounts payable for the respective terms and constitute a limitation upon County's obligation to compensate Provider for its work under this Agreement. These maximum amounts, however, do not constitute a limitation of any sort upon Provider's obligation to perform all items of work required under this Agreement. Unless otherwise expressly stated in this Agreement, Provider shall not be reimbursed for any expenses it incurs under this Agreement.

5.2 Method of Billing and Payment

5.2.1 Invoices. Provider may submit invoices only for goods provided and services completed in accordance with the Payment Schedule set forth in Exhibit B. Unless otherwise indicated in Exhibit B, an original plus one copy of each invoice must be submitted within fifteen (15) days after the end of the month for which payment is sought, except that the final invoice must be submitted no later than sixty (60) days after all services are completed. Provider shall submit with each invoice a Certification of Payments to Subcontractors and Suppliers on the form provided by County, as may be modified in County's reasonable discretion. If applicable, the certification shall be accompanied by a copy of the notification sent to each subcontractor and supplier listed in item 2 of the certification form, explaining the good cause why payment has not been made. Unless otherwise stated in Exhibit B or the applicable Work Authorization, any Optional Services shall be invoiced in accordance with the existing invoicing schedule for any like goods or services provided under this Agreement, including (if applicable) invoiced pro rata for the initial invoice period.

5.2.2 Payments. County shall pay Provider within thirty (30) days of receipt of Provider's proper invoice, as required by the "Broward County Prompt Payment Ordinance" (Broward County Ordinance No. 89-49). Payment shall be made to Provider at the most recent address designated under the "Notices" provision of this Agreement. To be deemed proper, an invoice must comply with all requirements set forth in this Agreement and must be submitted pursuant to any instructions prescribed by the Contract Administrator. County shall have the right to withhold payment of the invoice based on Provider's failure to comply with any term, condition, or requirement of this Agreement. The parties hereto agree that any amounts so withheld shall not be subject to payment of any interest by County.

5.2.3 Unless a shorter period is required under applicable law or under the applicable contract, Provider shall pay its CBE subcontractors and suppliers within fifteen (15) days following

receipt of payment from County and shall pay all other subcontractors and suppliers within thirty (30) days following receipt of payment from County.

5.2.4 County may withhold, in whole or in part, payment to such extent as may be necessary to protect itself from loss on account of:

5.2.4.1 Defective work not remedied;

5.2.4.2 Claims filed or reasonable evidence indicating probable filing of claims by other parties against Provider, DB-Firm or County because of Provider's or DB-Firm's performance;

5.2.4.3 Failure of Provider or DB-Firm to make payments properly to Subcontractors, or for material or labor;

5.2.4.4 Damage to another subcontractor not remedied;

5.2.4.5 Liquidated damages;

5.2.4.6 County Consultant fees for engineering review of subsequent re-submittal of design related documents beyond the first re-submittal; or

5.2.4.7 Failure of Provider or DB-Firm to provide any and all documents required by the Design Build Contract Documents.

When the above grounds are removed, resolved, or settled to the satisfaction of the Contract Administrator, payment shall be made in whole or in part.

5.3 Permits, Licenses and Impact Fees. Provider shall secure and pay for all permits, licenses, and approvals necessary to construct the Project. Except as otherwise provided by the Design Build Contract Documents, all trade permits, sub-permits, and licenses required by federal, state, or local laws, rules and regulations necessary for the prosecution of the Work undertaken by Provider or any Subcontractor pursuant to this Agreement shall be secured and paid for by Provider or the Subcontractor. It is Provider's responsibility to have and maintain appropriate Certificate(s) of Competency, valid for the Work to be performed and valid for the jurisdiction in which the Work is to be performed for all persons working on the Project for whom a Certificate of Competency is required. Impact fees levied by any municipality shall be paid by Provider. Provider shall be reimbursed only for the actual amount of the impact fee levied by the municipality as evidenced by an invoice or other acceptable documentation issued by the municipality. In no event shall reimbursement to Provider in include profit or overhead of any Subcontractor.

5.4 Travel. With respect to travel costs and travel-related expenses, Provider and its Subcontractors shall adhere to Section 112.061, Florida Statutes, except to the extent, if any, that

Exhibit B expressly provides to the contrary. County shall not be liable for any such expenses that have not been approved in advance, in writing, by County.

5.5 Fixed Pricing. Prices set forth in Exhibit B shall remain firm and fixed for the term of the Agreement, including any option terms. However, Provider may offer incentive or volume discounts to County at any time.

5.6 Other Eligible Purchasers. Municipalities, other County agencies, the Broward Sheriff's Office, other special districts within Broward County, or any Authorized Third Party User (collectively, each an "Eligible Purchaser") may purchase Subscriber Equipment or Subscriber Equipment Maintenance as set forth on Exhibit A-4 under the terms of this Agreement (other than Sections 12.4 through 12.8 relating to CBEs) at the pricing set forth on Exhibit A-4, provided that said Eligible Purchaser is solely responsible for all payment and performance with respect to any such purchased Subscriber Equipment or Subscriber Equipment Maintenance. County shall not be responsible for any costs, liabilities, charges, or services relating to Subscriber Equipment or Subscriber Equipment Maintenance that may be elected or purchased by Eligible Purchasers.

ARTICLE 6. WARRANTIES

6.1 Ownership and License Rights. Provider represents and warrants that except as to third-party software licensed under this Agreement, Provider it is the owner of all right, title, and interest in and to the Equipment and other property being sold or provided to County under this Agreement, that it has the right to sell and provide such Equipment and other property to County, and that such sale is free and clear of any lien or interest of any other person or entity. Provider further represents and warrants that it has the right to grant to County the rights and the licenses granted under this Agreement as to the Software (including as to third party software licensed under this Agreement) and System. Provider warrants that it has not knowingly granted rights or licenses to any other person or entity that would restrict rights and licenses granted hereunder, except as may be expressly stated herein.

6.2 System Warranty. Provider represents and warrants to County that for a period of one (1) year from the date of Final Acceptance, the System will perform substantially as described in the Documentation and the Statement of Work (Exhibit A), will be free from defects in workmanship and material, and will have all of the qualities and features and be capable of performing all of the functions described in the Documentation and Statement of Work. This warranty shall not cover any failure of the System resulting from (a) use of the System in other than the manner for which it was intended; or (b) modification of the System by County not authorized by Provider.

6.3 Warranty Regarding Viruses. Provider further represents, warrants, and agrees that the System and any software or firmware provided under this Agreement are free from currently-known viruses or malicious software (at the time the System and any subsequent version thereof is provided to County), and that Provider has and will continue, for the full term of this Agreement, to use commercially reasonable security measures to ensure the integrity of such

software and firmware from data leaks, hackers, denial of service attacks, and other unauthorized intrusions.

6.4 Intellectual Property Warranty. Provider represents and warrants that at the time of entering into this Agreement, no claims that allege that any part of the System or other property provided to County under this Agreement infringes or misappropriates any patent, copyright, mask copyright, or any trade secret or other intellectual or proprietary right of a third party have been adjudicated adversely to Provider, and that Provider is unaware of any such potential or pending claim that is reasonably expected to impact County's ability to use the Software or System provided under this Agreement. Provider also agrees, represents and warrants that the P25 System (and all components thereof) and Services to be provided pursuant to this Agreement will not infringe or misappropriate any patent, copyright, mask copyright or any trade secret or other intellectual or proprietary right of a third party. If any Equipment, Software, or portion of the P25 System is finally adjudged to infringe, or in Provider's opinion is likely to become the subject of such a Claim, Provider shall, at County's option, either: (i) procure for County the right to continue using the applicable portion of the System; (ii) modify or replace the System (in part or in whole) to make it noninfringing; or (iii) refund to County all fees paid for the applicable System and for Services relating to that System under this Agreement. Provider shall have no liability regarding any infringement claim caused by any County modification of the System not authorized by Provider or the Documentation.

6.5 Quality of Performance and Materials. Provider represents and warrants that all services provided under this Agreement will be performed by a person duly qualified and sufficiently experienced to perform such services and, where required, licensed by all appropriate governmental authorities in the applicable area(s). Provider agrees that all services under this Agreement shall be performed in a skillful and respectful manner, and that the quality of all such services shall meet or exceed prevailing industry and professional standards for such services. Provider represents and warrants that all materials, Equipment, and products furnished pursuant to this Agreement shall be of good quality and free from defective or inferior workmanship.

Provider warrants to County that all materials and equipment under this Agreement will be new unless otherwise specified and that all of the Work will be of good quality, free from faults and defects, and in conformance with the applicable requirements under this Agreement. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Contract Administrator, Provider shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

Any items found not to be in conformance with the foregoing and with the Documentation or applicable specifications (if any) in this Agreement shall be replaced by Provider at no additional cost to County. If requested by County's Contract Administrator, Provider shall develop and utilize a quality assurance plan approved by County to ensure the appropriate quality of the work and materials provided under this Agreement.

6.6 Remedy for Breach of Warranty. In the event of written notice from County of a breach of warranty, Provider shall, at no charge to County, promptly correct the warranty breach including, when required, by (a) correcting, updating or replacing the Software, Equipment or Services, or (b) repairing the affected Equipment, or (c) providing to County other measures that correct the breach. In addition, upon notice from County of any warranty breach or other error or defect in the P25 System, Provider will immediately provide to County any known reasonable methods of operating the System in a manner that eliminates the adverse effects of the error or defect. If Provider is unable to correct a material breach of this Article within a reasonable period of time not to exceed ten (10) business days, County shall be entitled to cancel the Agreement as to the applicable nonconforming Software, Equipment, or Services, and receive a full refund of all amounts paid to Provider for the nonconforming portion of the System(s) (including any other portion of the applicable System(s) for which functionality is adversely affected by the nonconformance and all amounts paid for Services relating thereto), and Provider shall arrange for the removal and return of the applicable Equipment at Provider's expense. In the event of replacement of any of the Software, Equipment or Services, the replacement Software, Equipment or Services will be warranted as provided above from the date of replacement. The remedies in this Section are in addition to any other rights and remedies County may have under this Agreement or applicable law.

6.7 Additional Rights as to Defective Work. In addition to the foregoing, the Contract Administrator shall have the authority to reject or disapprove Work which it finds to be defective. If required by the Contract Administrator, Provider shall promptly either correct all defective work or remove such defective work and replace it with non-defective work. Provider shall bear all direct, indirect, and consequential costs of such removal or corrections including cost of testing laboratories and personnel. Should Provider fail or refuse to remove or correct any defective work or to make any necessary repairs in accordance with the requirements of the Design Build Contract Documents within the time indicated in writing by the Contract Administrator, County shall have the authority to cause the defective work to be removed or corrected, or make such repairs as may be necessary at Provider's expense. Any expense incurred by County in making such removals, corrections, or repairs, shall be paid for out of any monies due or which may become due to Provider, or may be charged against the Performance Bond. In the event of failure of Provider to make all necessary repairs promptly and fully, County may declare Provider in default.

If, within one (1) year after the date of Final Completion of the each Site, or such longer period of time as may be prescribed by the terms of any applicable special warranty required by the Contract Documents, or by any specific provision of the Design Build Contract Documents, any of the Work is found to be defective or not in accordance with the Design Build Contract Documents, Provider, after receipt of written notice from County, shall promptly correct such defective or nonconforming Work within the time specified by County, without cost to County to do so. Nothing contained herein shall be construed to establish a period of limitation with respect to any other obligation which Provider might have under the Design Build Contract Documents, including, but not limited to, any claim regarding latent defects. Failure to reject any defective

work or material shall not in any way prevent later rejection when such defect is discovered, or obligate County to Final Acceptance.

ARTICLE 7. DELIVERY, DOCUMENTATION AND PERFORMANCE AND PAYMENT BOND

7.1 Software. Unless otherwise stated in Exhibit A, Provider shall, within seven (7) days after the Effective Date, make the Software available to County and, unless the Software is embedded in equipment, deliver to County a master copy of the Software licensed hereunder in object code form, suitable for reproduction in accordance with this Agreement, in electronic files unless otherwise requested by County. All County license keys, usernames, and passwords shall be authenticated by Provider and perform according to Exhibit A (Statement of Work).

7.2 Documentation. Provider shall deliver copies of the Documentation to County concurrently with delivery of the applicable Equipment and Software, and thereafter shall promptly provide any updated Documentation as it becomes available during the term of this Agreement. Provider represents and warrants that the Documentation is sufficiently comprehensive and of sufficient quality to enable a competent user to operate the applicable portions of the System efficiently and in accordance with Exhibit A. County has the right to copy and modify the Documentation as it deems necessary for its own internal use.

7.3 Performance and Payment Bond. Within fifteen (15) calendar days of the Effective Date of this Agreement, Provider shall furnish a Performance and Payment Bond containing all the provisions of the Performance Bond and Payment Bond Forms attached to this Agreement.

7.3.1 Each Bond shall be in the amount of one hundred percent (100%) of the total amount of the Agreement (excluding Optional Services and Support and Maintenance) guaranteeing to County the completion and performance of the Work covered in this Agreement as well as full payment of all suppliers, laborers, or subcontractors employed pursuant to this Project. Each Bond shall be with a surety company which is qualified pursuant to Section 7.5. Each bond shall be increased in the amount of any change to the total amount paid under the Agreement (excluding Optional Services and Support and Maintenance).

7.3.2 The value of each bond shall be reduced as the one (1) year warranty period expires for each Site, to correspond in value to one hundred percent (100%) of the Construction Cost of the remaining Sites, or an additional bond shall be conditioned that Provider will, upon notification by County, correct any defective or faulty work or materials which appear within one (1) year after Final Completion of each Site.

7.3.3 Pursuant to the requirements of Section 255.05(1)(a), Florida Statutes, Provider shall ensure that the bond(s) referenced above shall be recorded in the public records of Broward County and provide County with evidence of such recording.

7.4 Alternate form of Security: In lieu of a Performance and a Payment Bond, Provider may furnish alternate forms of security which may be in the form of cash, money order, certified

check, cashier's check, or unconditional letter of credit. Such alternate forms of security shall be subject to the approval of County and for same purpose and shall be subject to the same conditions as those applicable above and shall be held by County for one (1) year after Final Completion and acceptance of the last remaining Site.

7.5 Qualifications of Surety. Each bond must be executed by a surety company of recognized standing, authorized to do business in the State of Florida as surety, having a resident agent in the State of Florida, and having been in business with a record of successful continuous operation for at least five (5) years. The surety company shall hold a current certificate of authority as acceptable surety on federal bonds in accordance with United States Department of Treasury Circular 570, Current Revisions. If the amount of the Bond exceeds the underwriting limitation set forth in the circular, in order to qualify, the net retention of the surety company shall not exceed the underwriting limitation in the circular, and the excess risks must be protected by coinsurance, reinsurance, or other methods in accordance with Treasury Circular 297, revised September 1, 1978 (31 CFR Section 223.10, Section 223.111). Further, the surety company shall provide County with evidence satisfactory to County, that such excess risk has been protected in an acceptable manner.

County will accept a surety bond from a company in accordance with the requirements set forth below, provided, however, that if any surety company appears on the watch list that is published quarterly by Intercom of the Office of the Florida Insurance Commissioner, County shall review and either accept or reject the surety company based on the financial information available to County. A surety company that is rejected by County may be substituted by Provider with a surety company acceptable to County, only if the Agreement price does not increase. The following sets forth, in general, the acceptable parameters for bonds:

Amount of Bond	Policy Holder's Ratings	Financial Size Category
500,001 to 1,000,000	A, A-	Class I
1,000,001 to 2,000,000	A ,A-	Class II
2,000,001 to 5,000,000	A	Class III
5,000,001 to 10,000,000	A	Class IV
10,000,001 to 25,000,000	A	Class V
25,000,001 to 50,000,000	A	Class VI
50,000,001 or more	A	Class VII

ARTICLE 8. PROTECTION OF SOFTWARE AND PROPRIETARY RIGHTS

8.1 County Proprietary Rights. Provider acknowledges and agrees that County retains all rights, title and interest in and to all materials, data, documentation and copies thereof furnished by County to Provider hereunder, including all copyright and other proprietary rights therein, which Provider as well as its employees, agents, Subcontractors, and suppliers may use only in connection with the performance of Services or Support and Maintenance Services under this

Agreement. Motorola, the third party manufacturer of any Equipment, and the copyright owner of any third-party Software own and retain all of their respective proprietary rights in the Equipment and Software. All intellectual property developed, originated, or prepared by Motorola in connection with providing the Equipment, Software, or Services under this Agreement remain vested exclusively in Motorola or the applicable third party manufacturer or licensor, and this Agreement does not grant County any shared development rights of intellectual property or source code.

8.2 Ownership. Except for custom work products, if any, County acknowledges that all copies of the Software (in any form) provided by Provider are the sole property of Provider or the applicable third-party licensor. County shall not have any right, title, or interest to any such Software or copies thereof except as expressly provided in this Agreement, and shall take all reasonable steps to secure and protect all Software consistent with maintenance of Provider's proprietary rights therein.

8.3 Custom Work Products. To the extent this Agreement (including in the Statement of Work, any subsequent Work Authorization, any amendment, or the procurement documents relating to this Agreement) expressly identifies any deliverables as custom work products that Provider is to develop and furnish, the parties agree that County shall own all rights, title, and interest in and to all such custom work products and that they shall be deemed to constitute "works made for hire" under the United States Copyright Act, 17 U.S.C. § 101. If, for any reason, any custom work product would not be considered a "work made for hire" under applicable law, Provider hereby exclusively and irrevocably sells, assigns, and transfers to County all of Provider's rights, title, and interest in and to such custom work product and in and to any copyright or copyright application(s) related thereto. Provider agrees that neither it nor its agents shall use or disclose any custom work product except for County's benefit as required in connection with Provider's performance under this Agreement, unless Provider has obtained County's prior written consent to such use or disclosure. "Custom work product" shall not include any software, copyrighted material, or other proprietary material developed by Provider or any third party prior to the Effective Date, but shall include any modification(s) thereof developed pursuant to this Agreement. To the full extent applicable, Provider shall provide County with the source code and object code for all custom work products upon Final Acceptance of the Software or System, or within thirty (30) calendar days after written request by the Contract Administrator, whichever occurs first.

ARTICLE 9. CONFIDENTIAL INFORMATION, SECURITY AND ACCESS

9.1 Public Records Law. As a political subdivision of the State of Florida, County is subject to Florida's Public Records Law, Chapter 119 of the Florida Statutes. Notwithstanding anything else in this Agreement, any action taken by County in compliance with, or in a good faith attempt to comply with, the requirements of Chapter 119 shall not constitute a breach of this Agreement.

9.2 Provider Confidential Information. Provider represents that the Software contains proprietary products and trade secrets of Provider. Any other material submitted to County by

Provider that Provider represents constitutes or contains trade secrets or is otherwise exempt from production under Florida public records laws (including Florida Statutes Chapter 119) must be segregated and conspicuously labeled "EXEMPT FROM PUBLIC RECORD PRODUCT – TRADE SECRET." Provider's Software and properly designated trade secret materials constitute "Provider Confidential Information." To the full extent permissible under applicable law, County agrees to treat Provider Confidential Information as confidential in accordance with this Section unless otherwise ordered by a court of competent jurisdiction. Provider must, simultaneous with the production of any Provider Confidential Information other than the Software, provide a sworn affidavit from a person with personal knowledge attesting that the Provider Confidential Information constitute trade secrets under Florida Statutes Section 812.081 and stating the factual basis for same. In the event that a third party submits a request to the County for Provider Confidential Information, the County shall refrain from disclosing the Provider Confidential Information, unless otherwise ordered by a court of competent jurisdiction or authorized in writing by the Provider. Provider shall indemnify and defend County and its employees and Authorized Third Party Users from any and all claims, causes of action, losses, fines, penalties, damages, judgments and liabilities of any kind, including attorneys' fees, litigation expenses, and court costs, relating to the non-disclosure of any Provider Confidential Information in response to a records request by a third party.

9.3 County Confidential Information.

9.3.1 All materials, data, transactions of all forms, financial information, documentation, inventions, designs, and methods that Provider obtains from County in connection with this Agreement, that are made or developed by Provider in the course of the performance of the Agreement, or in which County holds proprietary rights, constitute "County Confidential Information."

9.3.2 All County-provided employee information, financial information, and personally identifiable information for individuals or entities interacting with County (including, without limitation, social security numbers, birth dates, banking and financial information, and other information deemed exempt or confidential under state or federal law) also constitute County Confidential Information.

9.3.3 County Confidential Information may not, without the prior written consent of County, or as otherwise required by law, be used by Provider or its employees, agents, Subcontractors or suppliers for any purpose other than for the benefit of County pursuant to this Agreement. Neither Provider nor its employees, agents, Subcontractors or suppliers may sell, transfer, publish, disclose, display, license or otherwise make available to any other person or entity any County Confidential Information without the prior written consent of County. Provider shall not, under any circumstances, cause or allow any County Confidential Information to be accessed by, transmitted or stored to any location outside the continental United States, Alaska and Hawaii, without prior written authorization from the Contract Administrator. Provider shall ensure that all County Confidential Information stored, maintained or transmitted by Provider is encrypted using AES 256 or equivalent at all times, whether at rest or in motion.

9.3.4 Provider expressly agrees to be bound by and to defend, indemnify and hold harmless County and its officers and employees from the breach of any federal, state or local law by Provider or its employees, agents, Subcontractors or suppliers regarding the unlawful use or disclosure of County Confidential Information.

9.3.5 Upon expiration or termination of this Agreement, or as otherwise demanded by County, Provider shall immediately turn over to County all County Confidential Information, in any form, tangible or intangible, possessed by Provider or its employees, agents, Subcontractors or suppliers.

9.4 Maintenance of Confidential Information. Each party shall advise its employees, agents, Subcontractors, and suppliers who receive or otherwise have access to the other party's Confidential Information of their obligation to keep such information confidential, and shall promptly advise the other party in writing if it learns of any unauthorized use or disclosure of the other party's Confidential Information. In addition, the parties agree to cooperate fully and provide reasonable assistance to ensure the confidentiality of the other party's Confidential Information.

9.5 Security and Access. Provider will cooperate with County and provide any and all information that County may request in order to determine appropriate security and network access restrictions and verify Provider's compliance with County security standards. Any access by Provider to any aspect of the County's network must comply at all times with all applicable County access and security standards, as well as any other or additional restrictions or standards for which County provides written notice to Provider. If at any point in time County, in the sole discretion of its Chief Information Officer, determines that Provider's access to any aspect of the County's network presents an unacceptable security risk, County may immediately suspend or terminate Provider's access and, if the risk is not promptly resolved to the reasonable satisfaction of the County's Chief Information Officer, may terminate this Agreement or any applicable Work Authorization upon ten (10) business days' notice (including, without limitation, without restoring any access to the County network to Provider).

9.6 Data and Privacy. Provider shall comply with all applicable data and privacy laws and regulations, including without limitation the Florida Information Protection Act of 2014, Florida Statutes Section 501.171. Provider may not sell, market, publicize, distribute, or otherwise make available to any third party any personal identification information (as defined by Florida Statutes Section 817.568 or Section 817.5685) that Provider may receive or otherwise have access to in connection with this Agreement, unless expressly authorized in advance by County. If and to the extent requested by County, Provider shall ensure that all hard drives or other storage devices and media that contained County data have been wiped in accordance with the then-current best industry practices, including without limitation DOD 5220.22-M, and that an appropriate data wipe certification is provided to the satisfaction of the Contract Administrator.

9.7 Injunctive Relief. The parties represent and agree that neither damages nor any other legal remedy is adequate to remedy any breach of this Article, and that the injured party shall therefore be entitled to injunctive relief to restrain or remedy any breach or threatened breach.

9.8 Survival. The obligations under this Article 9 shall survive the termination of this Agreement or of any license granted under this Agreement.

ARTICLE 10. INDEMNIFICATION AND LIMITATION OF LIABILITY

10.1 Indemnification. Provider shall be fully liable for the actions of its current and former officers, employees, subcontractors and other agents under this Agreement. Provider shall at all times hereafter indemnify, hold harmless and defend County and all of County's current and former officers and employees and Authorized Third Party Users (collectively, "Indemnified Party") from and against any and all lawsuits, causes of action, demands, claims, losses, fines, penalties, damages, judgments, liabilities and expenditures of any kind, including attorneys' fees, litigation expenses, and court costs (collectively, "Claim"), raised or asserted by any person or entity that is not a party to this Agreement, which Claim is caused or alleged to be caused, in whole or in part, by any intentional, reckless, or negligent act or omission of Provider or any current or former officer, employee, Subcontractor or other agent of Provider, arising from, relating to, or in connection with any obligation or performance under this Agreement. In the event any Claim is brought against an Indemnified Party, Provider shall, upon written notice from County, defend each Indemnified Party against each such Claim through counsel reasonably satisfactory to County (approval of which shall not be unreasonably withheld). The provisions and obligations of this Section shall survive the expiration or earlier termination of this Agreement. Motorola will have no duty to defend or indemnify for any Claim for intellectual property infringement that is based upon: (a) the combination of the Motorola Equipment with any software, apparatus or device not furnished or approved by Motorola or otherwise specified in the Documentation or Specifications as compatible; (b) use of the Motorola Equipment in a manner for which the Motorola Equipment was not designed or that is inconsistent with the terms of this Agreement; or (c) the failure by County to install an enhancement release to the Software that is intended to correct the claimed infringement for which notice was provided to County that installation was necessary to avoid infringement. In no event will Motorola's liability resulting from its indemnity obligation to County extend in any way to County's revenues derived from user fee royalties payable to the County on a per use basis to the County. In addition, Provider's duties to defend and indemnify are conditioned upon: County promptly notifying Provider in writing of the Claim; Provider having sole control of the defense of the suit and all negotiations for its settlement or compromise; and County providing to Provider cooperation and, if requested by Provider, reasonable assistance in the defense of the Claim.

10.2 Limitation of Liability. Neither Provider nor County shall be liable to the other party for any damages under this Agreement that exceed the largest of the following amounts: (a) $100,000; (b) twice the maximum compensation amount specified in Section 5.1; or (c) the amount of insurance Provider is required to provide under Article 11. Neither party shall be liable for the other party's special, indirect, punitive, or consequential damages (including damages

resulting from lost data or records other than costs incurred in the recovery thereof), even if the party has been advised that such damages are possible, or for the other party's lost profits, lost revenue, or lost institutional operating savings. These limitations of liability shall not apply to (i) any Claim resulting from Provider's actual or alleged disclosure of County Confidential Information or resulting from an actual or alleged data breach in violation of applicable law, (ii) any Claim resulting from an actual or alleged infringement of any interest in any intellectual property, or (iii) any indemnification obligation under this Agreement.

10.3 Third Party Pass Thru Rights. Provider shall extend to County all rights and benefits Provider has from any third party as to the Equipment or Software as to any warranty or infringement claim, including any and all indemnification and hold harmless rights, to the extent permitted under any applicable agreement with the third party equipment or software supplier or otherwise available to Provider. Provider shall at all times use all reasonable efforts to cooperate with County in the event of a third party claim involving any part of the P25 System.

ARTICLE 11. INSURANCE

11.1 Provider shall maintain at its sole expense, on a primary basis, at all times during the term of this Agreement (unless a different time period is stated herein), at least the minimum insurance coverage designated in Exhibit D in accordance with the terms and conditions stated in this Article.

11.2 Such policies shall be issued by companies authorized and licensed to transact business in the State of Florida, with a minimum AM Best financial rating of A-, unless otherwise approved in writing by County. If any deductible amounts are permitted in Exhibit D, Provider shall be responsible for the payment of all such deductible amounts.

11.3 Provider agrees to include County as an additional insured under Provider's commercial liability insurance policy and any excess liability insurance policy. The listed certificate holder on all required policies shall be "Broward County."

11.4 Coverage shall be provided on forms no more restrictive than the latest edition of the applicable forms filed by the Insurance Services Office.

11.5 Provider shall notify County in writing within thirty (30) days after Provider learns of any claim against Provider's professional liability insurance policy in which damages claimed plus defense costs incurred to date exceed $250,000.

11.6 Within fifteen (15) days of execution of this Agreement, Provider shall provide County with proof of insurance in the form of Certificate(s) of Insurance and applicable endorsements. Failure to timely provide acceptable proof of insurance, as determined by County, shall entitle County to terminate this Agreement without any liability to Provider.

11.7 Provider must provide County with at least thirty (30) days' written notice of expiration, cancellation, or restriction of any coverage required under this Article. Provider shall provide certified copies of any required policy to County upon County's request.

11.8 If Provider subcontracts any work under this Agreement, Provider shall require that each subcontractor names County as an additional insured under the subcontractor's general liability insurance policy and any excess liability insurance policy.

ARTICLE 12. EEO and CBE COMPLIANCE

12.1 Nondiscrimination. Provider may not discriminate on the basis of race, color, sex, religion, national origin, disability, age, marital status, political affiliation, sexual orientation, pregnancy, or gender identity and expression in the performance of this Agreement, except that any project assisted by U.S. Department of Transportation funds shall comply with the nondiscrimination requirements in 49 C.F.R. Parts 23 and 26. Provider shall include substantially similar language in its contracts with any and all permitted subcontractors providing goods or services under this Agreement.

12.2 Failure by Provider to carry out any of the requirements of this Article shall constitute a material breach of this Agreement, which shall permit County to terminate this Agreement or to exercise any other remedy provided under this Agreement, Broward County Code of Ordinances, Broward County Administrative Code, or under other applicable law, all such remedies being cumulative.

12.3 Provider shall comply with all applicable requirements of the County's CBE Program as established by Broward County Business Opportunity Act of 2012, Section 1-81, Broward County Code of Ordinances (the "Act"), in performing this Agreement. Provider acknowledges that the Board, acting through the Office of Economic and Small Business Development ("OESBD"), may make minor administrative modifications to the CBE Program which shall become applicable to this Agreement if the administrative modifications are not unreasonable. Written notice of any such modification shall be provided to Provider and shall include a deadline for Provider to notify County if Provider concludes that the modification exceeds the authority of this Section of this Agreement. Failure of Provider to timely notify County of its conclusion that the modification exceeds such authority shall be deemed acceptance of the modification by Provider.

12.4 Provider will meet the following CBE participation goal by utilizing the CBE firms for the following percentage of Services under this Agreement:

CBE participation goal	15% or as otherwise approved by OESBD

Provider stipulates that each CBE firm utilized to meet the CBE participation goal must be certified by the OESBD. Provider shall inform County immediately when a CBE firm is not able to perform or if Provider believes the CBE firm should be replaced for any other reason, so that the

OESBD may review and verify the good faith efforts of Provider to substitute the CBE firm with another CBE firm. Whenever a CBE firm is terminated for any reason, including cause, Provider shall provide written notice to the OESBD and shall substitute another CBE firm in order to maintain the level of CBE participation required herein, unless otherwise provided herein or agreed in writing by the parties. Such substitution shall not be required in the event the termination results from County modifying the scope of services and there is no available CBE to perform the new scope of services, in which event Provider shall notify County and the OESBD may adjust the CBE participation goal by written notice to Provider. Provider may not terminate for convenience a CBE firm without County's prior written consent, which consent shall not be unreasonably withheld. County may add or increase the required participation of CBE firms under this Agreement in connection with any amendment, extension, modification, or change order to this Agreement that, by itself or aggregated with previous amendments, extensions, modifications, or change orders, increases the initial Agreement price by ten percent (10%) or more. To the extent Provider is subcontracting any work under this Agreement, Provider shall make a good faith effort to include CBE firms in work resulting from any such amendment, extension, modification, or change order and shall report such efforts, along with evidence thereof, to the OESBD.

12.5 In performing the Services, the Parties hereby incorporate the list of Provider's participating CBE firms, addresses, scope of work, and the percentage of work amounts identified on each Letter of Intent into this Agreement (Exhibit G). Promptly upon execution of this Agreement by County, Provider shall enter into a formal contract with the CBE firms listed in Exhibit G and, upon request, shall provide copies of the contracts to the Contract Administrator and OESBD.

12.6 Provider shall provide written monthly reports to the Contract Administrator attesting to Provider's compliance with the CBE participation goals stated in this Article. In addition, Provider shall allow County to engage in on-site reviews to monitor Provider's progress in achieving and maintaining its contractual and CBE program obligations. Such review and monitoring shall be by the Contract Administrator in conjunction with the OESBD, unless otherwise determined by the County Administrator. County shall have access, without limitation, to Provider's books and records, including payroll records, tax returns and records, and books of account, on five (5) business days' notice.

12.7 In the event of Provider's noncompliance with its CBE participation goal (including without limitation the unexcused reduction of a CBE firm's participation), the affected CBE firm shall have the right to exercise any remedies as may be available as between the CBE firm and Provider.

12.8 The Contract Administrator may, at its option, increase allowable retainage or withhold progress payments unless and until Provider demonstrates timely payments of sums due to all subcontractors and suppliers. The presence of a "pay when paid" provision in a Provider's contract with a CBE firm shall not preclude County or its representatives from inquiring into allegations of nonpayment.

ARTICLE 13. TERMINATION

13.1 The termination rights of County in this Article 13 may be exercised as to any one or more Statements of Work or component Systems, as elected in the sole direction of County, provided that any right to terminate for cause arises only as to the Statement(s) of Work related to the breach at issue.

13.2 This Agreement may be terminated for cause based on any breach that is not cured within ten (10) days after written notice from the aggrieved party identifying the breach. This Agreement may also be terminated for convenience by the Board upon providing written notice to Provider of the termination date, which shall be not less than thirty (30) days after the date such written notice is provided. If County erroneously, improperly, or unjustifiably terminates for cause, such termination shall, to the full extent permissible under applicable law, be deemed a termination for convenience, which shall be effective thirty (30) days after such notice of termination for cause is provided.

13.3 County may terminate this Agreement if Provider is found to have submitted a false certification pursuant to Section 287.135, Florida Statutes, if Provider has been placed on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or if Provider has failed to promptly implement corrective action for audit deficiencies upon reasonable notice by County. Notwithstanding anything contained in this Agreement to the contrary, the rights and obligations of the parties under this paragraph shall be governed by Section 287.135, Florida Statutes, to the full extent applicable.

13.4 Provider represents that neither it nor any of its affiliates has been placed on the discriminatory vendor list, as defined by Section 287.134, Florida Statutes. County may terminate this Agreement effective immediately, without any further obligation to Provider, upon learning that such representation is false or if Provider or any of its affiliates is placed on the discriminatory vendor list.

13.5 Additionally, and notwithstanding anything to the contrary in this Agreement, County may terminate this Agreement without any further liability to Provider upon the decertification of Provider as a Certified Business Entity ("CBE") by County's Office of Economic and Small Business Development ("OESBD"), if Provider's status as a CBE was a factor in the award of the Agreement and such status was misrepresented by Provider. However, such termination shall not be effective until expiration of any timely-filed review or appeal of the decertification decision.

13.6 Notice of termination shall be provided in accordance with the "Notices" section of this Agreement.

13.7 In the event this Agreement is terminated for convenience, Provider shall be paid for any goods and services properly provided through the termination date specified in the written notice of termination. Provider acknowledges that it has received good, valuable and sufficient consideration from County, the receipt and adequacy of which are hereby acknowledged by Provider, for County's right to terminate this Agreement for convenience, and Provider hereby waives, to the full extent permissible under applicable law, any and all rights to challenge the adequacy of such consideration or the validity of County's right to terminate for convenience.

13.8 In case of termination of this Agreement in whole or in part before Final Completion for any reason whatsoever, Provider, if notified to do so by County, shall promptly remove any part or all of the equipment and supplies of Provider or its Subcontractor from the property of County, failing which County shall have the right to remove such equipment and supplies at the expense of Provider.

ARTICLE 14. MISCELLANEOUS

14.1 Rights in Documents and Work. Any and all reports, photographs, surveys, and other data and documents provided or created in connection with this Agreement shall be and remain the property of County and, if a copyright is claimed, Provider hereby grants to County a nonexclusive perpetual license to use the copyrighted item(s), to prepare derivative works, and to make and distribute copies to the public. In the event of termination or expiration of this Agreement, any reports, photographs, surveys, and other data and documents prepared by Provider, whether finished or unfinished, shall become the property of County and shall be delivered by Provider to the Contract Administrator within seven (7) days of termination or expiration of this Agreement by either party.

14.2 Audit Right and Retention of Records. County shall have the right to audit the books, records, and accounts of Provider and its subcontractors that are related to this Agreement. Provider and its subcontractors shall keep such books, records, and accounts as may be necessary in order to record complete and correct entries related to the Agreement and performance thereunder. All books, records, and accounts of Provider and its subcontractors shall be kept in written form, or in a form capable of conversion into written form within a reasonable time, and upon request to do so, Provider or its subcontractor, as applicable, shall make same available at no cost to County in written form.

Provider and its subcontractors shall preserve and make available, at reasonable times within Broward County for examination and audit by County, all financial records, supporting documents, statistical records, and any other documents pertinent to this Agreement for a minimum period of three (3) years after expiration or termination of this Agreement or until resolution of any audit findings, whichever is longer. County audits and inspections pursuant to this Section may be performed by any County representative (including any outside representative engaged by County). County reserves the right to conduct such audit or review at Provider's place of business, if deemed appropriate by County, with seventy-two (72) hours' advance notice.

Any incomplete or incorrect entry in such books, records, and accounts shall be a basis for County's disallowance and recovery of any payment upon such entry. If an audit or inspection in accordance with this Section discloses overpricing or overcharges to County of any nature by Provider in excess of five percent (5%) of the total contract billings reviewed by County, the reasonable actual cost of the County's audit shall be reimbursed to the County by Provider in addition to making adjustments for the overcharges. Any adjustments and/or payments due as a result of such audit or inspection shall be made within thirty (30) days from presentation of County's findings to Provider.

Provider shall ensure that the requirements of this Section are included in all agreements with its subcontractor(s).

14.3 Public Records. To the extent Provider is acting on behalf of the County as stated in Section 119.0701, Florida Statutes, Provider shall:

a. Keep and maintain public records required were County performing the services under this Agreement;

b. Upon request from the County, provide County with a copy of the requested records or allow the records to be inspected or copied within a reasonable time and at a cost that does not exceed that provided in Chapter 119, Florida Statutes, or as otherwise provided by law;

c. Ensure that public records that are exempt or that are confidential and exempt from public record requirements are not disclosed except as authorized by law for the duration of the Agreement and following completion of the Agreement if the records are not transferred to the County; and

d. Upon completion of the Agreement, transfer to County, at no cost, all public records in possession of Provider upon termination of this Agreement or keep and maintain public records required were the County performing the service. If Provider transfers the records to the County, Provider shall destroy any duplicate public records that are exempt or confidential and exempt. If the Provider keeps and maintains public records upon completion of the Agreement, Provider shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to County upon request in a format that is compatible with the information technology systems of County.

The failure of Provider to comply with the provisions of this Section shall constitute a material breach of this Agreement entitling the County to exercise any remedy provided in this Agreement or under applicable law.

A request for public records regarding this Agreement must be made directly to the County, who will be responsible for responding to any such public records requests. Provider will provide any requested records to County to enable County to respond to the public records request.

IF THE PROVIDER HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE PROVIDER'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT (954) 357-8570, bbayag@broward.org, 115 S. ANDREWS AVE., SUITE 325, FORT LAUDERDALE, FLORIDA 33301.

14.4 Truth-In-Negotiation Representation. Provider's compensation under this Agreement is based upon representations supplied to County by Provider, and Provider certifies that that wage rates and other factual unit costs supporting the compensation are accurate, complete, and current at the time of contracting. The original price under this Agreement and any additions thereto will be adjusted to exclude any significant sums by which County determines the price was increased due to inaccurate, incomplete, or noncurrent wage rates and other factual unit costs. County shall be entitled to recover any and all other damages available under law or equity it incurs to the extent any such representation is untrue.

14.5 Public Entity Crime Act. Provider represents that it is familiar with the requirements and prohibitions under the Public Entity Crime Act, Section 287.133, Florida Statutes, and represents that its entry into this Agreement will not violate that Act. In addition to the foregoing, Provider further represents that there has been no determination that it committed a "public entity crime" as defined by Section 287.133, Florida Statutes, and that it has not been formally charged with committing an act defined as a "public entity crime" regardless of the amount of money involved or whether Provider has been placed on the convicted vendor list. Notwithstanding any provision in this Agreement to the contrary, if any representation stated in this paragraph is false, County shall have the right to immediately terminate this Agreement and recover all sums paid to Provider under this Agreement.

14.6 Independent Contractor. Provider is an independent contractor under this Agreement. Provider shall not have the right to bind County to any obligation not expressly undertaken by County under this Agreement.

14.7 Third Party Beneficiaries. The parties acknowledge that there are no third party beneficiaries under this Agreement.

14.8 Notices. In order for a notice to a party to be effective under this Agreement, notice must be sent via U.S. first-class mail with a contemporaneous copy via e-mail to the addresses listed below and shall be effective upon mailing. The addresses for notice shall remain as set forth herein unless and until changed by providing notice of such change.

NOTICE TO COUNTY:
Broward County Office of Regional Communications and Technology
Attn: Brett Bayag
115 S. Andrews Ave., Suite 325
Ft. Lauderdale, Florida 33301
Email address: bbayag@broward.org

NOTICE TO PROVIDER:
Motorola Solutions, Inc.
Attn: Judy Jean-Pierre, Sr. Counsel
500 West Monroe Street, 43rd Floor
Chicago, IL 60661
Email address: Judy.Jean-Pierre@motorolasolutions.com

14.9 Assignment and Subcontractors. Except for subcontracting approved by County at the time of its execution of this Agreement or any written amendment hereto, neither this Agreement nor any right or interest herein may be assigned, transferred, subcontracted, or encumbered by Provider without the prior written consent of County. If Provider violates this provision, County shall have the right to immediately terminate this Agreement. Notwithstanding the foregoing, solely to the extent of its rights and obligations as the licensor of the Software, Motorola may assign its rights or subcontract its obligations as licensor, or encumber or sell its rights in any Software, without prior notice to or consent of County; any such assignment, subcontract, transfer, encumbrance or sale shall have no effect upon and shall not relieve Motorola from any obligation(s) under this Agreement.

Provider shall utilize the Subcontractors identified in the proposal that were a material part of the selection of Provider to provide the services for this Project. Provider shall obtain written approval of Contract Administrator prior to changing or modifying the list of Subcontractors submitted by Provider. Where Provider's failure to use a Subcontractor results in Provider's noncompliance with CBE participation goals, such failure shall entitle the affected CBE firm to damages available under this Agreement and local and state law. The list of Subcontractors is provided on Exhibit G, Schedule of Subcontractors, attached hereto and made a part hereof.

Each Subcontractor must possess certificates of competency and licenses as may be required by law. Provider shall have a continuing obligation to notify County of any change in Subcontractors. Provider shall not employ any Subcontractor against whom County may have a reasonable objection. Provider shall not be required to employ any Subcontractor against whom Provider has a reasonable objection.

Provider shall be fully responsible for all acts and omissions of its Subcontractors and of persons directly or indirectly employed by its Subcontractors and of persons for whose acts any of them may be liable to the same extent that Provider is responsible for the acts and omissions of persons directly employed by it. Nothing in the Design Build Contract Documents shall create any contractual relationship between any Subcontractor and County or any obligation on the part of County to pay or to see the payment of any monies due any Subcontractor. County may furnish

to any Subcontractor evidence of amounts paid to Provider on account of specific work performed.

Provider shall bind in writing each and every Subcontractor to the applicable terms and conditions of the Design Build Contract Documents for the benefit of County, provided that this provision shall not, in and of itself, impose the insurance requirements set forth in Article 11 on Provider's Subcontractors.

14.10 Conflicts. Provider agrees that neither it nor its employees will have or hold any continuing or frequently recurring employment or contractual relationship that is substantially antagonistic or incompatible with Provider's loyal and conscientious exercise of the judgment and care required to perform under this Agreement. Provider further agrees that none of its officers or employees shall, during the term of this Agreement, serve as an expert witness against County in any legal or administrative proceeding in which he, she, or Provider is not a party, unless compelled by court process. Further, such persons shall not give sworn testimony or issue a report or writing, as an expression of his or her expert opinion, which is adverse or prejudicial to the interests of County in connection with any such pending or threatened legal or administrative proceeding unless compelled by court process. The limitations of this Section shall not preclude Provider or any person from in any way representing themselves, including giving expert testimony in support thereof, in any administrative or legal proceeding. Provider agrees that each of its contracts with subcontractors performing under this Agreement shall contain substantively identical language to ensure that each subcontractor and its officers and employees meet the obligations contained in this paragraph.

14.11 Waiver of Breach. The failure of either party to enforce any provision of this Agreement shall not be deemed a waiver of such provision or modification of this Agreement. A waiver of any breach under this Agreement shall not be deemed a waiver of any subsequent breach.

14.12 Compliance with Laws. Provider shall comply with all applicable federal, state, and local laws, codes, ordinances, rules, and regulations in performing under this Agreement. Provider shall ensure that its Subcontractors conform to and obey all applicable laws, regulations, or ordinances with regard to labor employed, hours of work, and Subcontractor's general operations. Provider's Subcontractor shall perform the required Services under this Agreement in such a way so as not to close any thoroughfare, nor interfere in any way with traffic on railway, highways, or water, without the written consent of the proper authorities.

14.13 Severability. In the event any part of this Agreement is found to be unenforceable by any court of competent jurisdiction, that part shall be deemed severed from this Agreement and the balance of this Agreement shall remain in full force and effect.

14.14 Joint Preparation. This Agreement has been jointly prepared by the parties hereto, and shall not be construed more strictly against either party.

14.15 Headings and Interpretation. The headings contained in this Agreement are for reference purposes only and shall not in any way affect the meaning or interpretation of this Agreement. All personal pronouns used in this Agreement shall include the other gender, and the singular shall include the plural, and vice versa, unless the context otherwise requires. Terms such as "herein," "hereof," "hereunder," and "hereinafter," refer to this Agreement as a whole and not to any particular sentence, paragraph, or section where they appear, unless the context otherwise requires.

14.16 Governing Law, Venue and Waiver of Jury Trial. This Agreement shall be interpreted and construed in accordance with, and governed by, the laws of the state of Florida. The parties agree that the exclusive venue for any lawsuit arising from, related to, or in connection with this Agreement shall be in the state courts of the Seventeenth Judicial Circuit in and for Broward County, Florida. If any claim arising from, related to, or in connection with this Agreement must be litigated in federal court, the parties agree that the exclusive venue for any such lawsuit shall be in the United States District Court or United States Bankruptcy Court for the Southern District of Florida. **BY ENTERING INTO THIS AGREEMENT, PROVIDER AND COUNTY HEREBY EXPRESSLY WAIVE ANY AND ALL RIGHTS EITHER PARTY MAY HAVE TO A TRIAL BY JURY OF ANY CAUSE OF ACTION OR CLAIM ARISING FROM, RELATED TO, OR IN CONNECTION WITH THIS AGREEMENT.**

14.17 Amendments. No modification or amendment to this Agreement shall be effective unless it is in writing and executed by authorized representatives of each party. Without limiting the foregoing, the terms of this Agreement shall prevail over and against any additional or contrary terms and conditions in any format or medium whatsoever including, without limitation, shrinkwrap, click-through, or terms and conditions associated with any upgrade, update, release, patch, or other modification of the System or Software, unless expressly agreed to in writing by an amendment hereto executed by authorized representatives of each party.

14.18 Prior Agreements. This Agreement represents the final and complete understanding of the parties regarding the subject matter hereof and supersedes all prior and contemporaneous negotiations and discussions regarding that subject matter. There is no commitment, agreement, or understanding concerning the subject matter of this Agreement that is not contained in this written document.

14.19 HIPAA Compliance. It is understood by the parties that County personnel or their agents have access to protected health information (hereinafter known as "PHI") that is subject to the requirements of 45 C.F.R. § 160, 162, and 164 and related statutory and regulatory provisions. In the event Provider is considered by County to be a covered entity or business associate or otherwise required to comply with the Health Insurance Portability and Accountability Act of 1996 ("HIPAA") or the Health Information Technology for Economic and Clinical Health Act ("HITECH"), Provider shall fully protect individually identifiable health information as required by HIPAA and HITECH. If requested by County, Provider shall execute a Business Associate Agreement in the form set forth at www.broward.org/Purchasing/Pages/StandardTerms.aspx. Where required, Provider shall handle and secure such PHI in compliance with HIPAA, HITECH and its related regulations and, if required by HIPAA, HITECH, or other laws, shall include in its

"Notice of Privacy Practices" notice of Provider's and County's uses of a client's PHI. The requirement to comply with this provision, HIPAA and HITECH shall survive the expiration or termination of this Agreement. County hereby authorizes the County Administrator to sign Business Associate Agreements if required under this Agreement.

14.20 Payable Interest

14.20.1 Payment of Interest. County shall not be liable to pay any interest to Provider for any reason, whether as prejudgment interest or for any other purpose, and in furtherance thereof Provider waives, rejects, disclaims and surrenders any and all entitlement it has or may have to receive interest in connection with a dispute or claim arising from, related to, or in connection with this Agreement. This paragraph shall not apply to any claim interest, including for post-judgment interest, if such application would be contrary to applicable law.

14.20.2 Rate of Interest. If, for whatever reason, the preceding subsection is determined to be invalid or unenforceable by a court of competent jurisdiction, the annual rate of interest payable by County under this Agreement, whether as prejudgment interest or for any other purpose, shall be, to the full extent permissible under applicable law, 0.25% (one quarter of one percent) simple interest (uncompounded).

14.21 Incorporation by Reference. Any and all Recital clauses stated above are true and correct and are incorporated herein by reference.

14.22 Representation of Authority. Each individual executing this Agreement on behalf of a party hereto represents and warrants that he or she is, on the date of execution, duly authorized by all necessary and appropriate action to execute this Agreement on behalf of such party and does so with full legal authority. Provider represents that it is an entity authorized to transact business in the State of Florida.

14.23 Domestic Partnership Requirement. Unless this Agreement is exempt from the provisions of Section 16½-157 of the Broward County Code of Ordinances, which requires County contractors to provide benefits to domestic partners of their employees, Provider agrees to fully comply with Section 16½-157 during the entire term of the Agreement. If Provider fails to fully comply with that section, such failure shall constitute a material breach which shall allow County to exercise any remedy available under this Agreement, under applicable law, or under section 16½-157. For that purpose, the contract language referenced in Section 16½-157 is incorporated herein as though fully set forth in this paragraph.

14.24 Drug-Free Workplace. It is a requirement of County that it enter into contracts only with firms that certify the establishment of a drug-free workplace in accordance with Chapter 21.31(a)(2) of the Broward County Procurement Code. Execution of this Agreement by Provider shall serve as Provider's required certification that it has or will establish a drug-free workplace in accordance with Section 287.087, Florida Statutes, and Chapter 21.31(a)(2) of the Broward

County Procurement Code, and that it will maintain such drug-free workplace for the full term of this Agreement.

14.25 Contingency Fee. Provider represents that it has not paid or agreed to pay any person or entity, other than a bona fide employee working solely for Provider, any fee, commission, percentage, gift, or other consideration contingent upon or resulting from the award or making of this Agreement. If County learns that this representation is false, County shall have the right to terminate this Agreement without any further liability to Provider. Alternatively, if such representation is false, County, at its sole discretion, may deduct from the compensation due Provider under this Agreement the full amount of such fee, commission, percentage, gift, or consideration.

14.26 Living Wage Requirement. If Provider is a "covered employer" within the meaning of the Broward County Living Wage Ordinance, Broward County Code sections 26-100 – 26-105, Provider agrees to and shall pay to all of its employees providing "covered services," as defined therein, a living wage as required by such ordinance, and Provider shall fully comply with the requirements of such ordinance. Provider shall be responsible for and shall ensure that all of its subcontractors that qualify as "covered employers" fully comply with the requirements of such ordinance.

14.27 Force Majeure. If the performance of this Agreement, or any obligation hereunder, is prevented by reason of hurricane, earthquake, or other casualty caused by nature, or by labor strike, war, or by a law, order, proclamation, regulation, or ordinance of any governmental agency, the party so affected, upon giving prompt notice to the other party, shall be excused from such performance to the extent of such prevention, provided that the party so affected shall first have taken reasonable steps to avoid and remove such cause of nonperformance and shall continue to take reasonable steps to avoid and remove such cause, and shall promptly notify the other party in writing and resume performance hereunder whenever and to the full extent such causes are removed. However, if such nonperformance exceeds sixty (60) days, the party that is not prevented from performance by the force majeure event shall have the right to immediately terminate this Agreement upon written notice to the party so affected. This Section shall not supersede or prevent the exercise of any right the parties may otherwise have to terminate this Agreement.

14.28 County Logo. Provider shall not use County's name, logo, or otherwise refer to this Agreement in any marketing or publicity materials without the prior written consent of County.

14.29 Resolution of Disputes. During the pendency of any dispute and after a determination thereof, Provider and its Subcontractor shall act in good faith to mitigate any potential damages including utilization of construction schedule changes and alternate means of construction. Provider shall carry on the Services and Work and adhere to the progress schedule during all disputes or disagreements with the County, including disputes or disagreements concerning a request for a Change Order or a request for a change in the Design Build Price or Design Build Time. No work or Services shall be delayed or postponed pending resolution of any disputes or

disagreements except as Provider and County may otherwise agree in writing. Suspension of Work or Services by Provider during any dispute or disagreement with County shall entitle County to terminate the Agreement for cause.

In the event a dispute cannot be resolved amicably between the Contract Administrator and Provider, Parties shall promptly escalate the dispute to the County Administrator, whose resolution will be determinative on behalf of County. If Provider objects to the resolution by the County Administrator, or the County Administrator does not resolve within sixty (60) days of submission and the dispute remains outstanding, upon written demand by either party, the Parties shall participate in voluntary, nonbinding mediation. Neither party shall commence litigation prior to completion or impasse of mediation, which shall be conducted within sixty (60) day of demand by either party. The mediator shall be mutually agreed upon by the Parties and expenses shared by the Parties. Should any objection not be resolved in mediation, the Parties retain all their legal rights and remedies provided under the laws of the State of Florida. **A PARTY SPECIFICALLY WAIVES ALL OF ITS RIGHTS, INCLUDING, BUT NOT LIMITED TO, CLAIMS FOR DESIGN BUILD TIME AND DESIGN BUILD PRICE ADJUSTMENTS PROVIDED IN THE DESIGN BUILD CONTRACT DOCUMENTS, INCLUDING ITS RIGHTS AND REMEDIES UNDER STATE LAW, IF SAID PARTY FAILS TO COMPLY IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF THIS ARTICLE.**

14.30 Counterparts. This Agreement may be executed in multiple originals, and may be executed in counterparts, each of which shall be deemed to be an original, but all of which, taken together, shall constitute one and the same agreement.

(The remainder of this page is intentionally left blank.)

IN WITNESS WHEREOF, the Parties hereto have made and executed this Agreement: BROWARD COUNTY through its BOARD OF COUNTY COMMISSIONERS, signing by and through its Mayor or Vice-Mayor, authorized to execute same by Board action on the 23rd day of May, 2017, and MOTOROLA SOLUTIONS, INC., signing by and through its Vice President, duly authorized to execute same.

COUNTY

ATTEST:

Broward County Administrator, as
Ex-officio Clerk of the Broward County
Board of County Commissioners

BROWARD COUNTY, by and through
its Board of County Commissioners

By: _____

23rd day of May, 2017

Approved as to form by
Joni Armstrong Coffey
Broward County Attorney
Governmental Center, Suite 423
115 South Andrews Avenue
Fort Lauderdale, Florida 33301
Telephone: (954) 357-7600
Telecopier: (954) 357-7641

By: _____ 5/16/17
René D. Harrod (Date)
Assistant County Attorney

Insurance requirements approved by
Broward County
Risk Management Division:

By: _____

Name: WAYNE FLETCHER

Title: RISK MANAGER

RDH
2017-05-01 Motorola P25 Agreement
05/01/17
#17-099.03

COUNTY COMMISSIONERS
CREATED
OCT 1st
1915
BROWARD COUNTY FLORIDA

PROVIDER

WITNESSES:

Signature

Daniel Kimpe

Print Name of Witness above

Signature

BUSTER LERNER

Print Name of Witness above

MOTOROLA SOLUTIONS, INC.

By: _____
Authorized Signor

Robert E. Marshall, Jr. - Vice President

Print Name and Title

15 day of May, 2017

ATTEST:

_____
Assistant Secretary or other person authorized to attest

(CORPORATE SEAL OR NOTARY)

EXHIBIT A – STATEMENT OF WORK

All references to Exhibit A shall be deemed to be inclusive of this Introduction, as well as Exhibits A-1, A-2, A-3, A-4, and A-5.

Provider and County agree that Provider shall provide the following work under this Agreement:

The System will provide a turnkey replacement of various communications subsystems operated by the County. The Provider shall provide equipment and services that includes all of the following:

- A new 700 megahertz (MHz), Project 25 (P25) Phase II system to replace the County's existing 800 MHz Motorola SmartZone System
- A new Internet Protocol (IP)-based microwave system to replace the County's existing Tadiran 6 GHz system, with all microwave links operating in the licensed 6 GHz frequency band, and with backward compatibility for legacy circuits to support the County's existing radio infrastructure during the transition period.
- A new dispatch console system for the County's three regional dispatch centers
- A new 800 MHz, P25 Phase II simulcast, 4-site 6-channel backup system
- A new 700 MHz, P25 conventional, 4-site interoperability system
- A new 800 MHz, analog conventional, 4-site simulcast interoperability system
- A new communications trailer with appropriately sized towing vehicle
- Civil work to support upgrades to new and existing radio sites to support the aforementioned communications subsystems.
- Configured consoles to interface with Fort Lauderdale talkgroups without the use of a control station interface through the Inter-RF Sub System Interface (ISSI), to support the dispatching for the City of Fort Lauderdale
- P25 Phase II-compliant subscriber radios as may be ordered by the County or Authorized Third Party Users.

Dispatching in Broward County is handled at three public safety answering point (PSAP) locations:

- Sunrise (Central Dispatch) – 10440 W. Oakland Park Blvd., Sunrise, FL 33351
- Pembroke Pines (South Dispatch) – 6057 S.W. 198th Terrace, Fort Lauderdale, FL 33311
- Coconut Creek (North Dispatch) – 4800 W. Copans Rd., Coconut Creek, FL 33063

1. Services General Description

A. The project includes several turnkey components, as follows:

1. Replacement of the existing system with a new P25 Phase I and Phase II 700/800 MHz radio system, including dispatch consoles. (SOW A-1)

2. Replacement or upgrade of existing dispatch consoles including supervisor and spare positions. (SOW A-1)

3. Upgrade existing and design and build new towers, shelters, and other facilities where required in connection with new and upgraded site deployments (SOW A-2)

4. Replacement of the existing microwave network with a new IP-based microwave network providing "five nines" (99.999 percent) link reliability and multiprotocol label switching (MPLS) routing. (SOW A-3)

5. Provision of subscriber equipment and maintenance to Authorized Third Party User agencies (SOW A-4)

B. The trunked radio system shall comply with the latest applicable P25 suite of standards adopted as Telecommunications Industry Association (TIA) and/or American National Standards Institute (ANSI) documents at the time of Final Acceptance.

C. The system shall provide a standalone 700/800 MHz, P25 DMM Phase I and Phase II trunked, simulcast system providing communications within the County. The system shall include a system expansion with additional radio site(s) to enhance the coverage needs of Broward County.

D. The Provider shall provide backup solutions, including a live 4-site 700/800 P25 Phase II, 7-channel fixed simulcast backup network supporting both voice and data; a 4-site, 2-channel conventional overlay (separate channels at each site); and a mobile communications trailer supporting two onboard conventional repeaters and a gateway system.

E. The Provider's System shall comply with the specifications set forth in the SOWs to the Agreement (which incorporate the specifications provided in the RFP), unless expressly otherwise approved in writing by the County. The RFP specifications reflect user operational requirements, system requirements, infrastructure requirements, and system support requirements for the County. The RFP specifications document addresses (but is not limited to):
    - Coverage requirements
    - Daily operational communications requirements of first responders
    - Significant system components
    - Minimum and maximum performance specifications for the system and for the subscriber units, based on defined user needs, national standards, and industry best practices

- Hardware specifications
- County-owned tower sites
- County raw-land sites
- Antennas, lines, grounding, and associated accessory items
- Connectivity with the Broward County microwave network
- Interoperability subsystem

F. The System shall leverage the County's existing sites, meet the daily coverage and capacity needs, support transparent roaming and interoperability within the region, enhance interoperability within Broward County, and provide reserve capacity for use during major manmade or natural disasters and emergencies.

2. Project Team

Motorola Solutions' Project Team will provide expertise in the following areas to support the scope required by the Agreement: project management, engineering, systems technologist, training, and service support.

Provider will ensure that the persons responsible for Provider's performance of the Services under this Agreement and, to the extent applicable, expressly identified in any Statement of Work (collectively "Key Personnel") are appropriately trained and experienced and have adequate time and resources to perform in accordance with the terms of this Agreement. To the extent Provider seeks or is required to make any change to the composition of the Key Personnel, County's prior written consent is required, and Provider will provide County with thirty (30) days' advance notice (or as much advance notice as is possible if thirty (30) days' notice is not possible) regarding any such requested changes and the management plan associated with such changes. County shall not be responsible for any additional costs associated with a change in Key Personnel.

Key Personnel: Motorola's Key Personnel include the following (Figure 0-1):

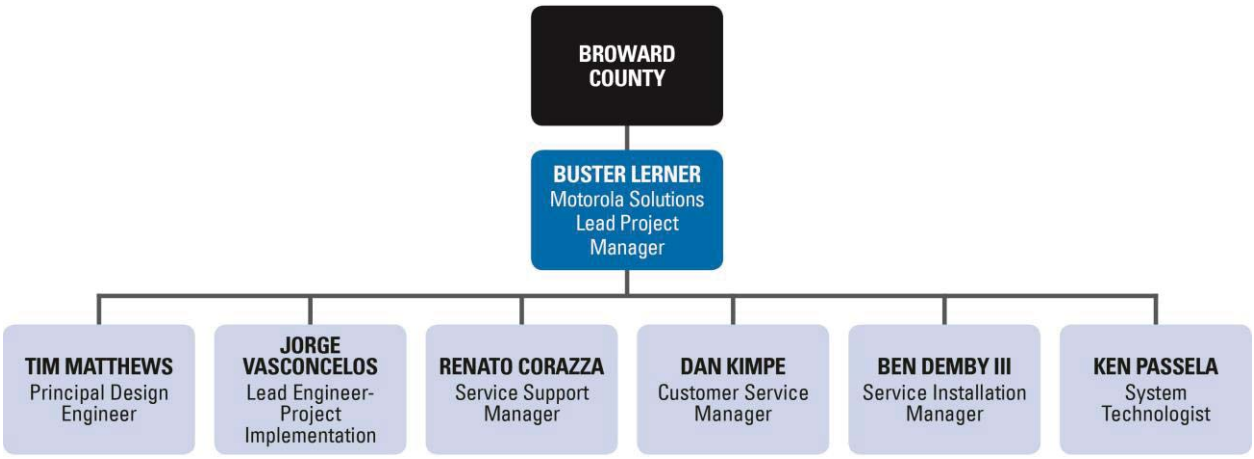


Figure 0-1: Motorola Solutions' Project Team for Broward County

Each Provider team member, with their specialized skills, relevant experience and customer focused goals will ensure the network will be implemented on time, as specified by the County's requirements and meeting and exceeding the County's performance expectations.

Provider will dedicate the proper resources to implementation of this project. Provider guarantees that all aspects of this project will have the appropriate resources. Unless otherwise agreed by the Parties, Provider's lead Project Manager is Buster Lerner and Lead Engineer-Project Implementation is Jorge Vasconcelos, both of whom will be exclusively dedicated to the performance of the Services for Broward County.

2.1 Project Staffing

A. Project staffing shall be managed by the Provider based on workload and the level of effort throughout the implementation/installation process; however, the positions identified below shall be staffed throughout the duration of the project and shall not be changed without prior approval of the County.

B. Provider's Project Manager:

1. Provider's Project Manager shall be the primary point of contact (POC) between the County and the Vendor.

2. Provider's Project Manager shall: bear full responsibility for supervising and coordinating the installation and deployment of the communications system; be responsible for development and acceptance of the PMP; manage the execution of the project against that plan; and oversee the day-to-day project activities, deliverables, and milestones completion.

3. Provider's Project Manager shall be responsible for coordination of the weekly status meetings.

C. Provider's Project Engineer:

1. Provider's Project Engineer shall have the primary responsibility for managing the system design and ensuring that the system is installed in accordance with the approved system design.

2. Provider's Project Engineer shall ensure the development of block diagrams, system-level diagrams, and rack diagrams to assist the installation team in completing the system installation.

3. The Provider's Project Engineer also shall supervise the development and execution of the System Acceptance Test Plan (SATP) and the Coverage Acceptance Test Plan (CATP), and guide the County Project Team through the processes and procedures necessary to prove that the system performs as specified in the contract. No test plan will be executed until approved by the County.

D. Provider's DB-Firm: Carrick Contracting Corporation

E. DB-Firm's Consultant (Engineer of Record): Amec Foster Wheeler Environment & Infrastructure, Inc.

As the systems integrator, Motorola Solutions provides the resources and project management necessary to complete the tasks required for implementation of the project. The Motorola Solutions System Integration (SI) organization is dynamic, utilizing both internal and external resources. Table 0-1 below provides a description of the roles responsibilities for the project team.

Table 0-1: Project Team Roles and Responsibilities

Motorola Solutions Team Member	Responsibilities
Lead Project Manager: Buster Lerner The Project Manager's primary responsibility and authority is to manage and administer the project to completion as defined within the Agreement. This individual will be County's single point of contact for all items related to the Agreement and official communications between the	- Manage and refine the SOW, project schedule, implementation plan, and change orders. - Allocate available resources, personnel, funding, and material to ensure that the system is implemented according to the Agreement. - Conduct an inventory of received equipment to ensure proper delivery. - Inspect the physical condition of Motorola Solutions-supplied hardware.

Motorola Solutions Team Member	Responsibilities
County's PM and Motorola Solutions.	- Ensure that Motorola Solutions-provided equipment specifications are met. - Verify that all site preparation is complete prior to the installation of the equipment. - Supervise field installation and implementation teams, ensuring all on-site installation, integration, and optimization tasks are performed within contract requirements. - Ensure quality workmanship by all Motorola Solutions personnel, vendors, and subcontractors. - Prepare for and conduct regular progress meetings and provide progress reports as required. - Obtain County sign-off and acceptance upon completion of training, installation, and acceptance testing. - Escalate resolution of any issues encountered during system implementation. - Manage the project to County's satisfaction. - Ensure successful transition to the warranty and maintenance phase.
Engineering: Jorge Vasconcelos The Motorola Solutions' Engineering team primary responsibilities is to ensure the technical integrity of County's system design.	- Analyze County needs. - Design P25 system. - Develop site design parameters. - Develop system documentation. - Develop the proposed Acceptance Test Plan (ATP). - Assist in the development of the proposed system cutover plan. - Provide continuous technical support even after project acceptance.

Motorola Solutions Team Member	Responsibilities
Systems Technologist: David Bache Provider's most advanced field technical resource ready to support County's project.	- Participate in all equipment programming and configuration development. - Oversee the integration and optimization of all system hardware and software. - Participate in the ATP. - Assist in the development and execution of the system cut-over plan. - Provide continuous technical support even after project acceptance.
Training Consultant: Sherri Martin The Training Consultant will develop and will manage training deliverables through system acceptance. This individual will be the single point of contact for training-related matters working closely with Motorola Solutions' Project Manager to ensure deliverables are in accordance with the implementation plan.	- Participate in the CDR to re-assess County's needs and expectations (e.g. validate student numbers, monitor technology or courseware updates, etc.). - Participate in project status meetings to stay abreast of the project implementation plan and ensure the training plan stays in sync. - Facilitate student registrations in online courseware. - Conduct a Training Kickoff meeting with County's core team to discuss the courses, target audiences, field labs, possible training locations, and tentative training dates. - Manage the collection of data needed for the instructors to prepare and/or tailor end-user materials to County's system and features. - Discuss the tentative training plan/ dates with you to obtain confirmation 60-90 days prior to training. - Order training materials for end-user level courses. - Monitor course evaluations and obtain County's feedback on how training is progressing. - Continue to serve as point of contact even after system acceptance for questions about training or continuing education on Motorola Solutions products.

Motorola Solutions Team Member	Responsibilities
Account Manager: Kim Camps The Account Manager serves as the liaison responsible for addressing County's needs that arise from day-to-day operations as well as issues that arise from system implementation.	- Assist in the configuration and pricing of equipment quotes. - Order, process, and manage equipment orders. - Perform a consultative role in applying Motorola Solutions' equipment solutions.
Customer Support Manager: Dan Kimpe Dedicated Broward Customer Support Manager (CSM) coordinates support resources to help ensure optimal quality of service (maintenance) delivery.	- Oversee the execution of Broward County's support contract (maintenance or warranty) by serving in the role of the advocate for Broward County. - During the warranty phase, act as a point of contact for issue resolution and escalation, monitoring of Motorola Solutions' contractual performance and providing review and analysis of process metrics.
Field Services Organization (FSO): Don Leuthke FSO is staffed with trained and qualified technicians to provide rapid response, repair, restoration, installations, removals, programming, and scheduled preventive maintenance tasks for site standards compliance and RF operability.	- Installation of RF equipment. - Support Services for both Warranty and Post Warranty. - Available 24x7 On-Call Support. - On-Site Troubleshooting. - Customer Required Response Times. - Preventative Maintenance. - Third-Party Vendor Management. - Hardware Repair Logistics coordination. - Access to Product Engineers and Designers.

2.2 Subcontractors

During Project Delivery

During project delivery, Motorola is authorized to utilize subcontractors as stated expressly herein or in the Agreement; any other subcontracting requires prior written approval by County Contract Administrator. Motorola is solely responsible for the Services, including the performance of its subcontractors in providing any of the Services. Motorola will coordinate core team members for effective coordination and communications and will manage subcontractor scope, performance, quality, and schedule according to the same core project management principles applied to the Motorola Solutions organization.

Motorola Solutions' Project Manager will coordinate the activities of Motorola Solutions' subcontractors to assure cost-effective performance and resolution of technical interface issues during design as opposed to during integration activities.

Motorola Solutions' Project Manager will be the single authority for subcontract actions and reporting and will have the full responsibility for quality performance, schedules, and cost control.

Each subcontractor will assign a lead manager who will be responsible for its company's performance. These managers will report directly to Motorola Solutions' Project Manager on scheduling and implementation issues and to the System Engineer on specific technical assignments. All subcontractors will submit as-needed progress reports to Motorola Solutions describing progress, level of effort, and anticipated problems which will be integrated into the project's tracking system. The subcontractors' weekly progress reports will serve as Motorola Solutions' primary mechanism for ensuring that they remain on track to deliver their promised results.

Provider shall utilize the following subcontractors (Table 0-2):

Table 0-2: Motorola Solutions' Subcontractors

Subcontractor	Role in Broward County Project
Aviat	Turnkey Microwave Solution
V-Comm	MPE/IM Studies
Carrick Contracting Corporation	Engineering Services
Bohren's Moving and Storage	Storage and Delivery
VPI Systems	Logging Solution
Kirms Communications	Tower work
Certified CBE Businesses	
ARM Electrical Services, Inc.	Provide and install DC Power Systems.
Weezer Electric	Provide electrical work such as: permits, installation, modifications for new and existing sites and UPS work.
Lambert Brothers, Inc.	Provided site construction services such as: permits, concrete, shelters and fencing installations.
Mejia Telecommunications	Provide services relating to towers and antenna and line systems.

3. Security/Access/Licensing

Provider will cooperate with County and provide any and all information that County may request in order to determine appropriate security and network access restrictions and verify

Provider compliance with County security standards.

3.1 JIS Security

Provider shall comply with all security requirements of the Criminal Justice Information Services (CJIS) Security Policy CJISD-ITS-COV-08140-5.2, Version 5/2 dated 08/09/2013 or later.

3.2 Licensing

Provider or its subcontractor shall possess all required licensing, including state certified general contractor or state certified electrical contractor, Broward County general building contractor class "A" or master electrical contractor, and licensed engineer certified under Florida Statutes Section 471.023.

3.3 ID Badges

Provider and subcontractor personnel servicing and requiring unescorted access to General Facilities must have a County issued contractor ID badge (contractor ID badge) which will be the responsibility of the contractor to obtain. Depending upon the request, the badge may carry electronic access privileges. The badge must be visible and worn at all times together with the contractor's company/business contractor ID badge. Similar to employee security/ID badges, requests for contractor ID badges are initially approved by the requesting agency director or designee and then submitted to Facilities Management Division (FMD) Security for final approval.

Many Broward County government facilities will have areas designated as critical to security and public safety, pursuant to Broward County Ordinance 2003-08 Sections 26-121 and 26- 122, as may be amended. The issuance of a ID badge for unescorted access to facilities critical to security and public safety may entail a comprehensive statewide and national background check. Unescorted access to certain facilities occupied by the Broward Sheriff's Office (BSO) and the State Attorney's Office will require a national fingerprint-based records check per the Criminal Justice Information System (CJIS) policy. A Provider employee found to have a criminal record consisting of felony conviction(s) shall be disqualified from access to the State Attorney's Offices and certain BSO facilities. A Provider employee with a record of misdemeanor offense(s) may be granted access if the System Security Officer (CSO), Terminal Access Coordinator (TAC), and FDLE determines that the nature of the offense(s) do not warrant disqualification. Applicants shall also be disqualified on the basis of confirmations that arrest warrants are outstanding for such applicants.

The issuance of an ID badge for unescorted access to General Facilities requires a "Level 1" FDLE background check, which can be conducted by the Florida Department of Law Enforcement (FDLE). This "Level 1" FDLE background check is the Provider's responsibility, including any associated cost. FDLE background checks can be done by Provider by phone at (850) 410-8109 or online at https://web.fdle.state.fl.us/search/app/default

Upon completion of the background check, Provider must attach a copy of the results to the Provider's application for an ID badge. The Project Manager or designee utilizing the service of the contractor will be the "Sponsor" and will either provide the contractor with a Provider ID Badge Request Form or assist the contractor in completing an on-line application for the County issued contractor ID badge.

Requests for an ID badge requiring an FDLE background check may require lengthy processing and review by the Broward Sheriff's Office (BSO). Provider and subcontractors must therefore submit the request to Broward County Security at least two (2) weeks prior to the start of service by the contractor. When identification badges are ready, Broward County Security will contact the contractor to arrange pick up. Upon pick up, the applicant must present a valid Florida identification and must be accompanied by his or her supervisor. Broward County Security will then supply contractor ID badge valid for the anticipated period within which the work will be performed. The validity period must be clearly stated on the Contractor ID Badge Request Form; however, the period of validity will not exceed one (1) year. Background checks will be required for renewal of contractor ID badge. At the termination of the contract and separation of employee services, Provider is responsible for the collection and return of all contractor ID badge to the Project Manager and/or to Broward County Security.

3.4 Compliance

Compliance with the County's security requirements is part of the overall contract performance evaluation. Final payment will, in part, be contingent on the return of all Provider ID badges issued to Provider personnel.

4. Project Schedule

The Project Schedule (as referenced in Section 4.4.1 of the Agreement) is set forth in Schedule 10 and identifies key milestones necessary for project implementation and necessary to meet the proposed project schedule. Motorola Solutions will leverage its significant experience in large-scale project management to ensure successful and timely project implementation in keeping with the Project Schedule.

Any changes to the Project Schedule must be approved by both parties in writing. Motorola Solutions will work collaboratively with the County to ensure the deliverables and responsibilities of both parties are met.

Exhibit A-1 Radio System SOW

The 700 MHz communications System as set forth in this SOW A-1 and being provided by Motorola will provide an Association of Public-Safety Communications Officials, International (APCO) P25 interoperable radio communications system to support mission-critical communications within the County.

The County presently operates a 10-site Motorola Type II SmartZone, public safety-grade, two-way radio system that provides communications to first responders countywide. The system operates in the 800 MHz band and uses simulcast and trunking technology, as well as microwave connectivity, to provide a mix of analog and digital voice communications. The existing system has reached the end of its support period and will be replaced by Provider as part of this Agreement. In addition to the primary P25 system, the Provider will provide backup capabilities to include a 4-site P25 Phase II simulcast system supporting both voice and data, a conventional overlay, and a mobile communications platform.

1.1 Software. Provider will provide the Software itemized in Schedule 1.

1.2 Equipment: Provider will provide the Equipment itemized in Schedule 2, which Provider represents will provide the desired functionality as stated in the specifications.

1.3 Standards and Guidelines

A. Provider shall comply with the following standards, rules, regulations, and industry guidelines:
   1. American National Standards Institute (ANSI)
   2. National Electrical Manufacturers Association (NEMA)
   3. Electronics Industry Association (EIA)
   4. Telecommunications Industry Association (TIA)
   5. Telecommunications Distribution Methods Manual (TDMM)
   6. National Electrical Code® (NEC)
   7. Institute of Electrical and Electronics Engineers (IEEE)
   8. Federal Communications Commission (FCC)
   9. Underwriters Laboratories, Inc. (UL)
   10. American Society of Testing Materials (ASTM)
   11. National Fire Protection Association (NFPA) 1221 (latest revision)

B. Provider shall comply with industry best practices for system installation, grounding, bonding, and transient voltage surge suppression (TVSS), as outlined in the Motorola R56®, Standards and Guidelines for Communication Sites (latest revision).

C. If the requirements of this SOW conflict with any of the aforementioned standards, rules, regulations, and industry guidelines, then the more stringent of the two shall become applicable.

D. Provider shall identify, coordinate and obtain all necessary applications, licenses, permits, or other approvals necessary to comply with all applicable codes, permitting or licensing requirements, and other government or regulatory requirements. Provider shall promptly notify the County of any issues that do or are likely to arise, and shall develop an appropriate action plan to resolve. Provider shall be solely responsible for all costs and fees.

1.4 Project Management Plan and Project Schedule

A. Motorola shall provide and maintain a current Project Management Plan (PMP) that includes a detailed Work Breakdown Structure (WBS), project scope, deliverables, schedule, quality assurance/quality control (QA/QC) processes, and risk management sections.

B. The PMP shall describe how the Provider will monitor and control the installation and deployment of the System, and mitigate risks in order to ensure that the System meets the design specifications and is delivered on time.

C. Motorola shall schedule and conduct regular status meetings between the County Project Team and Motorola Project Team. The Provider shall provide a schedule for these meetings subject to the approval of the County.

D. Motorola will provide and maintain the Project Schedule, which will detail tasks, milestones, start and end dates, task predecessors, and task owners based on an approved WBS in Microsoft Project format. The schedule shall represent tasks associated with completing work on all items identified in the WBS. Motorola will update the Project Schedule at least weekly, including with the actual dates as tasks are completed.

E. The Project Schedule may be modified only with the written approval of the County Contract Administrator. Motorola will provide the County will ongoing visibility to the Project Schedule with the ability for the County to make informed decisions regarding any requested changes during the project.

F. Motorola shall review the Project Schedule and provide an updated progress schedule periodically to County for review and approval, and the Project Schedule shall be provided as an agenda item for all County/Providerweekly status meetings.

G. The Project Schedule shall, at a minimum, identify the schedule and applicable deadlines for the following:
   1. Site surveys
   2. Detailed design review
   3. Required site modification
   4. Required shelter modification
   5. Equipment manufacturing
   6. Factory acceptance test
   7. Equipment delivery
   8. System installation
   9. System configuration
   10. System optimization
   11. Acceptance testing
   12. Coverage testing
   13. User training
   14. Fleet map development
   15. System cutover
   16. System documentation development and delivery
   17. System and equipment warranty

The Project Schedule identifies key milestones necessary for project implementation and necessary to meet the proposed project schedule. Motorola Solutions will leverage its significant experience in large-scale project management to ensure successful and timely project implementation in keeping with the Project Schedule. Any changes to the Project Schedule must be approved by both parties in writing.

1.4.1 Project Punch List

A. The Provider shall establish and maintain a punch list, as mutually agreed to with the County, for site facilities, equipment, and acceptance tests.

B. The punch list shall be maintained in real time and published weekly. The punch list shall include the following at a minimum:
   1. Sequential punch-list item numbers
   2. Date identified
   3. Item description
   4. The party responsible for resolution
   5. Expected resolution date
   6. Resolution date
   7. Details about how each punch-list item was resolved and tested
   8. Notes about the item

C. If responsibility for resolving an item is transferred to another person or group, a new entry shall be added to the punch list and the original entry shall be appropriately noted.

D. The Provider shall be responsible for reviewing each punch-list item and advising the County of any changes. The status of punch-list items shall be updated during each weekly status meeting.

1.4.2 Project Meetings

A. A project kickoff meeting shall be scheduled prior to the beginning of the project.

B. Weekly project status meetings shall be scheduled following contract award and the initial kickoff meeting.

C. The Provider shall be responsible for scheduling the meetings as well as preparing meeting agendas and minutes. Meeting agenda items shall include, at a minimum, the following items:
   1. Schedule review
   2. Status of deliverables
   3. Risk items
   4. Changes
   5. Plans for the next period
   6. Action-item assignments
   7. Punch-list review

1.4.3 Quality Control Plan

It is Motorola Solutions' policy to produce and provide products and services of the highest quality that meet or exceed the needs of Motorola Solutions' customers. Motorola Solutions will perform all work consistent with high quality commercial practices and in accordance with Motorola Solutions' quality standards for fixed equipment installations and all applicable manufacturer installation and maintenance manuals. Motorola Solutions will comply with all applicable standards such as Electronics Industries Association (EIA) and FCC standards and regulations in effect at the time of contract execution.

Motorola Solutions will utilize the ISO 9001 Quality Management System as the quality management system standard to control its Services and all equipment and work relating to the System.

Since Motorola Solutions' QMS is an end-to-end quality management system, the entire span of the project is monitored continuously for adherence to quality deliverables. Quality is assured through vigilance in active management techniques. This section outlines the Quality Control Plan (QCP) steps

and procedures that will be used by Motorola Solutions in the implementation of the project from proposal through final acceptance.

The QCP utilized by Motorola and which will be utilized for the System installation and Services under this Agreement is set forth on Schedule 6.

1.4.4 Risk Identification and Management

Motorola Solutions will utilize risk management processes during the project so that any impacts to the project's overall cost and schedule are eliminated or minimized. Motorola Solutions will utilize a risk management process that is a collaborative approach with focused County involvement and participation. Motorola Solutions will identify potential risks to the project at the outset, and work closely with County to develop mitigation strategies to eliminate or minimize the impact of the risks on the project. In addition, Motorola Solutions project managers and system engineers will continue to refine the Project Schedule and system design respectively throughout project execution in order to develop cost reduction and schedule improvement plans that will be presented to County for approval and mutual agreement to implement.

Risk management consists of not only identifying negative impacts to the project but also potential positive impacts which would benefit Broward County. Risk management looks for positive changes that would reduce cost and/or improve the schedule. Motorola's risk management processes will be designed and applied to achieve the following objectives:

1. Identifying potential risks that may occur during the project.
2. Mitigating the adverse events.
3. Identifying opportunities to improve the cost and/or schedule of the project.
4. Meeting project commitments and minimize any variances.

During implementation of the project, Motorola Solutions will perform periodic review meetings that in addition to tracking action items on the project will monitor the status of each risk item. These reviews will analyze each risk, identify any new risks that may impact the project, assess the impact of those risks, and assign action items to develop risk mitigation plans. This review will also determine the effectiveness of any mitigation plans that have been triggered by a risk event occurring.

Effective Change Management during Project Delivery

Once the project design review is completed and the design is approved by Broward County, Motorola Solutions will maintain effective change management in compliance with County's policies and procedures during the project to capture the impact of any proposed changes to the requirements during implementation.

1.4.5 Project Communications Plan

Motorola will provide a Communication Plan that will define and formalize key meetings, their frequency, and required attendees. This will provide Broward County with meaningful and focused meetings that accomplish the goals and objectives set prior to each meeting.

Motorola Solutions' Communication Plan will identify the key stakeholders and project team members on the project. Tools will be used to store project information such as site audits and other site

development information. Broward County can quickly view the status of each individual site and the progress with respect to the schedule. Site documentation will be readily available for use by Broward County and the project team.

Broward County's representatives will be supplied access to project documents such as schedules, status reports, risk logs, requirements documents, and change requests. Version control will ensure that the most current documentation and all past versions are available for review.

Status reports (provided periodically as the parties agree, and upon request by County) will highlight any potential issues and identify the action being taken to mitigate them. Action items will be assigned to individuals and completion dates will be tracked to ensure the items are completed. Status Reports will also be used to provide Broward County an accurate assessment of the progress of the project and give visibility to the resource requirements to complete the near term tasks. Action item lists will be maintained and updated on a weekly basis to identify and quickly resolve identified items.

Motorola Solutions team members and subcontractors will work together to enhance team and customer communications and provide a complete project record of all communications.

1.5 CAD PremierOne GPS Location Integration

This feature, called ASTRO 25 Responder Location Integration, provides the following core features of ASTRO which are integrated with PremierOne CAD:

The Responder Location Feature allows PremierOne to obtain the location of subscriber radios via the ASTRO 25 infrastructure. This capability allows dispatchers and supervisors to monitor the location of personnel who are using ASTRO subscribers. The location update rate is configured on a per Unit Status basis allowing specific location cadences for statuses such as Emergency, In-Route, etc. Location services are enabled on a per subscriber basis allowing agencies to limit its use to portable radios or other specific groups.

1.5.1 ASTRO Subscriber Requirements

The Responder Location feature requires APX portable or mobile subscribers equipped with a GPS receiver, the current subscriber firmware version, and the Enhanced Data option. XTL/XTS subscribers do not support Enhanced Data and are not recommended for use with Responder Location. The XTL/XTS radios can send location data by the addition of a GPS Remote Speaker Mic for portables and additional external GPS receiver added to the mobiles but must use an IV&D channel set up at the sites. Sites can have both IV&D channels and Enhanced Data channels. Obviously the reporting rate will be significantly different and therefore impact the resources of the system.

At a minimum, the non-Motorola subscriber would need to support the P25 Data over trunking SNDCP protocol to support the following features:

- GPS
- Text Messaging
- Over the Air Programming (OTAP) – Also known as POP25 for Mot Subs

- Over the Air Rekeying (OTAR)

Motorola's ASTRO Subscribers are designed to operate on the P25 SNDCP standard. The solutions are implemented, tested and certified for optimum performance with the various components operating on Motorola systems, such as the Presence Notifier, Text Messaging Service, and GPS server.

While many vendors offer features that use the P25 SNDCP standard, the implementation of these features differ between the radios, the servers on the system, and applications – this means compatibility issues can exist with non-Motorola P25 subscribers.

The ability to do OTAR and GPS would also depend upon the capabilities of the non-Motorola subscriber and how the manufacturer has implemented the P25 OTAR and GPS Standards.

Even if the manufacturer claims compatibility, OTAR and GPS are not tested in the P25 Compliance Assessment Testing Program, meaning the applications may not be stable to a mission critical standard. IV&D features are not part of the P25 CAP Testing Program.

Many other features are in the P25 Standard (such as OTAR and GPS) and should theoretically work across vendor platforms; however there are no interoperability tests defined for these features. Motorola tests every feature offered between its Subscribers and Infrastructure to a Mission Critical level of stability.

In the event agencies within Broward County elect to purchase non-Motorola subscribers and wish to implement OTAR, GPS, or other P25-standard features, Motorola will fully participate with other vendors to troubleshoot and validate proper performance on the Broward County system.

1.5.2 ASTRO Infrastructure Requirements

When deploying an ASTRO 25 infrastructure with Intelligent Middleware (IMW), the location functionality described with the PremierOne CAD can be enabled as part of that effort.

ASTRO systems must be properly equipped and licensed to support data operation. The minimum requirements are ASTRO 7.14 infrastructure (or later) with Enhanced Data, IMW 5.x, and a GGSN and a Packet Data Gateway for each zone. Motorola is supplying all of the equipment, software, and options necessary to support the PremierOne GPS location integration.

The System solution will utilize the ASTRO infrastructure. Options for the System include IMW and Enhanced Data. A capacity study must be performed to determine the system's ability to accommodate Responder Location features.

1.5.3 ASTRO System Capacity

ASTRO communication systems utilize narrowband channels to support voice and data communications. The capacity of ASTRO systems, that is, the volume of voice and data traffic they can support, varies with the number of channels in the system and the system architecture (multi-site, simulcast). The ASTRO infrastructure provides two types of packet data bearer service between data enabled subscribers and host applications:

- Integrated Voice & Data (IV&D) is a P25 compliant data service that is integrated with trunked voice services. Trunked data allows data transmission inbound from a data enabled trunked subscriber through the ASTRO Infrastructure to a host application in a connected Customer Enterprise Network.

- Enhanced Data is a data solution based on Phase 2 voice signaling but uses the full channel for data. It allows data transmission inbound only, and is primarily used for periodic location update messages. Enhanced Data offers a 12 fold improvement in inbound location reporting capacity over Trunked IV&D. Its use is limited to Motorola APX subscribers.

The Automatic Responder location (ARL) features can utilize an ASTRO system for data transport. The location reporting parameters configured in PremierOne have a dramatic impact on feature performance and on ASTRO data utilization. It's critical to take the ASTRO system's configuration and capacity into account when configuring these application features.

The table below provides general guidelines for the channel utilization of Enhanced Data channels supporting ASTRO location data only. PremierOne CAD control signaling and other data applications such as, OTAP, OTAR, and Radio Management also require data capacity and will increase data channel utilization.

ASTRO Data Solution	Capacity Guidelines (Location updates only)
IV&D Enhanced Data (w/ Header Compression)	150 Users per channel at 30 second location cadence 300 Users per channel at 60 second location cadence 1 channel for IMW Registration per 500 Users

Motorola will perform a detailed capacity analysis prior to finalizing the PremierOne Responder Location feature configurations. Motorola's Hydra coverage analysis tool allows the system engineer to assess both the system's RF coverage and its voice and data utilization. All potential data sources will be analyzed including Radio Management, OTAP, OTAR and PremierOne. The analysis process will accurately determine the volume of Responder Location data that the ASTRO system can support.

1.5.4 ASTRO Location Accuracy

There are a number of factors that impact the accuracy of ASTRO location updates. Some are a fundamental aspect of the Global Positioning System design such as the need to "see" satellites. Others are a result of the ASTRO system implementation and configuration settings. These settings can be adjusted for a specific implementation, but always involve a trade-off between competing system characteristics.

1.5.5 GPS Signal Availability

The ASTRO subscriber's GPS antenna must be able to receive GPS signals from five or more satellites to accurately derive a location. Operation in buildings, tunnels, urban canyons, or densely forested areas can reduce GPS location accuracy or prevent the subscriber from determining its location altogether.

1.5.6 Temporary Signal Loss

ASTRO subscribers cache their last known location. In the event that an ASTRO subscriber loses GPS fix, it will send its last known location in response to a location query or scheduled location update. The subscriber will send its last known location for up to 100 seconds after losing GPS fix. The accuracy of the location updates sent during temporary signal loss is a function of the subscriber speed.

1.5.7 GPS Acquisition Time

When ASTRO subscribers are powered on they require a finite amount of time to accurately establish their location. This is referred to as Time To First Fix (TTFF). In the Cold Start scenario a subscriber is turned on after a prolonged period of time and does not have an accurate estimate of its position or time. TTFF in this case is <60 seconds 95% of the time. In a Warm Start scenario the subscriber is turned on and has an accurate location and time estimate. TTFF in this case is <10 seconds 95% of the time. This can result in a delay between subscriber power up and the first accurate location update. For example, if an officer turns on a portable radio when exiting the vehicle the Responder Location CAD feature may not receive an accurate location update for over a minute.

1.5.8 GPS Sleep Cycle

APX subscribers use a sleep cycle to conserve battery life when GPS signal lock cannot be achieved. When the GPS receiver enters sleep cycle it powers down for 90 seconds then wakes and searches for GPS signal lock for 180 seconds. If it is able to achieve GPS signal lock it will remain awake, otherwise it will return to sleep for another 90 seconds. This behavior can result in a delay between the time when a subscriber moves into a location with GPS signal (e.g. goes outside) and its first location update.

1.5.9 Voice Priority

ASTRO IV&D subscribers give priority to voice transmissions. If a user is talking on their radio or receiving a transmission from another user, their radio cannot originate or receive data traffic. This voice preference results in data packets being queued within the radio for transmission when the radio is not participating in a voice service. Packets are discarded if they are older than the 12 second queue dwell timer. This can cause a variable arrival rate of location update reports at PremierOne.

1.5.10 Open Mic on Emergency

ASTRO subscribers can be configured to transmit audio after the Emergency Button is pressed. This will prevent the subscriber from transmitting location updates until the radio de-keys.

1.5.11 ASTRO Data Capacity Analysis (CapAnal-1)

The objective of this activity is to ensure the Customer's ASTRO communication system is properly equipped, configured, and has the capacity to support ASTRO data dependent PremierOne CAD features such as ARL and AMS. The results of the capacity analysis provide guidance for provisioning ARL and AMS features. A Motorola System Engineer will conduct the assessment of the existing ASTRO

system. If an ASTRO system is in deployment then the analysis will be performed on the proposed ASTRO system design.

Motorola will:

1. Collect and review as-built information about the ASTRO system from the Motorola ASTRO deployment team, system Manager, or Customer.
2. Document any deficiencies in the ASTRO system such as licenses, product versions, firmware versions, and system components that are required for PremierOne / ASTRO integration
3. Collect 30 days of ATIA data from the production ASTRO system
4. Analyze the ATIA data to determine the busy-hour voice load model
5. Collect PremierOne CAD provisioning parameters and usage statistics
6. Document the desired operation of ARL features including estimates of anticipated use
7. Analyze collected data and define a data load model based on the desired features and target configuration
8. Perform a voice and data capacity analysis using the Hydra ASTRO modeling tool. Multiple scenarios will be considered in an effort to optimize the use of available RF channels to provide PremierOne functionality while maintaining the required voice Grade of Service (GoS)
9. Prepare ASTRO Capacity Analysis Report that describes any required ASTRO system changes and the maximum recommended provisioning parameters for ARL features.
10. Present and discuss the Capacity Analysis Report with Customer and finalize the PremierOne ARL provisioning parameters.
11. Provision the PremierOne CAD with the agreed parameters.

County will:

1. Provide access to the ASTRO Master Site for collection of ATIA and configuration data.
2. Provide information about the current subscriber types, quantities, and expected use.
3. Provide information about any other current or planned users on the ASTRO system
4. Review and discuss the Capacity Analysis report with Motorola.

1.5.12 PremierOne CAD Integration Scope of Work

Motorola Solutions will perform the following services associated with the PremierOne CAD Integration:

1. Provide all associated hardware, software, and licenses required to provide Broward County the above-stated functionality.

2. Provide engineering, project management, installation, and any other services required to fully deploy the above-stated functionality

3. Provide the solution in a manner which does not include any single points of failure, including backhaul connections and hardware redundancy, where appropriate

4. Provide connectivity between the primary and DSR master site IMW servers with the primary and disaster recovery (DR) CAD servers

5. Provide any configuration updates to the CAD or radio systems required to support this feature

6. Complete a data capacity study to optimize GPS polling rates
7. Install and configure interface
8. Provide CAD provisioning support
9. Provide training for County dispatch personnel regarding the use of this capability
10. Provide any integration services required with the County's Public Safety Internet (PSI) network, or any other required external network
11. Provide any required firewalls to interface between the radio network and any external networks
12. Develop an acceptance test to validate proper performance of the CAD integration, and successfully execute the test

1.6 Radio Management

Motorola Solutions' Radio Management is a solution that comprehensively manages radio configuration and subscriber radios.

Key Radio Management Features include:

1. Easily Searchable Radio Inventory Database.
2. Centralized Radio Configuration and Codeplug Management.
3. Automated Radio Updates of Codeplugs, Firmware, and Software Flash Versions.
4. Batch Programing of Motorola Solutions APX Radios over an ASTRO25 P25 System.
5. No Missed Calls with OTAP due to Voice Priority with Motorola Solutions' Infrastructure.

Radio management enriches each agency's management of radio inventory, reduces initial programming time, optimizes routine programming maintenance and aids in software updates on a regular basis. The control, ease of use and efficiency Radio Management provides compliments the APX radio subscriber fleet and offers a dynamic and well organized fleet management solution.

Using Radio Management (RM), APX Radios are assigned a codeplug template that can be unique or shared among a large group of radio users. Changes to these templates can then be performed via RM either individually or scheduled as part of a batch job by a radio technician. Regardless if the radio is being programmed as part of a large batch or an individual change, Radio Manager will track if the radios has been successfully programmed, providing a clear view of the entire radio fleet and codeplug history for each radio.

Radio Management can also be used to manage the Software Flash Versions, or enabled feature sets, as well the firmware of each APX Subscriber. These updates can be performed on an individual or group basis using the RM server to manage the process.

Radio Management is agnostic to how the APX radio is connected to the RM system and is able to use multiple methods to communicate with the subscriber. Regardless to how the APX radio is updated the RM server will provide a report to the radio technician of current programming status of each radio.

Table 1.6-1: Radio Management Usability Methods

Methods to Use Radio Management	
Computer and Program Cable	✓
Bluetooth	✓
Wi-Fi	✓
ASTRO 25 OTAP	✓

Motorola Solutions APX subscribers on an ASTRO 25 system are also able to have their firmware updated over-the-air via the Over the Air Software Update process. The OTA Software update can send new firmware to every APX subscriber on the system in a broadcast fashion. This is done by using the voice channel to send small packets of data to the APX radios at the same time over the voice channel. This allows all of the APX radios in the fleet to compile the new firmware over a period of days and then allow the radio users to accept the new firmware when it is fully downloaded. The OTA software process runs in the background of the APX radio's operation and does not affect its' voice or data communications. This enables users to stay in the field, reducing costs and time and is exclusive to Motorola Solutions.

Solution Architecture:

IP Network, Network Server, Administrator Workstation(s), RM Licenses for each radio

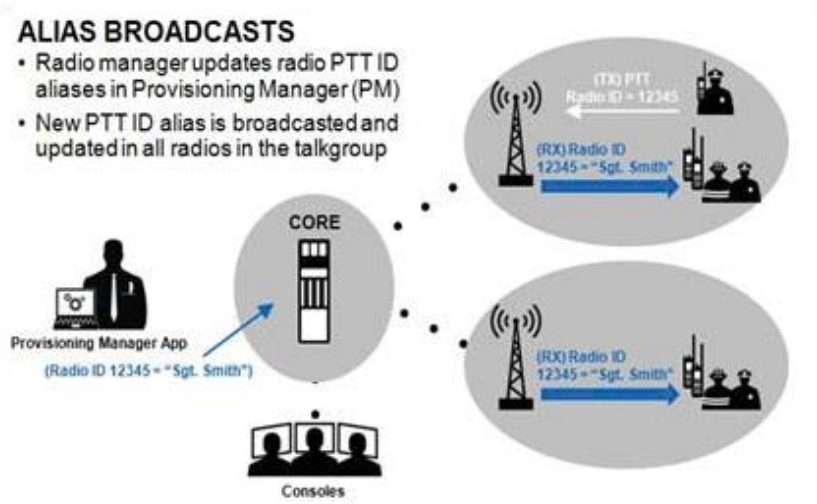


Figure 1.6-1: APX Alias Updates

By using Radio Management, OTAP, OTA Software, and Alias Update, the APX radio fleet can be kept up to date with the latest software and features with minimal downtime, allowing First Responders to focus on the task at hand and not their radios. The Radio Management feature for the Astro 25 system proposed includes the following:

- Radio Management Online Licenses Delivery

- ADD: Radio Management Licenses Online For 10,000 Subscribers
- Windows Desktop Workstation
- Rack Mount Windows Database Server For Large Size Fleets
- Rack Mount Windows Job Processor Server
- Tech Global Evolution Series 19 inch Non Touch
- Windows Laptops

1.6.1 Radio Management Scope of Work

Motorola will provide the following services associated with the deployment of Radio Management:

1. Provide all associated hardware, software, and licenses required to provide Broward County the above-stated functionality.
2. Provide the solution in a manner which does not include any single points of failure, including backhaul connections and hardware redundancy, where appropriate
3. Provide engineering, project management, installation, and any other services required to fully deploy the above-stated functionality
4. Stage the equipment along with the complete system at CCSI and demonstrate the Radio Management functionality by selecting the appropriate RM Factory ATPs mutually agreed to by Broward County and Motorola. This should be done during the Contract Design Review prior to the staging event.
5. Provide installation of all servers, clients and programming laptops in the field
6. Provide any required interfacing with external networks, including but not limited to the County's PSI, leased circuits, the internet, any municipal networks (Motorola is not responsible for leased backhaul costs).
7. Provide any required firewalls to interface between the radio network and any external networks
8. Develop and load the subscriber initial templates for those subscribers that will be managed by RM. This requires a manual read of each subscriber radio that will be configured with Radio Management, from the Radio Management terminal. The labor for this effort is not included, and will be billed separately at the subscriber programmed rates defined in this contract.
9. Provide training for Broward County personnel that will use the RM feature, including system management and user training.

1.7 Over the Air Rekeying (OTAR)

This feature provides the Astro 25 system the ability to change encryption keys over the air to subscribers that have the OTAR-Multikey feature. This feature requires IV&D and Presence Notifier (PN) licenses for each subscriber. All system-level licenses are being provided by Motorola. The PN licenses also serve for other options such as OTAP and Location and only need to be purchased once. The KMF consists of three major elements:

- A Client/Server software application
- A Windows Computer Network
- A KMF CRYPTR

The KMF CRYPTR is a device that performs encryption and decryption for all security critical key management messages. Encryption Modules equipped with AES are APCO Project 25 and FIPS 140-2 compliant.

KMF Redundancy allows for automatic database back up and automatic switch over from the main to the standby server in a system. Redundant servers can be co-located, or at a remote site while on the same subnet, to enhance failure recovery. The Redundant OTAR feature for the Astro 25 system proposed includes the following:

- KEY Management Facility
- KMF Server And Client Software
- More Than 1000 Radio Users
- 64 Agency Partitioning
- KMF Redundancy Software
- KMF DL380 G9 Server With Windows Server 2012 Embedded
- USB Modem By Multitech - Required For KVL-KMF Communication Remotely
- KMF CRYPTR
- Basic Software Option
- AES 256 Encryption Kit
- Line Cord, North America
- Rack Mount Kit For Cryptr II
- Tech Global Evolution Series 19inch Non Touch
- Computer, Z440 Workstation Windows 10

1.7.1 Over the Air Rekeying Scope of Work

Motorola will provide the following services associated with the deployment of Over the Air Rekeying:

1. Provide all associated hardware, software, and licenses required to provide Broward County the above-stated functionality for the system infrastructure. Subscribers will require the addition of the OTAR/Multi-Key option and IV&D. APX subscribers shipped after 1/1/2016 has IV&D included.
2. Provide the solution in a manner which does not include any single points of failure, including backhaul connections and hardware redundancy, where appropriate
3. Provide engineering, project management, installation, and any other services required to fully deploy the above-stated functionality
4. Provide any required interfacing with external networks, including but not limited to the County's PSI, leased circuits, the internet, any municipal networks
5. Install primary and backup geographically redundant KMF servers
6. Install terminals for access to KMF servers
7. Stage the equipment along with the complete system at CCSI and demonstrate the OTAR functionality by selecting the appropriate OTAR Factory ATPs mutually agreed to by Broward

County and Motorola. This should be done during the Contract Design Review prior to the staging event.

8. Perform the same ATPs after system installation and optimization using fielded Broward County OTAR capable radios.
9. Provide training for Broward County personnel that will use have access to and use the OTAR feature.

1.8 Over the Air Programming (OTAP)

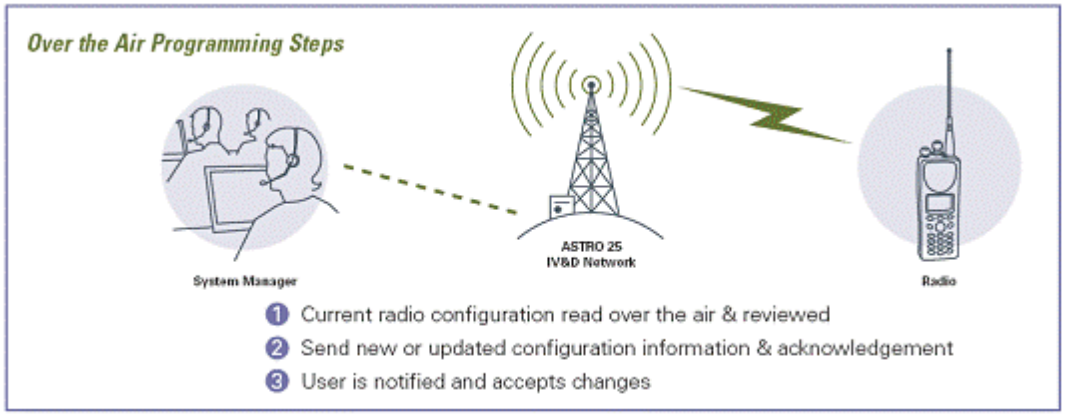
IV&D on the proposed ASTRO 25 digital trunked radio network provides a capability to reprogram or "reconfigure" radios units over-the-air. In addition to minimizing administrative costs and logistics issues, POP25 allows the County to respond faster to changing conditions, reprogramming your entire fleet in hours or days, instead of the weeks or even months required for a manual update.

This feature, known as Programming Over Project 25 (POP25) will enable the County to easily reprogram their radios to reflect network growth and changes. POP25 automates the programming process, sending updates quickly and transparently over the air using the ASTRO 25 IV&D network instead of requiring users to bring their radios in for manual reprogramming.

The OTAP feature for the Astro 25 system proposed includes the following:

- Unified Network Services
- Unified Network Services Software
- Astro Network Application Interface
- Mcafee Standalone Anti Virus Software
- High Capacity/Geo Redundant Server
- 10,001-20,000 Device Licenses For Presence
- SQL SVR STD2014 EMB

The Presence licenses are common for OTAR, OTAP and GPS location so these only need to be purchased once that covers all three features.



Over-the-Air Programming steps

1.8.1 Over-the-Air Programming Steps

Users can make, receive, and continue calls during the entire process.

POP25 handles all of the same configuration parameters that can be programmed manually via Motorola CPS, including changing or adding:

1. Radio ID.
2. Talkgroups.
3. Mode names.
4. Scanning features.
5. “Rekeying” for software based Advanced Digital Privacy (ADP) encryption.
6. Call lists.
7. Conventional channels.

Built-in security mechanisms prevent unauthorized users from “eavesdropping” during the re-programming process.

POP25 supports read, write, and clone operations. It reads the entire memory codeplug from a radio. Once the codeplug is read, it can either write the codeplug to same or different radios or can save the codeplug. In order to reduce the write-time, POP25 writes only those parts of the codeplug that have changed using a process called differential write. In addition, using locally-stored archived codeplugs or templates, POP25 can change codeplug parameters locally and then write the codeplug over the air to a radio.

Another important feature supported by POP25 is batch programming. Batch programming allows multiple radios to be reprogrammed at once without the need for the network manager or technician to individually poll and program each radio individually. This also allows programming of units to be set up and scheduled for a later time.

1.8.2 Additional Information

Depending on circumstances and codeplug size, the approximate time is 2-4 minutes to read and 2-4 minutes to reprogram the entire content of a radio/codeplug.

The codeplug must be read over the air and then modified. Only the parameters to be change are sent back over the air. In addition to the size of the codeplug, the timeframe required for reprogramming depends on the type of modifications, number of talkgroups or channels affected, and number of modifications. Changing fewer parameters in the radio lends to a shorter reprogram time.

Batch programming enables 16 radios to be set up for programming at once. This POP25 programming feature is accomplished in a serial fashion; POP25 can be set up for the user to accept or decline a program. If the program is declined, it can be pushed automatically to the radio at the next “turn-on”. POP25 can also be scheduled to send out the programming over the air at a specified time so it does not need to be attended.

1.8.3 Programming Over P25

Motorola's feature called POP25 allows radios to be remotely configured from your network by sending a sequence of commands over-the-air via the IV&D transport layer. POP25 enables reconfiguration of talk groups, personalities, and channels without physically touching the radio.

Benefits and features of POP25

Feature of Our Technical Solution	Benefit of Our Solution to Broward County
Radio is fully available for voice calls during the POP25 reprogramming. If a call is initiated or received during the reprogramming, the POP25 application will pause, allowing the call to proceed. Once the call is complete, the POP25 reprogramming will resume without any user involvement.	Voice priority always. No need to switch to a conventional channel to make a voice call. No need to manually restart programming after the call and/or lose track of who got programmed.
The POP25 feature can be configured to allow the user to accept, delay, or reject the new radio configuration based on their current situation. This prevents the radio from being reset without the involvement of the user.	User control of POP25 reprogramming is available if desired.
The duration of the reprogramming is based on the size of the radio codeplug, enabling smaller codeplugs to be downloaded more efficiently. Typical download time is approximately 2 minutes.	Reprogramming to be performed as quickly as possible.
The POP25 feature can only be enabled/disabled by using the Customer Programming Software, and Advanced System Key. This prevents users from inadvertently disabling the feature.	Security
The radio user is free to roam from site to site while the download is taking place.	Mobility

POP25 can reduce the total amount of time spent per radio unit update by up to 85%, allowing users and equipment to remain operational in the field. Assuming one reprogramming event every other year over the average lifetime of a radio (10 years), the total coordination and programming time can be reduced from 3.5 hours to only 30 minutes.

Motorola uniquely provides voice priority over data that is configurable. Other substantial benefits include:

1. No loss of communications while reprogramming occurs.
2. Programming resumes automatically after interruption.
3. Quicker network optimization.
4. Eliminates time spent tracking assets for reprogramming.

Over-the-Air Programming utilizes the same CPS that is used every day to program radio units. POP 25 supports all read, write, and clone operations. Codeplug templates can be changed locally, and then sent over the air to the radio. Most of the editable CPS parameters can be changed via over-the-air programming, including radio personalities, talkgroups, channels, and sites. The only exception is Channel Announcement (audible indication of channel on the radio), which is not available for modification over the air.

1.8.4 Voice Priority

Users retain full use of the radio during configuration data transfer. Radio voice calls take priority over data transfers, ensuring that Over-the-Air Programming will not interfere with the user's ability to communicate.

Voice conversations will not be interrupted during the data transfers. While data is being transferred to the radio, the radio user can continue normal operation without any loss of productivity. Once the download is complete, the radio user receives a visual status in the display and an audio tone. The user takes action by accepting the changes immediately or delaying the update until a more convenient time.

1.8.5 User Interaction

Radio codeplugs sent by the programmer will be automatically received by radio users. No interaction is required during the download process. During this process, the LED light on the radio will blink, and the data icon will appear on the display (if applicable).

Following the data transmission, an audible notification will alert the user that they can accept, delay, or reject the update to the codeplug. If the user has a non-display model of radio, the radio will require a power cycle to accept the codeplug changes. The programmer can remove the "reject" option from the radio user, allowing the radio user to only accept the codeplug, or delay until a later time.

The radio will continue to beep until an action is taken, notifying the user of the action required. If no action is taken and the radio is powered down, the radio will accept the codeplug upon power up.

The CPS user (programmer) will receive an acknowledgement that the download to the radio unit was successful. The programmer does not receive the choice of the user to accept, delay, or reject. If the radio is turned off during the codeplug transmission, the programmer will receive notification that the download was unsuccessful. The CPS will timeout in 180 seconds if the transmission had started, and was interrupted by the power cycle. If the radio is not currently in the coverage area, or not powered on, the Presence Notifier will indicate that the IP address is invalid and the radio is not found.

Should a radio user need to make a voice call during a codeplug download, the radio will leave the data channel upon PTT and move to a voice channel. The radio will remain on the voice channel for the duration of the voice conversation. While on the voice channel, no data is transmitted. The codeplug download will resume following voice traffic, if the voice conversation is less than 180 seconds. However, if the voice conversation is longer than 180 seconds, the codeplug write will cancel automatically and the programmer will need to reinitiate the download.

1.8.6 Coverage

Over the Air Programming allows an authorized person to wirelessly access and update a data enabled ASTRO 25 mobile and portable radio wherever they are located in the coverage footprint of an Integrated Voice and Data system. There is complete system-wide mobility within coverage of the IV&D system. The Presence Notifier tracks the radios within the network by IP address. This allows the system to know whether the radio is turned on or off. The CPS interfaces with the Presence Notifier to recognize when the radio is on and within coverage area of the system.

1.8.7 Timing

The time it takes to read or write a radio is dependent upon the size of the codeplug and the utilization level of the IV&D pipe. Typically, on a system where the data pipe is not heavily active, a 50K codeplug takes around 2 minutes. It is important to note that during the read and write process, voice activity can take priority so codeplug changes do not interfere with mission critical situations. (The voice priority can be configured using the network management configuration applications)

1.8.8 Over the Air Programming Scope of Work

Motorola will provide the following services associated with the deployment of Over the Air Programming:

1. Provide all associated hardware, software, and licenses required to provide Broward County the above-stated functionality for the system infrastructure. Subscribers will require the addition of the OTAP option and IV&D. APX subscribers shipped after 1/1/2016 have IV&D included.
2. Provide the solution in a manner which does not include any single points of failure, including backhaul connections and hardware redundancy, where appropriate
3. Provide engineering, project management, installation, and any other services required to fully deploy the above-stated functionality
4. Provide any required interfacing with external networks, including but not limited to the County's PSI, leased circuits, the internet, any municipal networks
5. Stage the equipment along with the complete system at CCSI and demonstrate the OTAP functionality by selecting the appropriate OTAP Factory ATPs mutually agreed to by Broward County and Motorola. This should be done during the Contract Design Review prior to the staging event.
6. Perform the same ATPs after system installation and optimization using fielded Broward County OTAP capable radios.
7. Provide training for Broward County personnel that will use have access to and use the OTAP feature.

1.9 Automatic Resource Location (ARL)

1.9.1 ASTRO 25 OUTDOOR LOCATION

Dispatchers need to be able to quickly identify the location of outdoor personnel whether they are in a life threatening situations or exercising their daily schedules. The ASTRO 25 Outdoor Location Solution is a resource tracking solution that uses Global Positioning System (GPS) satellites to provide operators with the ability to accurately locate and track outdoor personnel and assets, on demand, and in real-time.

The ASTRO 25 Outdoor Location Solution does not contain a mapping application. This would be provided within the CAD applications. In this case, it would be part of a Premier 1 CAD system.

1.9.2 ASTRO 25 INTELLEGENT MIDDLEWARE (IMW) PRESENCE

Presence within an ASTRO 25 network is used for monitoring the availability and absence of subscriber units with Automatic Registration Service (ARS) capabilities within an ASTRO 25 radio network. Presence is also required for Over the Air Programming or POP25. If POP25 was already purchased, then the presence does not have to be purchased with the location option.

The Presence service within IMW is responsible for monitoring the presence of ARS capable subscriber units and reporting their state. One of its primary purposes is to provide the IP address of subscriber units, thus avoiding the need to provision the subscriber units with the IP address of the various applications servers.

The GPS Location feature for the Astro 25 system that shall be provided includes the following:

- Unified Network Services *
- Unified Network Services Software *
- Astro Network Application Interface *
- Mcafee Standalone Anti Virus Software *
- High Capacity/Geo Redundant Server *
- 10,001-20,000 Device Licenses For Presence *
- SQL SVR STD2014 EMB *
- 10,001-20,000 Device Licenses For Location
- Integration for P1 CAD mapping

* These are not required if POP25 was already added

1.9.3 LOCATION ON PUSH-TO-TALK

The Location on PTT feature enables ASTRO 25 trunked radio systems to continuously track the location of individual radio users while they are involved in voice calls. With each transmission, the APX radio with Location on PTT will send its Global Positioning System (GPS) location to the dispatch mapping application. ASTRO 25 Location on PTT provides timely, accurate location information when needed most – during emergencies and critical incidents. GPS location data is sent with each PTT or

"hot mic" activation, following an emergency button press or man-down situation. This allows dispatchers to effectively coordinate back-up and support services during an emergency situation. Additionally, Location on PTT increases location accuracy even during times when the radio system is heavily congested with voice traffic. Every time a first responder presses the PTT button, their location is updated, helping dispatchers make quick decisions based on current location data.

With Location on PTT, radios will no longer be required to complete a call and connect to a data channel in order for a location update to be sent to dispatch. An APX radio in a group call or emergency call sends its current GPS location over the voice channel during each transmission. Location data is embedded directly in the voice stream and sent continuously with no impact to voice quality or performance. Radios with Location on PTT can be configured to send their location after each PTT during group calls and during emergency calls. Location on PTT can be sent over the voice channel, in addition to cadence, distance or manual updates already being sent over the data channel. Once location data is received by the Packet Data Gateway (PDG) at the ASTRO 25 Master Site, it is then forwarded on to the mapping application via Intelligent Middleware (IMW). Dispatch can then use the mapping application to view the location of any APX radio, in near real-time, for faster emergency responses.

1.9.4 ASTRO 25 ENHANCED DATA

ASTRO 25 voice systems have been building to portable grade coverage specifications for several years. The ASTRO 25 system provides all of the components and the wide-area system coverage necessary to perform a mobile and portable GPS reporting function. Motorola understands the customer's needs to poll for location data more frequently. Constant tracking of the locations of all field personnel has been a need for the Public Safety sector for a long time. Enhanced Data on ASTRO 25 Integrated data will provide the following benefits:

- Provide outdoor location data for all of the users with a faster polling rate.
- Increased AVL and telemetry capacity as compared to Classic P25 Integrated Data.
- Ability to have dedicated, data only, Enhanced Data channels.
- Ability to prioritize data over non Emergency voice calls on Enhanced Data channels.
- ASTRO Enhanced Data is an optional proprietary feature for the 7.14 release and beyond. Since the Broward County release is 7.17, this feature is available today.

The Enhanced Data feature for the Astro 25 system includes the following:

- Trunked Enhanced Data
- 10,000 Enhanced Trunked Data User Licenses
- Simulcast Remote Site Licenses IV&D+ENH Data

1.9.5 Automatic Resource Location Scope of Work

Motorola will provide the following services associated with the deployment of Automatic Resource Location:

1. Provide all associated hardware, software, and licenses required to provide Broward County the above-stated functionality for the system infrastructure. Subscribers will require the addition of the GPS, IV&D and Enhanced Data options. APX subscribers shipped after 1/1/2016 have GPS and IV&D included.
2. Provide the solution in a manner which does not include any single points of failure, including backhaul connections and hardware redundancy, where appropriate
3. Provide engineering, project management, installation, and any other services required to fully deploy the above-stated functionality
4. Provide any required interfacing with external networks, including but not limited to the County's PSI, leased circuits, the internet, any municipal networks
5. Provide any required firewalls to interface between the radio network and any external networks
6. Stage the equipment along with the complete system at CCSI. Since only the IMW servers will be staged with the system that hosts the Location application, testing will be limited. The function of context activation can be demonstrated which shows that an IP assignment has been activated for a subscriber.
7. The integration will be completed and tested with PremierOne CAD in the field and in alignment with the scope and services defined in Section 1.5.
8. Provide system manager training for Broward County personnel that will be responsible for managing the ARL components of the radio system

2. Phase Overview and Detailed Implementation Process

The step-by-step implementation plan for the project is identified in Figure 1 below. Note: not all Phases are sequential, including without limitation that Installation, Civil Work, Subscriber Installation, and Training may occur at any time during the project as approved by the County or the applicable Authorized Third Party User.

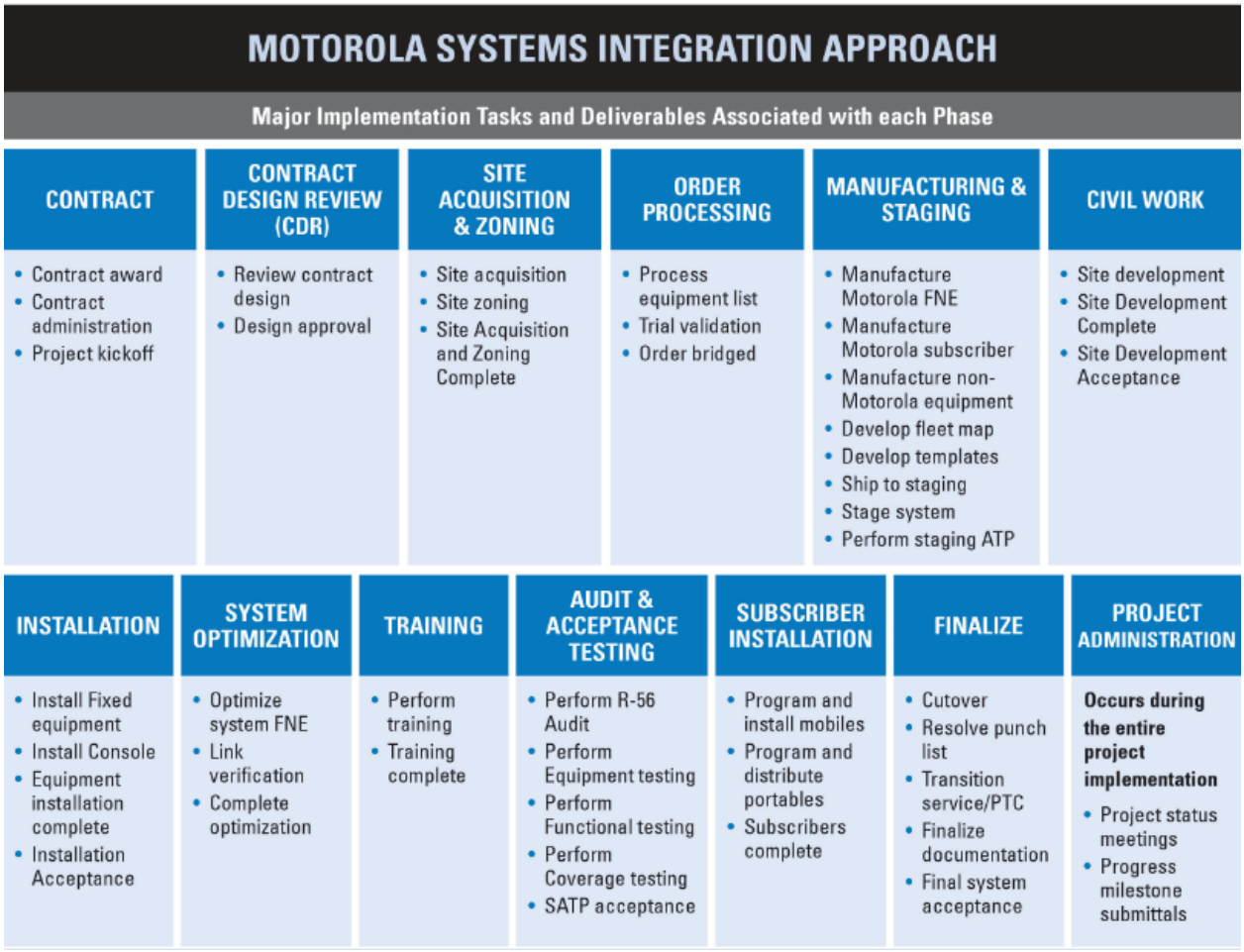


Figure 1 - Motorola Solutions' Systems Integration Approach

2.1 Phase Overview

This project will include the following major Phases:

1. Contract/Project Kickoff.
2. Design Review.
3. Order Processing/Manufacturing.
4. Fleet Mapping.
5. Staging and Shipment.

6. System Installation.
7. Optimization.
8. Training.
9. Cutover.
10. Preliminary Acceptance Testing.
11. Final Acceptance.

The Work Breakdown Structure (Figure 2) identifies the specific tasks, responsibilities, and deliverables that comprise each phase:

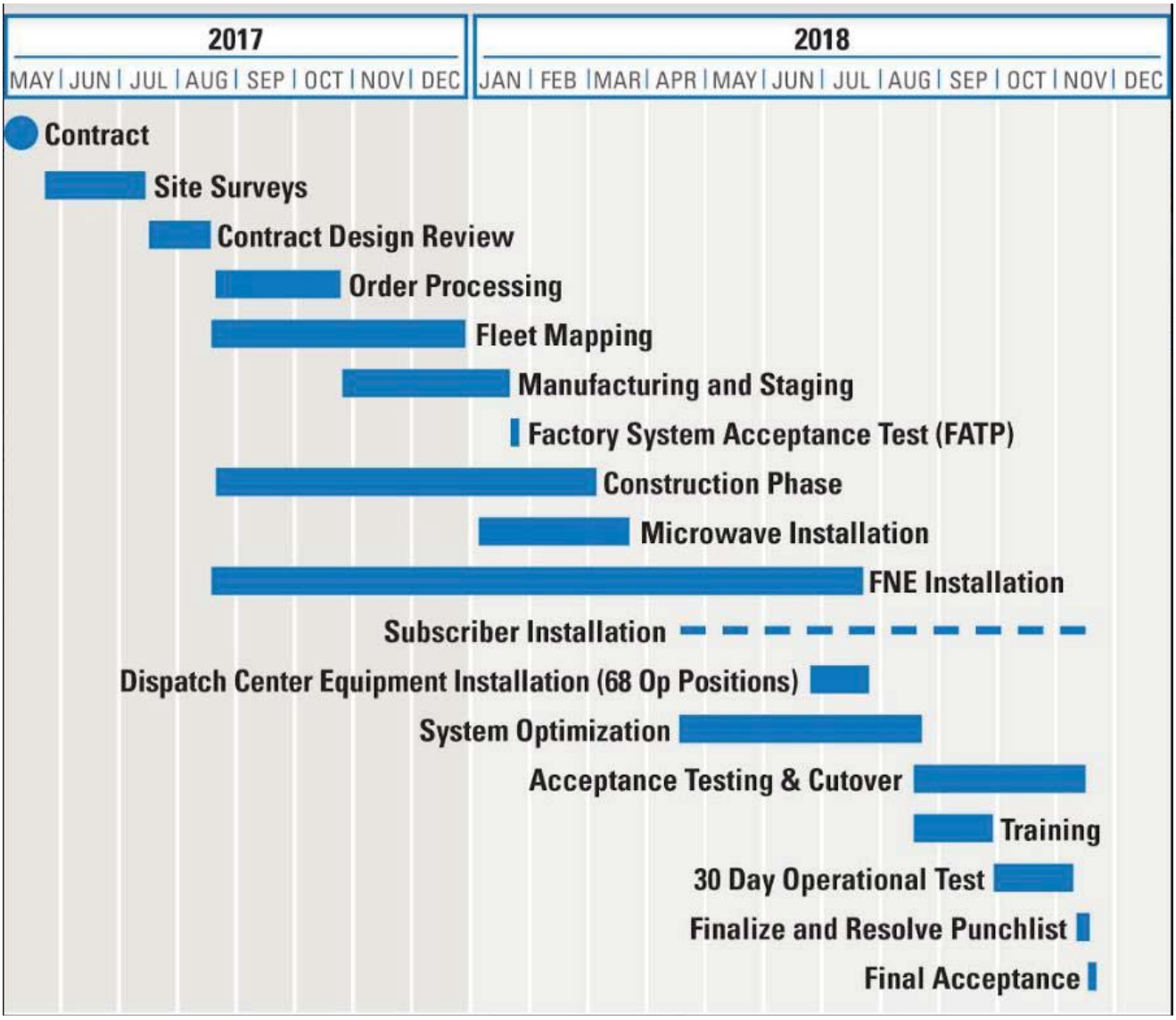


Figure 2 - Preliminary Project Schedule

Phase 1: Contract/Project Kickoff

The project will begin with a Project Kickoff meeting, which will include key Broward County and Motorola Solutions project participants. The objectives of the kickoff meeting include finalization of the

communication plan that contains the contact information for both entities. The meeting will also provide a preliminary Project Schedule review, and align expectations regarding the overall PMP. This will be a joint meeting in order for all the participants to provide their concerns and perspective on the project implementation.

Phase 2: Design Review

The Design Review phase sets the direction of the project on the road to success, from the start of implementation all the way through to final acceptance. At the review meetings, the County and Motorola Solutions will work together to confirm the accuracy of every detail of the design.

During the design review, Motorola Solutions and Broward County will review the proposed solution, including the preliminary design and statement of work, which reflects Broward County's requirements as defined in the RFP.

Also during the design review, Broward County and Motorola Solutions will optimize the proposed phased implementation approach to save time and cost while meeting the needs and requirements of Broward County. Motorola Solutions will provide guidance and cost-effective solutions that anticipate not only the current needs and requirements but also allow for enhancements to meet Broward County's future needs. Throughout this interactive process, Broward County (including, to the extent involvement is approved by the County, its member agencies and other stakeholders) will be afforded opportunities for participative involvement in cost savings, risk mitigation, and the change management process.

The design review shall be conducted in two subphases, as defined below:

Phase 2A: Preliminary Design (45 Days After Notice to Proceed (NTP))

The Provider shall submit the Preliminary Design package in their native editable format and Portable Document Format (PDF) within 45 days after the applicable Notice to Proceed for SOW A-1 is issued. The Preliminary Design Package shall include the following:

A. QA/QC plan
B. Detailed Project Schedule (in Microsoft Project)
C. System-level and block diagrams (in Visio format)
D. Patching schedules and termination details for all cabling necessary for a complete record of the installation
E. Radio and microwave channel plans
F. Equipment room overview drawings
G. Equipment rack/cabinet elevation drawings
H. Tower profile drawings indicating antenna-mounting locations
I. Detailed lists of materials for each site
J. 30-day Operational Test Plan (OTP)
K. Coverage Acceptance Test Plan (CATP)

L. Updates to Acceptance Test Plans to cover OTAR, OTAP, Radio Management, and Automatic Resource Location

Phase 2B: Final Design (90 Days After NTP)

Provider shall submit the Final Design package 90 days after the Notice to Proceed for SOW A-1 is issued. The Final Design Package shall include the following:

A. Any updates to previously submitted design information
B. Cutover plan
C. System operation and maintenance manuals for all equipment
D. Factory test data
E. Site installation drawings
F. Structural analyses and results
G. A detailed Staging Acceptance Test Plan outlining a comprehensive series of tests that will demonstrate proof of performance and readiness for shipment

Phase 3: Order Processing/Manufacturing

Upon finalization of the system design at the design review and written approval of the Final Design by County Contract Administrator, Motorola Solutions will place factory orders for the System Equipment. Motorola Solutions will place factory orders for all Motorola Solutions-manufactured equipment as well as all third-party equipment. Motorola Solutions will also manufacture Motorola Solutions equipment and track third-party equipment suppliers.

Phase 4: Fleet Mapping

As the system is being installed, the County and Motorola Solutions will develop the plan for controlling radio communications within and across the County's groups, otherwise known as "fleetmapping." Motorola Solutions will be responsible for installation of mobile subscribers per SOW A-4. Motorola Solutions will have a two touch process when programming the subscribers. The second touch will remove the legacy system code plugs.

Phase 5: Staging and Shipment

The System Equipment will be staged at Motorola Solutions' Customer Center for Solutions Integration (CCSi), an ISO 9000 certified process. Provider will conduct a comprehensive staging acceptance test plan during Staging to confirm proper system operation in a factory environment. Provider will label and inventory the Equipment at CCSi in an efficient and consistent manner in compliance with the County's inventory procedures or as otherwise instructed by the County Contract Administrator.

For all shipments of System Equipment, Provider shall submit a bill of materials/packing list with two copies for each shipment of equipment. The packing list shall include the following information at a minimum for each component per site (tower, dispatch location, etc.) included in the packaging:

1. Manufacturer
2. Model
3. Serial number
4. Unique identification of the package containing the item

All items shipped by Provider or its suppliers will include the above information in both Excel and barcode format.

Phase 6: System Installation

Following factory staging and associated testing, the equipment will be shipped to the Motorola Solutions storage facility, prior to installation. As the equipment arrives on-site, Motorola Solutions personnel will perform site audits to ensure that each site is ready for equipment installation. After the equipment is installed, Motorola personnel will conduct equipment measurements to ensure that all appropriate levels have been set, and that the equipment is functioning according to the system design and manufacturer's specifications. Motorola Solutions local installation teams will install per Motorola quality standards (R56) and Motorola Solutions' team will inspect the equipment at Broward County sites as they are installed and commissioned.

Phase 7: Optimization

Once all equipment is in place and fully installed, Motorola Solutions will configure, optimize and program all system equipment and subsystems as agreed upon during design review. During this phase, the System Technologist will perform installed component level testing on the RF equipment. A County representative will witness these tests at the time each site is optimized for operation within the system. Note that this optimization could occur outside of the 8:00 a.m. to 5:00 p.m. workday depending on schedule, if determined appropriate by the County Contract Administrator. Motorola Solutions System Technologists will be on site for this phase and will prepare the system for acceptance testing.

Phase 8: Training

Motorola Solutions will provide training timed appropriately for Broward County to ensure comfort with the system. The training plan will be finalized during Design Review and will be agreed upon between Motorola Solutions and Broward County. Motorola Solutions will also have engineers and technicians working with Broward County to answer any questions regarding the new system. The detailed training plan for Broward County is stated in Schedule 3.

Phase 9: Cutover Planning

The new system cutover plan will be finalized during Design Review. Motorola Solutions will work with Broward County to ensure smooth cutover for the County. Details of the cutover are set forth in Section 1.8.1 and following.

Phase 10: Preliminary Acceptance Testing

Preliminary Acceptance will include Coverage Testing, 30-Day Operational Test, and preliminary Acceptance Testing. Any punchlist items identified during the acceptance testing process will be resolved by Motorola before resubmitting for testing. Acceptance testing shall follow the procedures set forth in the Agreement.

Phase 11: Final Acceptance

Upon completion and preliminary acceptance of the Services provided by Provider pursuant to SOW A-1, A-2, and A-3, the System will be subjected to Final Acceptance testing which shall govern, upon successful completion of all final acceptance test criteria, County's written issuance of notice of Final Acceptance.

2.2 Detailed Phase Description and Work Breakdown

The following sections define in detail the expected project phases for the planning, design, manufacture, installation, optimization, and testing of equipment proposed. Each phase of the project defined in this Implementation Plan includes a responsibility matrix. These matrices define the responsibilities of both Motorola Solutions and Broward County and detail the tasks and deliverables for each phase. Each phase also includes completion criteria.

Phase 1: Project Initiation and Kickoff Meeting

Motorola Solutions' project management team will initiate a project kickoff meeting that includes key Broward County and Motorola Solutions project participants. The objectives of the kickoff meeting include the following:

9. Introduction of Motorola Solutions and the County's Project Managers as the single points of contact with authority to make routine project decisions.
10. Introduction of ASTRO 25 project team participants.
11. Review of the roles of the project participants to identify communication flow and decision-making authority between participants.
12. Review of the overall project scope and objectives.
13. Review of the resource and scheduling requirements.
14. Review Project Management Plan and processes.

During the Project Initiation phase, Motorola Solutions will work with the County to review and finalize the following project processes and procedures:

15. Detailed Project Schedule.
16. Risk Management Plan.
17. Change Control (Change Management) Plan.
18. Issues Document and Action Item Log.

Responsibilities and deliverables for Motorola Solutions and the County during the Design Review phase are defined in the following table:

Phase 1 Responsibility Matrix

Task	Responsibility	Deliverable
Initiate the project with a Kickoff Meeting.	Motorola Solutions and Broward County	Documented Project Personnel Names, Responsibilities, Contacts, and Project Review Procedures
Begin creating Risk Management Plan.	Motorola Solutions	Initial Risk Management Plan
Define format of the Issues and Action Item Log.	Motorola Solutions	Initial Issues and Action Item Log
Review change control procedures with County Project Manager.	Motorola Solutions	Initial Change Control Plan
Work with Motorola Solutions personnel in finalizing and approving the Change Control Plan.	Broward County	Approved Initial Change Control Plan
Develop a communication plan to address the types of communications that will be established such as the weekly status meetings and status reports. Weekly status meetings will be face to face. The communication plan will also indicate the appropriate points of contact for different types of communication.	Motorola Solutions	Communications Plan
Existing system documentation.	Motorola Solutions	County's Existing System Documentation
Updated Quality Control Plan	Motorola Solutions	Updated Quality Control Plan

Completion Criteria

This task will be considered complete when the project kickoff session has been held with Motorola Solutions and the County representatives in attendance, and when project scope, schedules, procedures, roles, and responsibilities have been documented and agreed upon.

Phase 2: Detailed Design Development and Review

After the Project Initiation and Kickoff Meeting, Motorola Solutions will meet with the County's project team to achieve written agreement on the contract system design, identify any special system or

product requirements and their impact on system design or implementation, and refine the system implementation plan and plan documentation.

Motorola Solutions' proposed comprehensive system design will serve as the baseline design for the Design Review. During the Design Review phase, Motorola Solutions and the County will work together to finalize the system design.

The County and Motorola Solutions will review and finalize the design through analysis of the system functionality, interface requirements, and end-user requirements, as mutually agreed upon by Motorola Solutions and the County.

Document List

Motorola Solutions will develop baseline versions of the following documents in cooperation with the County.

19. Project Schedule.
20. Statement of Work.
21. System Description.
22. Design of the P25 System.
23. System Block Diagrams.
24. Site Equipment Information:
    - Power Consumption Data.
    - Site Heat Output Data.
25. Civil Site Audits (Substantial Completion Acceptance Criteria, per SOW A-2)
26. Testing Plans:
    - Staging ATP
    - Coverage ATP
    - Field ATP
    - 30-Day Operational Test
    - System ATP
    - Final ATP (inclusive of Radio System, Microwave System, and Facilities and Infrastructure Services)
27. Training Plan.
28. Transition/Migration Plan.
29. Antenna system drawings

Some of the documents will be high level in their initial form, and require further development through the course of the project implementation. All documents will be finalized prior to commencement of Final Acceptance testing.

During Detailed Design Development and Review, Motorola Solutions and the County will have the general responsibilities shown in the following table:

Phase 2 Responsibility Matrix

Task	Responsibility	Deliverable
Review baseline design with the County. Motorola Solutions and the County will participate in a series of meetings where the Preliminary Design will be developed and reviewed.	Motorola Solutions and Broward County	Preliminary Design Package submitted to County
Update the Preliminary Design to the Final Design based on the design feedback from the County, Motorola Solutions will present the design documents listed above.	Motorola Solutions	
Final Design incorporating County's feedback will be developed by Motorola	Motorola Solutions	Final Design Package submitted to County for review; Final Design finalized and approved by both Parties

Completion Criteria

This activity is complete when all the Final Design has been approved in writing by the County Contract Administrator and all associated documentation (Preliminary Design Package and Final Design Package) has been delivered to the County, reviewed by the County, and approved by the County.

After written approval of the Final Design by County, Motorola Solutions will schedule all factory orders for shipment to meet the approved project schedule. Specific design activities are described in the following sections. Some detailed design development activities will encompass the review and finalization of multiple documents.

The following sections provide more specific detail with respect to Design documentation.

A. Project Schedule

The objective of this task is to further develop the Project Schedule contained in the proposal and incorporate any updates from the Pre-Contract Infrastructure Design.

The Project Schedule will be based upon the requirements identified in the Detailed Design Review and will take into account the project objectives, plans, schedules, approvals, priorities and inter-dependencies among tasks. These tasks will be established through a change order process and mutually agreed upon between the parties at the end of the Design Review. The resulting document defines the specific project tasks to be completed.

Responsibilities and deliverables for Motorola Solutions and the County during the Project Schedule phase are defined in the table below.

Project Schedule Responsibility Matrix

Task	Responsibility	Deliverable
Review with the County personnel the identified implementation tasks, priorities, inter-dependencies and other requirements needed to establish the Project Schedule. The Project Schedule will identify key project milestones, in addition to tasks that will require interruption of existing communications in order to move the new system into live operations.	Motorola Solutions	Project Schedule Review
Review the Project Schedule with the County personnel and make changes and/or corrections that are mutually agreed upon through the change order process.	Motorola Solutions	Project Schedule Completion
Review the Project Schedule and identify in writing any specific deficiencies found within 10 business days of receipt.	Broward County	Project Schedule Approval

Completion Criteria

This task will be considered complete upon mutual agreement of the parties to implement in accordance with the Project Schedule that has been developed within the Preliminary Design review.

B. Finalize Space, Power, and HVAC Requirements

Motorola Solutions will work with the County to finalize space, power, and HVAC requirements for the sites based on the agreed upon Final Design. Prior to the finalization of space, power, and HVAC requirements, Motorola Solutions will have completed the overall system configuration and architecture design jointly agreed upon by the County and Motorola Solutions. Motorola will provide a comprehensive report (including floor layout and rack drawings, as well as power consumption and heat output specifications) report identifying all applicable space, power and HVAC requirements at each applicable location required for the System.

Responsibilities and deliverables for Motorola Solutions and the County are defined in the table below

Finalize Space, Power and HVAC Requirements Responsibility Matrix

Task	Responsibility	Deliverable
Provide floor layout and rack elevation drawings for each site.	Motorola Solutions	Floor Layout and Rack Drawings
Provide power consumption and heat output data for each site.	Motorola Solutions	Power Consumption and Heat Output Specifications

Completion Criteria

This task is considered complete upon the County receiving the detailed report of all applicable space, power, and HVAC requirements.

C. Transition/Migration Plan

The implementation will require a detailed transition plan for a smooth transition of subscriber radio users and dispatch console operators from the existing radio system to the P25 radio system. During the Contract Design, a high-level transition plan will be developed as the implementation proceeds, further detail will be incorporated into the transition plan.

Responsibilities and deliverables for Motorola Solutions and the County during the development of the initial Cutover/Migration Plan are defined in the table below. The final transition plan will be developed during Preliminary and Final Design review.

Transition/Migration Plan Responsibility Matrix

Task	Responsibility	Deliverable
County will provide existing system, dispatch, vehicles, and user information that must be taken into account in developing the detailed Cutover Plan.	Broward County	Existing System, Dispatch, Vehicle, and User Information
An initial Cutover/Migration Plan will be mutually agreed upon, which identifies when and how specific agencies will migrate from operations on the existing system to operation on the new system.	Motorola Solutions and Broward County	Initial Cutover/Migration Plan

Completion Criteria

This task will be considered complete when the high-level cutover plan is mutually agreed upon by the County and Motorola Solutions.

D. Acceptance Test Plan Procedures

Motorola Solutions will update the proposed Staging ATP, Coverage ATP, Field ATP, 30-day operational test, and System ATP as part of detailed design development and review with the County to ensure that the appropriate testing is included, leading to the completion of the ATP documents. The ATP documents will identify the overall test structure for the project, including a list of the tests to be performed. Further development of the ATP document will be required over the course of the project, including development and agreement on test methodology. The ATP includes the acceptance criteria to ensure the equipment operates in accordance with the contract. The County reserves the right to request additional tests within the ATP to validate the performance of any equipment provided.

Responsibilities and deliverables for Motorola Solutions and the County are defined in the table below.

Phase 2 Responsibility Matrix

Task	Responsibility	Deliverable
Work with the County to develop the initial ATP document. Review the overall approach to testing including hardware, software, and final system acceptance criteria.	Motorola Solutions	Initial ATP Document Complete
Review and approve updates to the ATP documents.	Broward County	Approval of updated ATP Documents

Completion Criteria

This task is considered complete upon the County's acceptance and approval of the updated ATP documents.

Phase 3: Order Processing and Manufacturing

Motorola Solutions will process orders for equipment and begin equipment manufacturing. Motorola Solutions will place factory orders for the Equipment necessary for the Equipment.

Responsibilities and deliverables for Motorola Solutions and the County are defined in the table below.

Order Processing and Manufacturing Responsibility Matrix

Task	Responsibility	Deliverable
Factory orders placed for all Motorola Solutions manufactured equipment.	Motorola Solutions	Orders for Motorola Solutions-manufactured Equipment
Order placed for any third-party equipment.	Motorola Solutions	Third-party Equipment Orders

Completion Criteria

This phase is considered complete when all equipment orders have been placed.

Phase 4: Fleetmap Development

Motorola Solutions assumes that the fleetmap to be used for the new P25 system will be similar to County's existing fleetmap, however Motorola will assist the County with fleetmap development regardless of the extent to wish changes will be made to the existing fleetmap. The fleetmap organizational structures of the existing system and the new ASTRO 25 system will be similar, allowing for a streamlined transition. For existing radios that will be swapped out to operate on the ASTRO 25 system, the user interface can be configured to be similar to existing configuration, or group names and switch positions can be modified as necessary. Motorola will develop transitional templates for new radio template development with input from the County. Motorola Solutions will work with the County to identify the differences and create the fleetmap for the new P25 system.

Responsibilities and deliverables for Motorola Solutions and the County are defined in the table below.

Fleetmap Responsibility Matrix

Task	Responsibility	Deliverable
Consult with partners (agencies) to confirm that the fleetmap remains the same.	Broward County	User Information/Data
Develop new subscriber and console templates.	Motorola Solutions	Templates Creation and submission to County for review and approval
Translate/develop fleetmap for the new P25 system. Create templates for new subscriber radios and new dispatch consoles.	Motorola Solutions	Conceptual Fleetmap and Associated Device Configuration Templates and submission to County for review and approval
Test the fleetmap for radios and consoles.	Motorola Solutions and Broward County	Fleetmap Tested and Approved

Completion Criteria

This task will be considered complete when Motorola Solutions has delivered applicable training and the required templates and the same have been reviewed and approved in writing by Broward County, and the fleetmap is tested and approved by both Motorola and County.

A. Frequency Planning

Motorola Solutions and the County will work together to finalize the frequency plan for the system. Motorola Solutions will evaluate frequency compatibility based on available spectrum identified by the County. Motorola Solutions will recommend a frequency plan for the new system. Motorola Solutions will assist in the preparation of the application per County's RFP.

Responsibilities and deliverables for Motorola Solutions and the County during the Frequency Planning phase are defined in the table below.

Frequency Planning Responsibility Matrix

Task	Responsibility	Deliverable
Request from FCC for assignment of frequencies.	Broward County	Agreement on the Frequency List
Motorola Solutions will evaluate each site within the coverage design for its compatibility with the available frequencies. Motorola Solutions will recommend a frequency plan. (Frequency assignments are required in advance of the manufacture of equipment).	Motorola Solutions	Recommended Frequency Plan
Motorola Solutions will evaluate the assigned frequencies per site and adjust the RF filtering system design to accommodate these frequencies.	Motorola Solutions	Revised RF Filtering Design
Motorola Solutions will execute a computer-based intermodulation analysis, and identify probable interference conditions. This will be factored into frequency planning. Any probable interference concern that cannot be addressed through the planning process will be shared with the County, along with a recommendation for remediation.	Motorola Solutions	Intermodulation Analysis and other County Frequency Recommendations
Approval of the frequency plan.	Broward County	LMR Frequency Plan Approval
Complete FCC frequency license applications for LMR system.	Broward County	License Applications Complete

Task	Responsibility	Deliverable
Complete FCC frequency license applications for microwave system.	Motorola Solutions	Microwave Frequency Plan Approval

Completion Criteria

This task is considered complete when the frequency plan is finalized and approved in writing by Broward County and the FCC microwave license applications have been approved and licenses granted

Phase 5: Staging and Shipment

Motorola Solutions will provide factory staging for the System at Motorola Solutions' CCSi in Elgin, Illinois.

Motorola Solutions will stage equipment in a single phase to facilitate a more efficient, faster staging activity, and to enable a shipping plan that will send parts of the system (RF sites, dispatch communications sites and microwave) to a single storage location. This approach will reduce the inefficiency of multiple handlings of equipment after shipping, and have a material effect on the installation process by making equipment available to installers closer to where it will be installed.

Motorola Solutions will assemble the system hardware at CCSi, including the Master Sites, RF simulcast cell, and Dispatch Communications Centers. Physical setup, racking, and location of hardware will comply with the County's approved equipment layout plans. Cables will be cut and labeled with information to clarify interconnection for field installation and to fit the room layout plan specifications. All provided inter-rack and inter-equipment cables will have connectors attached and tested.

After assembling the equipment, Motorola Solutions' staging team will power it up, load software, set levels, program, configure, and optimize the equipment. System parameters will be set according to inputs from Motorola Solutions' design team. System software and system features will be tested and validated. All system levels will be set according to specifications to verify proper end-to-end connectivity. These settings will be recorded and documented to provide baseline information to the field integration team.

The system will be exercised while in factory staging, allowing for testing and at least two week burn-in of components and boards for proper operation as a complete system prior to shipping to the County. Once the system or subsystem has been assembled, optimized, and integrated as a complete working unit, the system will be tested according to the Factory Acceptance Test procedures. County may, in its sole discretion, attend (through County representatives and/or Authorized Third Party User representatives) and witness Factory testing.

Once staging is completed, Motorola will carefully pack and ship the equipment in the racked configuration to a storage facility.

A. Factory Acceptance Testing

Motorola Solutions will coordinate with the Broward County for County representatives to visit CCSi and participate in a system demonstration and factory acceptance testing. This visit will provide the County with the opportunity to see the equipment assembled and working as an integrated system and to test in a hands-on manner, the functionality and features of the communication system that can be enabled in the factory environment. Responsibilities and deliverables for Motorola Solutions and the County are defined in the table below

Factory ATP Responsibility Matrix

Task	Responsibility	Deliverable
Motorola Solutions integrates the equipment for initial staging at CCSi and performs pre-testing to ensure the system provides the Contracted functionality and features.	Motorola Solutions	System Staging
County may elect to send personnel to CCSi to witness the Factory Acceptance Testing.	Broward County	Factory Acceptance Testing Witnesses
Motorola Solutions will perform testing in accordance with the Factory Acceptance Test Plan to verify the functionality of the communications system.	Motorola Solutions	Factory Acceptance Testing
Motorola Solutions integrates the equipment for initial staging at CCSi and performs pre-testing to ensure the system provides the Contracted functionality and features.	Motorola Solutions	System Staging
Staged equipment is shipped to a Motorola Solutions Storage facility inside Broward County for installation by Motorola Solutions.	Motorola Solutions	Staged System Shipped

Completion Criteria

This Factory Acceptance Testing will be considered complete when the County signs a certificate of acceptance of the Factory Acceptance Test and Motorola provides written notification that all staged equipment has been shipped to and received by the storage facility in Broward County.

Phase 6: Installation

A. Fixed Network Equipment Installation

Motorola Solutions will be responsible for the availability and readiness of all sites, according to the agreed upon Project Schedule.

Motorola Solutions will provide warehouse space following staging. Motorola Solutions will be responsible for delivery of equipment to the sites.

Installation of the Fixed Network Equipment (FNE) will consist of installing the radio communications infrastructure and computer equipment at the master sites, dispatch communications sites, and RF sites. During equipment installation, any required changes will be noted and assembled with the final as-built documentation of the system. The as-built documents will be provided at the end of the project along with the applicable standard Maintenance and Operations manuals.

Responsibilities and deliverables for Motorola Solutions and the County are defined in the table below.

FNE Installation Responsibility Matrix

Task	Responsibility	Deliverable
Site Requirements including, as a minimum power, space, environmental details and network termination information provided to the County.	Motorola Solutions	Site Requirements Document
Confirm that existing sites are ready for equipment installations per the Site Requirements, including: ▪ Adequate installation space. ▪ Cable trays/raceways. ▪ Demarcation points for RF, power, grounding, control, and networking within five cable meters of the equipment. Sites will be ready according to the project schedule for equipment installation.	Motorola Solutions	Site Readiness

Task	Responsibility	Deliverable
General Installation Responsibilities: ▪ Motorola Solutions will install the new system equipment that is provided by Motorola Solutions. ▪ Motorola Solutions will ground and bond the site equipment to the building or shelter ground system, in accordance with the site installation standards. ▪ Motorola Solutions will furnish all cables for power, audio and control, to connect the supplied equipment to the power panels or receptacles and the audio/control line connection point. ▪ All cabling will be cut to length, properly connected and terminated per Motorola Solutions standards and clearly labeled at both ends. ▪ Motorola Solutions will remove and dispose of any debris that is a result of the project activities from the site. ▪ All cabling, port assignments, and punch block connections will be recorded into the final system as-built documentation.	Motorola Solutions	Equipment Installations
Motorola Solutions will install Master Site Equipment in accordance with the Design Review Scope of Services and Equipment Lists.	Motorola Solutions	Radio System Installation Audit
Motorola Solutions will install ASTRO 25 Trunked Simulcast Site equipment and remote RF site equipment in accordance with the Design Review Scope of Services and Equipment Lists.	Motorola Solutions	Radio System Installation Audit
Motorola Solutions will install dispatch equipment in accordance with the Design Review Scope of Services and Equipment Lists.	Motorola Solutions	Radio System Installation Audit
Motorola Solutions will remove any decommissioned equipment and antenna systems from sites that are being used for the new system.	Motorola Solutions	Removal of Decommissioned Equipment
County will conduct inspection and check out of FNE on a site-by-site, system-by-system basis.	Broward County	Signed Installation Acceptance Documents

Completion Criteria

The installation of each FNE subsystem must be completed for this phase of the project to be considered complete. This task will be considered complete when the County reviews FNE installations with Motorola Solutions and approves by signing the installation check sheets.

The following sections describe the major system components to be installed at each County location.

B. ASTRO 25 FNE Installation

ASTRO 25 FNE Installation

The matrix below shows all site locations and the corresponding equipment (microwave and radio), including rack quantities and DC Power, according to the RFP design specifications.

Site Name	# Racks Main Astro 25	# Racks Backup Astro 25	# Racks 800 MA Ananlog	# Racks Main Master	# Racks DSR Master	# Racks Main Prime	# Racks GEO Prime	# Racks Backup Prime	# Racks 800 MA Prime	# Racks MCC7500 Network	# Racks Microwave	Total Racks	~ Rack Space DC Power	DC Power Weight (lbs)
CORE	3	0	0	2	0	2	0	0	0	0	1	**8**	7	20,880
Coconut Creek	3	2	1	0	0	0	0	0	0	0	1	**7**	7	20,880
Markham Park	3	0	0	0	0	0	0	0	0	0	1	**4**	6	11,760
Playa	3	0	0	0	0	0	0	0	0	0	1	**4**	4	8,520
Davie	3	2	1	0	0	0	0	0	0	0	1	**7**	5	12,912
Point Of America	3	0	0	0	0	0	0	0	0	0	1	**4**	4	8,520
Miramar	3	0	0	0	0	0	0	0	0	0	1	**4**	6	17,040
Channel 2	3	2	1	0	0	0	0	0	0	0	1	**7**	6	17,040
Deerfield	3	0	0	0	0	0	0	0	0	0	1	**4**	4	8,520
Tamarac	3	0	0	0	0	0	0	0	0	0	1	**4**	4	8,520
West Lake Park	3	0	0	0	0	0	0	0	0	0	1	**4**	4	8,520
BC Station 106	2	0	0	0	0	0	0	0	0	0	1	**3**	4	5,880
West Hollywood	3	0	0	0	0	0	2	0	0	0	1	**6**	6	11,760
Pompano Bch ClubN	3	0	0	0	0	0	0	0	0	0	1	**4**	4	8,520
Parkland	3	0	0	0	0	0	0	0	0	0	1	**4**	4	8,520
EOC	0	0	0	0	2	0	0	0	0	0	1	**3**	3	3,816
EMS	0	2	1	0	0	0	0	2	1	0	1	**7**	5	11,760
Sunrise Disp	0	0	0	0	0	0	0	0	0	1	0	**1**	0	0
Coconut Creek Disp	0	0	0	0	0	0	0	0	0	1	0	**1**	0	0
Pembroke Pines	0	0	0	0	0	0	0	0	0	1	0	**1**	0	0

Matrix for FNE & Microwave Equipment Install at each site.

Phase 7: Systems Integration and Optimization

During this phase of the project, Motorola Solutions will configure, optimize, and program infrastructure equipment. Motorola Solutions will provide field integration of Motorola Solutions-provided equipment.

Motorola Solutions will verify that all equipment is operating properly and that all levels are properly set, once installation in the field is complete. Motorola Solutions will optimize each site or node individually.

30. All audio and data levels will be verified.
31. All communication interfaces between devices will be verified for proper operation.
32. All features and functionality will be tested by Motorola Solutions to ensure that they are functioning according to the manufacturer's specifications and per the final configuration established during detailed design, and incorporating any subsequent contract changes.

Motorola Solutions will provide MPE/IM analysis based on two-way radio frequencies used in the System and used at the site. Motorola Solutions will not be responsible for any MPE issues caused by another system or source outside of the System; however, Motorola Solutions will work with the County to determine resolutions. Motorola Solutions will conduct an intermodulation analysis based on two-way radio frequencies used in the System plus other frequencies used at the site, list of which will be provided by the County. Motorola Solutions will not be responsible for any intermodulation issues caused by another system or source outside of the System; however, Motorola Solutions will work with the County to determine resolutions.

Motorola Solutions will maintain a punch list of items that require resolution. The County will be responsible for interfacing with its partners to ensure access and cooperation in association with dispatch communications integration and optimization. Motorola Solutions will pre-test the system to ensure readiness for Field Acceptance Testing.

Responsibilities and deliverables for Motorola Solutions and the County are defined in the table below.

Phase 7 Responsibility Matrix

Task	Responsibility	Deliverable
Provide all required liaison support with the partners for cooperation and access during field integration and optimization according to the Project Schedule.	Broward County	Broward County Provide Liaison with its Partners
Integrate and optimize the hardware (Schedule 2), software (Schedule 1), and interfaces (Schedule 5)	Motorola Solutions	Integration and Optimization of the System
Maintain and manage punch list of items that need resolution; resolve all punch list items to satisfaction of County.	Motorola Solutions	Punch list Resolution
Pre-test the sites and overall system to ensure readiness.	Motorola Solutions	Dry-run Field Testing
Motorola Solutions to notify the County that the system is ready for testing	Motorola Solutions	Notification of System Test Readiness for Field ATP and Coverage ATP

Completion Criteria

This task will be considered complete when the system is ready for Coverage ATP and Field ATP acceptance testing.

Phase 8: Training

The Training Plan will provide the County personnel with a core set of technical and operational training as set forth in Schedule 3. Three categories of training will be provided (to operators, system technicians, and system managers) to equip each group with the system and equipment related skills that they require to perform their roles.

Training is available in several scenarios, depending on the course, including online training, and instructor-led training (delivered on-site in Broward County). Motorola Solutions will provide training set forth herein, but additional classes may be available based on decisions made during design review

A. The Provider shall provide:

1. Operator training:

    a. Provider shall provide complete and comprehensive operational training that covers the features, operation and special care associated with the equipment supplied. Operator training shall include the following categories:

        i) Dispatch console operation - The Provider will be responsible for providing a local training facility at the Provider's expense with a minimum of 20 dispatch positions. The training shall be conducted on a 24/7 basis to account for all Broward County dispatch shifts. There shall be a ratio of one student per dispatch console position.

        ii) Subscriber radio operation

2. Technical/system management training:

    a. Provider shall provide complete and comprehensive technical training in the theory, maintenance and repair of each type of equipment and system provided for the project. This training shall include, at a minimum, system theory, troubleshooting, repair and servicing techniques as applicable to the selected system. Technical training shall include the following categories:
        i) Infrastructure maintenance and troubleshooting
        ii) Subscriber unit maintenance and troubleshooting

3. Provider shall provide complete and comprehensive technical training for County technical staff charged with managing the system. This training shall include, but is not limited to: planning and setting up the system and network; building and implementing system and network profiles and configurations; performing database-management functions;

monitoring and managing the system's performance; and writing and printing system reports. System management training shall include the following categories:

a. NMS operation and control
b. Fleet mapping and radio programming
c. Microwave network management
d. Inter-RF Subsystem Interface (ISSI) operation and control

B. Provider shall fully describe all proposed training programs detailing how Respondent intends to provide training. The training description shall include the following:

1. A list of all subjects with a description of each
   a. "Fingertip roaming" needs to be presented and defined
2. Class material to be provided by Respondent
3. Number of classes
4. Class duration
5. Need for recurring training
6. Class size
7. Class cost

C. Provider shall coordinate with the County regarding the number of attendees and schedule.

D. Classes shall be scheduled as near to system cutover as possible. Provider shall work with the County to develop the schedule.

E. Provider shall train County employees or designated individuals. In some cases, a train-the-trainer approach will be used to train other users.

F. Provider shall provide all instructional materials, including printed manuals, audio, video, interactive self-paced personal computer programs, and complete equipment operating instructions for all technical and operational training classes. Actual and/or exact model and series of equipment being delivered shall be made available for hands-on use and operation during training. All instructional materials shall be subject to the approval of the County and shall become property of the County.

Overview

Through the training provided by Motorola Solutions, Broward County personnel will gain in-depth understanding of the power of County's new system through education and proficient daily use. The training is complemented by detailed documentation and available continuing education programs.

Provider will collaborate with Broward County to develop a final customized training plan that fits County's needs.

Motorola training will deliver a combination of online training and field based instructor–led training in classrooms at Broward County locations using operational equipment. Motorola Solutions will employ knowledgeable and experienced instructors to deliver well–designed courseware and integrated lab activities.

Motorola instructors will be experienced and knowledgeable as to both the System and the practical aspects of Broward County manager, technician and end user job functions. Each instructor will have proven ability to communicate with a novice as well as expert personnel.

The Training Plan set forth in Schedule 3 contains the detailed training program, which may be modified upon approval of the County Contract Administrator.

Completion Criteria

This task will be considered complete when the training has been delivered as described in the Training Plan.

Phase 9: Cutover Planning

Motorola shall work with Broward County to develop a comprehensive cutover plan to migrate users from the old system to the new system. Motorola shall develop a detailed agency-by-agency schedule and step-by-step instructions to ensure a smooth migration and minimize risks to service interruption. The planning shall include how communications and interoperability will be maintained across both the old and new systems, including both console access and shared talkgroups to both the old and new systems.

The plan shall include mitigation strategies should problems occur during the cutover process, such as failures on the new system or an inability of users to communicate across both the old and new systems.

Completion Criteria

This task will be considered complete when the cutover plan has been delivered as described.

Phase 10: Preliminary Acceptance Testing

Preliminary acceptance testing is composed of coverage testing and 30-day operational testing, as well as preliminary acceptance testing criteria.

Testing will be performed when the system optimization is complete. Field acceptance tests verify the contracted system functionality and demonstrate RF coverage.

Motorola Solutions will submit the detailed test plans, developed from the baseline initial ATP, for approval 30 days prior to the beginning testing. County will review and provide feedback, which Motorola will incorporate in revised proposed detailed test plans. That process will continue until County approves in writing the detailed test plans.

Motorola Solutions will provide notice of the commencement of testing to the County at least 10 days in advance. Testing will occur in accordance with the agreed to test plans.

Completion Criteria

Upon successful completion of functional testing, the County's representatives participating in and observing the tests will sign off on this portion of the ATP. Coverage Testing will commence once the system has been optimized. Once successfully completed, coverage test results will be consolidated into a report and reviewed with the County.

This task will be considered complete upon the County's written approval of successful completion of all functional testing and the successful passage of the coverage testing. If a punch list of material unresolved issues is created as a result of any acceptance testing, Motorola will remedy the issue and resubmit for testing in accordance with the testing procedures of the Agreement.

A. System Functional Testing

Description

System functional acceptance tests will be performed when the system optimization is complete. The functional acceptance tests verify the functionality tested at factory testing. These tests will verify the entire system in operation, including radio system roaming and subscriber affiliation.

If the System does not successfully pass all aspects of the functional acceptance test, the failed items will be documented and remedied by Motorola and resubmitted to County for retesting in accordance with the procedures set forth in the Agreement.

Upon successful completion of the functional testing, the County will acknowledge testing completion by signing the Functional Test Completion Certificate.

Responsibilities and deliverables for Motorola Solutions and the County are defined in the table below.

System Functional Testing Responsibility Matrix

Task	Responsibility	Deliverable
Motorola Solutions will perform functional ATPs for the system. During each test, test results will be recorded for review and approval of the test.	Motorola Solutions	Execution of Functional Acceptance Testing
Upon successful completion of each Acceptance Test, the County and Motorola Solutions will sign an acceptance certificate, documenting acceptance.	Motorola Solutions and Broward County	Written Approval of Successful Functional Acceptance Testing

B. Coverage Testing

Coverage acceptance tests will be performed when the RF site and control equipment installations and optimization are complete. The coverage tests verify the coverage delivered by the system. A detailed CATP document is included in Section 2.10.5.1 Coverage Acceptance Test Plan.

Responsibilities and deliverables for Motorola Solutions and the County are defined in the table below (unless otherwise approved by the County Contact Administrator).

Coverage Testing Responsibility Matrix

Task	Responsibility	Deliverable
Motorola Solutions will perform Coverage Testing for the System. During each testing, test results will be recorded for review.	Motorola Solutions	Execution of Coverage Testing
Motorola to provide vehicles and drivers for Coverage Testing, assuming three test teams for a period of approximately two weeks. (County to provide the boats for water grids.)	Motorola Solutions	Provide Coverage Test Vehicles
Motorola Solutions will consolidate coverage test results and submit a report to the County, summarizing coverage performance in the tested area.	Motorola Solutions	Coverage Test Report

Task	Responsibility	Deliverable
Upon completion of the coverage testing, and submission of the Coverage Test Report, the County and Motorola Solutions will sign a certificate documenting agreement of completion of coverage testing.	Motorola Solutions and Broward County	Written Agreement of Successful Completion of Coverage Testing

Completion Criteria

This task will be considered complete upon the County's acceptance and sign-off of the functional test, and agreement of the successful completion of coverage testing.

C. System Acceptance

System Acceptance will be based only on the approved ATPs as set forth herein. Motorola Solutions will provide checklists for each test. If deficiencies are found during the testing, both the deficiency and the action plan will be agreed upon and documented. By signing and approving the functional testing certificate and agreement to the completion of the coverage test, the system will be deemed to have passed the applicable acceptance test(s). Acceptance testing is a cooperative effort and will be conducted by Motorola Solutions and witnessed and approved by the County.

D. 30 Day Operational Test and System Acceptance

Motorola Solutions will perform a 30-calendar-day operational test of the system to ensure that all hardware and software defects have been corrected prior to final acceptance. The fully integrated operation of the system, including all individual subsystems, will be demonstrated during these tests. The tests will be designed to demonstrate the reliability, long-term stability and maintainability of the systems. A failure of any component of the system during this test will cause the test to restart after the repair is completed.

The County will provide written acceptance of the Radio System within five working days after the successful completion and approval of all of the following:

33. Final design submittals.
34. Staging ATP.
35. System installation.
36. Final inspection and punch-list resolution.
37. As-built documentation.
38. Field ATP, including Coverage ATP.
39. 30-day operational test completion.
40. Training.

Implementation Preliminary Acceptance Milestone

Upon successful completion of all items stated above, the County will grant Preliminary Acceptance of the Radio System. If and to the extent the County allows partial or conditional Preliminary Acceptance, all outstanding, deficiencies that the Parties agree to defer in order to permit a conditional or partial

Preliminary Acceptance shall be reconciled and remedied by Motorola Solutions within the time agreed upon by the Parties and in no event later than the commencement of the maintenance phase.

E. System and Final Acceptance Tests

The County will grant System Final Acceptance within 30 business days after successful completion of the following:

1. Satisfactory resolution of all deficiencies contained in the punchlist at system acceptance.
2. Resolution of deficiencies identified subsequent to system acceptance.
3. Delivery of all required implementation documentation.
4. Completion of initial training.
5. Preliminary Acceptance of the Radio System, Microwave System, and Facilities and Infrastructure Services.

Implementation Final Acceptance Milestone

The County will grant written System Final Acceptance.

1.10 Radio Communications System Requirements

1.10.1 Overview

A. Motorola shall provide a complete P25 700/800 MHz digital radio communications systems as described below.

Primary Trunked System: P25 Mixed Mode, Phase I and Phase II—The system shall utilize the radio sites detailed in this SOW. The system must seamlessly integrate all sites such that end users can roam freely throughout the service area without interruption of service or the need to manually select sites. The system must utilize the latest system platform available at the time of system acceptance. If a newer platform is available at the time of acceptance than what was originally proposed, Motorola shall upgrade the system to the current system release. The system must meet the coverage and capacity requirements defined in this SOW. The system must be expandable to allow for additional capacity and features. The system must be configured to support P25-compliant data on voice channels running at 9,600 bits per second.

Trunked Backup System: P25 Mixed Mode, Phase I and Phase II—The system must utilize the radio sites detailed in this SOW. The system must seamlessly integrate all sites such that end users can roam freely throughout the service area without interruption of service or the need to manually select sites. The system must utilize the latest system platform. The system must meet the coverage and capacity needs of Broward County. The system must be expandable to allow for additional capacity and features.

700 MHz Conventional Backup System: P25 Phase I Conventional—The system must utilize the four mandatory radio sites detailed in this SOW. The system must operate on FCC-allocated 700 MHz interoperability channels, with each site providing two standalone conventional repeaters.

800 MHz Conventional simulcast interoperability system: Wideband Analog – The system must utilize the four mandatory radio sites detailed in this SOW. The system must operate on the three designated FCC-allocated 800 MHz NPSPAC interoperability channels.

Interference Locator: The System will include functionality to provide visualization on the UNC GUI of the location of non-authorized transmitters (or RF interference carriers) in a simulcast system ("Interference Locator"). Interference Locator utilizes existing GTR and Comparator system equipment at RF sites to quickly and easily track the location of non-authorized transmitters. Included within the functionality provided by Interference Locator is the UNC System License UA00521AA and a UA00467AA license for each Simulcast RF Sub-Site (i.e., 14 sub-sites for Broward County).

These systems shall provide portable and mobile radio coverage throughout the County as required in the RFP and described in this SOW. Motorola's solution will remedy the major in-building and on-street portable coverage deficiencies currently experienced by many of the agencies on the current systems and will provide reliable communications through redundant master and prime simulcast sites controlling a coverage network that meets the RFP's required simulcast and site selection requirements. The System will enable users to communicate seamlessly with one another, and

leverage the features of ASTRO 25 technology to interoperate with other P25 and conventional systems in the area. Preliminary System block diagrams are included as Schedule 7.

1.10.1.1 RFP Compliant Designs

Motorola Solutions has engineered a single simulcast cell design that represents operational ease and will support a maximum of 36 talkpaths. Having one simulcast cell means that the same capacity is available across the entire service area, eliminating “operational seams”, which negatively impact user operations. Motorola’s solution will provide a single 11 site, 19 channel, 700 MHz simulcast P25 Phase 2 TDMA digital trunked radio system.

In addition to the simulcast network that provides coverage for the populated areas of the County and off shore, a P25 6 channel Phase 2 ASTRO Site Repeater will provide the required coverage in the Everglades area of the County. This system will utilize the 700 MHz channels, which will be provided by Broward County. The design could however use 800 MHz channels or even a combination of 700/800 depending on the grouping of the available channels. The System will provide the ability to support both P25 Phase 2 TDMA users and users that are only capable of P25 Phase 1 FDMA operation.

To preserve wide area Trunking communications, even in the event of the failure of major hardware components, the radio system includes a hardware redundant Zone Core site and Dynamic System Resiliency (DSR). Each Zone Core site has been configured to provide redundancy to key equipment components, such as Zone Controllers, Core LAN switches and Core Gateways, in order to eliminate single points of failure that could result in a loss of wide area Trunking operation to the radio system. To preserve simulcast radio system operation, even in the event of the failure of major hardware components, the radio system also includes GEO Redundant Simulcast Prime sites. Both Cores and GEO Redundant Simulcast Prime sites will be implemented at separate locations in order to provide a distributed architecture between two sites on the radio network. This will prevent the loss of both the Zone Core and the Simulcast Prime site in the event of a catastrophic event that causes the complete destruction of a single location.

Each remote RF site consists of Base Radios, IP networking, antenna networks, and is controlled by the Simulcast Primes and Core sites. The sites are synchronized by a Global Positioning System (GPS) redundant time and frequency reference that has a backup Rubidium reference in order to keep the network timing synchronized. The multi-site architecture of the simulcast cell provides an inherent level of site redundancy. The loss of a single remote RF site will result only in a reduction of the coverage footprint, while maintaining the same system capacity throughout the system.

The System also includes three MCC 7500 IP-based radio dispatch console sites as required by the RFP. A 24 position MCC 7500 dispatch console site will be located at the Broward County Sunrise central dispatch center. A 23 position MCC 7500 dispatch console site will be located at both the Coconut Creek North Dispatch center. A 21 position MCC 7500 dispatch console site will be located at both the Pembroke Pines Dispatch center.

To allow for the capability to configure system parameters, monitor system activity, generate system reports, and to monitor all critical systems and site status alarms, Network Fault Management (NFM) equipment will be installed at each site. In addition three Network Management (NM) client workstations will be installed at TBD locations.

Site connectivity will be provided by a combination of licensed 6 GHz and 11 GHz digital microwave which will provide a Layer 3 MPLS transport for all dispatch and radio infrastructure sites including the Broward County EOC. To preserve connectivity between the remote RF sites and Prime sites and between the Prime sites and the Zone Core sites, the microwave network has been configured in two rings between all sites. A failure to any one path between sites will result in a redirection of the links to the opposite direction of the ring. This will eliminate single points of failure, which could result in a loss of connectivity between the remote RF and the Control sites. A system topology diagram is included in this proposal.

The primary system will utilize the mandatory existing site infrastructure, such as towers, radio communications shelters and generators but will include new site infrastructure equipment as described in detail in the following sections.

Also included in the System provided by Motorola is a 700 MHz simulcast P25 Phase 2 TDMA 7 channel 4 site backup system with 2 conventional 700 MHz repeater channels at the 4 sites. In addition, a 3 channel 4 site 800 MHz analog conventional simulcast is also co-located at the 4 backup sites.

Motorola Solutions will provide a Mobile Communications Trailer and properly sized vehicle with all of the required control stations, repeaters and GUI control interface.

1.10.1.2 Redundancy and Survivability

A. The radio communications system shall support mission-critical operations; therefore, a high degree of redundancy and survivability is required. A network topology utilizing fault tolerance shall be incorporated to the greatest extent possible through a distributed and/or redundant architecture.

B. Provider's System will be fully redundancy including for all system elements in which failure would result in a major failure of the system; single points of failure are not acceptable. Such redundant elements include, but are not limited to, the following:

    1. System controllers and fixed site equipment
    2. Simulcast controllers and voting equipment
    3. Backhaul network
    4. Power systems
    5. Network Management System
    6. Dispatch console position
    7. ISSI gateway

C. The trunked system shall include several modes of degraded operation, known as failure modes. The system shall be capable of automatic activation of failure modes in the event of a system failure. Additionally, the system shall switch to a failure mode gracefully. Failure modes shall include the following scenarios, at a minimum:

1. Loss of single site
2. Loss of multiple sites
3. Loss of system controller
4. Loss of simulcast controller
5. Loss of a frequency channel due to interference, including interference appearing on a control channel
6. Loss of multiple channels due to wideband interference
7. Loss of a repeater station due to an equipment failure
8. Loss of a dispatch console position
9. Loss of an ISSI gateway

D. The trunked system must include geographically redundant components to allow continued wide-area operation and dispatch console connectivity in the event any location becomes inoperable or isolated from the network. Motorola shall provide geographically separated system controllers, simulcast controllers, and voting equipment.

E. Motorola will provide both a geographically separated redundant master site and prime simulcast site. Geographic redundancy of both the master sites and simulcast prime sites combined with component-level redundancy at the master site and prime sites eliminate any single point of failure in the system. These multiple layers of redundancy ensure that users will continue to communicate and maintain full-featured functionality in the event of major or multiple failures. The redundant master and simulcast prime sites are configured in a hot-standby configuration with automatic switch-over capability, enabling automatic protection against a full loss of the primary master or prime sites, as well as less severe equipment or component failures.

1.10.2 System Technology

The System will provide an integrated network that includes P25 TDMA voice infrastructure, dispatch consoles, conventional channel gateways for interoperability and encryption capabilities. It includes the following features and benefits for the County agencies:

Extensive Coverage throughout the Broward County Service Area

The new P25 system coverage will provide exceptional coverage throughout the Broward County area and provides public safety users a highly reliable and trustworthy system. The simulcast designs use 11 RF sites as well as a single standalone repeater site, to provide compliant 95% reliable portable coverage throughout the three defined portable service areas that include a 25 db building loss service area, a 20 db loss service area and an outside service area that is primarily the Everglades within

Broward County. This coverage design also includes 95% mobile coverage for a minimum of 10 miles offshore.

Backup system Coverage for the Broward County Service Area

The trunked backup system will provide 95 percent coverage for a portable radio operating outdoors, with 95 percent reliability, for those portions of the county identified in the RFP.

System County and Expandability Now and For the Future

The system leverages the prior antenna sites purchased Broward County by expanding the system with the singular focus of meeting Broward County's current requirement to support the existing users with the ability to support future growth. The ASTRO 25 platform being provided is highly scalable and enables Broward to expand the system to support additional radio users, dispatch sites, dispatch consoles and RF sites that may be added in the future. Provider will include 75 licenses for dispatch console operator positions. The System will b able to support up to 500 operator positions with the addition of console user licenses. The System includes three dispatch center locations, and can support up to 55 separate dispatch console locations.

Increased System Functionality and Security

Enhanced programming, security, roaming, and interoperability capabilities will be provide by Motorola using both P25 standard functionality and Motorola Solutions data and value-added capabilities:

1. **Communications with other agencies is assured**, with shared encryption, enhanced roaming and system wide access to dispatchers using the proposed MCC 7500 consoles.
2. **Users will be able to roam seamlessly throughout the simulcast system coverage area** and into the Everglades providing simplified operation without the need to manually switch between different areas of the system.
3. **Interoperability through the ISSI8000 with automatic roaming** will be provided for four (4) other systems (Motorola Host Master Site, Miami-Dade, Palm Beach, Collier) with 10 simultaneous talkgroups.
4. **Dispatch centers will have increased integration with the system radios resources** through the use of Motorola MCC 7500 dispatch technology. The MCC 7500 integrates directly into the system's core, providing access to all authorized resources system wide. The MCC 7500 dispatch console utilizes the same Gold Elite console Graphical User Interface (GUI) used today by the County thus allowing for an easy transition for dispatch users.

Mission Critical Reliability Provided by Geographic and Equipment Redundancy

The System will provide geographic redundancy of both the master sites and simulcast prime sites combined with component-level redundancy at the master site, prime sites, RF sites, and dispatch sites, eliminating any single point of failure in the system. These multiple layers of redundancy will ensure that users will continue to communicate and maintain full-featured functionality in the event of major or multiple failures. Provider will configure the redundant master and simulcast prime sites in a hot-standby configuration with automatic switch-over capability, enabling automatic protection against a full loss of the primary master or prime sites, as well as less severe equipment or component failures.

Technology and Support for the Long-Term

Provider's System is built on the ASTRO 25 platform, and the System will use technology that has already been deployed in over 500 Project 25 systems, for customers whose first responders rely on mission-critical communications during both day-to-day activities and during critical events. The System's ASTRO 25 technology is modular and scalable, enabling the incremental addition of new features and functionality throughout the system's lifetime.

1.10.2.1 Dispatch Consoles and Logging

To minimize the impact that the dispatch operators experience during a system migration, Motorola Solutions will utilize the familiar Gold Elite GUI interface as part of the System's robust, public safety dispatch solution, the MCC 7500.

Motorola will provide a robust logging recorder solution that will provide the County with a fully Internet Protocol (IP), based system that meets and exceeds the needs of the County today and in the future. The solution being provided by Motorola will allow the County to take advantage of the latest in public safety grade logging solutions.

1.10.3 Interoperability/ P25 Statement of Requirements (SOR)

1.10.3.1 Interoperability Features of System

The System will be interoperable with other P25 radio systems as well as with non-P25 systems. In addition, it supports full, seamless communications between P25 Phase 1 and P25 Phase 2 radios, dynamically switching between FDMA and TDMA modulations as necessary. The Equipment and other infrastructure being provided has been proven to support radios from other vendors, with combined fleets in operation on many of the hundreds of ASTRO 25 systems servicing public safety agencies.

A. Interoperability with Project 25 Radio Systems

The System will accommodate additional users and system growth through a modularly expandable design that will scale as the County's needs change. It supports interoperability with other Project 25 systems in the region. The County's System will be able to interconnect with these systems either through an ISSI gateway or directly without the need for an ISSI connection when connecting to one of the many Motorola Solutions P25 systems in the South Florida area.

The subscriber units being provided are P25 Phase 1 and Phase 2 compliant units. All of the radios will have the ability to operate on foreign P25 Phase 1 or Phase 2 systems. The radios also will be able to operate in analog and digital conventional modem, which will allow users to operate on outside agencies conventional systems or through radio to radio talk around mode.

1.10.3.2 System Features Tested for Compliance with Project 25 Standards

The table below lists the P25 features of the System that Motorola will provide:

P25 Trunked System Feature Matrix

The following table is a list of P25 trunking features available on an ASTRO 25 trunking system. Features available on your system will vary dependent on the options purchased.			
P25 TRUNKED SYSTEM FEATURE MATRIX			
Last Updated: April 28, 2015		**RELEASE 7.15**	
TIA-102 STANDARD PUBLISHED P25 TRUNKED FEATURES	**FDMA CAI**	**TDMA CAI**	**TIA STANDARDS DOCUMENTS**
P25 CAI TRUNKING - PROJECT 25 COMMON AIR INTERFACE			
VOICE CALLS			
Group Voice Call	Yes	Yes	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1 / TIA-102.BCAE
Individual Voice Call	Yes	Yes	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1 / TIA-102.BCAE
Availability Check on Called Party	Yes	Yes	TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D/ TIA-102.AABA-B/TIA-102.AABB-B/TIA-102.BBAC;-1 / TIA-102.BCAE
Broadcast Voice Call	Yes	Yes	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1 / TIA-102.BCAE
Announcement Group Call	Yes	Yes	TIA-102.AABD-A;A-1 / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B/TIA-102.AABB-B/TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1 / TIA-102.BCAE
Emergency Group Voice Call	Yes	Yes	TIA-102.AABD-A;A-1 / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B/TIA-102.AABB-B/TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1 / TIA-102.BCAE
Emergency Call	Yes	Yes	TIA-102.AABD-A;A-1 / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B/TIA-102.AABB-B/TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1 / TIA-102.BCAE
Pre-Programmed Emergency Group Call	Yes	Yes	TIA-102.AABD-A;A-1 / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B/TIA-102.AABB-B/TIA-102.BBAC;-1 / TIA-102.BCAE
Group Regrouping (part of P25 Dynamic Regrouping)	Yes	Yes	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABH
MOBILITY MANAGEMENT			
Roaming	Yes	Yes	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-

			102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1
Intra-System Roaming (Automatic)	Yes	Yes	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1
Inter-System Roaming (Manual)	Yes	Yes	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1
Registration	Yes	Yes	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1
Restricting service access only to valid SU	Yes	Yes	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1
De-registration	Yes	Yes	TIA-102.AABD-A;A-1 / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B/TIA-102.AABB-B/TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1
Group Affiliation	Yes	Yes	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1
Call Restriction	Yes[1]	Yes[1]	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1
Call Routing	Yes	Yes	TSB102-B
Wide Area Call	Yes	Yes	TIA-102.AABD-A;A-1 / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B/TIA-102.AABB-B/TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1
Location Registration	Yes	Yes	TIA-102.AABD-A;A-1 / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B/TIA-102.AABB-B/TIA-102.BBAC;-1
WUID Validity Timer	Yes	Yes	TIA-102.AABD-A;A-1 / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B/TIA-102.AABB-B/TIA-102.BBAC;-1
KEY MANAGEMENT			
KFD Based Key Management			
Manual Rekeying Features	Yes	Yes	TIA-102.AACD-A / TIA-102.BBAC;-1
Keyload	Yes	Yes	TIA-102.AACD-A / TIA-102.BBAC;-1
Key Erase	Yes	Yes	TIA-102.AACD-A / TIA-102.BBAC;-1
Erase all Keys	Yes	Yes	TIA-102.AACD-A / TIA-102.BBAC;-1
View Key Info	Yes	Yes	TIA-102.AACD-A / TIA-102.BBAC;-1
KMF Based Key Management			
Unique Key Encryption Key (UKEK)	Yes	N/A[2]	TIA-102.AACD-A / TIA-102.AACA-A
Individual Radio Set Identifier (Ind RSI)	Yes	N/A[2]	TIA-102.AACD-A / TIA-102.AACA-A

Key Management Facility Radio Set Identifier (KMF RSI)	Yes	N/A[2]	TIA-102.AACD-A / TIA-102.AACA-A
Message Number Period (MNP)	Yes	N/A[2]	TIA-102.AACD-A / TIA-102.AACA-A
Keyload	Yes	N/A[2]	TIA-102.AACD-A / TIA-102.AACA-A
View Individual RSI	Yes	N/A[2]	TIA-102.AACD-A / TIA-102.AACA-A
Load Individual RSI	Yes	N/A[2]	TIA-102.AACD-A / TIA-102.AACA-A
View KMF RSI	Yes	N/A[2]	TIA-102.AACD-A / TIA-102.AACA-A
Load KMF RSI	Yes	N/A[2]	TIA-102.AACD-A / TIA-102.AACA-A
View MNP	Yes	N/A[2]	TIA-102.AACD-A / TIA-102.AACA-A
Load MNP	Yes	N/A[2]	TIA-102.AACD-A / TIA-102.AACA-A
View Keyset Info	Yes	N/A[2]	TIA-102.AACD-A / TIA-102.AACA-A
Activate Keyset	Yes	N/A[2]	TIA-102.AACD-A / TIA-102.AACA-A
SECURITY SERVICES			
Encryption	Yes	Yes	TSB102-B / TIA-102.AAAB-A/TIA-102.AAAD-A / TIA-102.AACD-A / TIA-102.AACA-A/ TIA-102.BBAC;-1
DES-OFB Encryption of Voice	Yes	Yes	TSB102-B / TIA-102.AAAD-A / TIA-102.BBAC;-1
AES Encryption of Voice	Yes	Yes	TIA-102.AAAD-A / TIA-102.BBAC;-1
AES Encryption of Packet Data	Yes	Yes	TIA-102.AAAD-A / TIA-102.BBAC;-1
Multiple Encryption Algorithms	Yes	Yes	TIA-102.AACA-A / TIA-102.BBAC;-1
Multiple Encryption Keys	Yes	Yes	TIA-102.AAAD-A / TIA-102.BBAC;-1
SUPPLEMENTARY SERVICES			
Priority Call	Yes	Yes	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.BCAE
Preemptive Priority Call	Yes[7]	Yes[7]	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.BCAE
Dispatcher Audio Takeover	Yes	Yes	TSB102-BAGA / TIA-102.BBAC;-1 / TIA-102.BCAE
Emergency Alarm	Yes	Yes	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D/ TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1
Silent Emergency	Yes	Yes	TSB102-B
Radio Unit Monitoring	Yes[8]	Yes[8]	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1
Talking Party Identification	Yes	Yes	TSB102-B
Call Alerting	Yes	Yes	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1
Radio Check	Yes	Yes	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1

Radio Inhibit	Yes	Yes	TSB102-B/ TIA-102.AABD-B /TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1
Radio Uninhibit	Yes	Yes	TSB102-B/ TIA-102.AABD-B /TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1
Alert Tones	Yes	Yes	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1
SU Status Update	Yes	Yes	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1
Dynamic Regrouping (part of P25 Dynamic Regrouping)	Yes	Yes	TSB102-B/ TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABH
SYSTEM SERVICES			
Network Status Broadcast Message	Yes	Yes	TIA-102.AABD-B / TIA-102.BBAC;-1
System Status Broadcast Message	Yes	Yes	TIA-102.AABD-B / TIA-102.BBAC;-1
Channel Identifier Update Broadcast Message	Yes	Yes	TIA-102.AABD-B / TIA-102.BBAC;-1
Adjacent Status Broadcast Message	Yes	Yes	TIA-102.AABD-B / TIA-102.BBAC;-1
Backup Control Channel Broadcast Message	Yes	Yes	TIA-102.AABD-B / TIA-102.BBAC;-1
MISCELLANEOUS			
Electronic Serial Number	Yes	Yes	TSB102-B
Queuing	Yes	Yes	TIA-102.AABD-B / TIA-102.AABC-D/ TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1
Message Trunking	Yes	Yes	TIA-102.AABD-B / TIA-102.AABC-D/ TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1
Transmission Trunking	Yes	Yes	TIA-102.AABD-B / TIA-102.AABC-D / TIA-102.AABF-D / TIA-102.AABA-B / TIA-102.AABB-B / TIA-102.BBAC;-1 / TIA-102.CABC-B;B-1
Network Access Code	Yes	Yes	TIA-102.AABD / TIA-102.BBAC;-1
Extended hunt sequence	Yes	Yes	TIA-102.AABD / TIA-102.BBAC;-1
PHYSICAL LAYER			
P25 Phase 1 FDMA			
P25 Phase 1 FDMA CAI	Yes	N/A	TSB102-B / TIA-102.BAAA-A/TIA-102.BAAC-C/TIA-102.BAAB-B
Enhanced Full Rate Vocoder	Yes	N/A	TIA-102.BABA / TSB-102.BABE / TIA-102.BABB / TIA-102.BABC / TSB-102.BABD /TIA-102.BAAB-B
Frequency Division Multiple Access (FDMA)	Yes	N/A	TSB102-B / TIA-102.BAAA-A /TIA-102.BAAB-B
9.6 kbps Gross Bit Rate	Yes	N/A	TSB102-B / TIA-102.BAAA-A/TIA-102.BAAB-B

C4FM and CQPSK Modulation	Yes	N/A	TSB102-B / TIA-102.BAAA-A / TIA-102.BAAC-C / TIA-102.CAAA-D / TIA-102.CAAB-D / TIA-102.BAAB-B
12.5 KHz Channel Bandwidth	Yes	Yes	TIA-102.CAAA-D / TIA-102.CAAB-D / TIA-102.BAAB-B
P25 Phase 2 TDMA			
P25 Phase 2 TDMA CAI	N/A	Yes	TIA-102.BBAB / TIA-102.BCAD / TIA-102.BCAE
Enhanced Half Rate Vocoder	N/A	Yes[9]	TIA-102.BABA-1 / TSB-102.BABE / TIA-102.BABB / TIA-102.BABC / TSB-102.BABD / TSB-102.BABF / TIA-102.BABG / TIA-102.BCAD / TIA-102.BCAE
Time Division Multiple Access (TDMA)	N/A	Yes	TIA-102.BBAB / TIA-102.CCAB-A / TIA-102.BCAD / TIA-102.BCAD
12 kbps Gross Bit Rate	N/A	Yes	TIA-102.BBAB / TIA-102.CCAB-A
HCPM and HDQPSK Modulation	N/A	Yes	TIA-102.BBAB / TIA-102.CCAB-A
12.5 KHz Channel Bandwidth	Yes	Yes	TIA-102.BBAB / TIA-102.CCAB-A
DATA SERVICES			
Packet Switched Confirmed Delivery Data	Yes	N/A[10]	TSB102-B / TIA-102.BAEB-B
Packet Switched Unconfirmed Delivery Data	Yes	N/A[10]	TSB102-B / TIA-102.BAEB-B
Packet Switched Data Network Access	Yes	N/A[10]	TSB102-B / TIA-102.BAEB-B
TCP/UDP Port Number Assignments	Yes	N/A[10]	TIA-102.BAJD
Data Configuration - Radio to FNE	Yes	N/A[10]	TIA-102.BAEA-B / TIA-102.BAEB-B / TIA-102.BAEE-B
Packet Data Registration	Yes	N/A[10]	TIA-102.BAAD-A / TIA-102.BAEB-B
SU Registration	Yes	N/A[10]	TIA-102.BAAD-A / TIA-102.BAEB-B
SU Deregistration	Yes	N/A[10]	TIA-102.BAAD-A / TIA-102.BAEB-B
SU Location Tracking	Yes	N/A[10]	TIA-102.BAAD-A / TIA-102.BAEB-B
Mobile Data Interface (A)	Yes	N/A[10]	TSB102-B / TIA-102.BAEB-B
Link Layer and Physical Layer Protocols	Yes	N/A[10]	TIA-102.BAEA-B / TIA-102.BAEB-B
SNDCP (Subnetwork Dependent Convergence Protocol)	Yes	N/A[10]	TIA-102.BAEB-B
Fixed Host Data Interface (Ed)	Yes	N/A[10]	TSB102-B / TIA-102.BAEB-B
Ethernet (802.3)	Yes	N/A[10]	TIA-102.BAEB-B
Internet Protocol Suite	Yes	N/A[10]	TIA-102.BAEB-B

Notes:

1 Motorola Network Management provides the capability to provision the services available to both subscriber radios and talkgroups.

2 The P25 KMF utilizes the Phase 1 FDMA data channel. There is no P25 Phase 2 TDMA data channel.

3 Traffic Encryption is made up of two parts; Voice Traffic Encryption and Encrypted Integrated Data. Voice Traffic Encryption is defined by the P25 standard and Motorola offers. Today there is no published P25 standard for Encrypted Integrated Data however Motorola started offering this feature in the 7.8 release.

4 Today the Project 25 standard defines Chronological Integrity for OTAR, which Motorola offers.

5 Today the Project 25 standard defines Message Integrity for OTAR, which Motorola offers. The Project 25 standard will also support Message Integrity in the future Packet Data Security standard. Currently, Motorola supports Message Integrity for Encrypted Integrated Data.

6 Zerorize and No Service procedures can be used in Key Compromise situation.

7 Motorola understands this feature to mean Emergency Priority will Pre-empt a Non-Emergency Call.
8 Motorola supports remote unit monitor for talkgroup calls however it will not support the U2U version of remote unit monitor.
9 The APX subscriber uses the P25 enhanced vocoder. The XTS/XTL subscriber product portfolio uses the P25 baseline vocoder with added background noise reduction capability.
10 The P25 Phase 1 FDMA data channel is used for P25 Packet Data Delivery. There is no P25 Phase 2 TDMA data channel.
This matrix includes Motorola ASTRO 25 System Release 7.15 System Infrastructure Capabilities. All features and capabilities listed above are included in the most up to date and the current shipping version being provided to County under this Agreement, Release 7.17.

The System and the radios are designed to the Project 25 TIA-102 standard documents. Motorola Solutions fully supports and participates in the P25 Compliance Assessment Program (CAP) facilitated by the Department of Homeland Security DHS).

1.10.3.3 CAP Testing

All Equipment and infrastructure being provided as part of the System has passed P25 Compliance Assessment Program testing. Motorola will provide the Declaration of Compliance (SDoCs) for the ASTRO trunking network and G-Series repeater equipment, as well as all the radios and radio upgrades.

These SDoCs confirm testing with Motorola, Harris, Tait, EF Johnson, and Kenwood radios, as well as other P25 subscriber manufacturers.

Summary Test Report (STR)

An STR is issued by the manufacturer and outlines the individual tests conducted and the associated test results for a given product. Key information found on an STR includes:

5. Product description information.
6. Other devices the product is tested with.
7. Individual tests conducted on the product.
8. Pass criteria for performance tests.
9. Test results for a given test (Pass, Fail, etc.).

Supplier's Declaration of Compliance (SDoC)

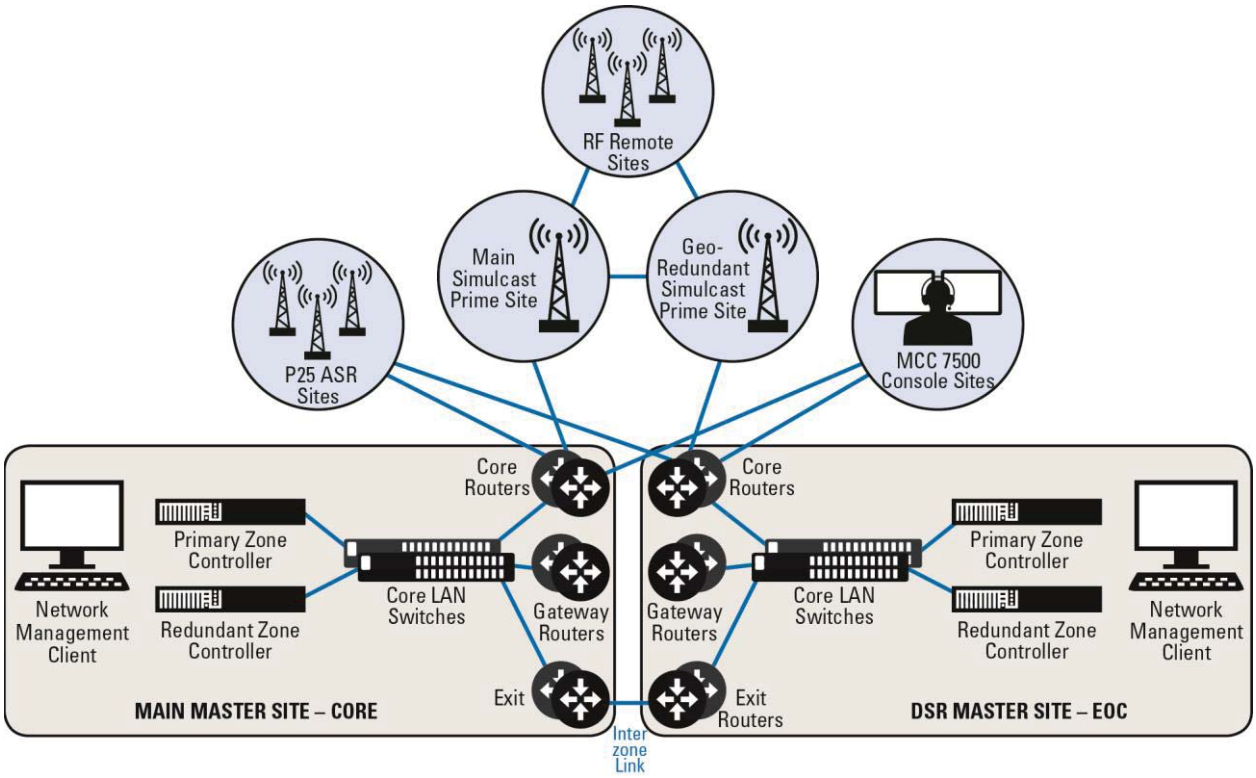
An SDoC is issued by the manufacturer and is a companion document to the STR. The SDoC references the applicable STR and includes a declaration that a product passed a given test suites. Key information found on an SDoC includes:

10. Product description information.
11. Other devices the product is tested with.
12. The test suites a product passed with any exceptions.
13. A declaration from the manufacturer including a signature from an authorized representative.

1.10.4 System Configuration

1.10.4.1 System Architecture

Motorola Solutions' design for the Broward County is a P25 Phase 1/Phase 2 700MHz, digital trunked communications system designed specifically to meet the County's needs and comply with the RFP's requirements. Motorola Solutions' ASTRO 25 trunked design will provide wide-area, high County voice communications to all user agencies. The figure below illustrates the proposed P25 radio system topology, including the overall system design, the geographically-redundant master and prime sites, simulcast cell, standalone repeater site, and dispatch console sites.



Proposed P25 Radio System Topology

The architecture is IP-based, comprised of advanced network of computer servers and workstations, high speed local area networks (LAN), wide area networks (WAN), sophisticated databases, management software and radio frequency (RF) equipment. Connectivity will be provided by the dual loop new MPLS-based microwave system.

1.10.4.2 Reliability and Redundancy Features of System

Motorola Solutions' solution provides the County with a mission critical reliable and redundant system. The system includes multiple levels of redundancy and is designed to withstand multiple failures and still provide full-featured trunked communications. Motorola Solutions' P25 system has no single point of failure that can disable P25 voice services within the network, or that would take more than 25% of the system channel Broward County out of service.

A. Control Site Redundancy

The master network controllers at both sites will have the same system components and will both be live on the system, with the primary Master Network Controller (master site) actively processing traffic and the second in a mirrored configuration, immediately ready to take over processing without requiring re-affiliation of radios or consoles.

B. Master Site Switchover

The system managers have the ability to manually switch between the active master site and the backup master site using the configuration tool. This manual switchover will result in the system going into site trunking mode for a period of up to two minutes before the previous backup master site becomes the active master.

Failure of the key components at the active master site will result in the automatic switch-over of control to the backup master site. During the switch over period between the master sites, the system temporarily enters into site trunking mode. (This usually lasts for less than 30 seconds, is typically only a few seconds, and many users may not even be aware a switch has occurred.)

In the seconds during switchover, when the system is in site trunking mode, the subscriber units and dispatch consoles in the field will have a visual and audible indication that the system is in site trunking, and that they do not have wide area communication with other users in the system, except those affiliated to the same RF site. Also during this period, the subscriber units will remain affiliated to their original RF site. Once the backup master site takes over control and the system is back in wide-area operation, the subscriber units go back to normal wide-area operation. No deaffiliation or reaffiliation takes place during this period. During the period when the entire system is in site trunking mode, the dispatch users will have a visual and audible indication of not having wide area access to trunked resources on the system.

C. Prime Site Switchover

The proposed Geo-Prime site system is designed in redundancy with a number of different configurations.

The Primary Prime site is equipped with two controllers while the backup prime (geo-prime) is equipped with a single controller. The failure of one of the prime site controllers at the primary prime site will result in the redundant controller taking over. Only in the event that both the primary prime site controllers failure will the backup prime controllers become active.

Both the primary prime site and backup-prime site have equal number of comparators. Failure of the comparator at the prime site will result in the corresponding comparator at the backup-prime site becoming active. This occurs even if all the other equipment at the primary prime site is still active. The transition to the backup comparator is transparent to users.

Switching from the backup-prime to the primary prime site is only done at the command of an authorized user to avoid the system automatically switching prime sites unnecessarily.

Further failure scenarios are found in the failure scenario section below.

D. System Failsoft

In the unlikely circumstances that the system suffers additional failures, the site then may go into Failsoft mode. Subscriber radios currently affiliated with the Failsoft site will be affected differently depending on how they are programmed or configured. The Failure analysis below describes the behaviors of subscribers during the site Failsoft operation.

Dealing with a site entering into Failsoft or one recovering from Failsoft requires special consideration to ensure that the control channel is not overloaded due to subscriber radios trying to affiliate.

Upon site failure or recovery, the system protects itself from conditions that might entail numerous radios registering simultaneously and potentially overloading the system using Random Hold-off Timers; Failure Random Hold-off Timer (FRHOT) and Recovery Random Hold-off Timer (RRHOT). Any site that has failed or is recovering will result in the system issuing a Random Hold-off Timer at affected site's adjacent sites. This value is configurable from 1 to 60 minutes.

Upon a site failure, those radios that are not programmed to remain at the failed site will seek out the best available wide-area site. Upon finding this wide-area site, the radios will attempt to register however not before receiving the FRHOT value that has been issued by the system. The FRHOT value is used to spread out registration requests over a longer time period. Using this value, the proposed APX P25 radio unit calculates a random time that determines when that radio unit attempts to register at the new site. Since each radio unit comes up with a slightly different time, the registration requests are spread out and the sites' inbound control channels do not become overloaded. While this is a critical feature to prevent site overload from registration requests, this feature is not part of the P25 standard and may not be available in non-Motorola radios. Talkgroup conversations that involve radios currently holding off registration due to the FRHOT feature will still be available to those radios. Should the radio user need to participate in a talkgroup call, the pressing of the PTT button will force an immediate registration request to the controller at which time the affiliation and registration will be treated immediately as a normal request.

When a site recovers from a failure scenario and provides a radio subscriber substantially higher level of coverage than the current site to which it is affiliated, the radio unit will try to register with this recovered site. To ensure the recovered site does not get overloaded with registration requests on the control channel, the system issues aRRHOT value which is issued by the system. This feature works similar to the FRHOT described above as each radio unit calculates a random time that determines when that radio unit attempts to register at the recovered site.

A complete and detailed failure mode analysis of the effects of component failures for each element of the system, diagrams showing component failures within the system and narratives describing the resiliency of the network during specific component failures are provided in the following sections in response to the RFP 2.3.1(Failure Mode Analysis).

E. Long-Term Outages

The System is designed with multiple levels of redundancy to ensure users are minimally impacted by failure conditions. While every step has been made to ensure the system remains operational at all times, there are functions that can impact the systems operations that are outside the design constraints of the Motorola Solutions System.

The primary cause of long-term outages is backhaul transport. However to try to minimize this potential from occurring, Motorola Solutions has included redundant routers to provide for path diversity for the transport system.

While Motorola Solutions develops very robust equipment, equipment at times fails. To minimize system outages, or Broward County reductions due to failed equipment, Motorola Solutions will provide the spare equipment identified in the equipment list that will help to ensure the system continues to operate when equipment failures occur.

There is no single component contained within the proposed ASTRO system that will cause long-term outage. Motorola Solutions has provided a failure analysis to explore failure of the major components within the system.

1.10.4.3 Narrative of Failure Analyses

[See Appendix]

1.10.5 System Expansion

A. The systems shall be expandable by adding additional hardware and/or software to increase coverage, capacity, or features. Provider shall provide equipment such that the system can be easily expanded by a minimum factor of 10 percent.

B. The trunked system shall be expandable to meet the minimum capacities listed below through the addition of hardware. **All software licenses shall be included consistent with the terms of this Agreement.** Replacement of the system and site control equipment to meet this requirement shall not be acceptable.

1. Interconnected system and site control equipment (if using a centralized architecture) – 3
2. Total simultaneous talk paths – 36
3. Simulcast cells – 5
4. Sites per simulcast cell – 30
5. Unit IDs –**250,000**
6. Affiliated users – 15,000
7. Talkgroups – 1,000
8. Dispatch positions - 100

1.10.5.1 Broward County and Expansion Features of System

The system is designed with expandability and future migration in mind. ASTRO 25 is an IP-based, standards-based, scalable technology. Motorola Solutions' experience in designing and implementing solutions to specifically address customers' needs makes Motorola Solutions uniquely suited to meet

and exceed the County's current communications requirements, as well as providing a system that will grow as the needs of the County grows.

Master Site and System Expansion Capabilities

Motorola Solutions' solution is modular and scalable, with controllers that can accommodate drastic expansion in RF sites, channels, console positions, and subscribers as the needs of the County changes over time. The expansion capabilities provided in the table below show that the solution will meet the County's needs now and in the future. The System facilitates future expansion by allowing system elements to be added over time as needed, including the addition of radio sites, channels, dispatch sites and consoles.

	ASTRO 25 Platform	System	Reserve Broward County
System Broward County			
Zones	7 E	1	6
Individual IDs	250,000 E L	150,000 *(Note 1)*	100,000
UNS License for GPS and Text	100,000 L	0	100,000
UNS License for Location	100,000 L	0	100,000
Key Management (OTAR) Licenses	64,000 L	0	64,000
Talkgroups	16,000 S	16,000	-
Zone Level Broward County	**Broward County is PER ZONE Broward County Increases by Adding Zones**		
Channels per Zone (Trunking + Conventional)	1000 E L	43 *(Note 1)*	957
Simulcast Subsystems	64 S	3	61
ASTRO25 Repeater Sites (ASR) (Including Simulcast Subsystems)	150 E L	4*(Note 1)*	146
Maximum Dispatch Sites	100 E	5 *(Note 2)*	95
Maximum Dispatch Operator Positions	500 E L	90 *(Note 2)*	410
Zone Historical Reports Application Licenses	10 S L	3	7
Dynamic Reports Application Licenses	5 S L	3	2
Zone Watch Application Licenses	10 S L	3	7
Affiliation Display Application Licenses	5 S L	3	2
UNC Application Licenses	7 S L	2	5
UEM Application Licenses	16 S L	3	13
RCM Application Licenses	32 S L	3	29
Historical Reports Application Licenses	10 S L	3	7
Subsystem Broward County	**Broward County is PER Subsystem Broward County Increases by Adding Subsystems**		

Single Simulcast Subsystems			
Sub-sites per Simulcast Sub-systems	32 $_S$	14 – Main Simulcast 4 – Backup Simulcast	18 28
Talkpaths per Simulcast Subsite	36–TDMA $_S$	36 – Main Simulcast cell 12 – Backup Simulcast	- 24
	29–FDMA $_S$	18 – Main Simulcast cells 6 – Backup Simulcast	11 23
ASTRO 25 Repeater Sites (ASR)			
Talkpaths per ASR site	36-TDMA $_S$	10 – BC Station 106	26
MCC Dispatch			
Maximum Dispatch Operators per Dispatch Site	500 $_{EL}$	24 – Sunrise 23 – Pembroke Pines 21 – Coconut Creek	26 27 29
Conventional Legacy Channels via CCGW per Dispatch Site	40 $_S$	24 – Sunrise 24 – Pembroke Pines 24 – Coconut Creek	16 16 16
Analog Conventional Channels per Console Operator Position	71 $_S$	11 – Sunrise*(Note 2)* 11 – Pembroke Pines*(Note 2)* 11 – Coconut Creek*(Note 2)*	60 60 60
Affiliated Talkgroup IDs per Console Operator Position	160 $_S$	160	-
Simultaneous Audio Sessions per Console Operator Position	60 $_S$	60	-

Note 1: The system is capable of 250,000 IDs once the hardware is expanded to multi-zone; the 250,000 unit ID licenses are included. The ASTRO 25 System proposed is a 14-site, 19 channel simulcast system and one ASTRO Repeater site with six channels. Also proposed is a 4 site, 7 channel backup simulcast trunked system and 8 conventional 700 MHz repeaters that are included in the system count as well as a 4 site 3 channel analog 800 MHz simulcast MA system.

Note 2: The ASTRO 25 System proposed has a dispatch console system at Sunrise, Coconut Creek and Pembroke Pines which has been included in the dispatch site and operator counts. The 11 conventional channels are 3 for 800 MA and 8 for the standalone conventional 700 repeaters.

Note 3: The aforementioned site licenses and dispatch licenses are not site-specific and can be utilized by the County at any site or dispatch location (subject to availability of hardware at the site or location).

Note 4: As indicated above, the subscript “S” indicates a system maximum capacity (e.g., a functional capacity limitation); the subscript “E” indicates the maximum capacity of the equipment as designed, and additional hardware may be necessary to increase capacity, and the subscript “L” indicates a

license capacity (i.e., the maximum number of licenses permitted under the current license scope and software, and additional licenses may be required to increase capacity).

1.10.5.2 Radio Channel/Site Expansion Capabilities

System Capabilities

The table above highlights the capabilities of the system that will utilize a small portion of the system's Broward County, ensuring the system is able to grow with the County over the next 15 to 20 years. In developing the design of the system, special attention was paid to ensure the system was not close to its limits so that future growth could be achieved without immediate restrictions. An example of such design is with the number of sites that can be supported by a Simulcast system, 32. The System will utilize 11 sites allowing for the growth of 21 additional sites to be added to the main simulcast cell.

It is important to note that in selecting to add sites to a simulcast cell, factors such as site separation are important as sites that are too far apart can have adverse impact to the system's performance while sites that are too close may not contribute to the system's overall coverage. Motorola Solutions is willing to work with the County to ensure any future expansion is reviewed thoroughly and the best solution is developed.

In addition to being able to add sub-sites to the proposed simulcast sites, the system also has the ability to add additional simulcast cells or ASTRO Repeater sites to provide the best solution for the County. The system is capable of supporting 64 simulcast cells while only three cells are being proposed.

Channel and site expansions are therefore important capabilities that the County must have to ensure growth can be easily accommodated. The following will address the impacts of both for future system expansion.

Channel Expansion per Site, per Channel

The main single simulcast sub-system is equipped with 36 TDMA talkpaths. This is the maximum for a single simulcast sub-system and is the most talkpaths offered by any manufacturer. Additional talkpaths would be accomplished by expanding into another simulcast sub-system. The System uses both standalone GTR8000 Base Radios with expandable transmitter combiners and racks designed to achieve economy of scale by accommodating more than six channels per rack for the main simulcast system and GTR 8000 Expandable Site Subsystem (ESS) 6 channels per rack for the backup system which then allows the effective utilization of certain infrastructure equipment including the Frequency Standards, RF antenna systems, Tower Top Amplifiers and Receiver Multi-couplers. The ESS configuration allow for two ESS racks to share a RX antenna system and to share a TX antenna system.

The main simulcast single sub-system will have 19 channels (36 TDMA or 18 FDMA talkpaths). Separate GTR8000 Base Radios were chosen to minimize the number of racks required which is a total of three per remote site. Included along with the radios are two 12-channel transmitter combiners to accommodate the 19 channels and have one additional port for expansion.

Since the ESS racks are able to accommodate six channels, these were chosen for the backup simulcast system and to provide transmitter ports and receiver ports for the two 700 MHz conventional repeaters at each of the four sites designated that are common with the backup system sites. The Backup sites are proposed with seven channels to provide the 12 TDMA talkpaths as required. Since two ESS racks are able to accommodate 12 channels, there are three expansion channels available for the backup system sites, which also meets the RFP 10% expansion requirement.

The proposed TTA receiver multi-coupler is capable of supporting up to 32 receiver ports and used only for the main simulcast receivers.

Channel expansion for the Backup simulcast sub system beyond three channels will require an additional ESS rack to be added which will provide an additional six channels. To provide additional autonomy for the Backup simulcast sub system, a separate receive antenna system, TTA and receive multi-coupler with 16 receiver ports is provided however for every three ESS racks (18 stations) only one of the MCU ports needs to be utilized. This separate receive antenna system will also be used for the three channel 800 analog Mutual Aid simulcast system receivers. The Backup Simulcast system will operate on either the 700 MHz band or the 800 MHz band. The Backup Simulcast will have a separate transmit antenna that will carry the seven trunked channels and either the two 700 MHz conventional repeaters or the three 800 MHz mutual aid repeaters. The 800 MHz MA or 700 MHz conventional stations not sharing a combiner with the Backup Simulcast system will utilize a standalone 4-channel combiner.

The three channel 800 MA simulcast system required by the RFP is designed with GTR8000 Base Radios and expandable transmitter combiners and will use the same receive antenna system as the Backup simulcast system. The 800 MA channels will have a dedicated 4 channel transmitter combiner and transmit antenna. This also meets the 10% expansion capabilities required.

Any expansion of existing systems is dependent on the existing and any new frequency pair having sufficient channel spacing to achieve full performance of the combiner system. The standard standalone transmitter combiners and ESS transmitter combiners are designed to accommodate channel spacing of 150 kHz or greater to achieve best performance.

Channel Expansion Process for Main & Backup Simulcast Cell Prime Sites

The system includes simulcast cells with the corresponding simulcast sub-sites and channels at each site. The main and backup simulcast prime sites have comparators corresponding to each channel. Expansion of a channel requires an additional GCM8000 comparator module. Each comparator shelf holds two channels thus, if there is an existing shelf with a single channel, a comparator module will only be required to add one additional channel in addition to the software. If two channels are to be added, then an additional comparator shelf with power supply will be required. All GCM8000 comparator power supplies are bussed together so that if any shelf power supply goes down, the shelf and comparator modules will continue to function.

Channel Expansion Process for Standalone 700 MHz Repeater Sites

The system includes two standalone 700 MHz repeaters at each of four sites. At each of the four sites, the two channels are housed in one GTR 8000 ESS Backup rack, which includes the necessary combiner, multi-coupler, and power supply modules. Each site has one TX antenna and one RX

antenna for the Backup system and the two conventional repeaters. In the proposed design, adding an additional channel to the two proposed up to three require a new radio and license; expanding beyond three channels will necessitate a new rack, combiner, Receiver Multi-Coupler (RMC), radio, and license.

The above channel expansion will be contingent on a number of items, including the frequency pair being added to the system, space, and electrical requirements.

Site Expansion

As noted earlier, the system is designed to utilize a small portion of the system's capability. The expansion of the system can occur in several ways:

Simulcast Cell Addition

As the needs of the County change, it's important that the system is able to accommodate these changes. The system is currently proposed with three simulcast cells for the single simulcast and four simulcast cells with the dual simulcast system. Therefore the County, in the future, can add either 61 (or 59) additional simulcast cells to the system. The location of these cells will be based on the needs of the additional RF coverage that is deemed necessary. In some instances it may be appropriate to utilize a small simulcast cell while in other situations larger cells. The flexibility of the system permits the system to develop as the desires of the County change. Simulcast coverage is typically beneficial for the ability to reuse frequencies while covering a large geographical area. This allows the County to focus coverage where it is needed the most.

Simulcast Sub-site Addition

The Main simulcast system is designed to accommodate 11 Simulcast sub-sites. That allows for 21 additional sub-sites to be added to the simulcast cell. The addition of the simulcast sub-site must consider several factors including site separation to ensure the additional sites do not have a negative impact on the remainder of the sub-site's performance. The Backup simulcast system is designed with 4 sub-sites. That allows for 28 additional sub-sites to be added to the cell.

ASTRO Repeater Site Addition

The ASTRO P25 system allows for 150 ASTRO Repeater sites (ASR) (minus Simulcast cells). The System has one ASR site, thus future expansion capabilities of 149 ASR sites is significant.

Grade of Service (GoS) – Trunked System

The required Grade of Service – GoS from the RFP is defined as "1% with 90% of the units that are placed in queue receiving a channel grant within two seconds. Motorola shall provide a single cell design with 36 talkpaths, delivering a 1% GoS for 3361 active users with Transmission Trunking and users making an average of five calls per unit per hour with a four second call duration.

Motorola shall validate that the 36-talkpath single cell design will accommodate the system load provided by the current system loading and usage patterns during the busy hour, plus projected future growth. Motorola shall consider the impact of the loss of two-talkpaths due to a repeater failure.

1.10.6 Site Selection

The radio coverage across the County's service area will be provided by a total of 15 RF remote sites: 14 simulcast remote sites, and one standalone ASR site. Motorola Solutions has designed the system with the eight mandatory sites required by the RFP plus four additional sites that provide the service area reliabilities that are required by the RFP. The site selection process has several steps that are followed to come up with sites that are optimum for meeting the wide area coverage required. First, the existing sites are taken into consideration by modeling the coverage for the required building losses and service area reliabilities. By doing this first, it determines where the additional coverage is required and if these existing locations are good locations for the overall wider area coverage. Next, additional sites are modeled by using the potential new sites listed within the RFP Appendix B-Addendum 2. Once these type sites are gathered for the deficient areas of coverage, they are entered into the Hydra coverage modeling tool. The Hydra modeling can then begin and determine which sites are the best locations to provide the additional coverage to meet the requirements of the RFP.

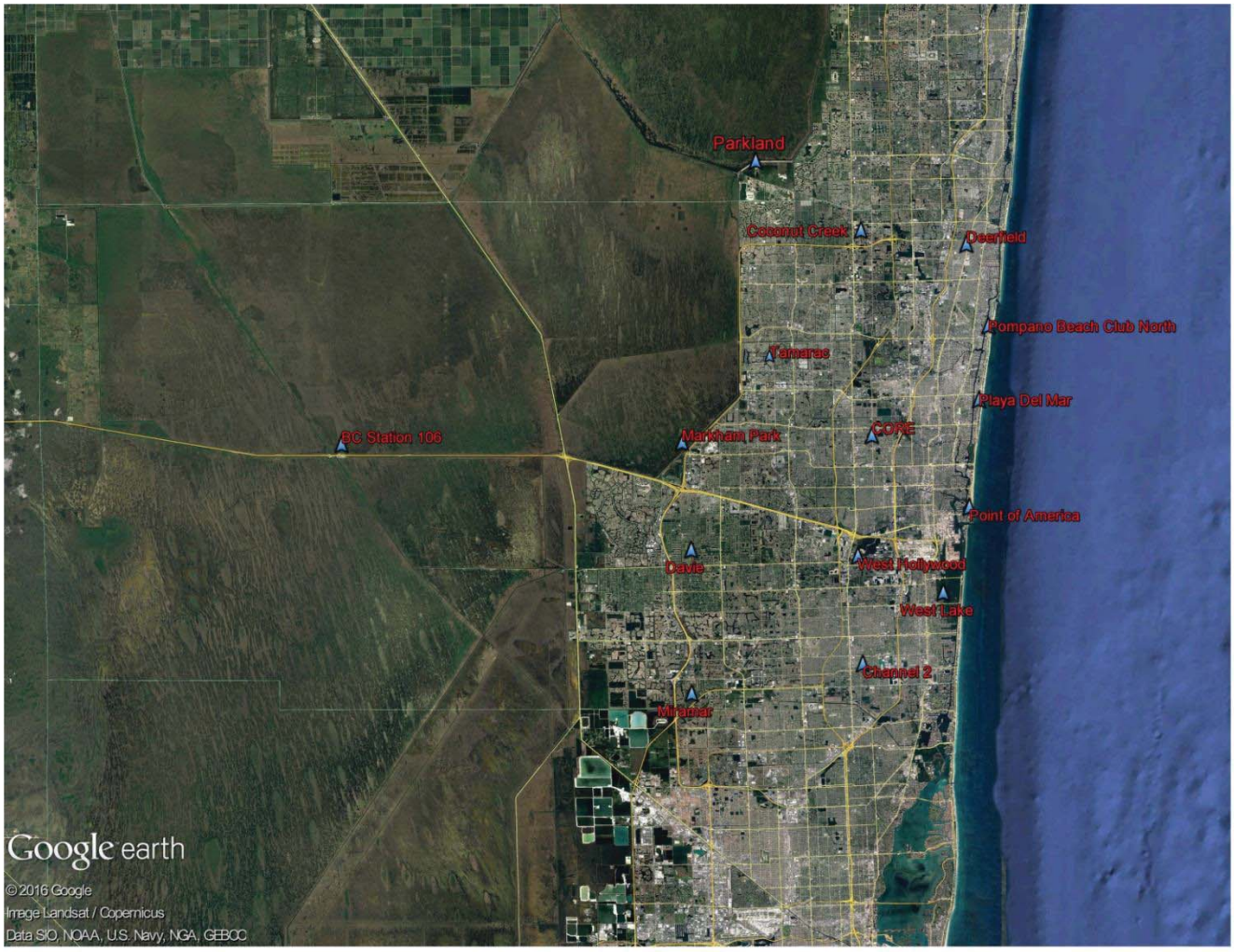
The precise site locations shall be confirmed by the Parties during the design phase and confirmed in the Final Design. Any modification to the site locations shall have no effect upon scope and shall not increase price or cost to County, unless confirmed in an appropriate amendment executed by the Parties. The Parties shall work cooperatively to achieve the final site locations and incorporate same into the Final Design in accordance with the agreed Project Schedule, scope and price.

The P25 700 MHz TDMA trunked system design consist of an ASTRO 25 simulcast cell. The remote simulcast sites contain the following RF equipment plus the ASR (i.e., multi-cast repeater site) as further detailed in SOW A-2:

1. **CORE Tower** – Main system one 19 channel simulcast prime site with co-located sub-site and main master site.
2. **EMS Tower** – Backup system 7 channel simulcast Prime Site, co-located sub-site and 800 Mutual Aid 3 channel prime site with co-located simulcast remote sub-site.
3. **EOC Tower** – DSR (backup) master site
4. **Coconut Creek Tower** – Main system one 19 channel simulcast sub-site, Backup system 7 channel simulcast sub-site and 800 Mutual Aid 3 channel simulcast remote sub-site.
5. **Davie Tower** – Main system one 19 channel simulcast sub-sites, Backup system 7 channel simulcast sub-site and 800 Mutual Aid 3 channel simulcast remote sub-site.

6. **Channel 2 New Tower** – Main system one 19 channel simulcast sub-sites, Backup system 7 channel simulcast sub-site and 800 Mutual Aid 3 channel simulcast remote sub-site.
7. **Markham Park Tower** – Main system one 19 channel simulcast sub-site.
8. **Playa Del Mar Building** – Main system one 19 channel simulcast sub-site.
9. **Point of America Building** – Main system one 19 channel simulcast sub-site.
10. **Miramar Tower** – Main system one 19 channel simulcast sub-site.
11. **Deerfield** – 300' self-supporting tower; Main system one 19 channel simulcast sub-site.
12. **Tamarac** –300' self-supporting tower; Main system one 19 channel simulcast sub-site.
13. **West Lake Park** – 300' self-supporting tower; Main system one 19 channel simulcast sub-site.
14. **BC Station 106 New Tower** (**Everglades**) – 300' self-supporting tower; ASR 6 channel repeater site.
15. **Parkland**: 300' self-supporting tower; Main system one 19 channel simulcast sub-site.
16. **Pompano Beach:** Rooftop-based Main system one 19 channel simulcast sub-site.
17. **West Hollywood:** 300' self-supporting tower; Main system one 19 channel simulcast sub-site and GEO Redundant 19 channel backup prime site.

A map showing the geographic location of the simulcast sites and the single ASR site in the system is provided in the figure below.



1.10.7 Coverage

A. The radio systems shall be designed to serve within the geographical boundaries of the county.

B. Coverage design, implementation, and testing for the system shall adhere to the TIA Telecommunications Systems Bulletin (TSB) #88-D or latest version, Wireless Communications Systems Performance in Noise-Limited Situations.

C. Channel Performance Criteria (CPC):

RF coverage is defined as the digital Bit Error Rate (BER) that provides an audio signal that delivers a minimum Delivered Audio Quality (DAQ) score of 3.4, for both outbound (talk-out) and inbound (talk-in) communications.

1. TIA defines DAQ 3.4 as “speech understandable with repetition only rarely required,” which is the minimum acceptable level for public safety communications.

2. Provider shall provide sample audio files, in .wav or .mp3 formats, demonstrating the audio quality associated with DAQ levels of 3.0, 3.4, and 4.0.

D. The radio system must provide coverage as described below:

1. The primary system shall provide 95 percent coverage for a portable radio inside a building with 25 decibels (dB) of attenuation, with 95 percent reliability, for those portions of the county east of I-95.

2. The primary system shall provide 95 percent coverage for a portable radio inside a building with 20 dB of attenuation, with 95 percent reliability, for those portions of the county west of I-95, east of U.S. 27 and south of 595; and west of I-95, east of the Sawgrass Expressway and north of 595.

3. The primary system shall provide 95 percent coverage for a portable radio operating outdoors, with 95 percent reliability, for the portion of the county west of U.S. 27 and south of 595, and west of the Sawgrass Expressway for the area north of 595.

4. The primary system shall provide 95 percent coverage for a mobile radio operating on a boat, with 95 percent reliability, for those portions of the county in the ocean extending 10 miles eastward from the coast.

5. The trunked backup system shall provide 95 percent coverage for a portable radio operating outdoors, with 95 percent reliability, for those portions of the county east of U.S. 27 and south of 595, and east of the Sawgrass Expressway and north of 595.

6. A map of the various coverage areas has been included in Appendix C. Boundary files to be utilized for each of these areas have been included as a supplement to the solicitation.

A. Provider shall utilize the following assumptions for subscriber radio performance in order to meet stated coverage requirements:

1. Vehicle-mounted mobile radios – Standard dash- or trunk-mount, with ¼ wavelength whip antenna mounted on the trunk with an output power of 10 watts

2. Boat-mounted mobile radios – Standard dash-mount, with ¼ wavelength whip antenna mounted on a boat mast, assumed at 5 feet above sea level

3. Portable radios – Standard portable radio outdoors or indoors:

    a. Talk-out to a portable radio on hip with a swivel belt clip
    b. Talk-in from a portable radio at hip using a remote speaker microphone
    c. ½ wavelength flexible whip antenna
    d. Hip level shall be assumed as a height above ground at 3.3 feet
    e. Appropriate level of in-building attenuation for both talk-out and talk-in based on coverage requirement

The P25 700/800 MHz TDMA simulcast trunked system coverage will meet the requirements of the RFP. The System will deploy 11 trunked simulcast sites operating in primarily TDMA mode with full interoperability access by subscribers operating on FDMA.

The coverage predictions and guarantee of coverage will provide 95% Service Area Reliability for portable radios worn on the hip with Remote Speaker Microphones operating outside on the roads and streets within Broward County at Delivered Audio Quality (DAQ) 3.4. In addition, the guarantee also provides 95% Service Area Reliability for portable radios worn on the hip with Remote Speaker Microphones operating within the five defined service areas detailed in the RFP for the following minimal acceptable db loss:

1.10.7.1 Coverage Maps

All coverage maps provided by Motorola under this SOW A-1 shall comply with the following:

A. Provider shall submit both talk-out and talk-in system composite coverage maps for all proposed design configurations. Updated maps shall be provider for updated site configurations until a final site configuration is available. The maps shall be clearly labeled and shall show link budget calculations for each of the following:

    1. Mobile radios – Standard dash- or trunk-mount, with antenna mounted on the trunk

    2. Portable radios – Standard portable radio outdoors:

        a. Talk-out to a portable radio on hip with a swivel belt clip
        b. Talk-in from a portable radio at hip level with a swivel belt clip

    3. Portable radios – Standard portable radio indoors:

a. Talk-out to a portable radio on hip with a swivel belt clip, with 20 dB of building loss
b. Talk-in from a portable radio at hip with swivel belt clip, with 20 dB of building loss
c. Talk-out to a portable radio on hip with swivel belt clip, with 25 dB of building loss
d. Talk-in from a portable radio at hip with swivel belt clip with 25 dB of building loss

B. Coverage shall be depicted using a light transparent color or cross-hatching for those areas that meet or exceed the minimum coverage reliability threshold.

C. All maps must clearly delineate the difference between areas with coverage predicted to be equal to or greater than DAQ 3.4 and areas that do not meet this coverage requirement. Vendors shall include the effects of simulcast interference in all coverage maps (if applicable).

D. Coverage maps shall be provided in two formats:

1. 11-inch x 17-inch, full-color, hardcopy
2. softcopy format printable to 11-inch x 17-inch full color.

E. Coverage maps must include sufficient detail to allow another party to duplicate the predicted coverage utilizing propagation software.

F. Coverage maps shall display coverage extending beyond the county borders.

G. Coverage maps shall consider any anticipated degradation resulting from simulcast interference.

H. All maps shall include a background layer suitable for County reference (e.g., topographic map, roads, rivers, etc.). Link budgets shall be provided that clearly define the following minimum information for both the radio and paging systems, related to each map and each site:

1. Base station/repeater RF power output
2. Antenna Height (radiation center)
3. Antenna mounting azimuth
4. Antenna gain/transmission line size
5. Antenna down tilt (if applicable)
6. Transmit effective radiated power (ERP)
7. Receiver sensitivity
8. Combiner loss/multicoupling gain/tower-top amplifier (TTA) gain/noise
9. Net TTA amplification gain

10. Mobile and portable antenna height for talk-out and talk-in
11. Mobile and portable RF output power
12. Mobile and portable gain or loss factors
13. Mobile and portable ERP.
14. Configuration of field units (e.g., talk-out to a portable inside 10 dB-loss buildings)
15. Simulcast timing parameters (if applicable)

A. Thirty-meter U.S. Geological Survey (USGS), North American Datum (NAD)-83 terrain elevation data shall be used for coverage simulations. Alternatively, 3-arc-second data may be used where 30-meter data is not available.

B. Antenna pattern files shall be provided in the EDX or PLANET formats.

The system will comply with the Coverage Maps listed in the table below.

Coverage Maps

Map #	Description	Antenna	Configuration	Location
1A	APX Mobile- Sedan	1/4 Wave	On Trunk Lid	Outside on Street
1B	APX Mobile- Sedan	1/4 Wave	On Trunk Lid	Outside on Street
2A	APX Portable	1/2 Wave Flex	RSM Swivel Clip	Outside on Street
2B	APX Portable	1/2 Wave Flex	RSM Swivel Clip	Outside on Street
3A	APX Portable	1/2 Wave Flex	RSM Swivel Clip	20 db Loss Service Area
3B	APX Portable	1/2 Wave Flex	RSM Swivel Clip	20 db Loss Service Area
4A	APX Portable	1/2 Wave Flex	RSM Swivel Clip	25 db Loss Service Area
4B	APX Portable	1/2 Wave Flex	RSM Swivel Clip	25 db Loss Service Area
5A	APX Portable	1/2 Wave Flex	RSM Swivel Clip	Outside Backup Service Area
5B	APX Portable	1/2 Wave Flex	RSM Swivel Clip	Outside Backup Service Area
6A	APX Mobile- Boat	1/4 Wave	5’ mast w/ Grd Plain	Off Shore Service Area
6B	APX Mobile- Boat	1/4 Wave	5’ mast w/ Grd Plain	Off Shore Service Area

1.10.7.2 Map Criteria

The tables below detail the map criteria used to generate the coverage maps. (Coverage is calculated for the Tamarac site based up a 180’ monopole, rather than the design requirement of a 300’ self-supporting tower. Channel 2 is calculated based upon the existing structure, rather than the design requirement of a 300’ self-supporting tower. These deviations are by agreement for purposes of coverage analysis.)

Fixed Network Map Criteria

Site Name	Base Power (dbm/watts)	Tx Height (center feet)	Tx AZ (deg)	Tx Ant Gain (dbd)	Ant Down Tilt (deg)	Tx Line	Tx ERP (dbm/watts)	Tx Comb Loss (db)	Simulcast Launch Delay (usec)	Rx Height (center feet)	Rx AZ (deg)	Rx Ant Gain (dbd)	Ant Down Tilt (deg)	Rx EFS dbm (includes ant gain)	Diversity Ant	TTA Gain / Noise Figure (db)	TTA Reserve Gain (db)
CORE	50/100	280	Omni	11.5	2	1 1/4"	53.3/213	4.9	0	305	Omni	12.0	0	-124.64	None	21/2.7	11
Coconut Creek	50/100	385	195	12.0	0	1 1/4"	53.6/229	4.9	10	410	195	14.3	0.75	-126.95	None	21/2.7	11
Markham Park	50/100	379	Omni	11.5	2	1 1/4"	52.6/182	4.9	5	404	Omni	12.0	0	-124.64	None	21/2.7	11
Playa	50/100	290	270	12.0	0	7/8"	55.1/324	4.9	0	290	270	14.3	0.75	-126.94	None	21/2.7	11
Davie	50/100	280	Omni	11.5	2	1 1/4"	53.3/213	4.9	10	305	Omni	11.5	0	-124.65	None	21/2.7	11
Point Of America	50/100	260	270	12.0	0	7/8"	55.1/324	4.9	0	260	270	14.3	0.75	-126.94	None	21/2.7	11
Miramar	50/100	280	0	12.0	0	1 1/4"	53.6/229	4.9	10	305	0	14.3	0.75	-126.94	None	21/2.7	11
Channel 2	50/100	280	Omni	10.5	1	1 1/4"	51.7/148	4.9	0	310	Omni	12.0	0	-124.65	None	21/2.7	11
Deerfield	50/100	285	Omni	10.5	1	1 1/4"	53.2/209	4.9	10	305	Omni	12.0	0	-123.15	None	21/2.7	11
Tamarac	50/100	155	Omni	11.5	2	1 1/4"	54.2/263	4.9	5	180	Omni	12.0	0	-124.64	None	21/2.7	11
West Lake Park	50/100	285	Omni	10.5	1	1 1/4"	53.2/209	4.9	0	305	Omni	12.0	0	-123.14	None	21/2.7	11
Pompano Bch ClubN	50/100	260	270	12.0	0	7/8"	55.1/324	4.9	0	260	270	14.3	0.75	-126.94	None	21/2.7	11
West Hollywood	50/100	285	Omni	10.5	1	1 1/4"	51.7/148	4.9	0	310	Omni	12.0	0	-124.65	None	21/2.7	11
Parkland	50/100	285	180	12.0	0	1 1/4"	53.6/229	4.9	10	310	180	14.3	0.75	-126.94	None	21/2.7	11
BC Station 106	50/100	310	Omni	11.5	1	1 1/4"	54.0/251	4.5	N/A	310	Omni	11.5	1	-126.45	Yes	21/2.7	11
EMS	50/100	380	Omni	11.5	0	1 1/4"	53.6/229	4.9	10	410	Omni	10.5	0	-126.95	None	21/2.7	11

Subscribers TDMA Map Criteria

Subscriber Type	RF Power (dbm/watts)	ERP (dbm/watts)	Tx/Rx Antenna Gain (db)	Tx/Rx transmission line loss Gain (db)	DAQ 3.4 Faded Sensitivity (dbm)	DAQ 3.4 Effective Faded Sensitivity Outside (dbm)	Tx/Rx Antenna Height (feet)	Antenna Type	Configuration
APX Portable w/RSM	34/2.5	25.4/0.35	-8.6	N/A	-109.8	-101.25	3.3	½ Wave Flex	Swivel case or equivalent
APX Mobile w/unity gain	40/10	30.8/1.2	-7.0	2.20 db	-112.36	-103.16	3.6	¼ Wave	Center of Trunk Lid
APX Mobile w/unity gain	40/10	36.8/4.8	-1.0	2.20 db	-112.36	-109.16	5	¼ Wave	Top of 5 foot mast w/grd plain

1.10.7.3 Coverage Model

Hydra[SM] Overview

Hydra is an innovative software tool developed by Motorola Solutions to accurately predict coverage, model traffic (voice and data), analyze interference, plan channel re-use, and perform other design tasks for radio networks. This description concentrates on Hydra coverage planning aspects.

Our solution presents typical Hydra coverage analysis for Broward County.

A. Hydra Development

Motorola Solutions' Hydra coverage prediction tool was developed to provide accurate coverage simulations by applying proven models to detailed system and environmental data across large geographical areas.

To create an accurate picture of the predicted radio coverage, many elements must be considered. Some of these elements, called system factors, are related to the system design parameters. System factors affecting coverage performance include frequency, distance, transmitter power, receiver sensitivity, antenna height, and antenna gain. Other factors, called environmental factors, vary according to the path taken by the radio signal and the environment surrounding the receiver. Environmental factors include terrain variations, obstructions, vegetation, buildings, ambient noise, and interference.

All coverage prediction methods try to account for both types of factors and incorporate them into a computational model. In general, the currently accepted models, such as Okumura, Longley-Rice, and TIA provide excellent portrayals of radio coverage when used within their respective ranges of applicability.

In the past, this level of analysis was adequate for the type of basic systems that were available. However, today's complex technologies, such as digital voice radios, packet data systems, or simulcast, require a much more in-depth analysis of the expected coverage performance to create a cost-effective design. This makes it necessary to select the appropriate coverage model, provide accurate representation of the environmental factors throughout the service area, and apply the coverage analysis method to every location within the service area.

Recognizing these facts, Motorola Solutions has developed Hydra, a multi-purpose network design tool that includes a coverage analysis program. Taking advantage of the knowledge gained from Motorola Solutions' many years of practical experience and coverage testing, Hydra provides a superior means for analyzing system coverage. This program, unique to Motorola, employs a technique of computing coverage on every tile in a service area rather than along a finite number of radials. Hydra computes "layers" of these tiles, with each layer containing the values of propagation model losses, coverage simulation results, or datasets. Layers can be displayed separately or in any combination as maps of the service area.

1.10.8 Site Equipment

Overview

The Provider shall provide all site equipment, which shall be new, of high quality, and designed to provide high reliability to support mission-critical communications. The site equipment, or RF infrastructure, consists of the following components:

A. System and site control equipment
B. Simulcast equipment
C. Receiver voting
D. Transmitters
E. Receivers
F. Combiners/multicouplers/TTAs
G. Antenna systems
H. Alarm remote terminal units
I. GPS frequency standard

All remote site equipment shall be configured to operate utilizing a -48 VDC power plant. All equipment located at dispatch facilities shall be configured to operate on the existing 120 VAC power systems.

The system is made up of various site equipment components that include System Controllers within the Master Sites, Simulcast Controllers and Voting comparators at the Prime Sites, Base Station Radios at the simulcast Remote sub-sites and Dispatch consoles at console dispatch sites.

1.10.8.1 System and Site Control Equipment

A. The system and site control equipment shall be capable of controlling all voice and data channels in the System. The control equipment may use a distributed or centralized architecture.

B. The control equipment shall fully support APCO P25 functional requirements, features, and performance objectives, including the CAI and the ISSI.

C. Provider shall provide a P25 ISSI for Broward County to connect to the adjacent four systems operated by neighboring agencies (Motorola Host Master Site, Miami-Dade, Palm Beach, Collier). The ISSI connections shall allow automatic system-to-system talkgroup roaming on up to 10 simultaneous talk paths per connected system.

D. Provider shall provide a P25 CSSI to enable Broward County to connect to P25-compliant console systems operated by nine neighboring agencies. The CSSI connection shall allow direct

talkgroup access at the Broward County public safety answering points (PSAPs) without requiring a conventional interface.

At the heart of the Broward County Radio System Infrastructure design is the Master Site. The Project 25 Master Site provides connectivity between voice subsystems that includes the simulcast prime sites, ASTRO Site Repeater sites and console dispatch sites. The Project 25 Master Network Switch is the central call processing center, delivering mission critical voice and data communications and allowing users to roam throughout the network without the need to make a manual selection. Designed for maximum availability and dependability, the core is the central source of network services and control. It is a fully IP-based, flexible, modular network with advanced call processing capabilities designed to meet the mission critical needs of Broward County.

The Project 25 network will adapt and change to accommodate additional users, increased geographic coverage, enhanced data applications, and connectivity to other networks to ensure an efficient and cost-effective solution for Broward County.

The Master Site serves as a central point for all system traffic in the Project 25 system, houses redundant zone controllers, and provides system management interfaces. Because the Master Site is so critical for wide area operation, the system has a second Master Site at an alternate location. This provides the highest level of redundancy known as Dynamic System Resilience. If the main Master Site have a catastrophic event that completely disables the main Master site, the backup Master Site takes over control of the system. The Master Site equipment is basically an IP network made up of redundant servers, LAN switches and Core routers.

1.10.8.2 Zone Core

The ASTRO 25 master zone core is the main control point for the communications system. The zone core contains the computing backbone for the system and all the components necessary for controlling voice calls and data messages within the system. In addition, the zone core provides the hardware and software components used for network management and system configuration. The zone core for the County has been sized to provide for the current and future needs of its user base, with the capability to support up to 150,000 radios on a single zone and 250,000 radios on a dual zone. Per the RFP requirements, 250,000 unit ID licenses are included in the System pricing.

The system architecture is designed with inherent fault distribution, ensuring that a single point of failure will not cause the complete disruption of communications. The ASTRO 25 architecture ensures that voice operation is maintained despite any single component failure anywhere on the network. In the case of a fault, the system can reroute the IP voice and data packets among the various redundant router configurations, and notify the supervisor/network management terminal of the fault.

Redundant Zone Controllers

The system offers redundant zone controllers. The zone controller is a software application that provides centralized control for call processing and mobility management functions in an ASTRO 25 system. The zone controller application is responsible for processing calls, managing audio paths, controlling zone infrastructure, and providing services to subscribers and dispatch consoles. The zone controller application resides on the HP DL380 dual virtual management servers (VMS01 and VMS02) and runs RedHat Linux in a VMware ESXi virtual machine.

The dual virtual management servers at the zone core contain the zone controllers and NM applications. Virtualization allows multiple virtual machines, with heterogeneous operating systems, to run in isolation, side-by-side on the same physical machine. Each virtual machine is allocated CPU, memory and storage resources used by the operating system and application associated with the virtual machine.

Virtual machines are encapsulated into files, making it possible to rapidly save, copy, and provision a virtual machine. Full systems (fully configured applications, operating systems, BIOS, and virtual hardware) can be moved from one physical server to another, for high-availability maintenance and continuous workload consolidation. These two physical servers (VMS01, VMS02) provide the processing for the redundant zone controllers, along with NM and reporting. These applications are distributed for reliability.

The zone controller operates in a redundant configuration. The LAN switch is used to switch system resources between the zone controllers and provide high availability call management within the zone. While the zone controllers are powered and enabled at the same time, only one is actively participating in call processing tasks at any one time.

The redundant zone controller configuration provides protection against a single point of hardware or software failure that results in the loss of wide area trunking until the zone controller is repaired or recovers automatically. The redundant zone controller remains in the standby state as long as the active zone controller does not report a malfunction that causes a switchover.

1.10.8.3 Zone Core LAN Switch Configuration

The zone core equipment includes a set of Core LAN switches that are the aggregate of all the Ethernet interfaces for all servers, clients, and routers at the zone core. Additional LAN switches are used for remote site access aggregation and in other capacities within the ASTRO 25 system, including at the prime site, the dispatch centers, and each of the remote RF sites.



Core LAN switch

Core Routers

The core routers perform the routing control of audio, data, and network management traffic in and out of the zone, replicating packets while achieving the fast access levels required by real-time voice systems. To increase availability, two core routers are used. The zone core audio, data, control, and network management equipment interfaces to the remote RF sites via the remote site aggregation LAN switches, through the core router.

1.10.9 ASTRO 25 Prime Simulcast and Voting Site Design

The prime site acts as a control and digitized audio center for the simulcast subsystem. The prime site will be co-located with the zone core at the main dispatch site. The site links route IP packets containing control and audio information from the prime site to each simulcast remote site.

1.10.9.1 GCP 8000 Controller

The GCP 8000 controller is designed for use in ASTRO 25 trunking systems. The GCP 8000 controller provides call processing and acts as a site link between the simulcast subsystem and the zone controller. The GCP 8000 is capable of supporting up to 36 voice paths and up to 30 simulcast sub-sites. The GCP 8000 controller communicates with interconnected ASTRO 25 infrastructure elements, such as the GTR 8000 base radio subsystem and the GCM 8000 comparator, which are also designed to be P25 compliant.

The GCP 8000 controller will be implemented in a fully redundant configuration with two controllers. The redundant (standby) controller automatically takes over site link or site control operations when the active GCP 8000 controller has failed. Communications between the active and standby controllers are configured through an Ethernet link. Channel status information will be kept consistent between the active and standby site controller to assure that accurate channel capability information will always be sent to the zone controller. In addition to the redundant controllers at the prime site, there will be a third controller at the redundant prime site, which will take over control operations automatically in the event of a failure of both controllers at the prime site.

1.10.9.2 Prime Site Routers

The prime site router provides a WAN interface that carries all of the traffic between the active and backup prime site to the zone core including voice, control, and network management traffic. The router provides direct IP packet network management connectivity for the remote sites to the zone core as well as:

18. Traffic prioritization—the router applies the correct prioritization marking to the packets leaving the site.
19. Fragmentation—the router fragments large IP packets as necessary.
20. Dynamic Host Configuration Protocol (DHCP) service—this service allows the technician with a properly configured computer running on a Windows operating system to connect to the LAN at the site.

Used with the NMS, the prime site router provides a proactively managed system and a means of receiving and reporting failure alarms, all of which increase router availability. Motorola Solutions has designed this system with redundant prime site routers, split between the prime and redundant prime sites.

1.10.9.3 GCM 8000 Channel Comparators

The GCM 8000 comparator is a band-independent device that acts as a subsystem-wide signal collector, voter, and distributor. The GCM 8000 comparator is designed for use in ASTRO 25 IP

simulcast trunking systems. With multiple base stations operating on the same frequency, it is possible for multiple RF sites to receive a single field unit transmission.

The GCM 8000 compares the various voice traffic signals and interprets and selects the best audio samples and assimilates an enhanced audio signal for simulcast broadcasting. By simultaneously transmitting the enhanced audio signals from multiple sites within the system, both coverage and signal quality are improved.

The geographic redundant prime site configuration for the County consists of redundant comparators at the primary simulcast prime site and at the secondary simulcast prime site.

1.10.9.4 Redundant Prime Site Ethernet LAN Switches

A pair of interconnected LAN switches is required to connect GCM 8000 comparators and GCP 8000 controllers to the prime site router. Two switches are used at the site to increase availability, and they are interconnected via Gigabit Ethernet trunks. Each of the two prime site controllers is connected to its own switch. Therefore, if one switch should fail at least one controller will have connectivity. Motorola Solutions has designed this system with redundant prime site Ethernet switches, split between the prime and redundant prime sites.

1.10.9.5 TRAK 9100 Time and Frequency Standard

The prime and remote sites include a redundant GPS-based time and frequency standard that provides a frequency/timing device for synchronized simulcast transmissions. In addition, the GCM 8000 comparator will receive timing information from the GPS. Each simulcast remote site will also utilize a GPS to provide the frequency/timing data needed to allow synchronization of simulcast transmissions. Each TRAK has redundant power supplies and Rubidium oscillators clocked by dual GPS antenna systems.

1.10.9.6 Redundant Remote Site Routers

Remote site routers provide an interface that routes all of the IP network traffic to and from the prime site for communication with the zone core. The site routers provide the following function for the network management packets:

21. Layer 3 routing—This restricts local traffic from accessing the microwave system and forwards important voice and data information to the prime site.
22. DHCP service—This service allows the technician with a properly configured computer running Windows to connect to the LAN at the site.

Used with the system's NM, the remote site router provides a proactively managed system as well as a means of receiving and reporting failure alarms.

1.10.9.7 Ethernet LAN Switches

The simulcast sub-site LAN switch performs two main functions at the simulcast remote site. The switch provides a 10BaseT LAN interface for the GTR expandable site subsystem and a 10BaseT port for the site router.

The service technicians using CSS software use a switch port to gain access at the site to service the site and access the system's GUIs to maintain the system. DHCP service allows the technician with a properly configured computer running Windows to connect to the LAN at the site. The site router will assign the computer running Windows an IP address that will allow the computer access to the ASTRO 25 network.

1.10.9.8 Base Station Equipment

A. General

1. Base station equipment shall be solid state in design and function with standard site conditions for temperature, altitude, and humidity.

2. Equipment shall have alarm contact interfaces to provide status to a separate alarm system.

3. The units shall be as compact as possible, with mounting configurations for standard relay racks or cabinets.

B. Base station equipment shall comply with Part 90 of the FCC Rules and Regulations, as well as appropriate EIA and similar agency standards, and be an FCC-type accepted for use in the 700/800 MHz frequency band.

C. Prior to implementation, the Provider shall perform the following studies at each site:

1. Intermodulation analysis – Provider shall consider equipment from all tenants located at the proposed site, per FCC license information.

2. Maximum Permissible Exposure (MPE) study (per latest revision of the FCC Office of Engineering and Technology [OET] Bulletin 65) – Providershall consider equipment from all tenants located at the proposed site, per FCC license information.

a. Provider shall gather the site data needed for these studies

D. The Provider shall resolve all issues predicted during the intermodulation analysis and MPE studies. If an intermodulation problem is identified within 12 months after Final Acceptance, the Provider shall resolve the issue without degrading system coverage or performance, at no cost to the County.

E. Base station equipment must dynamically support either Phase I or Phase II talkgroups based on the talkgroup type that is selected. Static assignment of Phase I or Phase II operation is not permitted.

A. GTR8000 Site Repeater/Base Radio

The GTR 8000 base radio consists of a transceiver module, power amplifier module, fan module, and power supply. The transceiver module includes the functionality for the exciter, receiver, and station control. The base radio software, configuration, and network management, as well as inbound/outbound traffic handling, are performed through this transceiver module. On-board serial and Ethernet ports are located on this module for local servicing via CSS. The power amplifier module amplifies the low-level modulated RF signal from the transceiver module and delivers the amplified signal on the path to the transmit antenna. The power supply module supports the transceiver and power amplifier modules, and can also provide auxiliary power to a connected site controller or Receive Multicoupler/Low Noise Amplifier (RMC/LNA).

1.10.9.9 Antenna Systems

A. Provider shall provide all antenna system equipment necessary for a complete design.

B. Antennas shall meet the following requirements:

1. 7/16-mm DIN connector
2. Passive intermodulation (PIM) rated
3. Voltage standing wave ratio (VSWR) of 1.5:1
4. Return loss of **14 dB**
5. 6-foot sidearm mount
6. Compliant with TIA-222 Rev G and Florida Building Code requirements

C. Antennas shall be appropriate to provide the required coverage and meet applicable FCC rules and regulations.

D. Transmission line type and length shall be constructed of copper and appropriate to provide the required coverage.

E. Transmission lines must be equipped with the following accessories:

1. Hanger kits (no snap-on kits permitted)
2. Hoist grip
3. Ground kits
4. Radio frequency (RF) surge suppression
5. Connectors installed per manufacturer specifications

F. Transmit combiner/receiver multicoupler: Provider shall include sufficient capacity for a 10-percent growth in the number of connected transmit and receive stations.

G. Provider shall include detailed specification sheets for all proposed equipment, including, but not limited to antennas, receiver multicouplers, transmitter combiners, and TTAs (if applicable).

H. TTAs shall be accompanied by a test line for troubleshooting purposes.

I. Antenna systems shall be designed with sufficient redundancy so that a failure to any one component in the transmission system will not disable the entire site.

J. A spare 700/800 MHz antenna shall be mounted at each location with an appropriately sized feedline to temporarily replace a failed transmit or receive antenna.

K. Transmit antennas shall be equipped with an Advanced Power Meter (APM) to provide VSWR alarming.

Motorola Solutions' design utilizes the primary, backup and mutual aid simulcast systems using antennas from three manufactures that include Sinclair, RFI, dbSpectra and RFS. These antennas will meet the requirements as indicated the table below:

Antenna Systems

Site Name	TxAnt 1	TxAnt 2	Tx3Ant Backup System	TxAnt 800 MA	RxAnt 1	RxAnt 2	TTAs (main system)	RxAnt 3 (MA&Backup)	TTA (MA&Backup)	Spare Tx Antenna
CORE	SC412-HF2LDF	SC412-HF2LDF	N/A	N/A	DS7E12F36U	DS7E12F36U	428E-83I-01-T	N/A	N/A	SC412-HF2LDF
Coconut Creek	SE4192-SwBP2LDF	SE4192-SWBP2LDF	SE4192-SWBP2LDF	SE4192-SWBP2LDF	BLR-12A-B1	BLR-12A-B1	428E-83I-01-T	SE4192-SWBP2LDF	428E-83I-01-T	SE4192-SWBP2LDF
Markham Park	SC412-HF2LDF	SC412-HF2LDF	N/A	N/A	DS7E12F36U	DS7E12F36U	428E-83I-01-T	None	None	SC412-HF2LDF
Playa	SE4192-SWBP2LDF	SE4192-SWBP2LDF	N/A	N/A	BLR-12A-B1	BLR-12A-B1	428E-83I-01-T	None	None	SE4192-SWBP2LDF
Davie	SC412-HF2LDF	SC412-HF2LDF	SC412-HF2LDF	CC807-11	DS7E12F36U	DS7E12F36U	428E-83I-01-T	DS7E12F36U	432-83H-01-T	SC412-HF2LDF
Point of America	SE4192-SwBP2LDF	SE4192-SwBP2LDF	N/A	N/A	BLR-12A-B1	BLR-12A-B1	428E-83I-01-T	None	None	SE4192-SWBP2LDF
Miramar	SE4192-SwBP2LDF	SE4192-SwBP2LDF	N/A	N/A	BLR-12A-B1	BLR-12A-B1	428E-83I-01-T	None	None	SE4192-SWBP2LDF
Channel 2	CC807-11-T1	CC807-11-T1	CC807-11-T1	CC807-11-T1	DS7E12F36U	DS7E12F36U	428E-83I-01-T	DS7E12F36U	428E-83I-01-T	CC807-11-T1
Deerfield	CC807-11-T1	CC807-11-T1	N/A	N/A	DS7E12F36U	DS7E12F36U	428E-83I-01-T	None	None	CC807-11-T1
Tamarac	SC412-HF2LDF	SC412-HF2LDF	N/A	N/A	DS7E12F36U	DS7E12F36U	428E-83I-01-T	None	None	SC412-HF2LDF

Site Name	TxAnt 1	TxAnt 2	Tx3Ant Backup System	TxAnt 800 MA	RxAnt 1	RxAnt 2	TTAs (main system)	RxAnt 3 (MA&Backup)	TTA (MA&Backup)	Spare Tx Antenna
West Lake Park	CC807-11-T1	CC807-11-T1	N/A	N/A	DS7E12F36U	DS7E12F36U	428E-83I-01-T	None	None	CC807-11-T1
Pompano Bch Club N	SE4192-SwBP2LDF	SE4192-SwBP2LDF	N/A	N/A	BLR-12A-B1	BLR-12A-B1	428E-83I-01-T	None	None	SE4192-SWBP2LDF
West Hollywood	CC807-11-T1	CC807-11-T1	N/A	N/A	DS7E12F36U	DS7E12F36U	428E-83I-01-T	None	None	CC807-11-T1
Parkland	SE4192-SwBP2LDF	SE4192-SwBP2LDF	N/A	N/A	BLR-12A-B1	BLR-12A-B1	428E-83I-01-T	None	None	SE4192-SWBP2LDF
BC Station 106	SC412-HF2LDF	None	N/A	N/A	DS7E12F36	DS7E12F36	432-83H-01-T	None	None	SC412-HF2LDF
EMS	N/A	N/A	SC412-HF2LDF	CC807-11	N/A	N/A	N/A	DS7E12F36U	428E-83I-01-T	N/A

Additional information about the site coordinates, tower heights, Antenna Site Registry, and antenna model information is included as *Evaluation Criteria Attachments Section 2.4.*

All of the antenna models used will meet the RFP requirements and the TIA-222 Rev G Florida Building Code. The BLR12A-B1 does not have a PIM rating since it is a receive antenna and is only banded for 700/800 receive thus it is not PIM rated. All models use the 7/16-mm DIN connector. Antenna models to manufacturer are as follows:

1. SC-412 & SE-4192 – Sinclair.
2. DS7E12F36 – dbSpectra.
3. CC807 – RFI.
4. BLR12 – RFS.

All transmission lines are LDF copper. 1 ¼" is used on all transmit lines except at Playa Del Mar and Point of America where 7/8" copper is used. All receive main lines will use 7/8" copper. All TTA test port lines will use ½" copper.

All transmission line attachment, grounding and termination will meet the RFP requirements for antenna mounting (6' side arms, Stainless attachment hardware, hoist grips, RF TVSS, etc.). Motorola Solutions R56 quality standards require that all transmission line meet these requirements.

1.10.9.10 Backup and Interoperability Systems

7 Channel 700 Trunked TDMA Backup Simulcast System

A. Provider shall provide a P25 trunked backup system that includes the following elements:

1. Operates in the P25 mode with dynamic use of either P25 Phase I and P25 Phase II talkgroups at the base station level. Dynamic talkgroups are not required.

2. Utilizes the 4 radio sites identified in Appendix B.

3. Utilizes a total of 7 frequencies, providing 12 concurrent Phase II talk paths, or 6 concurrent Phase I talk paths.

4. Houses simulcast control equipment at the EMS radio site, which will not be utilized within the design of the primary trunked system.

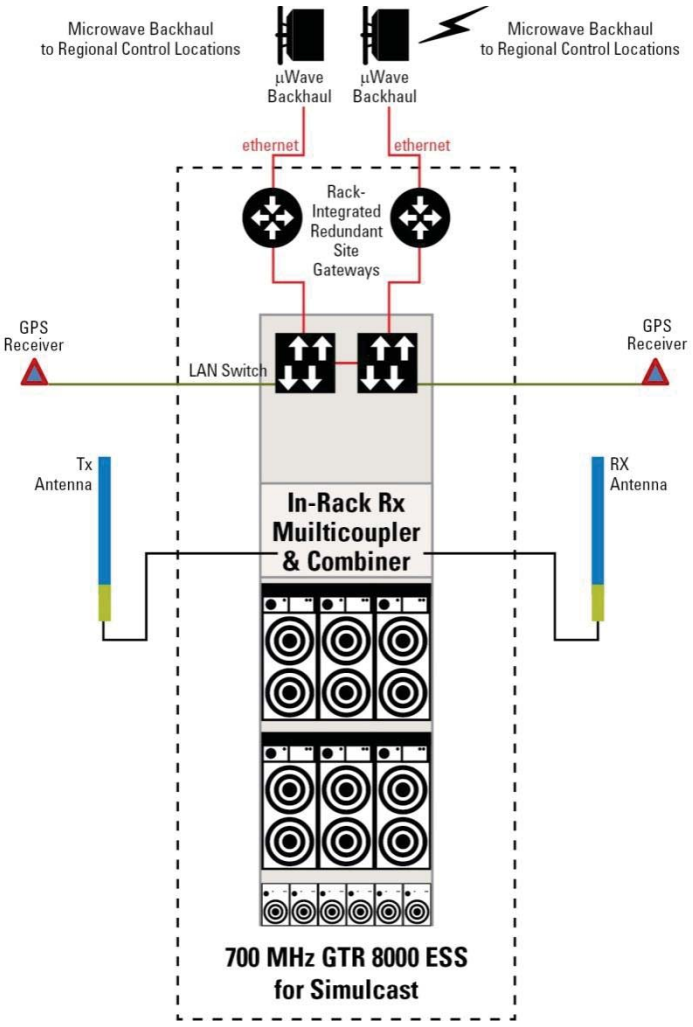
5. Provides the greatest level of autonomy possible from the primary trunked system to provide a high likelihood that the system will remain functional in the event of a failure of the primary trunked system.

6. Includes the capability to support P25 data applications at a baud rate of 9,600 bits per second per channel, while providing priority to voice traffic.

Motorola Solutions shall provide a 7 channel P25 TDMA simulcast system that will provide the 12 talkpaths required by the RFP. The 7 channel Backup Trunked TDMA Simulcast System prime site will be located at the EMS tower per the RFP requirements. This prime site will be configured as a standard prime site with redundant GCP8000 simulcast controllers, GGM8000 site and sub-site routers, site LAN and backhaul switches along with the same GCM8000 voting comparators as is used in the main system. The prime site will also have a dedicated TRAK frequency standard as is required at all trunked prime sites.

The P25 Backup Trunked simulcast remote sites use GTR 8000 ESS (Expandable Site Subsystem) racks, a space-efficient, single-rack design that integrates up to six GTR 8000 base radios, power supply modules, redundant GPB 8000 Reference Distribution Modules, redundant Ethernet LAN switches, redundant site gateways, transmit combiner, and receiver multi-couplers. A diagram of the GTR 8000 ESS is shown in the table below.

This platform was chosen to provide additional autonomy for the Backup System. The GTR 8000 platform requires low power, minimized rack space, and utilizes an IP-based transport layer, which allows increased backhaul flexibility. Subscriber audio is received and packetized by the stations. The internal GPB 8000 provides both LAN routing and GPS services for each station at the site thus the system is not dependent on the main system TRAK GPS. The packetized audio is routed via the GPB 8000 and the local redundant site routers to the MPLS/microwave backhaul network. The microwave routes the audio to the active prime site to be voted.



Simulcast GTR 8000 ESS Layout

The built-in six-channel transmitter combiner prepares the output signals from all the RF carriers in the GTR 8000 ESS for transmission on a single antenna. The cavity combiner has built-in single-stage circulator at each input. Each input to the combiner has a tuning and locking mechanism for each cavity to provide on-site frequency selection/tuning and to prevent unintentional detuning. Circulator loads are on the back of the combiner on a common heat sink. Since the Backup System is 7 channels and includes two conventional 700 MHz repeaters required by the RFP, the transmit output from each GTR 8000 ESS is combined with a second GTR 8000 ESS through a phasing harness. If the backup system is implemented in the 800 MHz band, the system shall share a combiner with the 800 MHz MA repeaters.

Subscriber audio is received and packetized by the stations. The GPB 8000 included in the GTR 8000 provides both LAN routing and GPS services for each station at the site. The packetized audio is routed via the GPB 8000 and the local redundant site routers to the microwave backhaul network. The microwave routes the audio to the active prime site to be voted.

The IP simulcast subsystems do not require site controllers at the remote sites in order to operate under control of the GCP 8000 site controllers at the simulcast prime sites. Simulcast site controllers

control the simulcast site over 100BaseT Ethernet IP links. This reduces equipment cost and eliminates a potential point of failure. In addition, each site uses redundant site gateways and reference distribution modules for network transport, switching, and GPS reference functions. All equipment is provided with alarm outputs as required to deliver status information to the network management system.

3 Channel 800 Mutual Aid Simulcast System

B. Provider shall provide a P25 conventional backup system that includes the following elements:

   1. Operates in the P25 conventional mode.

   2. Utilizes 2 standalone (non-simulcast) conventional 700 MHz repeaters at each of the 4 radio sites identified in Appendix B.

   3. Provides no wide-area dependencies for each individual repeater.

C. Vendors shall propose a wideband analog conventional simulcast repeater system to replace the County's current National Public Safety Planning Advisory Committee (NPSPAC) repeaters, which include the following:

   1. 8TAC92

   2. 8TAC93

   3. 8TAC94

   4. Each channel shall be configured in a 4-site conventional simulcast configuration with stations located at the EMS, Coconut Creek, Channel 2, and Davie tower sites.

   5. Voting equipment shall be located at the EMS location.

   6. These stations must be configured to operate in the receive-only default mode, with the ability to remotely turn on transmit capability from any of the three PSAPs.

Motorola Solutions has provided a design for a three channel 800 Mutual Aid system to replace the existing system required by the RFP. The system is a 3 channel by 4 site analog simulcast using the required NPSPAC MA channels detailed in the RFP. The Prime Site would be located at the EMS site along with a simulcast remote. The prime site would be connected to the Master Sites by the microwave network transport that would provide connectivity to all dispatch locations. A Conventional

Channel Gateway (CCGW) at the prime site provides the IP connectivity to each of the three conventional channels.

The prime simulcast control and voting uses the MLC8000 Voting Gateway Unit (VGU) for each channel. The three channels are configured using three GTR8000 Base Radios at each site with an MLC8000 Audio Gateway Unit (AGU). The GTR Base Radios require a 5 MHz frequency reference and the VGU/AGU require a 1pps/5MHz composite for synchronization of the simulcast. The existing site TRAK frequency standard will supply the required 5 MHz for each GTR station and 1PPS/5MHz composite for the MLC8000 VGU and AGU by the addition of a TRAK expansion shelf with additional Digital Distribution Modules (DDM) at the four Backup sites.

The 800 MA system will have a transmitter combiner, Advanced Power Monitoring (APM) unit and transmit antenna. It will also have a TTA, 16 port receive multi-coupler and receive antenna that will be shared with the Backup Trunked System.

1.10.9.11 Mobile Communications Trailer and F-350 Truck

The mobile communications trailer shall include the following components:

1. Appropriately sized vehicle for towing the proposed trailer

2. Graphical user interface (GUI)-based gateway system supporting up to 4 patches and 12 ports for locally interfaced control station radios.

3. Total of 10 rack-mounted control station radios broken down as follows:

    a. 8 x 700/800 MHz P25 Phase II capable
    b. 1 x UHF narrowband analog capable
    c. 1 x VHF narrowband analog capable
    d. 2 x UHF MOTOTRBO capable

4. Control station antennas must be omnidirectional and provide a minimum of unity gain.

5. Control station combiners are permitted to reduce the number of control station antennas.

6. Two 700 MHz repeaters operating in the P25 conventional mode:

    a. Antenna minimum gain of 6 dBd and omnidirectional
    b. Stations equipped with duplexers to share a single antenna for transmit/receive
    c. Repeaters shall be single frequency and locally controlled

7. Extendable automatic (not manual) mast with pre-mounted antennas that can be raised to 75 feet

8. Onboard 15 kw diesel generator to support continuous operation of equipment for three days between fuel refills

9. Automatic transfer switch

10. Single onboard HVAC to support proper environmental control of equipment

11. The ability to bypass onboard antennas in order to connect to pre-mounted antennas on an adjacent tower site.

12. Workspace for one technician

13. Steel storage cabinet

14. Hydraulic braking system

15. Motorola will provide training for the communications trailer onsite at Broward County.

Motorola Solutions shall provide a properly sized F-350 truck and the S8 Hybrid mobile shelter communication tower system. This integrated mobile communications trailer includes a robust hot dip galvanized trailer frame chassis, designed to operate in multiple surfaces, including unimproved roads. The trailer is equipped with hydraulic brakes per the RFP specifications and with (2) 8000lbs torsion axles, giving the ability of independent suspension and max ride stability. The trailer chassis also contains four outriggers designed to increase the foot print of the tower deployment and prevent any overturn momentum. All 8000lbs jacks, a total of nine, are in place to facilitate the easy operation and leveling of the mobile shelter tower. An 8x8 foot shelter, climatized and R18 Insulated is capable of supporting up to three full communication racks, and many other accessories. An 85 foot unguyed (no guy wires needed) is also part of this turnkey system. This tower is designed following the TIA-222G regulations and is capable of operating in winds up to 80mph, with a large payload installed.

The system is also equipped with:

1. Full size spare tire.
2. Hydraulics brakes.
3. Complete Motorola Solutions R-56 grounding and bonding system.
4. 15KW super quiet diesel Kubota generator, special design for mobile trailer tower units.
5. 100gallon fuel tank, providing over 96 hours (4 days) of operation at full load.
6. Auto transfer switch to provide power uninterrupted power operation between grid power and generator power.

Other accessories include:

1. Storage tool box and storage cabinet.
2. Two roof mounts.
3. HVAC system, a total of 30000 BTUs.
4. Roxtec I/O Ports.
5. Coax reels.
6. Protect dri-dek flooring.
7. Cable trays.
8. Shore power cords.
9. Work lights for night operation.
10. Obstruction lights in accordance with FAA regulations.

It is estimated that shipping weight of the system to be approximately 10500lbs. with a tongue weight set to be 9-12% of the overall weight, making this the lighter shelter trailer with an 85 foot unguyed tower available in the market, different of any steel or articulated tower system. The Aluma Tower S8hybrid can be towed by an F-350 truck model with no difficulty.

The equipment installed within the shelter of the mobile communications trailer will consist of two P25 conventional repeaters, twelve control station radios and a Graphical User Interface (GUI) based control system for the radios. The two P25 conventional repeaters will operate in the 700 MHz band and each will interface to a single antenna on the trailer tower through a duplexer. Eight of the control station radios will operate in the 700/800 MHz bands and will be capable of P25 Phase 2 TDMA operation. These eight control stations will interface with an antenna pair on the trailer tower through a control station combiner. Three of the control station radios will operate in the UHF band, with one being capable of analog operation and the other two being capable of MOTOTRBO. These three control stations will interface to an antenna pair on the trailer tower through a control station combiner. The remaining control station will operate in the VHF band in analog mode and will interface to a single antenna on the trailer tower. Control of the radios will be provided by a Motobridge Radio Gateway Unit. A laptop will be included in the trailer, which will provide the GUI interface into the Motobridge gateway for radio control. The radio equipment will be installed in three racks within the shelter of the trailer, which will leave working space within the trailer for a single technician.

Specification sheets for the mobile communications trailer and F-350 truck are as set forth in the Specifications (Schedule 8).

1.10.9.12 Data Capabilities

A. Both the primary and backup systems shall be configured to support an integrated P25-compliant data stream on any voice channel, providing a desired data rate of 9,600 bits per second per channel.

B. Voice must take priority over data in all circumstances.

C. Examples of data applications that should be capable of utilizing the data stream include, but not limited to, the following:

1. GPS subscriber radio location
2. Over-the-air programming (OTAP)
3. Over-the-air rekeying (OTAR)
4. Fire station alerting signaling
5. Text messaging

D. Data capabilities must support up to 1,000 concurrent subscribers

E. The system must support GPS functionality from subscriber units that do not match the system manufacturer.

F. The system must support data applications operating on a P25 data stream that do not match the system manufacturer.

G. In the event third-party applications running on the system's P25-compliant data stream do not operate properly, Provider must cooperate with the third-party application vendor and the County to submit to laboratory testing with the provider of the third-party application, in order to validate and achieve proper performance and optimize usage on the Broward County system.

Both the main primary system and the backup system have IV&D included for all voice channels to support any future applications required by the RFP. P25 features such as OTAR and GPS should work across vender platforms; however there is no interoperability tests defined for these features. Motorola Solutions will work with any other 3rd party GPS venders that adhere to the P25 standard data stream and cooperate with the third-party application vendor and the County to submit to laboratory testing with the provider of the third-party application, in order to validate and achieve proper performance and optimize usage on the Broward County system.

1.11 Dispatch Console

1.11.1 General Requirements and Features

A. Provider shall provide pricing for replacement of all existing Gold Elite consoles with state-of-the-art, IP-controlled consoles.

B. Provide shall provide ISSI-compliant consoles with licensing for connection to console systems operated by nine (9) neighboring agencies.

C. A list of existing console systems and operator positions is provided in Table 1 below.

Table 1: Broward County Public Safety Answering Points (PSAPs)

PSAP	Site Address	Console Manufacturer	Console Model	Number of Positions	Backup Control Stations
Sunrise (Central Dispatch)	10440 West Oakland Park Terrace, Sunrise, FL 33351	Motorola	Gold Elite	24	Yes
Pembroke Pines (South Dispatch)	6057 S.W. 198th Terrace, Fort Lauderdale, FL 33311	Motorola	Gold Elite	23	Yes
Coconut Creek (North Dispatch)	4800 W. Copans, Coconut Creek, FL 33063	Motorola	Gold Elite	21	Yes

D. The dispatch console is a critical link for public safety personnel. It is here that the dispatch operator must relay critical information from the public to public safety personnel in the field. At times, the dispatcher may be in stressful conditions with lives at risk. It is imperative that the dispatch console be laid out in a manner that results in the operation of such consoles being second nature to the dispatching personnel. The dispatching console shall provide the operator with as much information as necessary without the screen being cluttered, and shall be easily navigated to perform necessary functions. Features of the console shall include, but not be limited to:

1. Dispatch console equipment (operator positions) shall be designed to be placed on existing furniture and provide operators with an ergonomic design that permits ease of operation over extended periods, typically 8-12 hours for each operator.

2. Console positions shall be able to acoustically cross-mute channels in order to eliminate acoustic feedback between operators.

3. The screen display shall be designed so that all dispatching functions shall be operable from one display.

4. The screen display shall be very flexible, enabling authorized personnel to determine which functions are available at each operator position.

5. New features and screen configurations shall be supported through software programming and not reconfiguration of hardware.

6. Capability to program, store, retrieve, and edit multiple custom operator screens and configurations for each operator position should be provided.

7. Operator screen configurations and alias database should be stored locally or on a centrally located server.

8. The dispatch console shall display an alias name on screen when a unit with a radio ID stored in the alias database is transmitting.

9. Operator positions shall have the ability to decrypt and encrypt secure voice communications. Channels shall have a distinctive icon if encryption is being used for that channel. All consoles shall be configured to provide end-to-end Advanced Encryption Standard (AES) encryption to personnel in the field.

10. Upon activation of an emergency alarm by field units, dispatch positions shall provide an audible alert, display calling unit ID, and provide a visual alert of an emergency activation.

11. Operators shall have the ability to utilize a headset, foot pedal, and stationary gooseneck-type microphone for transmitting audio.

12. The capability to converse on the telephone utilizing the same operator headset that is used for radio conversations shall be provided.

13. Instant recall shall be provided allowing the operator to review and verify his or her recent traffic. Playback shall be available at the operator position.

14. Ability to display a loss of wide-area trunking notification if the system is experiencing a loss of connectivity.

15. The console system shall support an auxiliary input/output port for the control of analog logic sources.

E. The dispatch console system must seamlessly integrate with the City of Fort Lauderdale's Motorola P25 system currently being deployed. The system is served by the Motorola hosted master site located at Motorola's facility in Plantation, Florida. The interface may be accomplished through CSSI or other means that satisfy all identified requirements.

1.11.2 Trunked Radio System Requirements

A. Dispatch consoles shall be compatible with the proposed P25 trunked radio system. Dispatch consoles shall directly interface with single- and multi-site trunked system controllers, and shall allow interoperability between trunked and non-trunked channels in the system.

B. Dispatch consoles shall be able to monitor and transmit on all proposed trunked systems. Backward compatibility with the existing trunked system for ease of cutover is desired, but not required.

C. Dispatch consoles shall be equipped with an instant transmit switch for each talkgroup displayed.

D. In a trunked system with radio IDs, the push-to-talk (PTT) ID of the unit calling shall appear in addition to a call indicator. After the call is completed, the unit's PTT ID shall remain displayed until another call is received.

E. To aid dispatchers in a busy system, a list of the last 15 radio IDs should be available in a recent call list.

F. In order to enhance dispatcher effectiveness in a PTT ID system, the various display modes available shall interact as follows:

1. An operator shall be capable of setting up (and subsequently knocking down) an emergency call from the dispatch console position.

2. An option shall be provided to allow private communication between a dispatch console operator and a radio user. Once the operator is involved in a private call on a specific

resource, the operator shall not receive audio from another radio attempting to call on that same resource.

3. An option shall be provided that assigns priority to associated talkgroups. The dispatcher shall have the choice between normal preset priority and tactical priority, with tactical being the second-highest priority for a talkgroup in a system.

G. In the cases of multi-talkgroup transmit or talkgroup patch, the use of more than one trunked repeater should not be allowed; the talkgroups should be merged onto a single repeater in order to conserve repeaters.

H. It shall be possible to temporarily mute unselected talkgroups. The unselected audio will un-mute automatically after a programmable preset time. Mute shall be 20 dB minimum.

I. Dispatch consoles shall have the capability to patch together two or more talkgroups so that users may communicate directly.

J. If the dispatcher attempts to make a call on a trunked radio system connected to the dispatch consoles and all trunked channels are busy, visual and audible alerts will be initiated at the dispatch consoles.

1.11.3 Conventional Radio System Requirements

A. Dispatch equipment shall include an instant transmit switch for each conventional repeater channel and/or base station.

B. The console system shall support a minimum of 24 conventional resources interfaced to the radio backhaul network through conventional gateways at each of the three PSAPs (72 conventional resources total). The conventional resources need to be available to the consoles in the event of a loss of wide-area trunking.

C. On conventional resources capable of operating on multiple frequencies/modes, a control/indicator shall be provided to select the desired transmit frequency/mode (select channel). The select-channel function shall cause the associated channel to switch frequencies/modes. Once a channel has been selected, the operator shall be able to transmit on this channel by pressing the footswitch or transmit button.

D. <u>The conventional gateways shall support the following interfaces:</u>

1. Analog Interfaces

a. 2-wire input/output
b. 4-wire
c. VOX and Carrier Operated Relay
d. PTT Relay Output
e. Line Operated Busy Light (LOBL) Detectors
f. Analog Logging Output
g. Secure/Clear Call Input

2. Conventional Channel Types
    a. R1
    b. T1R1
    c. T2R2
    d. T4R4
    e. T8R8
    f. T12R12
    g. T14R14
    h. T16R16
    i. MDC1200
    j. P25 Conventional

3. Control Types
    a. E&M Control
    b. Tone Remote Control (TRC)
    c. Digital Control via IP link

E. A transmit audio level meter shall be provided that indicates the level of transmitted voice. This meter also shall indicate the level of receive audio present on the selected channel.

F. Operator positions shall have the ability to independently set each channel's volume level. Minimum audio levels shall be capable of being set to avoid missed calls.

G. A control/indicator shall be provided to allow the operator to mute or unmute audio from unselected channels. Selected audio and unselected audio shall be audible from separate speakers.

H. A control/indicator shall be provided that enables the operator to select multiple channels, which in turn gives the dispatcher the ability to broadcast to several channels at once.

I. Operators shall have the ability to patch two or more conventional repeaters and/or base stations together so that users may communicate directly. Operator positions shall be equipped such that a minimum of eight simultaneous patches shall be available.

1.11.4 Paging Requirements

A. Consoles shall support current signaling methods as well the proposed alphanumeric paging format. Additional features shall be described.

B. The console shall support the following paging formats:

1. Quick Call I
2. Quick Call II
3. Dual-tone Multi-frequency (DTMF)
4. MDC-1200 selective call
5. Trunking call alert
6. POCSAG 512/1200/2400 bits

C. Preprogrammed pages and groups shall be created and modified using the console alias database program.

D. A manual page feature shall be provided.

E. A visible indication shall be given when each page ends.

F. A list of standard pages shall be created to enable the operator to select or stack pages to be sent to multiple recipients.

G. An instant page feature shall allow operators to send multiple pages with the single press of a button.

H. Consoles shall be capable of transmitting at least three distinctive alert tones indicating to field units the priority or type of dispatch to follow.

1.11.5 Operator Position Equipment

A. All equipment supplied for use by the dispatch operators shall be capable of withstanding the 24 hours a day, 7 days a week (24 x 7) environment of today's PSAPs.

B. All equipment supplied for use by the dispatch operators shall be integrated into the Viking USA furniture at the dispatch locations.

C. Operator position display monitors will be, at a minimum, 22-inch liquid crystal display (LCD) or light-emitting diode (LED) touchscreens, with resolution of 1920 x 1080 or better.

D. Keyboards shall be a standard 101-key keyboard.

E. Operator functions shall be executed by positioning a screen pointer (cursor) over the appropriate icon and pressing the mouse button, or by touching the monitor screen.

F. A high-quality gooseneck microphone shall be provided for each operator position.

G. Minimum of 2 speakers per position.

H. Minimum of 2 headset jacks per position shall be provided that enable the operator to hear select audio via a headset and allow the operator to respond via a microphone attached to the headset. The headset plug inserted into the jack shall automatically disconnect the console's microphone and mute the select speakers.

I. Optional pricing for wireless headsets shall be provided by Providers (Pricing provided in Price Workbook)

J. A heavy-duty footswitch shall be provided to allow the operator to key the selected channel hands-free.

K. Console units running on personal computers (PCs) shall be capable of providing a GUI using the Microsoft® Windows 7 operating system, be capable of local-area network (LAN) client-server architecture for network access, and be capable of supporting multiple Microsoft® Windows 7-compliant applications.

L. PCs supplied shall be based on present state-of-the-art PC technology.

1.11.6 Common Electronics Equipment

A. The common electronics equipment shall contain all equipment necessary to route audio and control signals between the dispatch operator positions and the proposed P25 trunked system.

B. The common electronics equipment shall be capable of controlling the proposed P25 trunked system.

C. The common electronics equipment shall be capable of controlling the channels required or otherwise proposed by Provider.

D. The common electronics equipment shall not have a single point of failure. Redundant cards and power supplies shall be used when feasible.

E. The common electronics equipment shall be connected to the radio system directly; RF control stations shall not be used as primary connection to the radio system or the Fort Lauderdale system.

F. The common electronics equipment shall be capable of receiving alarm information from distant communications sites and displaying this information on the dispatch screen.

G. The common electronics equipment shall allow for a remote dispatch position. This remote dispatch position shall be connected via a LAN/WAN connection.

H. The common electronics equipment shall include redundant components so that an equipment failure does not impact service to the connected dispatch consoles.

1.11.7 Console System Technology

Motorola Solutions' dispatch console solution for the Broward County consists of 68 MCC 7500 dispatch console operator positions. The MCC7500 series consoles offer IP-based seamless connectivity between the County's dispatch operators and field personnel, as well as interoperability with existing trunked and conventional systems. The MCC 7500 meets the latest applicable standards of the FCC, EIA, NEC, IEEE, APCO Project 16B, and APCO Project 25.

Flexible, Scalable Design

The MCC 7500 will both provide the County with scalable, flexible, system architecture, sophisticated network management and security, and an easy migration to future capabilities. Their advanced feature set, ease of operation, and customizability will improve the safety of the County and County's first responders and decrease dispatch operator workload, while maintaining strict voice communications security.

Tight Integration with the Radio System

The consoles are directly integrated with the ASTRO 25 technology that provides the foundation of the radio solution. Operator positions connect directly to the radio system's IP transport network. Audio processing, encryption, and switching intelligence for dispatch are performed within each operator position, without additional centralized electronics. The console is capable of maintaining audio and data recording of the calls made on the communications system.

Designed for Mission Critical Use

An additional benefit of the MCC series console for the County is that it shares an operational likeness and user interface with the CENTRACOM Gold Elite consoles already in use by the County and County. This will reduce the need to formally train dispatch operators prior to transition from their current console to the new console. Motorola Solutions has had many successful migrations from Gold Elite to MCC 7500 consoles with little or no formal training.

All console equipment is designed and built to withstand the high demands of a 24/7 dispatch environment and requires desktop and mounting space similar to a personal computer.

The MCC 7500 console solution meets the County's need for a large-scale urbanized Public Safety/Mission Critical dispatch network. The system is highly configurable and customizable to ensure the maximum benefits are achieved for each dispatch agency. The software required to configure the system is provided within this proposal and can be configured in the field.

1.11.7.1 Dispatch System Reliability and Redundancy

Motorola Solutions has designed to system to meet a stringent requirement at Broward County's dispatch centers. Each dispatch center includes dual site links to the ASTRO 25 master network sites in order to maintain a high level of redundancy. In the event of primary link failure, the secondary link shall seamlessly take over backhaul control with no impact to dispatch operations.

If both site links fail, the affected dispatch center shall revert to fallback operations via wireless connectivity to the ASTRO 25 system. The Broward County dispatch centers are outfitted with a Conventional Site Controller (CSC) and Enhance Conventional Channel Gateways (ECCGWs) to facilitate this wireless fall back operation. The ECCGWs can interface back-up control stations to the dispatch center Radio Network Interface (RNI). This allows for the backup and interoperable control stations to be available as a resource to the MCC 7500 dispatch consoles.

Dispatch operators are provided a visual notification on resources that are impacted by the site link failure allowing operators to quickly utilize other resources to continue communication. The setup of the dispatch position for fallback operations is customizable to meet the needs of each dispatch center.

1.11.8 Trunked Radio Dispatch System Requirements

1.11.8.1 MCC 7500 System Description

The MCC 7500 console features an intuitive, GUI that operates under the Microsoft Windows platform and follows the same standards as other Windows programs around the world. The screen layout is simple and uses valuable space efficiently. Key information and critical functions are clearly identified

with easy to understand icons. Dispatchers can quickly recognize these icons instead of reading text, hence maximizing their productivity.

Many tasks can be completed more quickly and easily than ever before with the MCC 7500 consoles. Channels or talkgroups are displayed in on-screen “folders” for prioritization. Flashing red indicators easily identify incoming emergencies. Dispatchers can see information about who is calling, such as the time and call type. Trunked callers can be identified by real names versus numerical IDs.

1.11.8.2 Architecture Overview

The MCC 7500 dispatch console is Motorola Solutions’ IP high-tier radio dispatch console system designed for use in ASTRO 25 trunking systems.

Some of the more important features of the MCC 7500 console include:

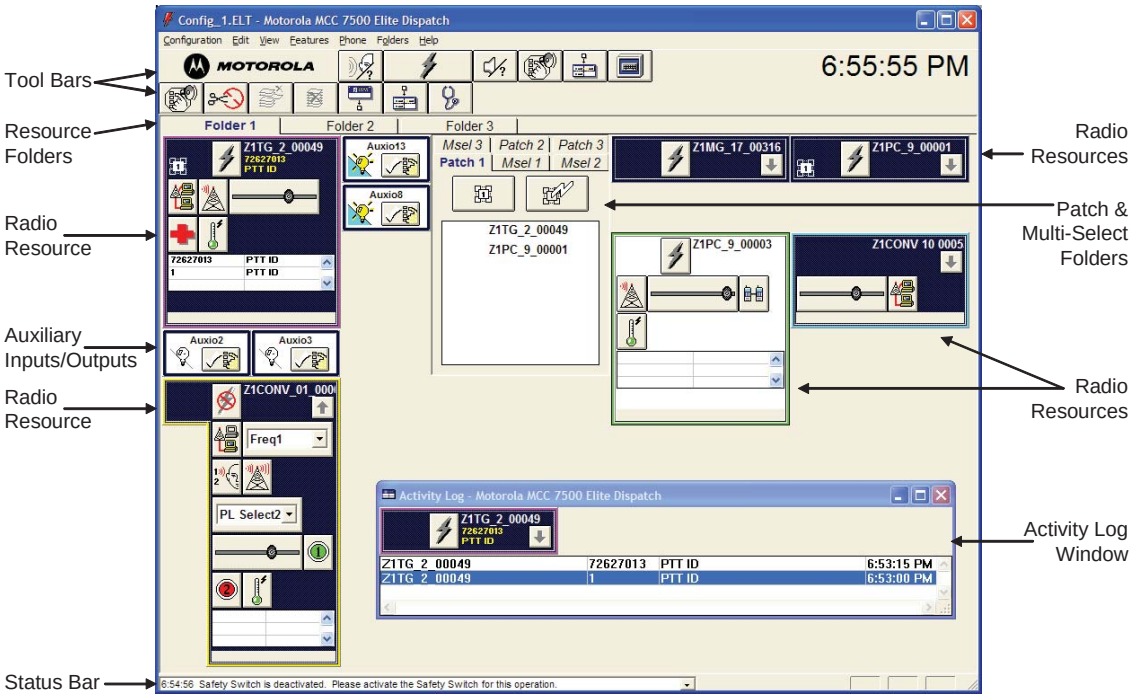
1. Seamless integration with ASTRO 25 trunking systems:
   - Supports the IP protocols of the trunking system’s transport network; no circuit-switched network to packet-switched network conversion equipment is necessary.
   - Encryption and decryption is performed within the dispatch consoles, which allows true end-to-end encryption in the radio system.
   - Participation in the radio system’s agency partitioning functionality.
   - Configuration of the console subsystem via the radio system’s centralized configuration subsystem (NM) so the user has a single point to configure the radio system. The configuration subsystem may be accessed from multiple remote locations so users can still have convenient access while enjoying the benefits of centralized configuration.
   - Management of the console subsystem via the radio system’s centralized network management subsystem so the customer has a single point for managing faults, accounting, performance, and security of the radio system. The network management subsystem may be accessed from multiple remote locations so customers can still have convenient access while enjoying the benefits of centralized management.
2. Centralized and/or distributed logging of conventional and trunked radio audio associated radio call information and certain radio system events.
3. Higher capacities in numerous areas.
4. The console system shall include a site trunking notification on each console position. The notification shall be provided through a mobile radio at each dispatch center interfaced through a console auxiliary input-output port.

1.11.8.3 Connection of MCC 7500 to IP Network

Motorola Solutions MCC 7500 console equipment connects directly to the trunking system’s IP transport network. It uses the IP packet protocols for passing call control data and call audio through the system.

Elite Dispatch GUI

The MCC 7500 dispatch console uses the Elite Dispatch GUI for displaying information to and accepting commands from the dispatch console user. The Elite Dispatch GUI is efficient, easy to use and intuitive, having been refined and proven through years of use in public safety dispatch centers around the world. The Elite Dispatch GUI in use today by the County is the same as the GUI and therefore will require minimal training for operators. An example of the Elite Dispatch GUI is shown in the figure below.



Elite Dispatch GUI

The Elite Dispatch GUI is based on Microsoft Windows GUI programming standards and contains many controls, displays, and features, which are familiar to anyone who has used Windows-based applications. These features are described in detail in the following sections. This GUI interface is the same as that currently in use by the County's Fire and Police Dispatchers thus making the transition to the new system very simple.

Pull Down Menus

The Elite Dispatch GUI provides the following pull down menus on a menu bar across the top of the dispatch window:

1. Configuration—Provides access to the configuration files used by the Elite Dispatch GUI. Also allows the dispatch application to be exited.
2. Edit—Allows various aspects of how audio, resources, and features are presented to the user on the Elite Dispatch GUI to be edited. Changes made using this menu are not permanent and are lost when the dispatch application is exited.
3. View—Allows the dispatch console user to control whether or not the Activity Log and Auxiliary I/O Windows are shown.

4. Folders—Allows the dispatch console user to switch between folders, add folders, and change the folder tab width. Changes made using this menu are not permanent and are lost when the dispatch application is exited.
5. Help—Provides access to detailed online help for using the Elite Dispatch GUI.

The user may customize which menus are displayed and what they contain via the Elite Admin application.

Toolbars

Up to two toolbars may be present across the top of the dispatch window and may be used to provide quick access to frequently used features. The following are examples of the items that may be placed in the toolbars:

1. Clock.
2. General Transmit Button.
3. Monitor Button.
4. All Mute Button.

Many other items may be placed in the toolbars. The Elite Admin application is used to define how many tool bars are displayed and what they contain.

Status Line

A status bar is provided across the bottom of the dispatch window for viewing the status of the dispatch console as well as various error messages. The most current status or error message is displayed in the status line until cleared by the dispatch console user. The dispatch console user may scroll through the last 10 statuses/error messages to view them and may clear them by using the Features menu on the menu bar.

Resource Folders

The Elite Dispatch GUI provides up to twenty resource folders for organizing the various resources (radio resources, auxiliary input/output resources, etc) which are assigned to the dispatch console. These folders may be given descriptive names to simplify the organization of the resources.

The resources on a folder are displayed when the dispatch console user clicks on the folder tab. Resources on folders that are hidden behind the one being displayed continue to operate in a normal manner. Radio resource audio on a hidden folder appears in the appropriate speakers/headsets along with a visual call indication on the folder tab. If an emergency alarm or call is received on a radio resource that is located on a hidden folder, a visual emergency indication is displayed on the folder tab.

A resource may be placed on more than one folder at the same time. This allows customers to create folders for special situations without having to move resources back and forth between folders.

The Elite Admin application is used to configure how many folders appear on the Elite Dispatch GUI and which resources appear on each folder. It is also used to put descriptive names on the folder tabs.

During dispatch operations the dispatch console user may, if so configured by the Elite Admin application, be able to add, remove, or move resources on the folders. If this is done, these changes are not saved if the user logs off or changes configuration files for the dispatch application.

Up to 36 compressed radio resources may be viewed on one folder when the program is run in the standard 800 x 600 resolution and there is no patch or multi-select folders. If patch and multi-select folders are used and are set to the minimum height, then 31 compressed resources may be viewed. To figure the number of auxiliary input/output resources that could also be viewed, use the rule of thumb that two auxiliary resources can fit in the same space as one radio resource. In other words, instead of 10 radio resources, 20 auxiliary resources could fit in the same space. If the program is run in 1024 x 768 resolution, there is room for even more radio and auxiliary resources per folder.

Radio Resources

Voice communication paths in the radio system are represented as radio resources on the Elite Dispatch GUI. Radio resources are also referred to as “tiles” on the Elite Dispatch GUI. These radio resources are used by the dispatch console user to communicate on and control the radio system.

The following radio resources are supported:

1. Trunked Talkgroups.
2. Trunked Announcement Groups.
3. Trunked Private Calls.
4. Analog Conventional Channels.

Indicators and Controls

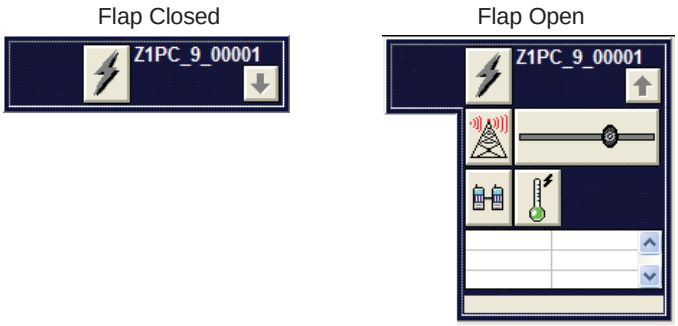
A radio resource contains indicators and controls that allow the dispatch console user to monitor and control various aspects of the radio channel. Examples of the indicators and controls that may appear on a radio resource include:

1. Instant Transmit Button.
2. Transmit Active/Transmit Busy Indications.
3. Patch Active/Patch Busy Indications.
4. Received Call Indication.
5. Received Call Stack.
6. Individual Volume Control.

The types of indicators and controls that appear on the radio resource depend on the type of radio channel it represents and how it has been configured in the Elite Admin application. The radio resource may be configured to always show the indicators and controls or to allow the dispatch console user to hide them when not in use to save space on the screen.

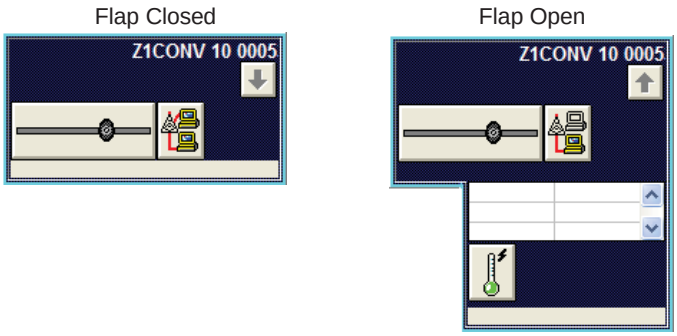
Compressed, Larger Compressed, and Expanded Resources

The figure below shows a radio resource that allows the dispatch console user to hide the indicators and controls. This is also called a “compressed” resource. Notice the small arrow button that allows the resource to be opened and closed to show the controls and indicators.



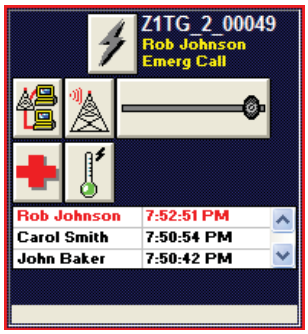
Compressed radio resource

The figure below shows a radio resource that always shows some of the indicators and controls, but allows the dispatch console to hide some of the others. This is also called a “larger compressed” resource.



Larger compressed radio resource

The figure below shows a radio resource that always shows the indicators and controls. This is also called an “expanded” resource. Notice there is no arrow button on the resource.



Expanded radio resource

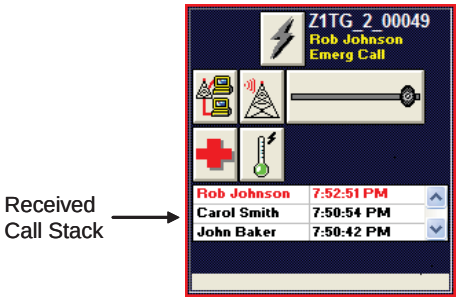
Full parallel status for radio resources is reflected across all the dispatch consoles that have these radio resources assigned on them. That is, any activity or change on a radio resource appears on all dispatch consoles that have that resource assigned on them.

Received Call Stack

The received call stack provides the dispatch console user with a visual record of the most recent inbound calls on radio resources. This allows the dispatch console user to keep track of calls during busy traffic periods.

Outbound calls on radio resources from dispatch consoles (both the dispatch console containing the received call stack or parallel dispatch consoles) are not shown in the received call stack.

The calls are displayed in list format on a radio resource with the most recent calls at the top of the list. The number of calls displayed in the list is configurable as is the type of information displayed. The types of information that can be displayed are unit ID, unit ID alias, site ID, zone ID and, type of call and time. If an alias is available for a piece of information it is displayed, otherwise the raw information is displayed. The figure below shows a radio resource containing a received call stack.



Received call stack on a radio resource

The received call stack provides a quick way for a dispatch console user to respond to calls in the stack. Various types of mouse clicks on calls in the stack provide the dispatch console user with different ways to reply to the call.

The received call stack is configurable on a per-resource per-console basis, so a resource on one dispatch console can have it while the same resource on another dispatch console does not have it.

The received call stack has a fixed memory of 25 calls, but the number of calls that are displayed is configurable via the Elite Admin application. The number displayed may be set anywhere from three to 24 calls in increments of three. Regardless of how many calls are actually displayed, the dispatch console user can always scroll through all 25 calls in the stack's memory.

Stack display size is configured on a per radio resource per dispatch console basis. That is, each resource on a dispatch console may have different sized stack displays and the same resource on different dispatch consoles may have different sized stack displays.

The dispatch console user can delete individual calls from the received call stack. All of the calls listed in a received call stack can also be deleted with a single action.

Auxiliary Input and Output Resources

Control relays and input buffers are represented as auxiliary input and output resources on the Elite Dispatch GUI. These auxiliary input and output resources are used by the dispatch console user to monitor the state of input buffers and monitor/control the state of control relays.

The auxiliary input and output resources are represented by various graphical icons that change their appearance based on the state of the resource. The particular icon that is associated with an input or output is configured by the Elite Admin application. Examples of some of the icons that may be used are shown in the figure below.



Icon for Input Buffer (shown in Active State)



Icon for Control Relay (shown in Active State)



Icon for Control Relay (shown in Inactive State)

Auxiliary I/O resource icons

Auxiliary input and output resources may be grouped together so that they can be moved or assigned/de-assigned as a group. This is useful for situations where the auxiliary input output resources are being used to interface to comparators or other devices that require multiple control relays or input buffers.

Auxiliary output resources may be protected by a “safety switch” to help prevent unintended activation or deactivation. In order to activate or deactivate an auxiliary output that is protected by a safety switch, the dispatch console user must first press the safety switch and then press the auxiliary output.

Latched auxiliary input resources may also be protected by a “safety switch” to help prevent unintended clearing of an active input. In order to clear a latched auxiliary input that is protected by a safety switch, the dispatch console user must first press the safety switch and then clear the auxiliary input.

Full parallel status for auxiliary inputs and outputs is reflected across all the dispatch consoles that have the auxiliary inputs and output resources assigned on them. That is, if an auxiliary input or output changes state, the change of state is reflected on all the other dispatch consoles that have that auxiliary input or output assigned on them.

Auxiliary input and output resources may also be placed on a separate auxiliary input and output window that is capable of being hidden when not needed. A button on one of the tool bars is used to open and hide the window. This allows the dispatch console user too easily and quickly access auxiliary input and output resources that are infrequently used without permanently consuming space on the screen.

Patch and Multi-Select Folders

The patch and multi-select features are accessed via a set of dedicated folders on the Elite Dispatch GUI. These folders are smaller than the resource folders and may be placed on the screen to suit the

dispatch console user's preferences. The placement is done in the Elite Admin application. There can be up to sixteen patch folders and three multi-select folders.

Patch Folders

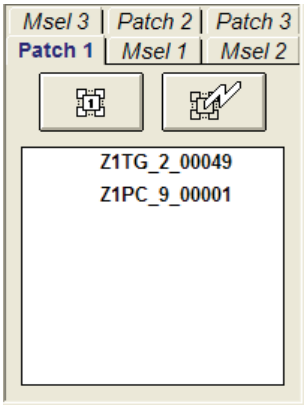
Clicking on one of the patch folder tabs brings it into view. The patch group is then opened by clicking on the left-most button on the folder. Once the patch group is open, the patch group is editable and members may be added or removed from the patch group by clicking on the desired radio resources. Note that patch groups are active whenever there are members assigned to them. This is true even if the patch group is not open.

The members of the patch group are shown on the patch folder along with the status of each member (patched or pending). The resources in the patch also show an indication that they are in a patch group.

Some patch groups contain members that were pre-assigned by the Elite Admin application. These patch groups become active as soon as possible after the dispatch console begins using the configuration file that contains the pre-assigned patch groups. The dispatch console user can add/remove members from the pre-assigned patch group, but these additions/removals are lost when the dispatch console either re-loads the configuration file or changes to a different configuration file.

A patch transmit button is provided on the patch folder to allow the dispatch console user to easily transmit on all members of the patch group with a single button press.

The figure below shows an example of a patch folder containing some radio resources.



Patch folder

Multi-Select Folder

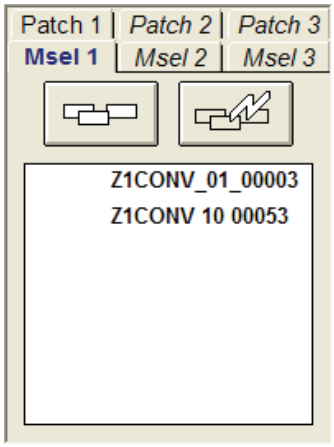
Clicking on one of the multi-select folder tabs brings it into view. The multi-select group is then opened by clicking on the left-most button on the folder. Once the multi-select group is open, the multi-select becomes active and members can be added or removed from the group by clicking on the desired radio resources. Closing the multi-select folder (by clicking on the left-most button a second time) deactivates the multi-select group.

Note that this operation is different from that of the patch folders. A dispatch console can only have one multi-select group active at a time, but it can have multiple patch groups simultaneously active.

The members of the multi-select group are shown on the multi-select folder.

Some multi-select groups contain members that were pre-assigned by the Elite Admin application. The dispatch console user can add/remove members from the pre-assigned multi-select group, but these additions/removals are lost when the dispatch console either re-loads the configuration file or changes to a different configuration file.

The figure below shows an example of a multi-select folder containing some radio resources.

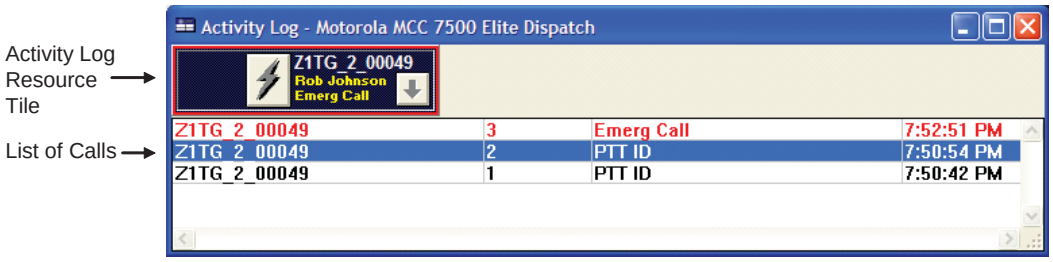


Multi-select folder

Activity Log Window

The activity log window can be used by the dispatch console user as a point of reference for all calls coming into the dispatch console. The activity log shows call information associated with all incoming radio calls such as the name of the radio resource and the time of the call. Incoming calls from all radio resources assigned to the dispatch console are displayed in the activity log.

The figure below is an example of an activity log window.



Activity log window

Up to 1,000 calls can be held in the activity log. The most recent call is on the top of the list and the oldest at the bottom. Once the list is filled, the oldest calls are discarded as new calls come in. The dispatch console user may resize the activity log to show various numbers of calls. For example, when

there is light activity, the dispatch console user may choose to show only a few calls. During busy hours, the dispatch console user may view more calls by simply dragging the lower right hand corner of the activity log (making it longer) to see additional calls.

Dispatch console users may respond to incoming calls simply by clicking on a call in the list. When this is done, the entry appears highlighted and the name of the radio resource appears on the activity log resource tile at the top of the activity log. The dispatch console user can then press the instant transmit button on the activity log resource tile to communicate with that radio resource.

The information displayed by the activity log can be customized to suit the dispatch console user's needs. The activity log can be configured to show combinations of Resource Name, Unit ID or Alias, Status Number or Alias, Receiving Site ID, Receiving Zone ID and Time. This configuration is done via the Elite Admin application and, if so configured, via the dispatch console user interface.

There are two levels of control over whether or not the activity log is displayed on a dispatch console. The first level is via the Elite Admin application, which controls whether or not a dispatch console has the capability of displaying the activity log. The second level is via the dispatch console user interface where the dispatch console user can choose to view or not view the activity log. Note that if the dispatch console has not been given the capability of displaying the activity log, then the dispatch console user cannot see the activity log at all.

The number of lines that are initially displayed by the activity log is configurable via the Elite Admin application or the dispatch console user interface. The number of lines that are displayed may also be changed in real-time by changing the size of the activity log window using standard Microsoft Windows resizing techniques. The user can scroll through all the entries in the activity log even if they cannot all be displayed at once.

The information listed in the activity log can be stored in a text file on the dispatch console's hard disk. The size of the text file can be specified to be between 1 MB and 20 MB. When the file fills up, new data overwrites old data beginning with the oldest data. All data associated with a call is logged to the file, regardless of what portion of the data is actually shown in the activity log window.

Help

The dispatch console is designed to allow the dispatch console user to quickly access information on how to use its features. This help is available right on the dispatch console graphical user interface.

There are three types of help available to the dispatch console user: On Line, Micro, and Tool Tips.

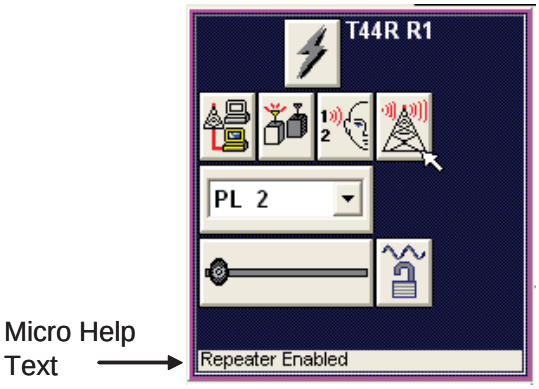
Online Help

Online Help provides detailed information on how to use the dispatch console. The user accesses Online Help via the Help menu on the menu bar. The user can search for topics or keywords to quickly find the desired information or the user can use a table of contents to find the information. The information is displayed in a pop-up window on the dispatch user interface.

Online Help allows new dispatch console users to shorten their learning curve and more experienced dispatch console users to quickly remember how to operate seldom-used features.

Micro Help

Micro Help provides information about the state of controls or indicators in a resource tile. When the cursor is placed over a control or indicator on a resource tile, a description of the control or indicator's state is given across the bottom of the resource tile. The figure below illustrates Micro Help text on a radio resource. The text across the bottom of the resource describes the icon to which the cursor is pointing.



Micro Help Text

The text displayed by the Micro Help feature may be edited via the Elite Admin application.

Micro Help allows a dispatch console user to view the status of a control or indicator textually instead of graphically.

Tool Tips Help

Tool Tips Help provides information about tool bar buttons and menu bar menus to the dispatch console user. When the cursor is placed over a toolbar button, the button's name appears in a small pop-up window next to the cursor and a short explanation of the button appears in the status bar at the bottom of the dispatch user interface window. When the cursor is moved across a menu item in a menu, a description of the menu item appears in the status bar at the bottom of the dispatch user interface window.

The text displayed by the Tool Tips feature may be edited via the Elite Admin application.

Tool Tips allow a dispatch console user to see a short explanation of the button or menu item of interest quickly.

Elite Admin Application

The manner in which resources and audio are presented to the dispatch console user on the MCC 7500 dispatch console is managed by the Elite Admin application. The look and feel of the Elite Dispatch GUI, as well as how received audio is routed on the dispatch console, can be optimized to meet customers' needs.

The following sections describe how configurations for the Elite Dispatch GUI are managed and what can be configured on the dispatch console via the Elite Admin application.

Managing Dispatch Screens

When it first starts running, the Elite Dispatch GUI application reads a configuration file that tells it what should appear on the GUI and how received audio should be routed on the dispatch console. These configuration files are created by properly trained personnel using the Elite Admin application. They are often called “ELT” files because their file names have an “.elt” suffix.

Multiple ELT files may be created to address different situations. For example, different ELT files can be created for different shifts in a dispatch center if the scope of dispatching changes significantly between shifts. Alternatively, different configuration files can be created for individual dispatch console users to meet their personal preferences.

A dispatch console user may switch between ELT files during normal operations, but cannot access any resources while the original file is being closed and the new file is being opened.

The ELT files may be stored locally on the dispatch console computer, on a different dispatch console computer, or in a central location. The choice on where to store the files depends on many factors such as:

1. Accessibility to the files—Do all dispatch console users need to access all the ELT files? If multiple agencies share a dispatch center, do they want to be able to access each other’s files?
2. Ease of managing the files—Are the dispatch consoles located in one physical location or are they geographically separated? Is one person managing the files or are multiple people managing them?
3. The topology of the radio system’s IP network—Are there servers (such as Domain Controllers) located at the dispatch console location that can be used to store the files? If the files are stored on a server, do the dispatch consoles have to retrieve them across WAN links?

By default, when the Elite Dispatch GUI application starts up it asks the dispatch console user to specify which ELT file it should use. If this is not the customer’s preferred mode of operation, the dispatch console can be configured so that it automatically opens a particular ELT file.

Admin Capabilities

The Elite Admin application allows a properly trained user to do the following:

1. Create new configurations.
2. Modify existing configurations.
3. Save configurations.
4. Determine how many toolbars are present.
5. Determine items that should go on the toolbar(s) and where on the toolbar(s) they should go.
6. Determine the number of resource folders.
7. Determine the number of patch/multi-select folders.
8. Name the resource folders and patch/multi-select folders.
9. Determine the location of patch/multi-select folders.

10. Determine the height of patch/multi-select folders (e.g., taller if there are many members in the groups).
11. Create pre-assigned patch/multi-select/primary groups.
12. Determine if dispatch console users have the ability to assign and de-assign resources.
13. Determine if the activity log is shown initially and where on the screen it is shown (dispatch console users may still hide or show the activity log).
14. Assign/unassign radio and auxiliary input/output resources to various folders.
15. Determine location of radio and auxiliary input/output resources in the folders (dispatch console users may temporarily change the locations by dragging and dropping the resources).
16. Determine where features are placed on each radio resource.
17. Modify the icons used for resource features.
18. Add a safety switch on radio resources.
19. Determine the size of each radio resource (compressed, larger compressed, or expanded).
20. Determine whether selected radio audio stays in a speaker or moves to a headset when headsets are used (this is done on a per-resource, per-console basis).
21. Determine border color for each radio resource.
22. Determine audio routing of resources to speakers.
23. Determine icons used for auxiliary input and outputs.
24. Determine if auxiliary inputs and outputs appear in a separate window.
25. Set initial volume level of each radio resource.
26. Determine if auxiliary outputs are safety switch protected.
27. Determine border color for each auxiliary input and output.
28. Modify Tool Tips and Micro Help text.

Auxiliary Inputs and Outputs

The MCC 7500 supports the ability to control or monitor Auxiliary inputs and outputs (Aux I/Os) that allow customers to control external devices via relay closures and sense the state of external devices via input buffers from the dispatch console. These Aux I/Os are referred to as Public Aux I/Os. Public Aux I/Os are accessible by more than one dispatch console. A change in state of the Aux I/O is reflected across all of the dispatch consoles that have it assigned on their user interfaces. These Aux I/Os are typically physically located in a common location that is shared by all the dispatch consoles.

The MCC 7500 dispatch console supports Public Aux I/Os by accessing and controlling RTUs and displaying the status of the RTUs' inputs and outputs on its user interface. A separate window to display the inputs and outputs is not required on the dispatch console.

Graphical icons provided by the dispatch console GUI are used to represent both the function and state of relay outputs. For example, an icon consisting of a light bulb may be used to represent a relay output that is controlling lighting of some type. The dispatch console user would click on the button associated with the icon to change the state of the relay output and the icon would change between a lighted bulb and an unlighted bulb to reflect the state of the lighting.

Graphical icons are also used to provide a visual indication of both the function and state of external inputs. For example, an icon consisting of a door may be used to represent an external input that is

connected to a door position sensor. The door can be shown in the open state when the sensor says the door is open and it can be shown in the closed state when the sensor says it is closed.

Multiple dispatch consoles may monitor and control the same relay output and/or external inputs. In this case, state changes are indicated across all dispatch consoles simultaneously.

Individual relay outputs can be configured so that they require a safety switch to be pressed before they respond to any commands from the dispatch console user. A relay output on one dispatch console can be protected by a safety switch while the same relay output on a different dispatch console is not. The resetting of latched inputs may also be protected by using the safety switch.

Supported Aux I/O Configurations

The following Aux I/O configurations are supported:

1. Momentary Input—this is an input where the user interface always shows the true state of the input. If the input is active, it is shown as active. If it is not active, it is shown as not active.
2. Latched Input—this is an input where the user interface does not necessarily show the true state of the input. When the input goes active, the user interface shows the state as active. The display will continue to show the state as active even if the input changes to the inactive state. A dispatch console user must manually reset the display to return it to the inactive state. Note that a dispatch console user cannot clear the display until the input itself is in the inactive state.
3. Momentary Output—this output relay is activated when the dispatch console user presses the button on the user interface and deactivated when the dispatch console user releases the button.
4. Latched Output—this output relay changes state only when the dispatch console user presses the button. The release of the button has no effect on the state of the relay. One press activates the relay; the next press deactivates the relay.
5. Interlocked Latched Output—this latched output relay is part of a group of latched output relays. Only one of the relays in the group may be active at a time. Pressing the button for a relay automatically deactivates the previously active relay. Pressing the same button twice does not deactivate that relay. There is always one and only one relay active in the group at all times. Interlocked relays work in a “break before make” fashion; that is, the previously active relay is deactivated before the new relay is activated.

Aux I/O Hardware

The SDM 3000 RTU is used to support most dispatch console Aux I/O needs. The SDM 3000 RTU is rack mountable in a standard 19-inch rack and is one rack unit high.

The SDM 3000 RTU is capable of supporting up to 16 outputs and 48 inputs. Expansion chassis can be added to increase the number of inputs and outputs. The output relays are capable of switching 1A @ 24VDC or 1A @ 24VAC. Input buffers are capable of sensing a dry closure through 1000 feet or less (round trip) of 24 AWG wire.

The RTUs can be physically located at console sites or trunking RF sites. The dispatch consoles and RTUs communicate with each other across the radio system's IP transport network. This allows much greater flexibility in putting Aux I/Os where they are needed compared to CENTRACOM Gold Series, which required all the Aux I/Os to be located in the CEB.

The RTU provides single pole Form A relay outputs. Double pole, Form B, or Form C relays must be implemented using external relays that are controlled by the RTU relays.

1.11.8.4 Feature Descriptions

High-level descriptions for all the features supported by the MCC 7500 dispatch console are given in this section.

Centralized System Management

The MCC 7500 console system is configured and managed by the trunking system's configuration manager, fault manager, and performance reporting applications. This provides the customer with a single point for configuring and managing the entire radio system, including the console portion.

The MCC 7500 console system is able to control certain conventional resources in addition to the trunking system. The trunking system's configuration manager, fault manager, and performance reporting applications also configure and manage the parts of the system interfacing to the conventional resources.

End to End Encryption

The addition of secure capability to the dispatch console allows true end-to-end encryption in the radio system. This provides the highest degree of security possible to those customers who wish to take advantage of this feature.

The dispatch consoles support multiple encryption algorithms and multiple secure keys to allow them to access and control talkgroups from different agencies, if necessary.

Gaining Access to Resources in the Communication System

Resource Assignment

Resource Assignment is a feature that allows a dispatch console user to choose which radio resources are monitored and controlled by the dispatch console. Resources must be assigned before they can be monitored and controlled. Once the assignment is made, the dispatch console starts receiving audio and status updates for the resource.

The resource assignment feature works in conjunction with the security group feature of the radio system's network manager. The security group feature determines which radio resources a given dispatch console user has the right to access. Those radio resources are then eligible to be assigned on a dispatch console via the resource assignment feature.

Resource Assignment allows the flexibility to change which resources are monitored and controlled at a dispatch console. This can be useful, for example, on shift changes. It does not force one shift to deal with resources that are only used by a different shift.

Resources can be unassigned when they are no longer needed at a dispatch console. Once resources are unassigned, the dispatch console stops receiving audio and status updates for the resource.

Aux I/O Assignment

Aux I/O Assignment is a feature that allows a dispatch console user to choose which Aux I/Os are monitored and controlled by the dispatch console. Aux I/Os must be assigned before they can be monitored and controlled. Once an Aux I/O assignment is made, the dispatch console starts receiving status updates for the Aux I/O.

Aux I/O Assignment allows the flexibility to change which Aux I/Os are assigned at a dispatch console. This can be useful, for example, on shift changes. It does not force one shift to deal with Aux I/Os that are only used by a different shift.

Aux I/Os can be unassigned when they are no longer needed at a dispatch console. Once Aux I/Os are unassigned, the dispatch console stops receiving status updates for the Aux I/O.

Resource Status

The Resource Status feature informs a dispatch console user of the operational condition of radio resources and Aux I/Os. This gives the dispatch console user greater control by knowing which resources are available and which are not available. Operational failures of the resources and Aux I/Os can be displayed to the dispatch console user so the lack of operational ability is known.

Configuration of Audio Presentation for Resources

Audio Destination Assignment

A dispatch console supports multiple speakers and can be configured so that the audio associated with different resources is routed to different speakers at the dispatch console. Audio Destination Assignment is a console feature that allows a dispatch console user to choose which audio destinations (speakers) are to be used for a given resource.

Audio for a resource is generally directed to one of two destinations, depending upon the resource's current select status. Selected resources have their audio sent to the speaker designated as the select audio destination for that resource. When a resource is not selected, its audio is sent to the speaker designated as the unselect audio destination for that resource. In most cases, a single speaker is designated as the select audio destination for all resources monitored by that console. In this case, whichever resource is currently selected has its audio presented in that speaker.

On some console installations, it may be desirable to route audio for a resource to a particular destination regardless of that resource's select status. This is accomplished by setting a resource's select audio destination to be the same as its unselect audio destination. Speakers configured in this way are often referred to as "dedicated" or "monitor" speakers.

Basic Audio (Talk/Listen) Functions

Single-Select

The Single-Select feature allows only one radio resource to be selected at a time. When a resource is single-selected, the previously selected resource becomes deselected.

The Single-Select feature is active when there are no Multi-Select groups open. When a Multi-Select group is closed without opening another Multi-Select group, the Single-Select feature becomes active, and the resource that had been selected prior to opening a Multi-Select group is once again selected.

Single-Selecting a resource routes the inbound audio on the resource to the designated speaker allowing that audio to be easily distinguishable from the other audio at the dispatch console. It automatically raises the resource's individual volume level to full so inbound audio on that resource can be heard clearly. It also designates that resource as the one to be used by console features such as General Transmit, Monitor, and Page PTT.

The main advantage of the Single-Select feature over the Multi-Select feature is that the previously selected resource is deselected when another resource is selected. This saves having to deselect one resource before selecting another.

Multi-Select

The Multi-Select feature allows a dispatch console to define groups of selected radio resources. When a Multi-Select group is opened, all of the resources in the group are simultaneously selected. A dispatch console can support multiple Multi-Select groups, each of which supports multiple, potentially overlapping, resources

If a Multi-Select group is opened while another Multi-Select group is open, the first group is closed and all of its resources deselected before the second group is opened. If a Multi-Select group is opened while no other Multi-Select group is open, the Single Selected resource is first deselected.

When a Multi-Select group is closed without opening another Multi-Select group, the Single Select feature becomes active and the resource that had been selected prior to opening the Multi-Select group is once again selected.

Resources can be added or removed from a Multi-Select group while it is open or while it is closed.

Multi-Selecting a group of resources routes the inbound audio on the resources to the resources' select audio destinations, allowing that audio to be easily distinguishable from the other audio at the dispatch console. It automatically raises the resources' individual volume level to full, so inbound audio on the resources can be heard clearly. It also designates those resources as the ones to be used by console features such as General Transmit, Monitor, and Page PTT.

The Multi-Select feature has two advantages over the Single Select feature. It allows multiple resources to be selected simultaneously. It also allows groups of resources to be defined and stored so that multiple resources can be conveniently selected and deselected. The resources of Multi-Select groups can also easily be simultaneously transmitted on without having to open the Multi-Select group by using the All Points Bulletin (APB) Transmit feature.

Inbound Call Indication

The Inbound Call Indication feature is used to indicate audio activity on a radio resource. If the resource is selected on the dispatch console, the indication flashes when inbound audio is detected. If it is not selected on the dispatch console, the indication does not flash. The indication is not affected by the select status of the resource on any other dispatch console.

It is also used to associate audio being heard from the dispatch console's speakers with a resource.

The Inbound Call Indication can have different sources depending on the type of resource on which it appears. For trunked resources, the source is the trunking controller. For some conventional resources, the source can be an input that detects an external dry closure. This is called a Carrier Operated Relay (COR) Input. For some conventional resources, the source is audio activity on the receive path from the station. This is called VOX detection.

Individual Resource Volume Control

The Individual Resource Volume Control feature allows the dispatch console user to change the level at which each resource is mixed into a speaker. (It is common to have the audio from many resources routed to the same speaker, especially when these resources are unselected.) The Individual Resource Volume Control feature can be used at individual dispatch consoles to lower the volume level of less important resources and raise the volume level of resources as they become important.

The initial volume level is set when the resource is assigned. The volume level for a resource is automatically raised to the full volume level when the resource is selected. If the volume level is adjusted while a resource is selected, it remains at the new volume level even after the resource is deselected. If the resource's volume level is not adjusted while the resource is selected, deselecting the resource restores its volume level to its volume level in effect prior to being selected.

All Mute

The All Mute feature is used to mute all of the audio on resources that are not currently selected at a dispatch console. When the All Mute feature is activated, all audio on resources that are not selected is muted until the All Mute feature is deactivated or a certain amount of time elapses, typically 30 seconds. The amount of time the All Mute feature stays active and the amount of attenuation it applies to the audio are programmable through the radio system's configuration application.

If a resource's individual volume setting is such that it is lower than the All Mute feature's attenuated level, the resource's volume setting will not be changed by the All Mute feature. That is, the dispatch console will not increase the resource's volume setting above the level set by the dispatch console user.

The All Mute feature is used when the dispatch console user does not want to be disturbed by the audio from the unselect resources. Using the All Mute feature is better than turning down the volume of the Unselect speaker because the volume is restored automatically when the All Mute feature is deactivated.

Acoustic Cross Mute

The Acoustic Cross Mute feature is used to prevent acoustic feedback from occurring when dispatch consoles are physically located near each other. Dispatch consoles that are monitoring the same radio resource can normally hear each other's outbound audio transmissions. This is called parallel operator audio. If two dispatch consoles are physically close to each other and the parallel operator audio appears in a speaker, the potential exists for a feedback condition between the speaker on the non-transmitting dispatch console and the microphone on the transmitting dispatch console.

The Acoustic Cross Mute feature provides the means to specify groups of dispatch consoles, which mute parallel operator audio on all radio resources that they have in common.

High Speed Mute

The High Speed Mute feature allows an external device to provide a dry contact closure to the dispatch console subsystem that, when activated, mutes the receive audio of a conventional radio resource at all dispatch consoles monitoring that resource. The audio received remains muted as long as the closure is present, and un-mutes when it is removed.

The High Speed Mute feature provides the customer with the means to control what audio appears at the dispatch consoles for a given conventional radio resource.

General Transmit

General Transmit is a feature that initiates a voice transmission on the currently selected resources. General Transmit is one of the most convenient methods for transmitting since it can be initiated with the footswitch, the headset transmit button, the microphone transmit button, or the General Transmit API functions.

General Transmit is a medium-priority transmission. Please refer to the Transmit Priority Levels feature on the following page for more information on transmit priorities.

It is important to note that a dispatch console can transfer control of an active General Transmit freely between the General Transmit API functions, the headset transmit button, the microphone transmit button and the footswitch while not losing the transmission. This can be used to free up a dispatch console user's hands for other activities such as writing notes.

The General Transmit feature provides easy access to transmitting on the selected resources.

Instant Transmit

Instant Transmit is a feature that allows a dispatch console user to initiate a transmission on a specific resource regardless of its select state. It is the most direct method of transmitting on a resource.

Instant Transmit is a high-priority transmission. Please refer to the Transmit Priority Levels feature below for more information on transmit priorities.

It is important to note that the dispatch console user can Instant Transmit even when the dispatch console user is currently performing a General Transmit or APB Transmit. In this case, microphone audio will be sent to both the selected resource(s) and the one upon which is being instantly transmitted.

The Instant Transmit feature gives the dispatch console user an additional level of control that is not available with the General Transmit feature. It gives a dispatch console user the ability to transmit quickly on a resource that is not selected. It allows a dispatch console user to monitor the audio from the selected resources in the headset, and simultaneously transmit to another resource. It also allows a dispatch console user to take over a lower-priority transmit from a parallel dispatch console.

Instant Transmit Safety Switch

Instant Transmit Safety Switch is a feature that requires a dispatch console user to press a "safety switch" before initiating an instant transmit on a specific resource (regardless of whether it is selected or not). This helps ensure the dispatcher does not accidentally instant transmit on a particular radio channel.

All Points Bulletin Transmit

APB Transmit is a feature that initiates a voice transmission on the resources of a Multi-Select group. An APB Transmit control on a dispatch console must have one and only one Multi-Select group associated with it.

APB Transmit is a high-priority transmission. Please refer to the Transmit Priority Levels feature below for more information on transmit priorities.

The APB Transmit feature allows transmission to all resources in its associated Multi-Select group even when the group is closed.

The APB Transmit feature provides easy access for transmitting to a pre-selected group of resources. APB Transmit is commonly used to make an announcement to many radio users. It also allows a dispatch console user to take over a lower priority transmit from a parallel dispatch console.

Transmit Priority Levels

The Transmit Priority Levels feature is a hierarchy of transmit privileges for different types of transmissions on the same dispatch console or between dispatch consoles. It provides an orderly and consistent method for allowing higher priority transmissions to take over resources from lower priority transmissions.

The priority levels from highest to lowest are:

6. Primary supervisor console instant transmit or APB transmit.
7. Secondary supervisor console instant transmit or APB transmit.
8. Non-supervisor console instant transmit or APB transmit.
9. General transmit on any type of console (single- or multi-select).
10. Patch transmit on any type of console.
11. Console Transmits While Receiving Audio.

The Console Transmits While Receiving Audio feature allows a dispatch console to receive audio from other radio resources while transmitting on a particular radio resource. This allows a dispatch console user to hear audio from other resources while transmitting.

Note that this is different from full duplex audio on a single radio resource.

Resource Transmit Status—Transmitting

The Resource Transmit Status—Transmitting feature is used on a per dispatch console basis to indicate when a dispatch console is transmitting on a resource. A visual indication is provided on the user interface to indicate it is transmitting.

Each dispatch console uses the Resource Transmit Status—Transmitting feature to display its own transmit status. It is not used to display the status of parallel dispatch consoles. Refer to the Resource Transmit Status—Parallel MCC 7500 Op Busy feature for more information about parallel dispatch console status.

Resource Transmit Status—Parallel MCC 7500 Op Busy

The Resource Transmit Status—Parallel MCC 7500 Op Busy feature is used to indicate when a parallel Motorola Solutions MCC 7500 dispatch console is transmitting on a resource. A visual indication is provided on the non-transmitting dispatch consoles to indicate a parallel dispatch console is transmitting. This feature, in conjunction with the Resource Transmit Status—Parallel Non-MCC 7500 Op Busy feature, provides the means for a dispatch console user to know if a particular resource is available for use.

The dispatch console user can see the alias of the parallel MCC 7500 dispatch console that is transmitting on either trunked or conventional resources.

Each dispatch console uses the Resource Transmit Status—Parallel MCC 7500 Op Busy feature to display the parallel console transmit status of each resource to which it has been assigned.

Resource Transmit Status—Trunking Busy/Callback

The Resource Transmit Status—Trunking Busy/Callback feature is used to indicate when a trunking resource is not available for a dispatch console user to use and to alert the user when it becomes available. Audible indications are provided on the dispatch console to indicate a trunking resource is not available and when it becomes available. This feature allows the dispatch console user to know when a trunked resource is available again without having to try to transmit on it continuously.

Trunked Base Station/Repeater Control

The Repeat Control feature (also known as Repeat Enable) allows a dispatch console user to enable and disable the ability of radio users in a talkgroup to hear the transmissions of other radio users in that talkgroup. When the feature is enabled on a talkgroup, transmit audio from a radio is made available to all of the radios monitoring the talkgroup. If the feature is disabled on a talkgroup, transmit audio from a radio is not made available to other radio users monitoring the talkgroup. In either case, the radio’s transmit audio is routed to the dispatch consoles.

When repeat control is enabled or disabled, all dispatch consoles with this resource assigned are updated with the current status of the feature. This feature can be controlled from any dispatch console.

System Access Priority Select (Normal/Tactical)

The System Access Priority Select feature allows a dispatch console user to select the relative system access priority of a trunked resource within the resource's communication system. Currently, there are only two possible priorities: NORMAL priority and TACTICAL priority. Call requests from a trunked resource with TACTICAL priority have priority over call requests from a trunked resource with NORMAL priority in obtaining a repeater for communications. Only emergency calls have a higher priority than TACTICAL.

When the System Access Priority status of a resource is changed, it is updated at all dispatch consoles in the systems that are monitoring that trunked resource.

The System Access Priority Select feature can be used to change the system access priority status of a trunked resource to TACTICAL in order to give the resource a better chance of gaining communication access in a busy system. If, during a repeater busy condition, two call requests are queued with one as NORMAL and the other as TACTICAL priority, then the one with TACTICAL priority gains access to the system when the next repeater becomes available.

Voice Call Types on Radio Resources

Conventional PTT Call

The Conventional PTT Call feature allows a dispatch console user to initiate and receive normal PTT calls on conventional radio resources. A normal PTT call is not directed to any specific individual or talkgroup and does not carry any special importance. It is intended to be heard by all users listening to that radio resource.

Trunking Talkgroup Call

The Trunking Talkgroup Call feature allows a dispatch console user to initiate and receive talkgroup calls on trunked radio resources. A trunking talkgroup call is a method for communicating with a specific set of users on a trunked radio system. Users only hear the audio associated with talkgroups with which they are currently affiliated.

This feature allows a user to speak with a specific group of users without disturbing other users.

Trunking Announcement Group Call

The Trunking Announcement Group Call feature allows a dispatch console user to initiate and receive announcement group calls on trunked radio resources. A trunking announcement group call is a method for communicating with multiple trunking talkgroups simultaneously. An announcement group is composed of multiple talkgroups that have been grouped together. The association of talkgroups to an announcement group is done by the trunking system's configuration subsystem.

This feature allows a user to speak quickly and easily with multiple trunking talkgroups simultaneously.

Trunking Emergency Call

Trunking Emergency Calls are high-priority voice transmissions initiated by radios or dispatch consoles that allow them to communicate with each other in critical situations. Trunking emergency calls initiated by dispatch consoles reserve a voice channel for the duration of an emergency.

A trunking emergency call is initiated by a radio when the radio transmits while it is in emergency mode. Trunking emergency calls are typically presented at a dispatch console using visual indications.

Dispatch consoles are notified when another dispatch console starts a trunking emergency call.

In ASTRO 25 trunking systems, priority is given to allocating a voice channel to a trunking emergency call over a regular call regardless of whether the regular call is at either a tactical or normal priority level.

Trunking emergency calls can be initiated from a dispatch console on ASTRO 25 IP trunking resources only. When a trunking emergency call is started from a dispatch console, the call is assigned a voice channel for an indefinite period. This guarantees a path for voice communication for the duration of an emergency. The voice channel is released only when a dispatch console ends the call.

A dispatch console user can take responsibility for an emergency by recognizing the trunking emergency call. All dispatch consoles are notified that the call has been recognized.

Trunking emergency calls initiated by a dispatch console are automatically reported to all dispatch consoles as being “recognized” since a dispatch console user took an explicit action to initiate the trunking emergency call.

When an emergency is over, a dispatch console can end the trunking emergency call. All dispatch consoles are notified that the call has been ended. When a dispatch console ends a trunking emergency call, the voice channel allocated for the call is released.

Ending the trunking emergency call at the dispatch console has no effect on the state of the radio that initiated the call. Any radio units that initiated trunking emergency calls remain in emergency mode until the radio users explicitly return them to a normal mode of operation. If a radio that is in emergency mode transmits after a dispatch console user has ended the trunked emergency call, the trunked emergency call will be reestablished.

The Trunking Emergency Call feature is used by radios and consoles for high priority voice communication. A dispatch console generally initiates a Trunking Emergency Call to guarantee a voice channel for the duration of an emergency.

Received Emergency Call Indication

The Received Emergency Call Indication feature allows a dispatch console user to be quickly informed that an emergency call has been received on a trunked resource. The indication is a visual indication on the user interface.

The visual indication continues until the emergency call has been ended by a dispatch console.

The Received Emergency Call Indication feature allows the dispatch console user to quickly identify on which resource an emergency call has occurred.

Auto-Open of Quick List

The Auto-Open of Quick List feature allows a dispatch console user to quickly access the controls necessary to handle a trunking emergency call. The Quick List contains controls for recognizing an emergency call, initiating an emergency call, and ending an emergency call.

The Auto-Open of Quick List feature automatically opens the quick list when a resource with an unacknowledged emergency on the dispatch console's user interface is expanded by the dispatch console user.

The Auto-Open of Quick List feature allows the dispatch console user to begin handling an emergency with a minimum of actions.

Emergency End (Knockdown)

The Emergency End (Knockdown) feature allows a dispatch console user to terminate an emergency call. After an emergency call has been recognized and the situation has been addressed, the dispatch console user ends the emergency call by using the Emergency End feature. When the dispatch console user does this, the visual emergency indication on the dispatch console's user interface is removed, and the dispatch console informs the trunking controller and all other dispatch consoles that the emergency has been terminated. Parallel dispatch consoles then clear their own emergency status indications for the resource if no other emergencies are active on it.

Emergency Automatic Audio Level Control

The Emergency Automatic Audio Level Control feature ensures that the audio associated with an emergency call is not missed due to its volume being too low.

When an emergency call is received by a dispatch console, the volume of the received audio associated with the call is raised to its maximum level. When the emergency call is acknowledged by a dispatch console user, the volume is returned to its normal level.

The Emergency Automatic Audio Level Control feature allows the dispatch console user to hear the emergency call audio while the emergency call audible alarm is active.

Trunking Individual Call

The Trunking Individual Call feature allows a dispatch console user to initiate and receive individual calls on trunked radio resources. A trunking individual call is a method for allowing a call to be placed to a specific user on the trunking system.

A dedicated individual call resource on the dispatch console user interface allows the dispatch console user to initiate or answer an individual call. All types of individual calls are initiated from the dispatch console in the same way. When an individual call request is received by the target radio, the dispatch console user receives an indication that the target radio is ringing. At this point, the dispatch console is waiting for the radio user to "answer" the ring. Once the individual call is answered, the call is allowed to proceed.

A dispatch console user may use an individual call to communicate privately with either a single radio user or a single MCC 7500 dispatch console user.

If the target radio or dispatch console is not available when an individual call is attempted, the dispatch console user receives an indication that the call could not be completed.

All inbound individual calls are announced to the dispatch console user. A ringing inbound call must be answered explicitly by the dispatch console user.

At a dispatch console, individual calls can be ended by a request from the dispatch console or by the expiration of an audio activity timer. The audio activity timer expires when there has been no audio activity on an active individual call for an extended period. This time is specified via the configuration application at the network manager. If there is no audio activity on an active individual call for the specified amount of time, the individual call is automatically ended.

When an individual call is ended by the radio user or the other dispatch console user, the console individual call resource automatically hangs up. Similarly, when an individual call is ended by the dispatch console user, the radio or other dispatch console automatically hangs up. This is known as the Cancel Service characteristic of individual call.

The Trunking Individual Call feature is designed to allow a dispatch console to engage in private conversations with individual radio or dispatch console users. Once an individual call is established on a resource, the resource can be added to a patch group with another type of resource.

Semi-Duplex or Full-Duplex Operation

Depending on the type of radio unit and the type of trunking system, an individual call can be either semi-duplex or full-duplex. The console subsystem is capable of supporting both types of calls with no configuration changes or dispatch console user intervention required.

When a dispatch console user is involved in either type of individual call, the dispatch console user is required to activate a PTT to talk. This is required to prevent unexpected results if a telephone resource is off-hook while an individual call is in process. A telephone resource does not require a PTT because it has hands-free full-duplex operation when the dispatch console user is using a headset. If the individual call also had hands-free full-duplex operation, the dispatch console would not be able to tell to which destination (telephone resource or individual call) the microphone audio should be sent. Therefore, a PTT is required to indicate to the dispatch console that the dispatch console user desires to speak on the individual call instead of the telephone resource. (In this context, the term “telephone resource” refers to two different types of telephone services. It refers to the external telephone that can be connected to a dispatch console so the dispatch console’s headset can be used for both radio and telephone communications. It also refers to the console telephony interface, which will be added in a future release).

The dispatch console always allows receive audio to be presented to the dispatch console user, but in a semi-duplex call, the radio system does not provide the receive audio while the dispatch console user is transmitting.

Advanced Signaling on Trunked Radio Resources

Display Radio’s Unit ID

The Display Radio’s Unit ID feature allows a dispatch console to display the unit ID associated with an inbound radio call. Unit IDs are unique numbers assigned to each radio and dispatch console in certain types of radio systems. A radio can send its unit ID when it makes a call.

The dispatch console user interface can be configured to display the unit ID of the source radio on inbound calls. This configuration is done at the local administration application. The unit ID can appear in a Received Call Stack, the Three Line Display, the Resource Header, and the Activity Log window.

Note that if an alias for the unit ID is available, the dispatch console will display the alias instead of the unit ID.

The unit ID of a parallel dispatch console is also displayed on the dispatch console when the parallel dispatch console transmits on radio resources which are common to both consoles or when the parallel dispatch console places a call to the dispatch console.

If an inbound call is received on a radio resource that does not support the concept of unit IDs, no unit ID is displayed on the dispatch console even if it has been configured to display unit IDs.

Send Console's Unit ID

The Send Console's Unit ID feature allows a dispatch console to send its unit ID when it transmits on a radio resource. Unit IDs are unique numbers assigned to each radio and dispatch console in certain types of radio systems. The unit ID allows the radios to display the ID of the dispatch console that is the source of the transmission.

The dispatch console's unit ID is sent when the dispatch console user transmits on a radio resource and when the user initiates an individual call to another dispatch console.

ID Conservation

The ID Conservation feature prevents dispatch consoles from consuming an inordinate amount of unit IDs in a trunked radio system. The ID Conservation feature allows a dispatch console to use a single unit ID for all the trunking talkgroup resources and individual call resources that it controls.

Emergency Alarm

An Emergency Alarm is sent by radio users to alert dispatch console users of a critical situation needing immediate attention.

When an Emergency Alarm is received by a dispatch console, an audible indication is sounded. A visual indication is also displayed to direct a dispatch console user's attention to the specific resource with the emergency alarm active on the dispatch console.

Any dispatch console user can take responsibility for an emergency by Recognizing the Emergency Alarm. All dispatch consoles are notified that the Emergency Alarm has been recognized.

The audible emergency indications are typically ended once all Emergency Alarms at a dispatch console are recognized. The audible emergency indications may also be ended by the dispatch console user without recognizing the Emergency Alarm.

When an emergency is over, a dispatch console can end the Emergency Alarm. All dispatch consoles are notified that the Emergency Alarm has been ended.

The emergency mode persists on the initiating radio unit until it is ended by the radio user explicitly.

The Emergency Alarm feature is used by radios to alert dispatch consoles of an emergency without the use of voice communication. This is generally followed by a voice transmission.

Received Emergency Alarm Indications

The Received Emergency Alarm Indications feature allows a dispatch console user to be quickly informed that an emergency alarm has been received on a trunked resource. The indications are audible and visual in nature.

The audible indication continues until either a dispatch console has recognized the emergency alarm or the dispatch console user mutes it. The visual indication continues until the emergency alarm has been ended by a dispatch console.

The Received Emergency Alarm Indications feature allows the dispatch console user to be quickly alerted that an emergency alarm has been received and to identify quickly on which resource it occurred.

Emergency Recognize

The Emergency Recognize feature allows a dispatch console user to assume responsibility for an emergency call or emergency alarm. When a dispatch console user recognizes an emergency, all other dispatch consoles are notified that the emergency has been recognized.

When an emergency has been recognized, the audible indications for that emergency are silenced at all dispatch consoles monitoring the emergency.

The Emergency Recognize feature is often confused with the Acknowledge feature. Recognize is used when a dispatch console user takes a specific action to assume responsibility for an emergency. Acknowledge is used when a piece of equipment (trunking controller or dispatch console) automatically sends a message to a radio telling it that its emergency message was received.

Mute Tones at Single Op

The Mute Tones at Single Op feature allows a dispatch console user to mute the tones associated with an emergency alarm only at his/her dispatch console. This feature does not recognize the emergency alarm, so other dispatch consoles continue to generate the emergency tones.

The Mute Tones at Single Op feature is used to silence the emergency alarm tones without recognizing the emergency. This would be used in a situation where one agency is monitoring a channel that belongs to another agency. If an emergency alarm comes in on the second agency's channel, the first agency could mute the tones at their dispatch consoles without having to wait for the second agency to recognize it.

Emergency End (Knockdown)

The Emergency End feature allows a dispatch console user to terminate an emergency alarm. All dispatch consoles are notified that the emergency alarm has been ended and which dispatch console ended it.

Call Alert

The Call Alert feature lets a dispatch console or radio leave a “page” at an unattended radio or dispatch console. Upon returning to the radio or dispatch console, the called user knows who called. Additionally, a Call Alert can be used to trigger an activity. For instance, a Call Alert may cause a vehicle’s horn to sound and its lights to flash.

Typically, the “page” appears at a radio as a series of beeps along with the unit ID of the sender. Traditionally, at a dispatch console, the received “page” is presented as a series of beeps along with a visual indication of who sent the Call Alert.

When a Call Alert is sent to an individual radio or dispatch console, the receiving radio or dispatch console is expected to acknowledge it automatically. A sent Call Alert can be aborted by the initiator before an acknowledgment is received. If after a period an acknowledgment is not received, the Call Alert is automatically terminated and the sender is notified that it was not successful.

The Call Alert feature provides the ability for a dispatch console or radio user to contact someone who is away from their radio or dispatch console, and hence cannot hear a voice message. Call Alert eliminates the need to tie up airtime trying to reach an unattended radio.

If a dispatch console receives a Call Alert, the identity of the caller can be displayed as a numeric Unit ID, or an alphanumeric alias for the calling radio.

Secure Trunked Radio Communication Functionality

Secure Capability in the Dispatch Console

The Secure Capability in the Dispatch Console feature allows radio voice messages to be encrypted and decrypted in the dispatch console itself. This feature allows the radio voice messages to be encrypted the entire time they are being transported between the dispatch console and the radio.

The dispatch console is capable of supporting up to four different encryption algorithms simultaneously. This allows dispatch console users to talk and listen on radio resources that have different encryption algorithms without any manual intervention or delay.

Trunked radio resources (talkgroups and private calls) can be configured with the ability to work in the secure mode. Secure-capable resources on a dispatch console may be configured so they always operate in secure mode or so the user can manually change between secure and non-secure modes.

The Secure Capability in the Dispatch Console feature allows conversations between a dispatch console user and a radio user to remain encrypted during the entire journey between the two users.

Advanced Encryption Standard (AES) Algorithm

The AES Algorithm feature allows the dispatch console and archiving interface server to process radio voice messages using the AES encryption algorithm. AES is a United States government encryption/decryption standard defined in Federal Information Processing Standard 197 (FIPS-197).

The dispatch console can encrypt and decrypt voice using the AES algorithm.

Secure Transmit Mode Selection

The Secure Transmit Mode Selection feature allows the dispatch console user to control the secure mode of transmissions on a trunked resource. The dispatch console user can choose whether his/her transmissions on a particular trunked resource are encrypted.

This feature applies to trunked resources individually; that is, different trunked resources on a dispatch console are independently configured to have or not have this feature. This feature can be configured differently for the same trunked resource on different dispatch consoles; that is, a trunked resource may have this feature on one dispatch console but not on another dispatch console.

When set to the secure mode, all transmissions on that trunked resource from that dispatch console are encrypted. When set to non-secure mode, no transmissions on that trunked resource from that dispatch console are encrypted.

This feature only applies to the dispatch console on which it is located. Radios and other dispatch consoles can have their secure modes set differently.

Receive Cross-Mode Indication

The Receive Cross-Mode Indication feature is used to indicate when an inbound (to the dispatch console) radio call is in a different secure mode than the dispatch console's setting for outbound (from the dispatch console) transmissions on a trunked resource. This helps prevent dispatch console users from responding to an inbound call in the wrong mode.

Clear Audio Alert

The Clear Audio Alert feature provides visual and audible indications when a trunked radio call is in the clear mode. The dispatch console can be configured to provide the indications on dispatch console transmissions, on radio transmissions received at the dispatch console or both. This alerts the dispatch console user that a call is unencrypted.

Multi-Select Cross-Mode Alert

The Multi-Select Cross-Mode Alert feature is used to inform a dispatch console user that there are trunked resources with different secure modes in a multi-select group. This helps prevent dispatch console users from transmitting the same audio in both secure and non-secure modes.

This feature does not prevent the dispatch console user from having trunked resources with different secure modes in a multi-select group; it merely informs the user that this is the case.

Patch Cross-Mode Alert

The Patch Cross-Mode Alert feature is used to inform a dispatch console user that there are trunked resources with different secure modes in a patch group. This helps prevent the transmission of encrypted audio in an unencrypted state in a patch.

This feature does not prevent the dispatch console user from having trunked resources with different secure modes in a patch group; it merely informs the user that this is the case.

Key Fail Indication

The Key Fail Indication feature is used to indicate when the dispatch console is unable to decrypt or encrypt a trunked radio voice message due to a problem with an encryption key. This indication is provided on the Elite Dispatch GUI status bar. Reasons for a key failure include a missing key or no keys match the key used to encode the incoming voice message.

Panic Key Zeroizing

The Panic Key Zeroizing feature allows all the encryption keys in a dispatch console to be erased (zeroized) with the push of a button. The button is recessed in a panel to reduce the chance of accidentally pressing it.

Erasing the keys on one dispatch console has no effect on the keys at other dispatch consoles.

Keyset/Indexset Selection via GUI

The Keyset/Indexset Selection via GUI feature allows the dispatch console user to manually select the Keyset/Indexset used by the dispatch console. This allows the dispatch console user to transmit to radios that are using a different keyset. (The dispatch console will automatically use the appropriate keyset to decrypt audio being received from a radio, so the Keyset/Indexset Selection feature does not really have an effect on received audio.)

The control for doing this is incorporated into the dispatch console's GUI so no extra devices [such as a Key Variable Loader (KVL)] are required to change which Keyset/Indexset is being used.

This feature does not apply to the archiving interface server since it does not have a GUI and it does not transmit encrypted audio.

Key Management via KVL

The Key Management via KVL feature provides the ability to manage all the keys for a dispatch console or archiving interface server using only a KVL (key variable loader).

Crosspatch Functionality

Standard Patch

The Standard Patch feature allows a dispatch console user to set up a communication path between two or more resources that are normally unable to communicate with each other. These could be trunked resources and/or conventional resources. When a dispatch console detects call activity on one resource in a patch group, it automatically transmits that audio to all other resources in the patch group.

Resources are patched by being included in a console patch group. A dispatch console supports a maximum of 16 patch groups. A resource can be a member of only one patch group in the entire console system at a time.

The Standard Patch feature can be used to allow radios within the same or different radio systems to communicate even though they use different resources in that system. For example, it can allow members of different talkgroups in a trunking system to communicate or it can allow conventional

radio users to be able to communicate with other conventional radio user and/or with trunked radio users.

Patch Auto-Start

The Patch Auto-Start feature allows a dispatch console to automatically start up pre-determined patches after a power cycle or reboot on the dispatch console computer.

If a dispatch console experiences an operating system reboot or an interruption in its AC power, this feature causes the dispatch console to automatically start the dispatch application, log into the dispatch console, and start up patches for all the patch groups that have been configured to use the Patch Auto-Start feature.

Patch groups that are configured to use this feature need to be pre-configured with the radio resources that are members of the patch group. A dispatch console user may add/delete members to/from the patch group during real-time operation, but if a reboot or power cycle occurs, only the pre-configured members are included when the patch is restored.

If a dispatch console user manually logs out of the dispatch application, this feature does not try to automatically restart it. It waits until the operating system is rebooted or the power is cycled off and on.

The combination of the Patch Auto-Start and the Patch Auto-Restore After Resource Interruption features provides a highly resilient patch service that may be used for long-term patch applications.

Patch Auto-Restore After Resource Interruption

The Patch Auto-Restore After Resource Interruption feature allows the dispatch console to provide as much patch functionality as possible during and after service interruptions in the radio system.

If a service interruption occurs on a resource that is in a patch group, the dispatch console keeps the patch active with the remaining members of the patch group. The interrupted resource is shown as being in a patch pending state for the duration of the interruption. If the interrupted resource is restored to service while the patch group is still active, the dispatch console attempts to add the resource back into the patch.

If a service interruption occurs that affects all the resources in a patch group, the dispatch console keeps the patch active with no members in it. Resources are shown as being in a patch pending state for the duration of the interruption. If resources are restored to service while the patch group is still active, the dispatch console attempts to add the resources back into the patch.

The word “attempts” is used in the previous paragraphs because there are conditions outside the control of the dispatch console, which may prevent it from adding a resource to a patch. Examples of these include the resource may not be available for use or another dispatch console placed it in a patch first.

The Patch Auto-Restore After Resource Interruption feature allows the dispatch console to provide as much patch functionality as possible after service interruptions without human intervention. This is useful for patches that are desired to be active for long periods.

The combination of the Patch Auto-Restore After Resource Interruption and the Patch Auto-Start features provides a highly resilient patch service that may be used for long-term patch applications.

Permanent Patch

The Permanent Patch feature has been replaced by a combination of the Standard Patch, the Patch Auto-Start and the Patch Auto-Restore After Resource Interruption features. Please refer to those features for information about what they do.

Patch Transmit

Patch Transmit is a console feature that allows a dispatch console to initiate a transmission on all resources contained within a patch group.

Patch transmit is considered a low priority transmission; its priority is less than that of all other transmit functions. A dispatch console using a higher priority transmission can take control of a resource from another dispatch console using a lower priority transmission. Note that this does not mean the higher priority transmission becomes the audio source for the patch. It only becomes the audio source for the channel(s) upon which it is transmitting.

A dispatch console can only patch transmit to one patch group at a time.

Note that if a dispatch console user does any type of transmission on a member of a patch group, the dispatch console will automatically transmit on all the other members of the patch group as well. While this operation does not involve the patch transmit feature, it does provide similar results.

The patch transmit feature allows a dispatch console user to send a voice transmission to all members of a patch group. This can be a convenient way for a dispatch console user to inform members of a patch group when a patch has been established between resources, or when the patch group is about to be dissolved.

Patch Busy Indication

The Patch Busy Indication feature provides a dispatch console user with an indication that a resource is a member of an active patch group on any dispatch console in the radio system. This is important because a resource can only be a member of one active patch group at a time.

Patch Reserved Indication

The Patch Reserved Indication feature provides a dispatch console user with an indication that a resource is a member of an active patch group on his/her dispatch console. This is important because a resource can only be a member of one active patch group at a time.

Patch Pending Indication

The Patch Pending Indication feature provides a dispatch console user with an indication that a resource the user is trying to place into a patch is not available. Some reasons a resource may not be available include:

1. It is already a member of an active patch group on another dispatch console in the radio system.
2. It may not be affiliated with the trunking system's controller.

3. A hardware failure may be rendering it unavailable.

The dispatch console will continue to monitor the status of the resource and will attempt to include it in the patch if it becomes available.

Patching Op Indication

The Patching Op Indication feature allows the dispatch console user to see which dispatch console patched a resource. This is useful in control rooms with many dispatch consoles and a user wants to quickly find out which dispatch console is controlling a patch.

Pausing the cursor on the Patch Busy Indication on a radio resource shows which dispatch console set up the patch group.

Communication System Request Rejections

Resource Reject

The Resource Reject feature informs the dispatch console when a requested operation, such as General Transmit, Instant Transmit, Call Alert, etc., has been rejected by the radio system. This feature provides information regarding the reason the request has been rejected by the radio system for the affected resources. Resource Reject messages differ from error messages in that a reject comes from the radio system whereas an error is generated within the dispatch console.

In certain situations, a single request might result in reject messages being received for multiple resources. For example, multiple rejects might be the result of resource regrouping done by a trunked radio system.

Resource Rejects are directed to the dispatch console that attempted the rejected operation. Parallel dispatch consoles do not receive the rejects.

Resource Rejects provide dispatch console information as to why the radio system is not allowing an attempted action to be performed. In many cases, the reject is because of a temporary condition within the system (e.g., all resources are busy, or the target radio is involved in another operation) which does not necessarily require corrective action. In other situations, a Resource Reject message informs the dispatch console of a system problem, indicating the need for a “system administrator” to correct the problem in the radio system. When an action is rejected, the Resource Reject feature provides a specific reason for why the request was denied.

Announcement/Intercom Functionality

Selective Op Intercom via Individual Call

The Selective Op Intercom via Individual Call feature allows a dispatch console user to speak privately with another dispatch console user through the dispatch consoles.

This feature is based on the Trunking Individual Call feature that allows a dispatch console user and a radio user to engage in a private conversation.

The user interface and operation of the Selective Op Intercom via Individual Call feature are the same as for the Trunking Individual Call feature. Please refer to the description text for the Trunking Individual Call feature for more information.

The Selective Op Intercom via Individual Call feature allows two dispatch console users to speak privately with each other through their dispatch consoles. It is useful for situations where two dispatch console users need to talk with each other, but are not close enough to talk face to face.

Group Op Intercom via Talkgroup Call

The Group Op Intercom via Talkgroup Call feature allows a group of dispatch console users to speak with each other through their dispatch consoles.

This feature is based on the Trunking Talkgroup Call feature. A talkgroup containing only dispatch consoles as members can be created. Any dispatch console transmitting on this talkgroup would be heard by all the dispatch consoles monitoring that talkgroup. Multiple talkgroups can be created to create different intercom groupings. This does not require any additional hardware beyond what is required for the rest of the trunking system.

The user interface and operation of the Group Op Intercom via Talkgroup Call feature are the same as for the Trunking Talkgroup Call feature. Please refer to the description text for that feature for more information.

The dispatch console user groupings are created by assigning trunking talkgroup to the desired dispatch consoles. All dispatch consoles that share such a resource may talk with each other. A dispatch console may be part of multiple groups.

The Group Op Intercom via Talkgroup Call feature allows a group of dispatch console users to speak with each other through their dispatch consoles. It is useful for situations where a specific group of dispatch console users need to talk with each other, but are not close enough to talk face to face.

All Op Intercom via Talkgroup Call

The All Op Intercom via Talkgroup Call feature is identical to the Group Op Intercom via Talkgroup Call feature. The only difference is the Trunking Talkgroup Call resource appears on all dispatch consoles. Thus, all dispatch consoles can participate in the discussion.

The All Op Intercom via Talkgroup Call feature allows all dispatch console users to speak with each other through their dispatch consoles. It is useful for situations where all dispatch console users need to talk with each other, but are not close enough to talk face to face.

System Maintenance and Supervisory Functions

Primary/Secondary Supervisor Levels

The Primary/Secondary Supervisor Levels feature provides a means for establishing a hierarchy of authority between the users of dispatch consoles. This hierarchy is used by the Transmit Priority Levels feature to determine the priority level of each transmission in a console subsystem.

There are three levels of dispatch consoles—primary supervisor, secondary supervisor, and non-supervisor:

1. A primary supervisor is the highest level and has transmit priority over all secondary supervisors and non-supervisors.
2. A secondary supervisor is the second highest level and has transmit priority over all non-supervisors.
3. A non-supervisor console is the lowest level and has no transmit priority over any other console.

The primary and secondary supervisor designations are associated with users, not with physical dispatch consoles. A console subsystem can have multiple dispatch consoles of each level.

The Primary/Secondary Supervisor Levels feature allows supervisory personnel to have the transmit priority necessary to carry out their responsibilities in a console subsystem.

Multiple Primary Supervisors

The Multiple Primary Supervisors feature allows multiple dispatch console users to be designated as primary supervisors in the same radio system. Refer to the description text for the Primary/Secondary Supervisor Levels feature for more information about primary supervisors.

This feature is useful when multiple customers are sharing a radio system and each customer wishes to have their own primary supervisor.

Console Disable

The Console Disable feature allows a dispatch center supervisor to send a disable command from the radio system's network manager to a particular dispatch console. Once the target dispatch console receives the disable command, the dispatch console becomes inoperable. None of the console features or resources can be used, and no call activity can be initiated or received on the disabled dispatch console. In addition, all the current activity on the dispatch console is ended. For example, if there is any kind of transmission active on the dispatch console, the transmission is aborted. If resources are patched by this dispatch console, the resources are removed from the patch group.

A dispatch center supervisor can send an enable command from the radio system's network manager to a previously disabled dispatch console in order to make it operable.

The Console Disable feature can be used to disable a dispatch console that is not being used in order to prevent unauthorized personnel from misusing it. For example, if a dispatch console is located in a remote site and is not being supervised, the dispatch console can be disabled.

Supervisor Takeover

The Supervisor Takeover feature allows a supervisor in a dispatch room to control whether or not a non-MCC 7500 dispatch console (e.g., a deskset) can access an analog conventional base station that is controlled by an MCC 7500 dispatch console. A relay is used to physically disconnect the transmit wireline pair from the non-MCC 7500 dispatch console from the station.

This feature can be used while the non-MCC 7500 dispatch console is actively transmitting on the channel. This has the effect of immediately de-keying the transmitter. The feature may be configured so the parallel non-MCC 7500 dispatch console is still able to hear any audio being received by the base station from radios.

This feature allows a supervisor to prevent unauthorized individuals from using parallel non-MCC 7500 dispatch consoles to transmit on conventional stations.

Aliasing

In a console dispatch environment, it is desirable for users to have the ability to use familiar names in place of various numbers that are used in radio systems. Names can be recognized quickly and are easier to remember than numbers.

An alias is an alphanumeric text string that is associated with some element of a console subsystem (e.g., a conventional channel, a talkgroup, a user, a "button" on a user interface, etc.). Typically, aliases are defined by users during the configuration of the console subsystem and do not change very often.

Aliases are used in the configuration, operation, and management of the console subsystem.

Trunking Talkgroup Resource

A Trunking Talkgroup Resource is capable of having a single 16-character alias associated with it. The aliasing system is capable of providing an alias for each Trunking Talkgroup Resource in the radio system.

The Alias feature allows dispatch console users to identify Trunking Talkgroup Resources by names rather than numbers. This allows dispatch console users to easily and efficiently operate the dispatch console.

Trunking Announcement Group Resource

A Trunking Announcement Group Resource is capable of having a 16-character alias associated with it. The aliasing system is capable of providing an alias for each Trunking Announcement Group Resource in the radio system.

The Alias feature allows dispatch console users to identify Trunking Announcement Group Resources by names rather than numbers. This allows dispatch console users to easily and efficiently operate the dispatch console.

Trunking Individual Call Resource

A Trunking Individual Call Resource is capable of having a 16-character alias associated with it. The aliasing system is capable of providing an alias for each Trunking Individual Call Resource in the radio system.

The Alias feature allows dispatch console users to identify Trunking Individual Call Resources by names rather than numbers. This allows dispatch console users to easily and efficiently operate the dispatch console.

Conventional Channel Resource

A Conventional Channel Resource is capable of having a 16-character alias associated with it. The aliasing system is capable of providing an alias for each Conventional Channel Resource in the radio system.

The Alias feature allows dispatch console users to identify Conventional Channel Resources by names rather than numbers. This allows dispatch console users to easily and efficiently operate the dispatch console.

Conventional Channel Frequency Selection Control

A Conventional Channel Frequency Selection Control is capable of having multiple 16 character aliases associated with it. Each frequency can have a unique alias within the control. The aliasing system is capable of providing an alias for each Conventional Channel Frequency Selection Control in the radio system.

The Alias feature allows dispatch console users to identify frequencies by names rather than numbers. This allows dispatch console users to easily and efficiently operate the dispatch console.

Conventional Channel PL Selection Control

A Conventional Channel PL Selection Control is capable of having multiple 16-character aliases associated with it. Each PL code can have a unique alias within the control. The aliasing system is capable of providing an alias for each Conventional Channel PL Selection Control in the radio system.

The Alias feature allows dispatch console users to identify PL codes by names rather than numbers. This allows dispatch console users to easily and efficiently operate the dispatch console.

Unit ID

A Unit ID is capable of having a 16-character alias associated with it. The aliasing system is capable of providing an alias for each Unit ID in the radio system.

The Alias feature allows dispatch console users to identify Units by names rather than numbers. This allows dispatch console users to easily and efficiently operate the dispatch consoles.

Aux I/O Resource

An Aux I/O Resource is capable of having a 16-character alias associated with it. The aliasing system is capable of providing an alias for each Aux I/O Resource in the radio system.

The Alias feature allows dispatch console users to identify Aux I/O Resource by names rather than numbers. This allows dispatch console users to easily and efficiently operate the dispatch consoles.

Security Management

User Accounts and Passwords

Radio system user accounts are used in radio systems to provide access to resources, simplify the use of certain features, and assist in ensuring security. The radio system allows an administrative user to create accounts for the various users of the system and assign different capabilities and access rights to them. One such account is for the users of the console subsystem.

A dispatch console requires that a valid radio system user account name and password be entered before it can be used on the radio system. The dispatch console validates the user account name and password with the radio system's network manager and allows the user to access only the resources for which the user has access rights. This also applies to third party applications that use the dispatch console's API.

Note that these radio system user account names and passwords are in addition to any user account names and passwords required to log into the Windows operating system on the dispatch console PCs.

Agency Partitioning

The radio system provides users with the ability to create groups of users and assign system resource access rights to those groups. This allows users to control which users have access to which resources in the radio system. This is how agency partitioning is supported in the radio system.

Agency partitioning allows radio systems, which are used by multiple agencies, to be configured in such a way that the users from each agency only have access to their agency's resources. This helps keep an agency's resources available for its users, and it prevents unauthorized people from making any changes to the agency's resources.

The console subsystem participates in this agency-partitioning scheme. Access to the various parts of the console subsystem is managed by the access rights given to user accounts.

A dispatch console checks with the network manager for the access rights assigned to the user and allows access to only the resources for which the user has access rights. This also applies to third party applications that use the dispatch console API.

The radio system network manager checks the access rights assigned to the user wishing to configure the console subsystem and allows access to only the portions of the console subsystem for which the user has access rights.

Network Security Enhancements

The radio system's IP transport network is protected against viruses, hackers and other unauthorized activities by a set of enhancements that are applied to each product connected to the network. The dispatch consoles support these enhancements.

Fault Management

Hardware Element Monitoring

The radio system's fault manager monitors and reports the status of all the hardware elements in the console subsystem. This allows the console subsystem to be fault managed from the same point at which the rest of the radio system is fault managed.

The specific hardware elements that are monitored are the dispatch console and any networking equipment that supports the console elements. Each of these hardware elements monitors critical internal hardware sub-elements and reports their status. This allows a failure within a hardware element to be detected. The hardware elements in the console subsystem are also periodically polled to request their status. This allows a failure of an entire hardware element to be detected.

Software Process Monitoring

The console subsystem monitors and reports the status of all the critical software processes running on the various hardware elements that comprise the subsystem. Changes in the status of software processes on a device are recorded internally. These internal records are primarily intended for use by qualified technical personnel in troubleshooting problems with the console subsystem. Status changes, which are useful for understanding the console subsystem's overall status, are also reported to the radio system's fault manager.

If a failure of a software process is detected, self-healing actions may be initiated to correct the failed process. Refer to the Self-Healing Actions feature for more information.

Network Link Integrity Monitoring

The network elements, which are used by the console subsystem, are monitored in the same manner as the network elements for the rest of the radio system. Any failures in these links are reported to the radio system's fault manager.

Automatic Discovery of Console Elements

The console subsystem supports the automatic discovery of console elements by the radio system's fault manager. This saves the user from having to manually gather and enter the necessary data into the radio system fault manager.

The radio system fault manager automatically discovers all network elements (both Motorola-manufactured elements and Motorola-supported third party elements) that are included in the system and adds them to the map of network elements in a topologically descriptive manner.

Outputting of Monitoring Results (SNMP)

The console subsystem supports the reporting of fault status to the radio system's network manager via the SNMP protocol.

Self-Healing Actions

The console subsystem automatically takes certain actions to try to remedy failures detected by its fault management routines. These actions are intended to provide as much functionality to the user as possible.

These actions include restarting failed software processes, resetting internal hardware or reloading software into internal hardware.

Configuration Management

Configuration Application

The console subsystem is configured by an application residing on the radio system's network manager. This configuration application is used to configure all console subsystem elements in the radio system. Using the configuration application, the user defines what hardware is present at each element and the capabilities of each element.

This configuration application is used in conjunction with the Elite Admin application.

The configuration application is used to define what is potentially available at each console subsystem element.

The Elite Admin application is used to define exactly which resources are available to the dispatch console user and how they are presented to the dispatch console user.

Automatic Distribution of Configuration Changes

When a change is made to the configuration information for the console subsystem, the radio system's network manager automatically distributes the changed information to all the console subsystem elements that require it.

As-Configured Documentation

The configuration management system generates documentation that allows the user to verify the configuration that was entered and provide information necessary for installation of the console subsystem.

The following information is contained in the documentation generated by the configuration management system:

1. Console subsystem information—A listing of which dispatch consoles have been created in the console subsystem.
2. Dispatch console information—A listing of the peripherals, peripheral port assignments, capabilities and audio destination assignments for each dispatch console.
3. Conventional channel gateway information—A listing of the channels, channel capabilities, channel connection information, and main/alternate designation for each conventional channel gateway.
4. Trunked resource information—A listing of the type of and capabilities for each trunked resource controlled by the console subsystem.
5. Conventional resource information—A listing of the type of and capabilities for each conventional resource in the console subsystem.
6. Aux I/O information—A listing of the type of capabilities for each auxiliary input or output in the console subsystem.

Date and Time

Date and Time Synchronization

The console subsystem synchronizes its time and date information with the radio system's time source via Network Time Protocol (NTP) on the radio system's IP network. This ensures that the time displays at the dispatch consoles and any time stamps on events in log files are accurate.

Adjustments for 12/24 hour format, different time zones, and Daylight Savings Time are automatically made if the operating system on the dispatch consoles and other console subsystem elements is configured to support them.

Time Display

The dispatch console provides the user with the ability to display the current time on the user interface. The time is synchronized with the radio system's time source.

The time displayed on the user interface is the PC clock time. Adjustments for 12/24 hour format, different time zones, and Daylight Savings Time are automatically made if the operating system on the dispatch consoles is configured to support them.

1.11.9 Conventional Radio Dispatch System Requirements

1.11.9.1 Dispatch System Interface with Conventional Systems

The MCC 7500 console was designed with the explicit goal of maintaining all the features of the Gold Elite console, which has been tried and tested over 15 years. This includes a robust interface to conventional channels, supporting 4-wire and 2-wire interfaces with MDC signaling for analog channels, and ACIM/V.24/IP interfaces for digital channels using Consolettes or GTR 8000 conventional radios. Additionally, the interfaces for the system will allow immediate communications without garbled audio due to re-digitizing the incoming voice. This means that digital conventional users will be able to talk clearly with both the County dispatchers and to users on the Broward trunking system.

Conventional Base Station Interfaces

The MCC 7500 is capable of accessing and controlling the County's analog and digital conventional base stations through the use of conventional channel gateways (CCGW). This capability lowers the County's cost of ownership in two-ways:

1. It uses the same transport network, reducing the requirements for dedicated backhaul.
2. It reduces the hardware requirements for interoperability, lowering fixed network equipment costs.

The dispatch console processes audio received from the station, and controls various features on the stations, such as frequency selection, private line selection, and repeater on/off. Using the high density version of the Enhanced GGM 8000-based CCGW, up to 16 conventional channels can be connected to the analog and V.24ports. These 16 channels can be a mixture of analog, MDC 1200, ACIM link, digital, or mixed mode operation.

High/Low Density Enhanced Conventional Channel Interface (HD/LD-ECCGW)

Today, Conventional channels are much more integrated into ASTRO 25 trunking systems than in previous radio systems. The zone controller manages conventional channels in a manner similar to how it manages trunked talkgroups.

The physical interface to the analog conventional stations also changes from previous radio systems. GGM 8000 Gateways are fitted with 4-wire/V.24 interface cards, which are connected to the conventional resources. This connection allows the conventional audio to use the same transport network as the trunked audio. The portion of the router hardware and software that support the conventional stations is called the Enhanced Conventional Channel Gateway (ECCGW). Up to sixteen conventional resources may be connected a High Density ECCGW. Up to eight conventional resources may be connected to the Low Density ECCGW. If the number of stations at a site exceeds the Broward County of the gateway, additional ECCGWs can be added to support those conventional stations.

The Conventional Site Controller allows dispatch console users continued access and control to local conventional channels if connectivity to the radio system's controller is lost. This mode of operation is

often called “fallback operation.” The conventional site controller, ECCGWs and dispatch consoles must all be on the same console site LAN to take advantage of fallback operation. ECCGWs located at RF sites or other console sites cannot be accessed by the dispatch consoles located at the console site when in fallback operation mode.

Only one conventional site controller is required per console site. This single conventional site controller is capable of supporting the full set of dispatch consoles and ECCGWs that can be placed in a console site.

All dispatch consoles and ECCGWs continuously monitor their connections to the radio system’s controller. If they detect that the connections have failed, they check their configuration data to see if a conventional site controller is present in their console site. If a conventional site controller does exist, they will automatically switch over to it.

During the switchover, the dispatch consoles entering fallback operation will lose any calls in progress on non-local conventional channels and all trunking resources. Calls on local conventional channels will be re-established after the switchover finishes.

When a dispatch console is in fallback operation, it will display a visual indication on the dispatch GUI on every non-local conventional channel and every trunked resource indicating the channel or resource is not available for use. The local conventional channels are shown as being fully available for use.

An indication is also given in the status bar at the bottom of the dispatch GUI that the dispatch console is in fallback operation. While in fallback operation, the dispatch consoles and ECCGWs continuously check to see if connectivity to the radio system’s controller has been restored. When they detect that connectivity has been restored, they will automatically switch out of fallback operation and into normal operation.

Conventional Channel Gateway

Conventional channels are much more integrated into the trunking systems than in previous radio—console configurations. The zone controller manages conventional channels in a manner similar to how it manages trunked talkgroups. The physical interface to the analog conventional stations also changes from previous radio systems. RF site routers are fitted with 4-wire interface cards, which are connected to the analog stations.

Doing this provides two key benefits:

1. It allows the conventional audio to use the same transport network as the trunked audio.
2. It reduces the number of individual interface devices in the radio system.

The portion of the router hardware and software that support the conventional stations is called the CCGW.

To interface to analog conventional stations, the routers must be able to vocode and de-vocode the conventional audio, key the station, detect when the station sends audio to the router and detect when a parallel deskset console transmits on the station. This capability has been added to the routers used in Motorola Solutions’ trunking systems.

Motorola Solutions shall provide CCGWs that match the existing configuration for conventional resources and additional ports to support connections for up to 72 conventional resources

Physical Interface to Station

The MCC 7500 conventional channel gateway provides eight ports (per router) to which analog conventional base stations may be connected. Each port contains the following inputs and outputs.

1. 600 Ohm, balanced analog audio input—Used to accept radio audio from the base station.
2. 600 Ohm, balanced analog audio output—Used to send console transmit audio to the base station.
3. Input buffer—Used to detect Carrier Operated Relay (COR) closure in the base station.
4. 1 Amp, 24 VDC relay output—Used for relay keying of the base station.
5. Each port is manifested as an RJ45 connector on the router.

Supported Configurations

The MCC 7500 conventional channel gateway supports the following types of analog conventional base stations:

1. R1.
2. T1R1.
3. T1R1 with Paging.
4. T2R2.
5. T4R4.
6. T8R8.
7. T12R12.
8. T14R14.

The dispatch console can process audio received from the station and present it to the dispatch console user via speakers or headsets key the station's transmitter and provide it with audio to be transmitted over-the-air (except for R1 stations which don't have a transmitter) control various features on the stations such as frequency selection, PL selection, repeater on/off, etc.

1.11.10 Paging

1.11.10.1 Integrated Paging System

The MCC7500 console provides all of the paging formats detailed in the RFP with one exception - POCSAG. POCSAG paging format is primarily used to page Alpha-Numeric digital pagers and is usually associated with a large paging terminal. The MCC7500 console could be used with an external paging encoder that generates the POCSAG and connected to the console's external paging port to a conventional paging base station.

The following analog tone paging formats are supported by the integrated paging encoder.

1. Quick Call I.
2. Quick Call II B–Tone and Voice.
3. Quick Call II C–Tone Only.
4. Quick Call II D–Battery Saver.
5. Quick Call II E–Competitive.
6. DTMF (a.k.a. Touch Code).
7. KNOX (only applies to standard KNOX box tones)
8. Single Tone 0.5.
9. Single Tone 1.5.
10. Motorola 5/6 Tone.
11. Digital Dial 1 (1500 Hz).
12. Digital Dial 2 (2805 Hz).
13. Digital Dial 3 (1500/2805 Hz).

As shown in the figure below the following system paging formats are supported by the integrated paging encoder.

1. Trunked Call Alert.
2. MDC 1200 Call Alert.
3. ASTRO 25 Conventional Call Alert.

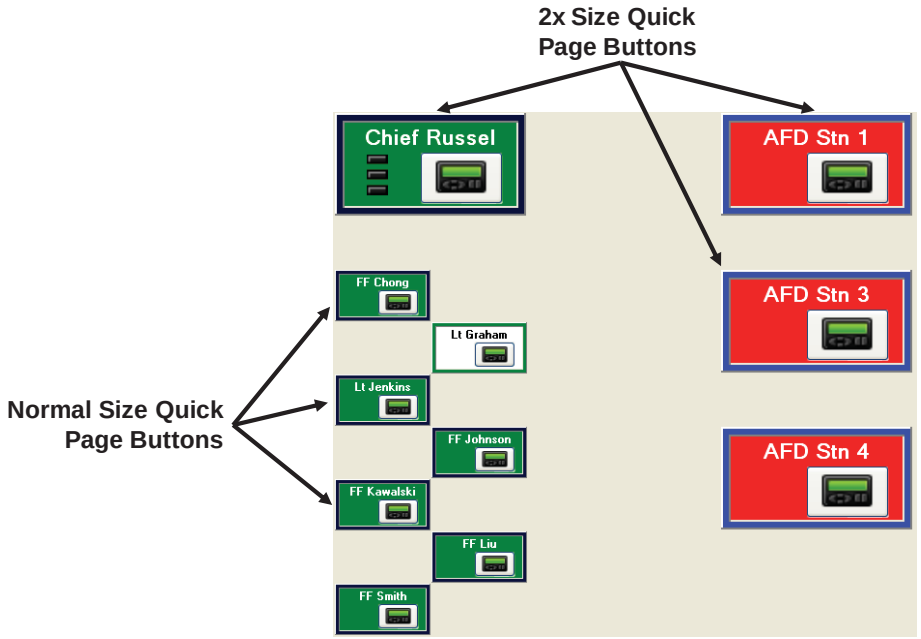


Figure: Quick Page Buttons

1.11.11 Voice Logger Output

Logging recorder outputs shall be provided for each talkgroup used for primary dispatch and select tactical talkgroups, as well as selected receive audio and the operator's transmit audio for each dispatch position. The interface shall support recording the maximum number of proposed

simultaneous talk paths—11 talk paths for Fort Lauderdale—and audio from up to 72 conventional resources interfaced to the system from conventional gateways. Audio from the 68 console positions spread between the three PSAPs shall be interfaced to each logging recorder locally through a punch block. The outputs from the console equipment shall be capable of being connected to the agency's current VPI recording equipment, and shall terminate to a wall-mounted punch block.

The County requires a logging recorder link that will support a direct connection without requiring a conventional interface. Provider must include any required Application Program Interface (API) associated with completing the connection. Provider shall identify within its proposal all VPI requirements necessary to complete the interface. The logging recorder interface must include sufficient redundancy to permit continued recording in the event of a failure to any one component. Motorola shall be responsible for all cabling associated with the logging recorder integration. The redundancy shall include parallel recording at Central Dispatch and North Dispatch.

1.11.11.1 Dispatch System Interface with Logging Recorder

The Archiving Interface Server (AIS) provides an interface between the dispatch consoles and the logging recorder system. This allows calls on the radio system to be recorded together with information associated with the calls. The AIS is comprised of a personal computer and Voice Processing Module (VPM). There is a one-to-one relationship between an AIS and IP logging recorder, such that each IP logging recorder in a system requires its own AIS.

The design includes the required number of AISs located at the Broward County Sunrise, Coconut Creek and Pembroke Pines dispatch equipment rooms. There are two AIS/VPM interfaces at Sunrise and Coconut Creek and a single AIS/VPM at Pembroke Pines. Since there is a co-located master site at both Sunrise and Coconut Creek, both AIS/VPMs will be connected directly to the master site LANs and interfaced to VPI via the master site Firewall and border router. The AIS/VPM at Pembroke will interface to VPI using a control center firewall.

Motorola Solutions has worked with VPI and identified all of their requirements that will provide the necessary hardware and software costs for the interface to the VPI logging recorder.

Motorola Solutions shall provide the turnkey integration of the proposed radio system with the County's existing VPI logging recorder, including all associated hardware, software, cabling, application programming interfaces (API), and all associated services. The integration shall permit the recording of all system talkgroup audio and console position audio from all three dispatch centers.

Broward County Console AIS

Each AIS is designed to accommodate 120 simultaneous clear conversations and 256 resources. Encrypted conversations or those on conventional resources will impact the number of simultaneous conversations that can be recorded.

Date and Time Synchronization

The console sub-system synchronizes its time and date information with the radio system's time source via Network Time Protocol (NTP) on the radio system's IP network. This ensures that the time displays at the dispatch positions and any time stamps on events in log files are accurate.

Adjustments for 12/24 hour format, different time zones and Daylight Savings Time are automatically made if the operating system on the dispatch positions and other console sub-system elements is configured to support them.

1.11.11.2 Operator Position Equipment

The MCC 7500 console equipment connects directly to the trunking system’s IP transport network. It uses IP packet protocols for passing call control data and call audio through the system.

Proposed Equipment Description

The MCC 7500 dispatch console is based on a Motorola-certified personal computer tailored with Motorola-provided hardware and software. The recommended Motorola Solutions hardware includes the following equipment at each of the operator positions:

1. One Motorola-certified personal computer, including keyboard, mouse, and 22-inch LCD monitor.
2. One voice processor module (VPM).
3. Two desktop speakers.
4. Two headset jacks.
5. One gooseneck microphone.
6. One dual pedal footswitch.

The hardware elements that comprise the dispatch console are described in the following paragraphs.

Voice Processor Module

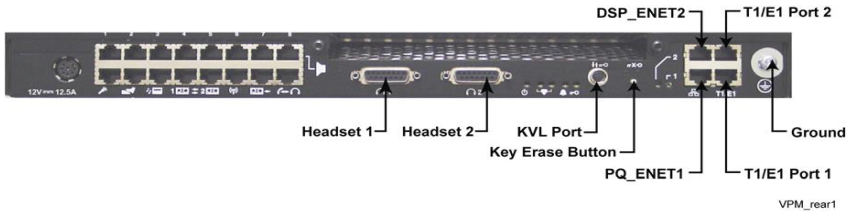
The VPM is designed so it can be mounted in furniture, placed on top of a writing surface, or mounted in an EIA 19-inch rack. It is also capable of supporting monitors weighing up to 80 pounds (36 kg) standing on top of it.

The VPM has connectors for the following devices:

1. One desktop microphone.
2. Two headset jacks.
3. Eight desktop speakers (four speakers max supported in the initial releases).
4. One local logging recorder.
5. One radio instant recall recorder.
6. One telephone instant recall recorder (not supported in initial releases).
7. One external telephone set.
8. One external paging encoder (for analog resources only).
9. One footswitch.
10. One generic transmit audio input.



Front view



Rear view

VPM views

The connections for the above items use RJ45 connectors except for the headset jack connectors, which are DB15. The audio inputs and outputs are 600 Ohm, balanced and transformer coupled, except for the microphone, which is 2000 Ohm, balanced, and does not use a transformer. They accept or provide audio levels appropriate for the devices being connected.

Some of the connectors listed above may be used to provide audio inputs and outputs for connecting other types of dispatch consoles to the Motorola Solutions radio system in conjunction with the MCC 7500 dispatch API.

The VPM uses an external power supply (similar to the power supplies used with laptop computers) which must be connected to an AC power source.

The VPM connects to the console site LAN switch and communicates with the dispatch console PC via Ethernet. While there is no direct physical connection between the VPM and the PC, there is a one-to-one relationship between the VPM and the PC. Each dispatch position has its own PC and its own VPM.

The VPM provides all the audio processing services and encryption/decryption services for the VPM-based dispatch console. These include:

1. Vocoding Services—It is capable of supporting AMBE and IMBE (for ASTRO 25), and G.728 (for analog resources) vocoder algorithms.
2. Audio Processing Services—It is capable of supporting audio level adjustments, summing, and filtering. It is capable of supporting multiple simultaneous streams of audio.
3. Encryption and Decryption Services (Optional) —It is capable of supporting multiple simultaneous encryption/decryption sessions using multiple algorithms and multiple secure keys.

The PC uses a Microsoft Windows operating system. Motorola-provided software provides call processing services and an enhanced version of the Gold Elite™ GUI.

The VPM-based dispatch console provides a suite of available APIs that may be used by third parties to interface CAD systems, non-Motorola dispatch consoles, or other devices with the Motorola Solutions radio system.

Personal Computer

The dispatch console uses a tailored Motorola-certified HP Z400 mid-tier workstation running Windows operating system. The PCs used in ASTRO 25 systems have a mini tower form factor.

The PCs are configured at Motorola Solutions so that the hardware and application software are installed and tested and are operating properly.

Desk Microphone

The dispatch console is capable of supporting a single desk microphone. The desk microphone contains a microphone cartridge on a flexible shaft and two buttons in its base. One button controls the General Transmit feature and the other controls the Monitor feature.

The desk microphone may be fastened or left free so the dispatch console user can pick it up during its use. The 18-inch long flexible neck allows the base to be placed behind a keyboard or writing area and still be able to position the microphone cartridge within a few inches of the user's mouth.

If a desk microphone is connected to a dispatch console while no headsets are connected, the desk microphone is active whenever any transmit function is active.

If a desk microphone is connected to a dispatch console while one or two headsets are connected, then the desk microphone is only active during a transmit function if its transmit button is pressed. This prevents the desk microphone from picking up unwanted background sound while the dispatch console user is using a headset to transmit.

Headset Jack

A dispatch console is capable of supporting up to two headset jacks. A headset jack allows a dispatch console user to use a headset while operating the dispatch console. The headset jack supports headsets which use either PJ7 (6-wire) or PJ327 (4-wire) long frame connectors (6-wire headsets have a PTT button while 4-wire headsets do not have a PTT button).

The headset jack contains two volume controls; one for adjusting the level of received radio audio and one for adjusting the level of received telephone audio. A small dimple is molded into the headset jack housing near the telephone volume control so the dispatch console user can tell them apart without having to look at them.

If an external telephone set connected to a dispatch console's telephone/headset port is taken off hook while a headset is connected to a dispatch console, the selected radio audio is removed from the headset earpiece and routed to the appropriate speaker(s). The received telephone audio is routed to the earpiece of both headset jacks. Both microphones of the headsets go live and their audio is routed to the external telephone set. This allows the dispatch console users to talk and listen on the telephone set in a hands-free full duplex mode.

Proposed dispatch system can support only following wired headsets:

1. SupraPlus monaural (single-ear headband style).
2. SupraPlus monaural (single-ear headband style) with noise-canceling microphone.
3. SupraPlus binaural (dual-ear headband style).

4. SupraPlus binaural (dual-ear headband style) with noise-canceling microphone.

Desktop Speakers

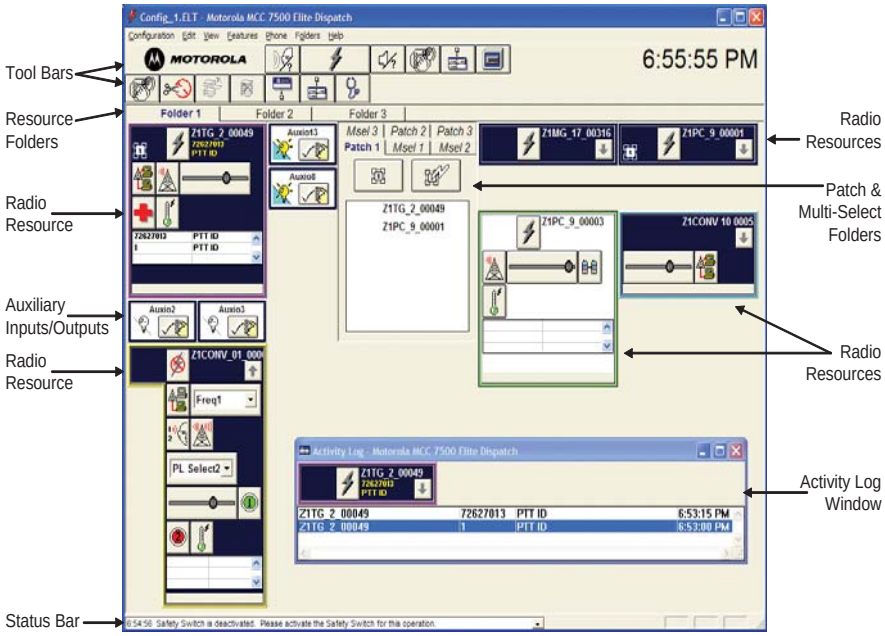
Proposed dispatch console is capable of supporting multiple speakers through which audio is presented to a dispatch console user. Each speaker on a dispatch console contains unique audio; that is, an audio source cannot appear in multiple speakers at a single dispatch console.

The speaker is a self-contained unit which may be placed on a desktop, mounted in a rack/furniture, mounted on a wall, or mounted on a computer monitor. It contains an amplifier which provides two watts of power maximum. Power for the speaker is obtained from the VPM via its interconnect cable. A mounting bracket is included with the speaker.

The speaker is designed for use near computer monitors. The speaker provides the user with a continuous volume control knob. This serves as a master volume control for all the audio which appears in the speaker. When the user adjusts this volume control, all the audio in the speaker is increased or decreased by the same amount.

Audio for a resource is generally directed to one of two destinations, depending upon the resource's current select status. Selected resources have their audio sent to the speaker designated as the select audio destination for that resource. When a resource is not selected its audio is sent to the speaker designated as the unselect audio destination for that resource. In most cases a single speaker is designated as the select audio destination for all resources monitored by that console. In this case, whichever resource is currently selected has its audio presented in that speaker.

The Individual Resource Volume Control feature allows the dispatch console user to change the level at which each resource is mixed into a speaker. (It is common to have the audio from many resources routed to the same speaker, especially when these resources are unselected.) The Individual Resource Volume Control feature can be used at individual dispatch consoles to lower the volume level of less important resources and raise the volume level of resources as they become important. In the console system, Individual volume controls are also available for each resource as shown in the figure below.



The system can support up to eight speakers per dispatch console

Footswitch

Motorola Solutions' dispatch console is capable of supporting a single footswitch with two pedals. If a footswitch with one pedal is used, the pedal controls the General Transmit feature. If a footswitch with two pedals is used, one pedal controls the General Transmit feature and the other controls the Monitor feature.

The footswitch allows a dispatch console user to access the General Transmit feature or Monitor feature without using his/her hands. This is useful in situations where the dispatch console user's hands are not free for activating those features. The footswitch may be permanently fastened to the floor if desired.

Telephone/Headset Port

The Telephone/Headset Port allows an external telephone set to be connected to the dispatch console. The dispatch console's headset can then be used to communicate on both the radio system and the telephone set. The port provides the following inputs and outputs:

1. A balanced 600-ohm analog audio output containing the headset's microphone audio.
2. A balanced 600-ohm analog audio input for the external telephone's received audio.
3. An input buffer for the Off Hook signal from the external telephone.
4. An input buffer for an Auxiliary Jack Sense signal from the external telephone.

When the dispatch console senses a dry closure on the Off Hook input buffer, it removes the selected radio audio from the headset earpiece and puts it back in the appropriate speaker(s). It then routes any audio appearing at the Telephone/Headset Port's audio input to the headset earpiece. It also routes headset microphone audio to the Telephone/Headset Port's audio output. This allows the dispatch console user to communicate hands-free on the telephone set.

When the dispatch console senses a dry closure on the Auxiliary Jack Sense input buffer, it ignores any closures on the Off Hook input buffer. This causes the headset to work with the radio system instead of the external telephone system. This allows the dispatch console headset to be used for radio operations when another person is staffing the telephone set.

If the dispatch console user transmits on any radio resources while the Off Hook signal is active, the headset microphone is re-routed to the radio system for the duration of the transmission. When the transmission is ended, the headset microphone is routed back to the Telephone Headset Port's audio output. The headset earpiece audio routing is not changed during the transmission, so the dispatch console user can still hear the telephone's received audio.

The Telephone/Headset Port allows a dispatch console user to use a single headset to communicate on both the radio system and a telephone system (e.g., a 911 system).

1.11.11.3 Common Electronics Equipment

The common backroom electronics for the MCC7500 is basically a single rack of network equipment that includes Site Routers and LAN switches. When conventional interfaces are required, there will also be Conventional Channel Gateways (CCGW) and a Conventional Site Controller which is only used to provide control of the CCGWs if the console site cannot communicate with the trunking zone. This design saves a significant amount of rack space as compared to the circuit switched Gold Elite consoles that require several racks of equipment for the same functionality.

1.12 Network Management System (NMS)

This section provides specifications and requirements for an integrated monitoring-and-control system for local and remote site facilities and equipment. The system is used to provide remote indication of status, alarms, and analog values, and to provide remote-control relay operations.

A. System Alarms: The system shall acquire, process and display information in an integrated and uniform fashion for a variety of critical systems including:

1. Trunked and conventional radio systems
2. Local and remote site facilities
3. Primary and backup power systems
4. Microwave, leased line and data networks

B. Site Alarms: Any change in the state of site equipment shall induce an alarmed state. Equipment monitored shall include, but not be limited to, the following:

1. Surge arrestors
2. Transfer switch (normal or bypass state)
3. Power fail
4. HVAC
5. Smoke detector
6. Intrusion detection
7. High temperature
8. Low temperature
9. High humidity
10. UPS/DC power fail
11. UPS/DC power state (normal or bypass)
12. DC battery charger (low voltage)
13. DC battery charger (high voltage)
14. DC battery charger (no charge)
15. Dehydrator (high pressure)
16. Dehydrator (low pressure)
17. Tower light failure
18. Generator (including generator run, low fuel, high temperature, fail, etc.)
19. Generator not in automatic mode
20. In an effort to reduce false alarms, all alarm contacts normally shall be closed when no alarm is present.

C. NMS components include:

1. Network management terminals (NMTs)
2. Remote terminal units (RTUs)

System Management Overview

System management for the ASTRO 25 system provides core network management of the radio enterprise network (REN) infrastructure, complemented by unified cloud management of the County and County's user radios, encryption keys, media content, batteries, and firefighter safety equipment.

1.12.1 Network Management Terminals (NMTS)

A. NMTs shall provide primary processing, display and control of information to and from a variety of RTU locations. System status and alarm conditions shall be displayed. The system shall provide the ability to remotely access the system to check the operational status of the system and to view alarms.

B. NMTs shall be installed at three locations to be determined. It should be assumed that these locations may not be located at positions with access to the radio backhaul network, and may therefore require virtual private network (VPN) access.

C. NMTs shall be configured to allow concurrent access to each of the three locations.

D. NMTs shall meet the following general requirements:

1. Expandable software and hardware architecture shall be easily updated by adding software modules and hardware boards.

2. Hardware and software platform shall be PC-based using current versions of hardware and software, and utilize the Microsoft Windows 7® operating system or other as approved by the Contract Administrator.

3. Both graphic and tabular displays shall provide instantaneous and comprehensive network status information.

4. NMTs shall provide full archiving and control functions.

5. Multiple alarm protocols for higher-level network management systems shall be mediated by the NMTs.

6. NMTs shall be designed to monitor a large cross section of equipment so that they can consolidate multiple alarm systems, rather than just poll alarms from RTU locations.

7. NMTs must perform full management functions with a local terminal.

8. NMTs shall provide email notification of alarms.

9. NMTs shall provide alarm filtration and consolidation.

10. Web-browser interface shall be provided for common management functions.

11. Secure Web-browser interface shall be provided to monitor alarms and perform control and management functions via Intranet or Internet.

12. Local printer for report printing at each NMT location.

13. Security profiles to allow restricted NMT access to specific user profiles.

14. Ability to automatically generate emails for system alarm notifications.

15. Ability to interface Unit ID and alias information with the County's Motorola PremierOne CAD system.

16. Ability to interface the NMS system via standardized data interfaces to third-party systems (CAD, other NMS, etc.)

E. NMTs/RTUs Communications Protocol(s) supported:

1. Vendors shall fully describe all protocols used or supported.

2. Vendors shall identify which of the following protocols are supported, either standard or as an OPTION:

    a. American Standard Code for Information Interchange (ASCII)
    b. Simple Network Management Protocol (SNMP)

3. Proprietary protocols may be acceptable, as long as all requirements are met.

F. Standard Features:

Vendor's solution shall include the following features:

1. Providershall provide programmable display screens including the following:

    a. System Summary – High-level screen summary window with links to other screens
    b. Change of State – Summary of points that have changed state from alarm to normal or normal to alarm
    c. Standing Alarms – Summary of all points in alarm condition
    d. Programmable Alarm Windows – Allowing logical grouping of alarms, such as by type or site

2. Shall provide for the graphic depiction of the network allowing annunciation and point selection via icons:

    a. Nested-tree depiction of the network with drill-down capability
    b. Capability to drive external display devices

3. Programmable console environment, including:

    a. Database definition
    b. Screen colors
    c. Alarm summary formats
    d. Blink attributes
    e. Pager alarm formats
    f. Audible alert formats

4. Status Points – The following status types shall be supported:

    a. Simple status – Contact open or closed
    b. Change detect – Simple status plus change detect since last scan

5. Control Points – The following relay control types shall be supported:

    a. Direct control
    b. Select before operate
    c. Batch – Control multiple relays with a single operation

6. Analog points – Display the value of a monitored quantity such as temperature, fuel level, VSWR, etc.

7. Time stamp indicating date and time of message within 0.5 seconds

8. Conditional assignable text messages (minimum 256 characters) for each point to be issued on a change of state or alarm

9. Alarm qualification – On a point basis, programmable delay before alarm is issued

10. Alarm deactivation – On a point basis, the ability for the operator to deactivate an alarm to inhibit additional annunciation

11. Alarm history:

    a. Logging of all alarms to disk and printer (selectable)
    b. Minimum history log of 500,000 entries

12. Email support – Text message of alarm sent to email lists

13. Ping interrogator – To confirm that servers, routers and IP-based equipment are physically present on the network

14. Editor – Providing point configuration utilities to create and edit point databases

15. Security – Multiple levels of user name and password protection to all for flexible system management

16. Reports – Provider shall define the reports that are available. Provider shall describe how trend analysis is supported and how current system status is reported. System shall be able to provide comprehensive planning and analysis, and shall have a flexible user interface.

1.12.1.1 Network Management System

The Network Management System (NMS) is a set of software applications or tools used to manage the ASTRO 25 wide area trunked radio system and its constituent components.

The NMS supports the following services:

5. Network Monitoring—Applications are included for monitoring the status of the transport network and the individual infrastructure components; displaying status information; forwarding alert information; and performing diagnostic procedures.
6. Configuration Management—Facilities are provided for entering and maintaining the operational parameters of the infrastructure components and user devices (i.e., the mobile and portable radios).

7. Accounting Management—NMS supports the tracking of radio usage of the system by providing an optional interface to third party accounting and/or billing applications.
8. Performance Management—Standard and optional applications are available for monitoring, reporting, controlling, and optimizing the use of system resources.
9. Security Management—NMS includes features for setting user privileges and controlling their access to view and/or modify information contained in the configuration databases.

The NMS subsystem includes the following virtual, zone-level servers within the zone core of the ASTRO 25 system and is available from either the EOC dispatch center or other dispatch centers via remote desktop when authorized by the System Manager.

10. ZDS.
11. UEM.
12. UCS and UNC.

1.12.1.2 Zone Database Server

The ZDS handles a variety of tasks; including hosting the zone configuration database, administering applications licenses, authenticating network manager users accessing the system, and performing back-end support for user applications.

The ZDS performs the following database server functions:

13. Maintains the infrastructure (zone configuration) database for the zone.
14. Exports the infrastructure information from its database to the zone controller where it is stored as the local infrastructure database.
15. Maintains a replica of the current UCS database and home zone map.
16. Exports the radio information it receives from the UCS to the zone controller.

The ZDS also performs all network management and fault management polling of system devices to support the network management clients. The fault management information that the ZDS collects is passed on to the UEM server.

The ZDS handles a variety of administrative tasks, including the following:

17. Administering the standard and optional applications licenses.
18. Authenticating network manager users accessing the system.
19. Performing back-end support services for user applications.
20. Handling telephone interconnect (optional) record processing.

1.12.1.3 User Configuration Server

The UCS provides database storage and back-end processes required for most system-wide functions. The UCS makes it possible for management personnel to configure home zone maps, users, radios, talkgroups, critical sites, Adjacent Control Channels (ACC), security information at a system-level, and other system-level parameters. Group and Unit ID home zone assignments are also made at the UCS level. This information is configured using the PM application and is saved in the UCS database.

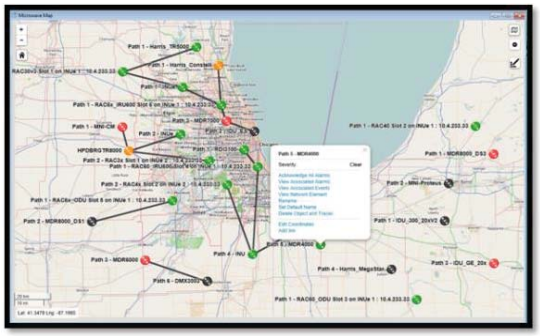
1.12.1.4 Unified Event Manager

UEM Enhanced Navigation uses the latest geo-map navigation to provide a high-level system view, with the ability to drill down to get device-specific status. With the use of the SDM 3000, this feature supports device metering, environmental inputs, and digital controls, through a single interface. UEM Enhanced Navigation can also configure role-based access for different UEM users.

This feature is ideal for organizations utilizing the ASTRO 25 UEM for fault management functions. Organizations that used the MOSCAD GMC, in combination with UEM in previous ASTRO 25 versions, will now be able to track all device and environmental information from a single-user interface. The organization and accessibility of this data allows for a more intuitive end-user experience.

ALL THE INFORMATION YOU NEED TO KEEP YOUR SYSTEM RUNNING AT PEAK PERFORMANCE

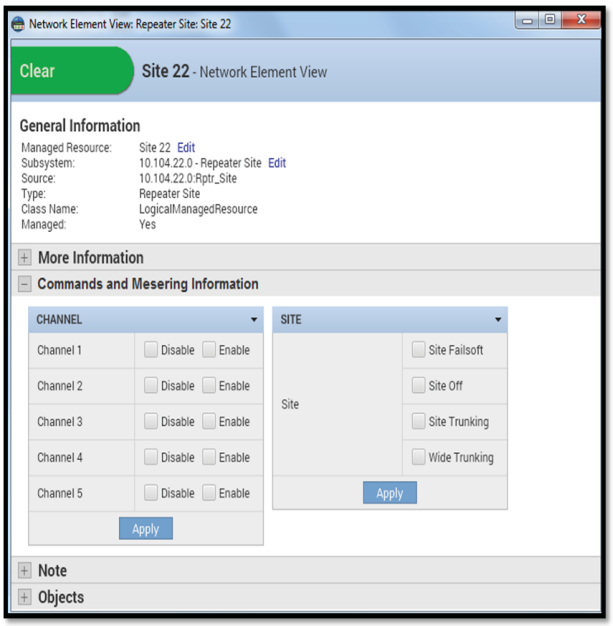
UEM Enhanced Navigation Tools:



- Integrated Fault Management allows a single-user interface to view, organize, and manage fault data.
- Interactive Maps provide a system-wide view, zone view, and site view.
- A detailed user-interface provides context-based navigation, name aliasing, acknowledgment of alarms, digital commands and control, analog input readings, and device metering.



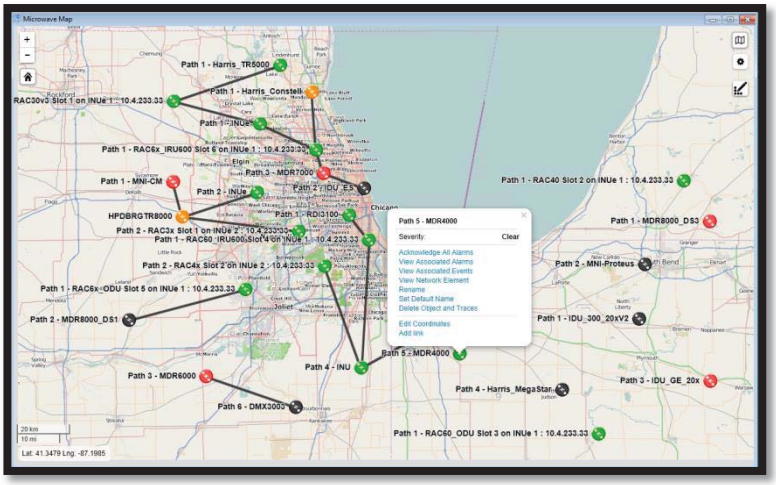
- Environmental Alarms monitor environmental inputs and provide a high-level view of the site, including digital input status, analog input status or valve, and digital output control status.
- Real-time Metering allows users to view readings remotely, assess signal strength and power, and diagnose issues remotely.
- Command and Control features allow users to enable or disable channels, view multiple channels at once, and set role-based or permissions-based access.



The UEM provides a central location for managing all radio, transport, and environmental devices on the system.

The Enhanced UEM introduces support for microwave devices, device metering, environmental inputs and digital controls. There are also new site and network element overview screens with interactive maps and drill down navigation.

The UEM application (offered on M and L Cores) includes new functionality. IP connectivity to sites is required.



New functionality (standard):

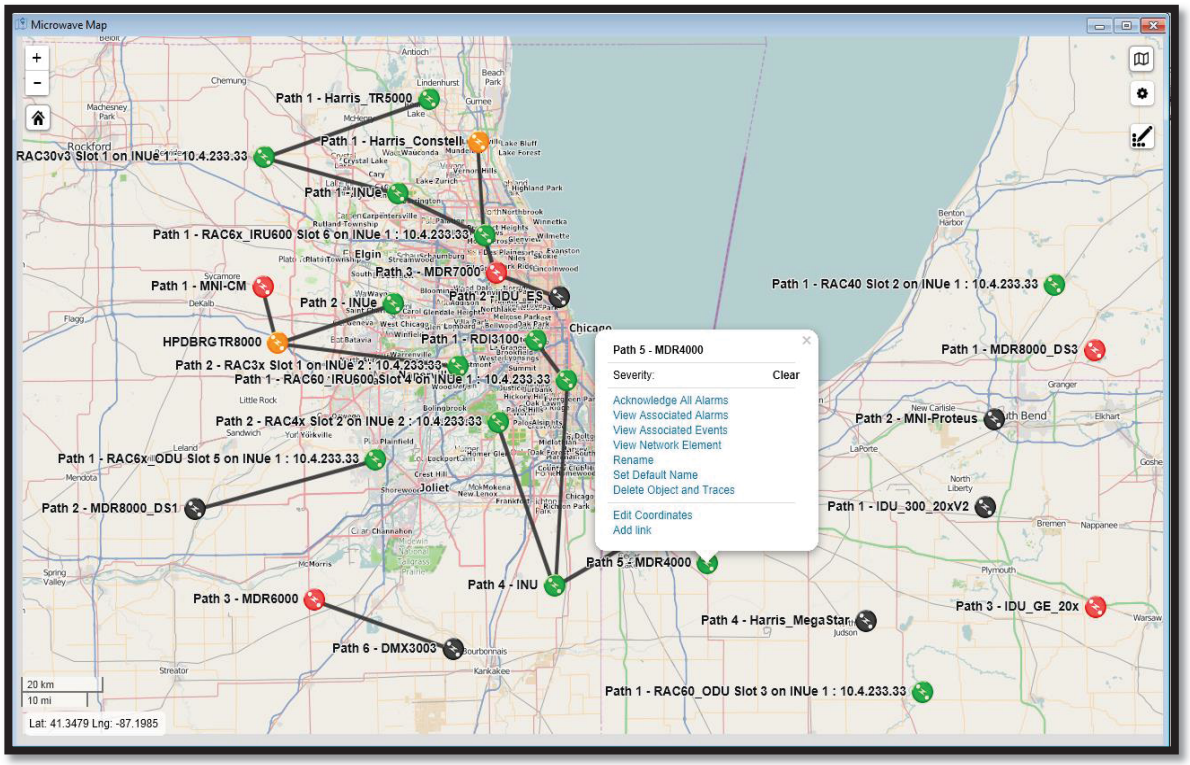
1. Interactive Map View.
2. Zone level (M & L Core only).
3. Ability to Acknowledge Alarms.
4. Display Name Aliasing.

5. Saved Settings for Reports.

The new UEM system, zone, site and network element views provide high level status at a variety of levels. Improved navigation allows a user to drill down from high level status alarms to the finest detail. Context based menus also allow users to jump straight to the details from any screen.

View of Collocated Sites - view relative locations of Zone Core, RF Sites and Console Sites to better understand impact of fault alarms. Site Icons - identify site types and alarm status from a single screen.

Microwave status view (OPTIONAL) – view status of all microwave radios in a zone from one screen. Link visualization – see what radios are connected to each other to better understand impact of fault events.



The application automatically discovers devices on the network to determine their real-time status. Color-coded symbols displayed on a topography map provide a geographical and hierarchical representation of the entire network. The UEM allows each user to filter out and customize the

pertinent information important to their roles and responsibilities. Features and benefits of the UEM are outlined in the table below.

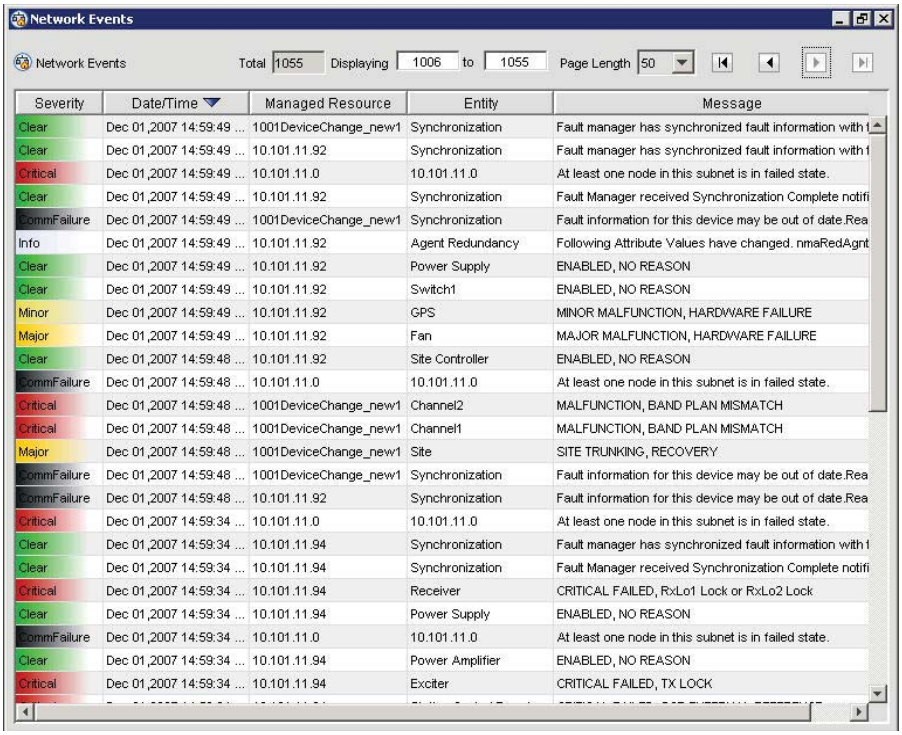
Benefits of the UEM

Feature	Benefit
Centralized View of Entire Communications Network	Network Managers can view the entire ASTRO 25 system status and quickly isolate problems to the board level.
Intuitive Graphical User Interface (GUI)	Network Managers can be quickly notified of failures on the system and diagnose device problems, utilizing a display and an intuitive GUI.
Auto Discovery of Devices	Components are automatically discovered and map views are created to show the overall health of the network.
Active Alarms View and Alarm Summary	Persistent single view all failure conditions in the network and a quick reference summary of alarms by severity allows users to quickly pinpoint the highest priority failures.
Secure Device Access (optional)	SNMPv3 protocol with Triple DES and AES 256 bit encryption to prevent security breach attempts.
Northbound Interface (optional)	Real time event stream using a standard industry protocol that can be used to forward events to a higher-level management application for added flexibility.
Email Notifications	User specified event notifications sent via email—which can also be forwarded to a portable mobile device—allows System Managers to simultaneously address other tasks.

The UEM gives the Network Manager virtually instantaneous notification of any system deficiency or element failure.

1.12.1.5 UEM Event Browser

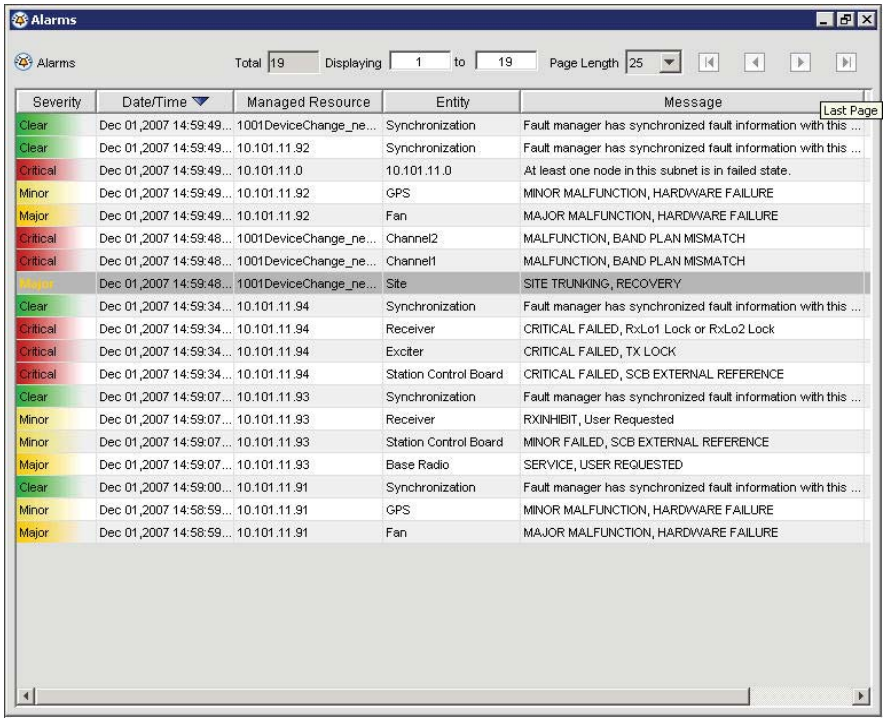
All events (or a filtered subset of events) that are received by UEM is viewable via the UEM event browser. By default, when viewing an event, the event browser displays Severity, Date/Time, Managed Resource, Entity, and Message (see figure below). Additional display properties are available. Up to 10,000 of the most recent events from any managed device within a zone can be displayed.



UEM Event Browser sample screen

1.12.1.6 UEM Alarm Browser

The UEM alarm browser (see figure below) allows the user to view all alarms, or a filtered subset of alarms. By default, when viewing an alarm, the alarm browser displays Severity, Date/Time, Managed Resource, Entity, Message, and Owner/Assignee information. Additional display properties are available. UEM supports exporting events and alarms for future analysis.



UEM Alarm Browser sample screen

1.12.1.7 Network Management Terminals and Licenses

The NMS Windows-based client/server architecture distributes most of the user application processing to the client PC workstations. The following applications run on or may be accessed from the Network Management terminal:

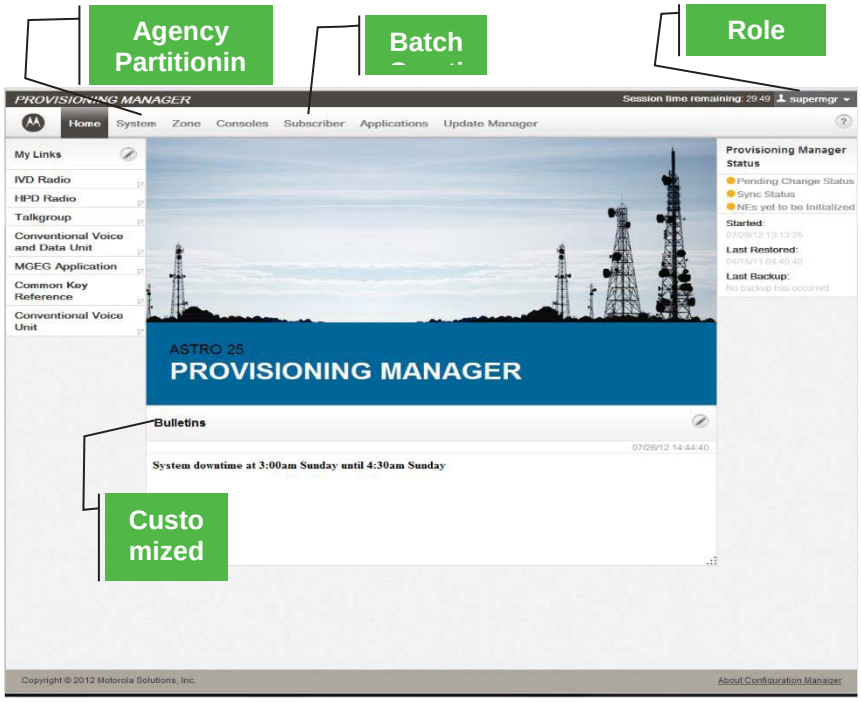
1. PM.
2. RCM.
3. ZoneWatch.
4. Zone Historical Reports.
5. UEM.
6. UNC.

1.12.1.8 Provisioning Manager

The PM provides data entry screens for the mobile and portable radio units authorized to use the system. The PM is also used to set security information at a system level. The user interface is web-

based and has intuitive browser-based user navigation features. Configuration reports can be generated. A sample PM screen is shown below.

The subscriber profiles feature allows the replication of parameters that are common to multiple radio units, thereby reducing the time and effort to load the user configuration database. Working in concert with the UCS, radio unit data is entered once only for each unit and automatically distributed to the user configuration database residing in the ZDS at its resident zone and all other zones in a multi-zone system.



Sample PM screen

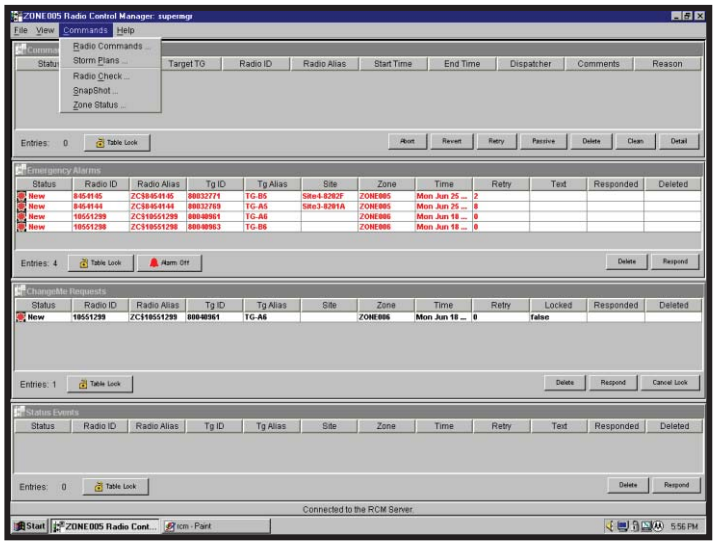
1.12.1.9 Radio Control Manager

The RCM application provides two types of functions: radio commands can be initiated (e.g., Dynamic Regrouping and Selective Inhibit) and radio events are displayed (e.g., Status and Emergency Alarm). A sample RCM screen is shown in figure below.

The RCM has the following features:

1. Dynamic Regrouping—Dynamic Regrouping allows a dispatcher or system manager to dynamically program an affiliated radio user to a particular talkgroup. The dynamic regrouping function is implemented within one second per regrouped radio. A companion function “Cancel Regroup” cancels the regrouping command and removes the radio from the regrouped talkgroup. When a radio is regrouped, the subscriber will acknowledge (ACK) the command, and the ACK is sent to the initiating terminal. The subscriber will generate an audible noise indicating to the user that the radio has been regrouped.

2. Storm Plans—Storm Plans provide the system with a consistent procedure for special or emergency situations. A completed Storm Plan can have a maximum of four commands, each containing a maximum of 100 individual radio tasks.
3. Selective Inhibit/Cancel Inhibit—Selective Radio Inhibit enables a user to functionally disable a subscriber unit that is currently affiliated to the system. This feature can be used to disable stolen radios or invalid users. If the initial inhibit command fails within 30 seconds, a notice is sent to the initiating terminal to select either “endless search” or “quit”. The companion feature “Cancel Inhibit” reactivates the radio in the same manner.
4. Other features include:
   - GUI for ease of use.
   - Status function.
   - Online Help.



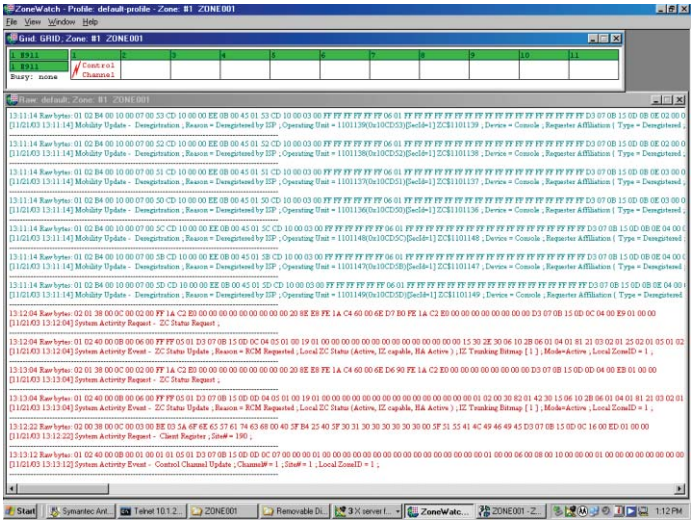
RCM screen example

1.12.1.10 ZoneWatch Grid and Control

A ZoneWatch Grid and Control sample screen is shown in figure below.

ZoneWatch Grid and Control is a performance management tool with customizable displays and graphs to monitor real-time communications activity in a zone. The information displayed can help system managers be proactive in making better resource planning decisions, such as when additional channels need to be added to busier sites.

1. ZoneWatch Grid Screen—Air traffic within a single zone is displayed on a Site/Channel grid. Real-time call activity for each channel is displayed in its respective cell.
2. ZoneWatch Control Display—This display presents call activity messages. These can be used to isolate errors, trace the progress of a call and troubleshoot or analyze current system activity. It also provides information about activity occurring on the control channel, such as rejects, emergency alarms, and unit affiliations.



ZoneWatch control display example

1.12.1.11 Zone Historical Reports

Zone Historical Reports are provided.

This application produces reports on radio infrastructure and radio resource usage across a single zone. A predefined set of reports, with field selection capability, is supplied to produce “standard” or tailored reports.

Historical reports are generated automatically or on demand. Automatic reports are produced at a specific scheduled time and date or on a recurring time and date interval. Reports can be sent to the monitor screen, a printer, Hyper Text Markup Language (HTML), or CSV files.

This display provides real-time line charts or 3D bar graphs that illustrate channel utilization for all call types—group, private, control channel, and dynamically blocked calls.

1.12.2 Remote Terminal Units (RTUS)

A. RTUs shall be provided in sufficient quantities to monitor the entire network, including:

1. Trunked and conventional radio network components
2. Site facilities including shelter, tower, lighting, power and generator
3. Microwave radios, channel banks, etc.
4. Simulcast paging transmitters
5. Data network equipment, including routers, switches, etc.
6. Other miscellaneous equipment

B. RTUs shall be fully compatible with NMTs supplied and provide complementary functionality wherever necessary to provide a complete working system.

C. RTUs shall support the following points:

1. Status/alarms – 48 minimum, expandable to 256
2. Control outputs – 8 minimum, expandable to 32
3. Analog inputs – 8 minimum, expandable to 16

D. RTUs shall support time stamp and system time synchronization.

E. Terminations for all points shall be provided on suitable terminal blocks providing ease of installation, testing and maintenance.

1.12.2.1 Environmental Alarms

Interfaces for the environmental alarms at the radio sites are provided by SDM 3000 Remote Terminal Units (RTU). The SDM 3000 RTU acts as the primary interface to the site devices. The SDM 3000 RTU acts as an intelligent site management terminal that allows for continuous monitoring of critical site components and alarms. The NFM SDM 3000 RTU routes alarms information to the Network Management System and to the Motorola Solutions System Support Center via the IP-interface at each remote site, located on the ASTRO 25 LAN.

The system includes an SDM 3000 RTU for each RF and Dispatch site in the system and any site that has microwave. This will allow for monitoring of the required alarms at each location that includes serial alarms from microwave radios at each site and TRAK frequency standards. Each of the SDM 3000 RTUs is provided with digital alarm inputs, and relay outputs for control of external devices. These inputs and outputs may be used by the County to interface to site alarm devices such as power, intrusion, lights, and other site alarms.

1.12.2.2 Inputs and Outputs Included on Each SDM 3000 RTU

Motorola to provide RTU interface to provide alarms for all equipment included in or interfacing with the System, including retrofitting existing equipment if no RTU interface is already present. Existing sites will be brought up to same level of alarming system as new sites provided under this Agreement, as part of the scope of services being provided by Motorola. Provider shall ensure that the recommended alarms identified in Schedule 5 for each shelter will be monitored and interfaced as part of the System, unless otherwise approved by Contract Administrator.

Forty-eight Digital Inputs (DI) providing 48 dry-contact inputs; any of the inputs may be used as low-speed counters under application control. The module provides an isolated current so that the open/closed state of the sensor may be determined. Each of the inputs is opto-isolated from the remaining circuitry on the module to provide maximum input surge immunity.

Sixteen Digital Outputs (DO) providing 16 low-current relay outputs; 12 of the relays have Form A contacts and four relays have Form C contacts. Magnetically latched relays should be used in systems that require long operation from the backup battery when the mains power fails; electrically energized relays should be used when it is mandatory that the relays open following loss of power or when the module is removed from the SDM 3000 RTU. Each relay has an internal feedback contact that the application may use to verify that the relay is open or closed. All connections to the relays are made via plug-in screw terminals on the module, and all relays have surge arresting devices installed.

Eight Analog Inputs (AI), are provided in various options supporting either 8 4-20 ma inputs, 8 ±1 ma inputs, 8 ±2 ma inputs, 8 ±1 VDC inputs, 8 ±2.5 VDC inputs, or 8 ±5 VDC inputs. Each of the eight inputs, plus ground and temperature, are opto-switched into a precision A-to-D converter; ground is measured so short-term drift may be cancelled and temperature is measured so that the temperature drift associated with all silicon-based chips may be negated.

The F4544 SDM3000 RTU for ASTRO sites supports up to six expansion units. The SDM3000 I/O Expansion Advanced unit includes the following inputs and outputs:

1. 48 WET or DRY Alarm Inputs.
2. 16 Electrically Energized Control Outputs.
3. 8 Analog Inputs (-5V to +5V DC).

1.12.2.3 Example of Local Discrete Alarms

The table below shows a general listing of the site equipment alarms (as applicable at each site), which will be monitored at the sites.

Site Alarms

Site Environmental Alarms	Site Environmental Alarms
Tower Lighting	Fire Suppression System Trouble Fault
Building Intrusion	Air Conditioner A Failure
Building Low Temperature	Air Conditioner B Failure
Building High Temperature	Commercial Power Failure

Site Environmental Alarms	Site Environmental Alarms
Building Smoke/Fire	Transfer Switch Position
Fire Suppression System Discharge	TVSS Failure
Generator Alarms	**Generator Alarms**
Generator Running	Generator Control Switch Not Set
Generator Low Fuel	Generator Low Oil Pressure Pre-Alarm
Generator Over Crank	Generator Low Coolant Temperature Pre-Alarm
Generator Other Failure	Generator High Coolant Temperature Pre-Alarm
Generator Battery Charger Alarm	Generator Low Oil Pressure Alarm
Generator High Coolant Temperature Alarm	Generator Low Coolant Temperature Alarm
UPS Power System Alarms	**UPS or DC Power System Alarms**
UPS Online	Rectifier/Battery Charger Low Voltage
Microwave System Alarms	**Microwave System Alarms**
Transmitter A	Transmitter B
Receiver A	Receiver B
Rectifier/Battery DC Voltage	Rectifier/Battery Charger Low Voltage
Rectifier/Battery Charger No Charge	Rectifier/Battery Charger High Voltage
Transmission Line High Pressure	Transmission Line Lower Pressure

1.12.3 FNE Equipment Specification Sheets

Motorola Solutions has provided FNE equipment specification sheets as *Evaluation Criteria Attachments Section 2.8*.

1.13 System Implementation, Test and Acceptance

1.13.1 Cutover Plan

A. The Provider shall be responsible for planning and coordinating the implementation of all equipment, subsystems and the overall system.

B. Execution of the cutover plan shall ensure that new systems are brought online with minimum interruption to all existing systems and communications.

C. During final design, Provider shall deliver a preliminary cutover plan describing how the radio system will be phased into a fully operational system.

1. Provider shall successfully complete all tests and training prior to the actual cutover of systems.

2. Provider shall provide the necessary labor to cutover from existing systems to the Systems.

3. The plan shall include the schedule and procedures associated with the transition of each operational user group. The plan shall specifically address how the existing users will begin using the new system with minimal operational impact.

4. The plan shall provide detailed component or subsystem cutover plans, and specifically shall delineate between systems that affect and do not affect ongoing operations.

5. The plan shall include contingencies.

6. The County reserves the right to approve and change the cutover plan as it relates to any or all system components.

   Motorola is fully responsible for the turnkey execution of the cutover plan, including any additional equipment and services required to facilitate the cutover plan. These responsibilities include but are not limited to:

   1. Calculation of power and heat loading for existing equipment
   2. Relocation of existing equipment
   3. Reinforcement of floors to support weight of added equipment, including DC power plant
   4. Upgrades to site electrical systems to support old and new systems concurrently with consideration factored in for the cutover from AC to DC power

5. Upgrades to site HVAC systems to support old and new systems concurrently
6. Placement of a temporary shelter if space cannot be secured within an existing shelter, and all associated services to relocate equipment between the shelters until a final system configuration is achieved and the temporary shelter is decommissioned.
7. Upgrades of site grounding systems to the latest revision of R56
8. Seamless migration and cutover of the microwave network
9. Initially install equipment operating in the AC mode and cutover operation to DC at a later point

The only cost associated with the cutover for which Motorola will not be directly responsible are associated with enhancements to the tower structure if the structural analysis determines the tower cannot safely support the proposed load.

1.13.1.1 High-Level Cutover Plan

The initial cut over plan provides a basic outline of recommended procedures to provide Broward County the most efficient system migration minimizing operational impact. The current Gold Elite consoles can be changed out while still operational on the Hosted Master Site. This plan has four critical parts. The steps beyond step 1 (indicated below) require the new radio shelters and towers to be completed. Existing towers that will be reused will need structurals completed with all of the new antennas and be ready to accept new antennas. The following tentative cutover plan will be refined by the Parties during design review, subject to final County approval.

1. The Motorola Gold Elite Consoles at the three dispatch centers would be the first infrastructure that would be changed to the new MCC7500. The new consoles can be staged and shipped with a software release that is compatible with the HMS 7.14 release. This will allow the consoles to be installed while still on the HMS. Since the dispatch screens are nearly the same as the Gold Elite screens, the training requirements will be minimal. Once the VPI IP logging additions are completed by Replay, the consoles can be changed at the Pembroke Pines location one position at a time. Both Gold Elite and the MCC7500 consoles can operate simultaneously thus the acceptance testing can be performed on the first position with minimal disruption to the dispatch center. When all 21 positions have been completed and the operation has been determined to be stable, the existing Gold Elite CEB racks can be removed. This is an important step since the space occupied by the CEB racks will allow the MCC7500 rack to be permanently installed and provide a rack space for the microwave rack and the Master Core equipment racks at Sunrise and Coconut Creek. This procedure will then be repeated at the other two dispatch centers. Upon completion, Broward County will be dispatching on the MCC7500 consoles still operating on the HMS until the new system is ready for cut over.
2. The next step is installation of the new microwave transport once all of the new tower sites have been completed. The new microwave will operate on different frequency bands than the current microwave. Most paths will be 6 GHz but will be use the lower 6 GHz band designated 6L. This may vary depending on the path coordination and available 6 GHz frequencies and will only be known once

the physical path surveys are completed and frequencies are assigned by coordinators. Some of the shorter paths will be 11 GHz. Once the final antenna heights have been determined from the physical surveys, coordination is completed and frequencies assigned, Motorola can then determine the optimal method to transition equipment while ensuring the continuity of user operations. There are two main ways to cut in a new replacement microwave transport that will be explored:

A. Install the new microwave in parallel with the existing microwave. This is the ideal method if it can be done but is dependent on things such as tower structural loading, new antenna locations and frequencies assigned. With this method, the complete microwave system can be installed, and acceptance tests completed. The existing 16 DS1s can then be transferred over using the existing Larus Route Switches. Once the route switching has been tested and verified to be working properly, the existing microwave can be removed. This is another important step as it provides additional space for the new microwave that may have been temporarily located until the old equipment can be removed and will free up one more rack. The new microwave only requires one rack per site therefore, in most cases, this will free up one to two rack spaces. The exception to this is where the existing microwave comes from the County PSB prime site. These existing radios will need to remain in place at Core, Playa and Point of America to connect the existing 16 DS1s to the existing sites.

B. Another method that may be considered and will be most appropriate due to tower loading is an "Underbuild." With this method, the new 6 GHz antenna and waveguide is installed and the new and old system shares the new waveguide and antenna where there are new and old parallel paths. The advantage is that the old waveguide and antenna can be removed at the same time keeping the tower loading minimized. Once the remainders of the new paths are complete and the new microwave testing is complete, the DS1s can be transferred to the new microwave and the old parallel paths removed. With the current new microwave path design, the following paths could use this procedure depending on the new frequency assigned:
    i. Core to Markham Park.
    ii. Davie to Miramar.
    iii. Miramar to Channel 2.

C. The third step is phasing in the RF sites. The new sites and sites with new shelters will have no issues installing the new DC power systems and the three RF racks. The seven existing sites have no space. The DC power system requires 4 to 6 rack spaces depending on if it is a prime site and backup system site. The -48VDC battery plants must be placed in permanent locations due to the weight. Prior to installing any battery plant, the building floor must be evaluated for maximum lbs per sq foot. In most cases, a floor plate will be required to distribute the weight to meet the maximum specifications for the particular building. In addition, the battery plants have to be built on site and all battery modules inter connections put in place. Once completed, it is not movable without disassembly. The following will need to be known prior to providing a more detailed cut over plan:
    - What existing equipment racks will be coming out or can be relocated to a temporary location.

- There are four sites that will be main system remote simulcast only sites. These are Playa, Point of America, Miramar and Markham Park.
- There are three sites that will have the main system, backup system and the 800 MHz MA system. These are Coconut Creek and Davie. Channel 2 is the third is getting a new shelter so will not be an issue with space.
- The Core site is a prime site for the main system and the 800 MA system in addition to a main system co-located remote simulcast site, backup system remote simulcast site and 800 MA system co-located remote simulcast site.
- There are three new RF racks that contain all of the equipment for the 19 channel system. At minimum, the network rack and one radio rack would need to be temporarily located between existing racks to bring the site on line with 10 channels.
- At these six sites, there are some possibilities that can be done to use minimum space to get at least 10 channels on line initially by powering the GTR8000 Base Repeaters using AC from the existing UPS since these stations can do both AC or DC. Most G-series equipment that includes simulcast controllers, and voting comparators can operate AC or DC. The site DC power charger-rectifier can also run from 120 vac from the site UPS to power network equipment such as routers and RTUs that are equipped either AC or DC but not both. This would only require one charger-rectifier module plus one for a backup which is minimal current from the UPS. The GTR8000 Base Repeaters draw similar current as the existing 800 MHz Quantar stations.

D. The last step would involve testing the system for proper operation with at least a sub-set of the total system. This could be a few channels on line to test the system features and coverage. The existing MCC7500 training consoles at Pembroke Pines could be moved over to the new Master Core for testing the complete system ATP and the coverage ATP. Once the tests are successful and completed, the system will be ready for transitioning.

1.13.2 Staging

A. Each individual assembly or equipment unit shall undergo factory testing prior to shipment.

B. Standard factory test documentation that indicates the tests performed and the successful completion of testing, shall be submitted to the County.

C. System Staging:

1. The complete system shall be staged and tested at the factory, in the United States, to the greatest extent practical. The intent of the staging tests is to demonstrate to the County that the system is ready for shipment and installation.

2. Staging will be scheduled at a point that the system design is finalized and all system radio sites have been secured. Staging will not be scheduled in order to expedite payment milestones.

3. The microwave subcontractor must make accommodations to stage its equipment at the P25 Vendor's facility, to allow staging of the complete radio and backup system simultaneously.

4. Provider shall provide all necessary technical personnel and test equipment to conduct staging tests. All deviations, anomalies and test failures shall be resolved at Provider's expense.

5. Provider shall use an approved Staging Acceptance Test Plan. The Staging Acceptance Test Plan shall be submitted no later than 15 business days before the testing starts, and shall be approved no later than five business days before the testing starts. It is expected that the SATP has been performed and all tests have been successful before the County witnesses the official SATP. The SATP shall be signed and dated by Provider and County representatives following completion of all tests. All tests in the Staging Acceptance Test Plan shall be marked as either pass, fail, or pass qualify.

6. Failed tests shall be documented, corrected and retested. All defective components shall be replaced and retested. Defective components that cannot be corrected shall be replaced at the expense of Provider.

7. Retest of individual failed SATP tests or the entire plan shall be at the County's discretion.

8. The fully executed and completed SATP document shall be provided to the County.

Once the system details are verified and captured during the Design Review process, the system's Fixed Network Equipment (FNE) will be ordered and manufactured. Motorola will stage all FNE systems before shipment. Motorola Solutions achieves its high levels of customer satisfaction in part by assembling and testing every communications system sold to stringent quality and functional performance tests prior to the system shipping.

After the system is assembled and configured, staging technicians and engineers will power up the equipment, load software, set parameters, program, configure, and optimize the radio equipment. Radio parameters will be set according to inputs from the field integration team. System software and system features will be tested and validated. Additionally, MCC 7500 dispatch positions will be assembled, configured, and optimized in order to execute all the ATP tests. All system parameters will be set according to specifications to verify proper operation and functionality. These parameter settings will be recorded and documented to provide baseline information to the field integration team.

Once the system or subsystem has been assembled, optimized, and integrated as a complete working unit, the system will be tested according to the Factory Acceptance Test procedures. Factory acceptance testing will comprise all major systems in the radio solution, including the subscriber radios. These tests will provide the County with the opportunity to observe the radio subscriber equipment programmed and optimized as an integrated system and to test the functionality and features of subscriber radios in a factory environment. During testing, all measurements or outcomes will be recorded within the test script, as indicated in the test. The result of a test procedure will be "Pass", "Fail", or a measured value.

1.13.3 System Installation

A. Installation shall include a complete, tested system to include placement of associated cabling, appropriate system layout, and terminal connections. Providershall provide associated power supplies and any other hardware, adapters and/or connections to deliver a complete operable system to the County at the time of acceptance.

B. All installations shall be performed by factory-authorized or Vendor-affiliated service shops. Other shops or installers may be used upon mutual agreement between the County and Vendor. Qualified, adequately trained personnel familiar with this type of work shall perform all installations. Providershall provide the names of the service shops, their qualifications, a description of their certified training on the System, a summary of their experience and a list of five references (minimum) for each proposed shop.

C. Prior to the start of the system installation, the Provider shall participate in a mandatory project site survey with the County or County's representative to confirm actual equipment location within each space. At that time, the exact equipment locations shall be determined and documented by Provider.

D. Provider shall coordinate with others, as appropriate, to confirm that any preparation work that affects the installation of the base station equipment, such as tower work, coring, bracing, conduit, electrical, etc., is complete before final inspection.

E. Provider shall provide and pay for all materials necessary for the execution and completion of all work. Unless otherwise specified, all materials incorporated into the permanent work shall be new and shall meet the requirements of this specifications document. All materials furnished and work completed shall be subject to inspection by the County or the County's representative.

F. Equipment supplied as spare equipment shall not be used for installation of the System. All spare equipment shall be supplied in an unused condition.

G. All equipment and devices shall be cleaned internally and externally, and all damaged finishes shall be repaired.

H. Worksites shall be left neat and broom swept upon completion of work each day. All shelter floors will be thoroughly cleaned and all scuff marks and abrasions shall be removed prior to acceptance. All trash shall be removed weekly.

I. Inspection:

1. The County shall conduct an inspection of the installations upon substantial completion. Any deficiencies shall be documented on a single punch list and provided to Provider for resolution.

2. Final acceptance testing shall not commence until all punch-list items are resolved.

Following factory staging and testing, the equipment will be shipped to the Motorola Solutions storage facility, prior to installation. As the equipment arrives on-site, Motorola Solutions personnel will perform site audits to ensure that each site is ready for equipment installation. After the equipment is installed, Motorola personnel will conduct equipment measurements to ensure that all appropriate levels have been set, and that the equipment is functioning according to the system design and manufacturer's specifications.

Once the equipment has been confirmed to be operating properly, Motorola personnel will repeat site-auditing procedures in order to verify that each site adheres to the standards documented in quality control, Motorola Solutions will maintain strict adherence to documented procedures including Motorola Solutions' Standards and Guidelines for Communication Sites (R56) manual. Motorola Solutions will also adhere to TIA, FCC, National Electric Code, and all applicable federal, state, and county codes and ordinances as defined in the RFP. Successfully completing these audits ensure that the quality of the installation will support the system's performance and safeguard against site safety issues.

1.13.4 Fleet Mapping

A. Broward County wishes to optimize fleet maps amongst user agencies in order to improve interoperability and usability. The Provider shall develop the fleet map in coordination with the County radio system coordinators.

B. Provider shall develop the actual fleet map with input and direction from the County. The fleet map shall contain at a minimum:

1. Talkgroup ID
2. Agency
3. Emergency actions
4. Encryption capability
5. Roaming capability
6. Priority
7. Scan

C. Proivder also shall develop subscriber unit programming templates. These templates shall have the basic features and functions defined for a particular subscriber unit and user type. Templates shall be developed on a per-agency basis.

D. Once the fleet map and templates are approved and completed, Provider shall use these for installation of subscriber units and for further configuration of the system. Providershall submit these with the final as-built documentation.

As the system is being installed, the County and Motorola Solutions will develop the plan for controlling radio communications within and across the County's groups, otherwise known as "fleetmapping". Taken as a whole, the process of fleetmapping includes the collection, qualification, and organization of data regarding the radio communications between individuals, and developing specific fleetmaps that determine how the radio communications for each user group of an organization can be most efficiently controlled.

Fleetmapping also provides a structured approach to the management of many radio users and provides the opportunity to plan for expansion or make changes within an organization. Its primary objective is to allow the backbone radio system and subsystems to communicate properly with dispatch consoles and radio users in the field. Typical system fleetmap templates are built from customer involvement and feedback, Motorola Solutions' best practices in engineering and guidelines, and system product specifications.

Fleetmapping will begin with meetings between the County and Motorola Solutions to define the relevant groups within the County, review current organization SOPs, and current resource utilization. Through these meetings, Motorola Solutions personnel will create a master list of talkgroups based on agencies' organizational structure and cross-functional requirements, and detail the specific loading and configuration of each of those talkgroups, including estimated number of users, anticipated call frequencies and durations. Based on this set of data, Motorola can then create programming templates for each subscriber, including system wide parameters, button and menu assignments, and feature configurations. Once the templates are reviewed and approved by the County groups, Motorola will use the final versions to develop subscriber codeplugs and test them on the live system.

Motorola Solutions will also be responsible for installation of mobile subscribers as defined in the proposal. Broward County and /or User Agencies will be responsible to provide vehicles for Motorola Solutions to perform installs in an efficient manner.

1.13.5 Coverage Testing

1. The CATP shall be consistent with the procedures and guidelines outlined in TIA TSB-88, latest revision.

2. Coverage testing shall commence only after the radio systems are fully tested and aligned. Significant changes to the system shall require retesting of coverage at the County's discretion.

3. Provider shall perform two types of coverage testing:

    a. Automated objective mobile drive testing providing Bit Error Rate (BER) and signal strength measurements
    b. Non-automated subjective Delivered Audio Quality (DAQ) testing (intelligibility testing)

    Both types of testing shall be complementary and serve to fully verify that coverage requirements are met, both technically and operationally.

4. Test Configurations:

    a. Configurations for the objective and subjective testing shall represent typical operating configurations to the greatest extent possible, using portable and mobile radio equipment to be used with the system.

    b. Automated Objective Mobile Drive Testing:

        i) Provider shall test both the signal level and BER, at a statistically significant number of test locations throughout the county utilizing automated test equipment.

        ii) For testing purposes, the county shall be divided into the minimum amount of uniformly sized test grids per the estimate of proportion formula in TSB-88 3.3. The grid size may vary from a minimum size of 0.25 mile by 0.25 mile to a maximum of 1.25 mile by 1.25 mile. Each of the four subdivided areas with separate coverage requirements must independently achieve a statistically significant number of test points.

        iii) Inaccessible grids shall not count as either a pass or fail in the statistical analysis.

        iv) A grid will be considered a "fail" if the outbound signal is measured at a BER greater than or equal to 2.4%, or an inbound signal is measured at a BER greater than or equal to 2.6% (per TSB-88).

v) Any failed grids may be changed to “pass” if the underlying issue is corrected and the grid is retested.

vi) This testing shall include both talk-out and talk-in measurements.

c. Non-automated Subjective DAQ Testing:

i) Non-automated subjective DAQ coverage testing shall be conducted using typical portable radios supplied with the system.

ii) Test radios shall be placed in line with attenuators to simulate the appropriate level of in-building attenuation. Vendors may identify alternate testing methodologies to adequately simulate in-building characteristics.

iii) Talk-out and talk-in performance shall be documented.

iv) Provider shall provide a standardized test form for testing.

v) A grid will be considered a “fail” if both the inbound and outbound subjective audio evaluation has been graded less than DAQ 3.4. (Speech understandable with some repetition)

d. The CATP will be successfully completed when both the objective and subjective tests conducted in each of the four coverage areas achieve a pass rate of 95 percent.

1.13.5.1 Coverage Acceptance Test Plan

Overview

This Coverage Acceptance Test Plan (CATP) is designed to verify that the voice radio system implemented by Motorola Solutions meets or exceeds the required coverage reliability within the Broward County service areas, as defined by the RFP. The CATP defines the coverage testing method and procedure, the coverage acceptance criterion, the test documentation, and the responsibilities of both Motorola Solutions and the County.

Coverage acceptance testing is based upon a coverage prediction that accurately represents the implemented infrastructure and parameters that are consistent with the contract agreements. If the implemented system varies from the design parameters, then a revised coverage map will be prepared. New test maps will reflect the measured losses and gains associated with the implemented infrastructure and subscribers. These will be used to define the test configuration and potential areas from which test locations may be included in the evaluation process.

To verify that the radio coverage reliability is met as is presented, the indicated coverage areas within Broward County will be divided into equally sized test tiles.

The table below shows the Coverage ATP test tile sizes and approximately quantity.

Test Tiles for Coverage ATP

Test Tile	# of Test Tiles (min # 215) *	# of Test Tiles (min # 821)	# of Test Tiles (min # 383)	# of Test Tiles (min # 694)	# of Test Tiles (min # 837)
Size (miles)	Backup	Everglades	10 Miles Off Shore	20 db Loss	25 db Loss
0.87	N/A	1045	N/A	N/A	N/A
0.62	N/A	N/A	549	856	N/A
0.28	N/A	N/A	N/A	N/A	1012
1	332	N/A	N/A	N/A	N/A

*** max tile size of 2km or 1.25mi**

There will be five Coverage ATP test service areas as noted in the RFP. Each one of these tests will be standing alone and will be completed by separate test teams. The Grid Maps for the five individual tests were included in the response to the RFP as *Evaluation Criteria Attachments Section 2.12*.

The table below shows the predicted service area reliabilities as required by the RFP.

Predicted system coverage for CATP

Equipment	Service Area	Service Area	Service Area	Service Area	Service Area
Configuration	Backup system	Everglades	10 Miles Off Shore	20 db Loss	25 db Loss
Portable (RSM) outside	≥95%	≥95%	N/A	N/A	N/A
Portable (RSM) 20 db loss	N/A	N/A	N/A	≥95%	N/A
Portable (RSM) 25 db Loss	N/A	N/A	N/A	N/A	≥95%
Mobile ¼ Wave Boat Mast	N/A	N/A	≥95%	N/A	N/A

The following section provides a detailed description of the CATP.

1.13.5.2 CATP Definitions

Several definitions are needed to accurately describe the coverage test method.

Coverage Area

The coverage area is the geographical region in which communications will be provided that meets or exceeds the specified Channel Performance Criterion (CPC) at the specified reliability for the specified equipment configurations. These coverage areas are the jurisdictional boundaries of Broward County and the service areas defined by the RFP.

Channel Performance Criterion

The CPC is the specified minimum design performance level in a faded channel. For this system, the CPC is a Delivered Audio Quality (DAQ) of DAQ-3.4 for portables and mobiles. DAQ definitions are provided in table below.

DAQ definitions

DAQ	Faded Subjective Performance Description
1	Unusable, speech present but unreadable.
2	Understandable with considerable effort. Frequent repetition due to noise/distortion.
3	Speech understandable with slight effort. Occasional repetition required due to noise/distortion.
3.4	Speech understandable with repetition only rarely required. Some noise/distortion.
4	Speech easily understood. Occasional noise/distortion.
4.5	Speech easily understood. Infrequent noise/distortion.
5	Speech easily understood.

Reliability

The reliability, also defined as the CPC service area reliability, is the percentage of locations within the coverage area that meet or exceed the specified CPC. It represents the average of all tiles for the defined service area. As already described above, there are five defined service areas as outlined within the RFP. Motorola Solutions has indicated the CPC service area reliability of these areas in the table for the losses detailed in the RFP. Although the coverage maps do not guarantee coverage within a specific location, they do indicate the ability of the system to overcome the expected losses of typical buildings located within the county as defined by the RFP.

Equipment Configurations

There are two configurations for the field unit equipment or subscriber upon which coverage acceptance is based. Motorola Solutions' coverage maps for this system indicate the coverage area for the following equipment configurations:

1. Portable (2.5-watt).
   A. Remote speaker microphone.
   B. Hip level (3.3 feet for transmit and receive) with ½ wave flex antenna.
   C. Swivel case clip.

2. Boat (10-watt) with ¼ wave antenna mounted on a boat mast at 5 feet with a ground plain.

The infrastructure that supports this configuration is the following:

4. 11-site TDMA system transmitting simulcast and receiver voting.
5. 1 ASTRO Site Repeater.
6. Transmitting TDMA ASTRO® 25 Harmonized Differential Quadrature Phase Shift Keying (H-DQPSK) Simulcast Modulation, which is fully compliant P25 and Receiving ASTRO® 25 Harmonized Continuous Phase Modulation (HCPM).

1.13.5.3 CATP Method

The method used to test coverage is statistical sampling of the predicted coverage area to verify that the CPC is met or exceeded at the required reliability for each of the defined equipment configurations. It is impossible to verify every point within a coverage area, because there are infinite points; therefore, coverage reliability will be verified by sampling a statistically significant number of randomly selected locations, quasi-uniformly distributed throughout the predicted coverage area.

This CATP provides a method of tracking test tile location using Motorola Solutions' Voyager℠ hardware and software. A GPS receiver will provide location information indicating when a valid test tile is available for testing. The method follows TIA TSB-88.3-D §5.0, "Performance Confirmation" for statistical sampling.

This CATP provides an objective, quantitative method of measurement using Voyager software in conjunction with an APX 6000 portable radio for location reference, signal strength measurements and BER measurements. The SSI measurements will be for information only. The BER measurements will be for a pass/fail for the objective portion of the CATP per the RFP.

The CATP provides a subjective audio quality test by using actual equipment and simulating the required building loss with attenuators, and then performing voice test messages to determine the pass or fail of the required DAQ-3.4 voice quality. The subjective portion of the test will be for a pass/fail for the subjective portion of the CATP per the RFP.

Determine the Required Number of Test Tiles in the Coverage Area

The predicted coverage area shown on Motorola Solutions' coverage maps and service area will be divided into a tile pattern to produce at least the number of uniformly sized test locations (or tiles) required by the Estimate of Proportions formula { TSB-88.3-D, §5.2.1, equation 2}. The minimum number of test tiles required varies for different systems, from a hundred to many thousands, depending on the size of the service area, desired confidence in results, type of coverage test, and the predicted versus required reliability. Motorola's Hydra℠ coverage modeling tool calculates the required test tiles as described.

Constraints on Test Tile Sizes

The minimum tile size is 100 by 100 wavelengths; however, the minimum practical test tile size is typically about 400 by 400 meters (about 0.25 by 0.25 miles). The minimum practical tile size for any system is determined by the distance traveled at the speed of the test vehicle while sampling, GPS

error margin, and availability of road access within very small test tiles. A related consideration is the time, resources, and cost involved in testing very large numbers of very small tiles. The maximum test tile size is 2 by 2 kilometers (1.25 by 1.25 miles). In some wide-area systems, this constraint on maximum tile size may dictate a greater number of test tiles than the minimum number required by the Estimate of Proportions formula.

Accessibility to Test Tiles

Prior to testing (if possible) or during the test, Motorola Solutions and the County will determine whether any test tiles are inaccessible for the coverage test (due to lack of roads, restricted land, etc.). Inaccessible tiles will be eliminated from the acceptance test calculation; however, a minimum number of test locations must be accessed to provide a statistically valid test. This is important since all valid test tiles are part of the prediction and when tiles are removed from the proof of performance testing, the area reliability accuracy could be adversely affected. TSB-88.3-D, §5.5.4 provides consideration for inaccessible test locations called "Estimated based on adjacent grids (single grids only)." Single inaccessible test locations would be considered a "pass" if five of the eight surrounding test tiles provide passing results, provided that the CATP test tiles are defined as follows:

7. Only those test tiles where the majority of the tile falls within the boundaries of the CATP area under test.
8. Those test tiles within the CATP boundaries that are actually tested.
9. Inaccessible test tiles that are surrounded by not less than five contiguous test tiles which have been tested and show an actual passing result (untested test tiles are not counted).
10. Any other untested test tiles that do not fit any of the criteria above (e.g., untested test tiles surrounded by other untested test tiles, or less than five passed test tiles, etc.) would be categorized as simply "untested" and will not be factored into the results as a "CATP tile."

Randomly Select a Test Location within Each Tile

Using Voyager, the actual test location within each test tile will be randomly selected by the test vehicle crossing into the tile at an arbitrary point, with an arbitrary speed and direction. This will be the queue for the objective sampling test to begin. After the sample is taken for both SSI and BER, the test team will initiate the subjective voice test to determine if the test point passes the audio quality DAQ test.

Perform Measurements in Each Tile

In each test tile, a series of 200 or more sequential outbound SSI measurements (sub-samples) will be made and 2 sequential BER measurements (sub-samples) also made for Time Division Multiple Access (TDMA). This test location measurement, containing a number of sub-samples, constitutes the test sample for this location. The test sample will establish the local mean and median SSI/BER within the test tile. With this measurement, the target SSI/BER for each configuration and loss is established. The distance over which the sub-samples are measured will be 40 wavelengths. A mean of multiple SSI/BER sub-samples is used rather than a single measurement to ensure that the measurement is not biased by taking a single sample that might be at a peak or null point on the radio wave.

Determine If Each Test Tile Passes or Fails the CPC Requirement for the Objective Test

To simulate a portable with the required losses of buildings and portable configuration, the indicated net attenuation in table below is used with a portable and the mobile unity gain antenna on the test vehicle.

Both talk-in and talk-out BER tests must pass in a given tile for the grid to pass the objective test.

Net target signal strength indication – TDMA mobile

Objective Test	Mobile Faded Sensitivity (dBm) DAQ-3.4	Measured Faded Target SSI (dBm) DAQ-3.4	Net Attenuation for Mobile Antenna Loss and Delta for Talk-in/Talk-out (dB)
Outside	-112.36	-112.36	0

Net target signal strength indication – TDMA portable with RSM

Objective Test	Portable Faded Sensitivity (dBm) DAQ-3.4	Portable Faded Target SSI (dBm) DAQ-3.4	Net Attenuation for Portable Antenna and Building Loss (dB)
Outside	-109.8	-104.3	-5.5 (-8.6-1.0+4.1)[1]
20 dB bldg loss	-109.8	-84.3	-25.5 (-8.6-1.0-20.0+4.1)[1]
25 dB bldg loss	-109.8	-79.3	-30.5 (-8.6-1.0-25.0+4.1)[1]

[1] The -8.6 dB is the antenna loss figure for the APX portable at hip level in a swivel case. The +4.1 dB is the mobile antenna and transmission line that a portable does not have and thus must be added back to get the signal at the input to the test radio. The -1.0 db is for the increased antenna height of the typical test vehicle (5.0').

Determine If Each Test Tile Passes or Fails the CPC Requirement for the Subjective Test

The following tables will be used for the determining the correct net attenuation for the subjective voice quality test using TDMA. The attenuation again simulates losses that may be encountered by various urban area buildings as defined in the RFP. These net attenuations will be used for the subjective voice testing in a vehicle. In each test tile, a voice test exchange will be initiated using predetermined text typical of a common voice exchange between the fixed location and the portable location. The person conducting the test at the portable will be moving at a typical speed for the surrounding conditions. Coverage acceptance testing will be performed in the both the talk-out and talk-in direction to determine if test tile passes or fails. Both talk-in and talk-out tests must pass in a given tile for the grid to pass the subjective test.

Net target signal strength indication – TDMA mobile

Objective Test	Mobile Faded Sensitivity (dBm) DAQ-3.4	Measured Faded Target SSI (dBm) DAQ-3.4	Net Attenuation for Mobile Antenna Loss and Delta for Talk-in/Talk-out (dB)
Outside	-112.36	-112.36	0

Net target signal strength indication – TDMA portable with RSM

Objective Test	Portable Faded Sensitivity (dBm) DAQ-3.4	Portable Faded Target SSI (dBm) DAQ-3.4	Net Attenuation for Portable Antenna and Building Loss (dB)
Outside	-109.8	-104.3	-5.5 (-8.6-1.0+4.1)[2]
20 dB bldg loss	-109.8	-84.3	-25.5 (-8.6-1.0-20.0+4.1)[1]
25 dB bldg loss	-109.8	-79.3	-30.5 (-8.6-1.0-25.0+4.1)[1]

A. Determine the Coverage Area Reliability for Acceptance

After all accessible tiles in the coverage area have been tested; the coverage area reliability (percentage) will be determined by dividing the number of tiles that pass by the total number of tiles tested. The coverage test acceptance criterion for each equipment configuration is that the tested coverage area reliability must be equal to or greater than the required reliability as shown in the tables.

[2] The -8.6 dB is the antenna loss figure for the APX portable at hip level in a swivel case. The +4.1 dB is the mobile antenna and transmission line that a portable does not have and thus must be added back to get the signal at the input to the test radio. The -1.0 db is for the increased antenna height of the typical test vehicle (5.0').

1.13.5.4 Responsibilities and Preparation

This information will help set the expectations of the County and Motorola Solutions regarding requirements for equipment, personnel, and time during the coverage test.

The County will provide the following for the duration of the coverage test:

1. **Boats for testing the off shore** and Everglades (Broward County plus 10 miles off shore). This can be given to the in-vehicle team that finishes first.
2. **County representative(s)** may be provided by County at County discretion (one can be a County Consultant) for any test vehicle or for the fixed location (which may be the dispatch center).

Motorola Solutions will provide the following for the duration of the coverage test:

1. **Test teams and Vehicles for the duration of the test.** A minimum of three test teams will be provided: one team for the Everglades area, a second team for the 20 db service area and a third team for the 25 db service area. Whichever team finishes first can then test the off shore service area or the Backup service area. Motorola will provide all necessary vehicles other than the boat(s) for the water grids. Each test team shall include distinct team members as follows: (1) driver; and (2) operator of the equipment (the test kit Voyager). In addition to the foregoing, Provider will provide additional Motorola representatives or subcontractors for each of the following: (i) at the dispatch location returning DAQ calls; (ii) at a simulcast prime site monitoring inbound BER; and (iii) at the ASR site monitoring inbound BER.

2. **At least one calibrated Motorola Voyager coverage testing package** per team.

3. **Test radios for each field team** (unless required otherwise, use the delivered customer subscribers).

Coverage acceptance testing will be performed within the borders of Broward County and within the 10 miles off shore service area. Motorola Solutions has determined the minimum number of test tiles required, as described in Section 1.13.5.3 of this CATP. Motorola Solutions and the County will plan the route for the test vehicles through the coverage test area, to ensure that at least the minimum required number of tiles is tested. If possible, any tiles not accessible to the test vehicles will be identified while planning the route.

Motorola Solutions will check and/or calibrate the test radios (standard APX 6000 portables) used with the Voyager coverage testing package in the County's presence.

Motorola Solutions will conduct this test only once. If any portion of the test is determined to be unreliable because of proven equipment malfunctions or failures, Motorola Solutions will repeat the portion of the test affected by the equipment malfunction or failure. The County will have the option to accept the coverage at any time prior to completion of the coverage test.

Before starting the test, the County and Motorola Solutions will agree upon the time frame for Motorola Solutions' submission of a report containing the coverage test results.

1.13.6 CATP Procedures

1.13.6.1 Subjective Voice Quality Testing

A subjective listening test will be performed for coverage acceptance testing to verify talk-out and talk-in DAQ performance of the system.

The procedure for the subjective DAQ coverage test will be as follows:

1. To perform a statistically valid subjective DAQ test, a large group of people is required to ensure high confidence in the results. However, obtaining a large group of people for a subjective listening test is usually impractical; therefore, several (3 to 7) people in a car or van must be used for the test. Since a group this small cannot provide statistically significant results, it is very important that the personnel participating in the subjective test be familiar with the sound of radio conversations. Before subjectively testing, all personnel who will evaluate audio quality must be "calibrated" by listening to examples of static and faded audio of various CPC levels from the type of system being tested.
2. A fixed control point location will be established. Prior to testing, the County and Motorola Solutions will agree upon a procedure to allow each audio transmission to be evaluated for approximately 8 to 20 seconds.
3. The test participants will be divided into teams, each consisting of personnel from the County, Mission Critical and Motorola. Each team will have members that operate a portable unit inside the test vehicle and members that are stationed at the fixed control point location. An odd number of team members is required to avoid ties for the pass/fail consensus.
4. As the field test teams drive through the coverage areas, test locations within each tile will be selected randomly by Voyager that will be conducting the objective BER and informational SSI testing. The voice subjective test may begin after the sampling is complete. This is to prevent any possible receiver degradation to the receiver sampling the SSI/BER and to meet the TSB88 requirement of a randomly selected test point.
5. The field test unit will make a call and identify the test tile by the current x-y tile or tile cell number location and repeat one of ten phonetically balanced phrases (approximately 8 seconds in length). The fixed location unit (console) test team will then determine if the voice passes or fails the DAQ criteria as defined by the table. The fixed location will then repeat 1 of the 10 phonetically balanced phrases (approximately 8 seconds in length) and the field team will in turn determine if the voice passes or fails the DAQ criteria.
6. Test teams will only be permitted to attempt the DAQ test one time per grid. A failure of the initial test must be recorded as a failure for the grid. Multiple attempts compromise the ability to accurately capture signal reliability.
7. The tile pass/fail evaluations will be used to determine the coverage area reliability of the defined coverage areas in the table. A tile will only be counted as a pass if both the talk-in and talk-out BER test yield a passing result. A failure of either test will result in a failure for the grid.
8. Coverage acceptance will be based on demonstrating that the percentage of the tile locations, as described in the table for each equipment configuration will provide an audio quality of DAQ-3.4 or better. The system coverage acceptance criterion will be the successful passing of each of the equipment configurations.

9. Motorola Solutions reserves the right to review any test tiles that fail the subjective DAQ tests. If a failed grid is to be retested, a sufficient number of tests must be performed to accurately capture signal reliability for the grid. At a minimum, a test must be repeated 20 times within a grid, with all tests yielding a passing result, for a previously failed grid to be converted to a pass.
10. If a coverage test, or a portion thereof, is suspected by Motorola Solutions to have failed due to external interference, those tiles suspected of being affected by an interferer may be re-tested based on the criteria defined above and with the approval of Broward County. If the tiles (or test points) re-tested are confirmed to have failed due to interference, those tiles (or test points) will be excluded from all acceptance calculations and Motorola Solutions will work with Broward County to identify potential solutions to the interference issues. In this circumstance, Motorola must prove the presence of interference, and may only exclude the tiles from consideration with the approval of Broward County.

1.13.6.2 Objective SSI Informational Testing

Motorola Solutions will conduct attenuated outbound BER for the area reliabilities as shown in the table for a pass/fail test and collect the SSI for information only. Both the subjective and objective BER testing as described would be performed at the same time but evaluated independently of each other. A tile that tests above the target BER for the objective test point would not constitute a failure for the subjective testing. The reason for this is that the points are taken at different times (thus at different locations). The modeling does not predict the probability of one location against the other but predicts area reliability of all test points for each test within the test area.

1.13.7 CATP Documentation and Coverage Acceptance

During the coverage acceptance test, Voyager generates computer files that include the mean and median SSI and BER for each test tile. It also generates a comma separated values (.csv) file that documents these samples for each test point taken. A copy of this data will be provided to the County or Mission Critical at any time during the test or as required.

Motorola Solutions will process this data to determine whether the coverage test was passed for the equipment configurations and to produce a map that graphically displays the statistical coverage test results along with the analyzed numbers of the passes and failures.

Motorola Solutions will submit to the County a report detailing the coverage test results. This report will include a document, which is to be signed by both the County and Motorola, indicating the test was performed in accordance with this CATP and the results of the test indicate the acceptance or non-acceptance of the coverage portion of the system. The County will have the option to accept the coverage at any time prior to completion of the coverage test or documentation process.

1.13.7.1 Mobile/Portable Equipment Checklist

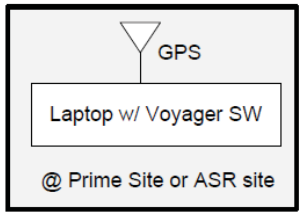
Vehicle Make:		Radio Serial No.:	
Vehicle Type:		Radio Network ID:	
Vehicle No.:		Date:	
Service Shop:		Technician:	

Note: A failure of any preliminary check will cause rejection, and the vehicle will be returned for correction before continuing the testing and installation.

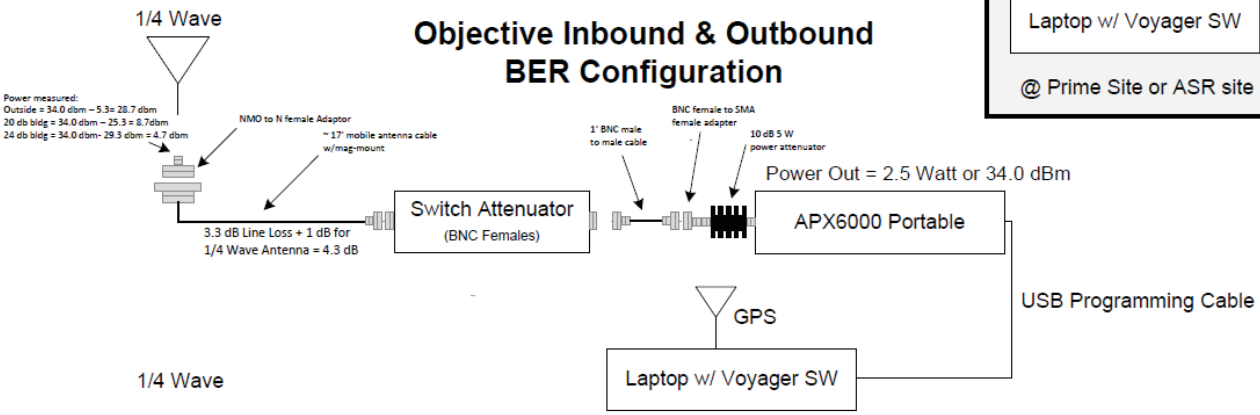
Battery Visual	**Pass**	**Fail**
1. Broken or Cracked Case		
2. Broken or Cracked Cover		
3. Acidic Odor		
4. Excessive Corrosion on Battery Posts		
5. Battery Posts Tight		
Wiring Visual	**Pass**	**Fail**
1. Wires Pinched or Damaged		
2. Wires Running Over Hot or Moving Parts		
3. Condition of Battery Ground		
4. Condition of Battery to Hot Lead		
5. Wires Run Through Firewall (grommet installed)		
Radio Check	**Pass**	**Fail**
6. Radio Mounted Securely		
7. Antenna Type (unity, 3 dBqw, etc.)		
8. Antenna Line Type and Length		
9. Antenna Installed Correctly		
10. Antenna Length Correct		
11. Tx Power Forward		
12. Tx Power Reverse (≤ 4% of Forward Power)		
13. VSWR (< 1.5:1)		
14. Tx Deviation		
15. Tx Frequency		
16. Rx Sensitivity		
17. Effective Receiver Sensitivity Degradation (refer to the Systems Engineer for maximum allowable degradation)		
Radio Software Check	**Pass**	**Fail**
18. Verify the hardware revision and model/and serial numbers (include an archive file with the software release version and personality parameters)		

Comments:

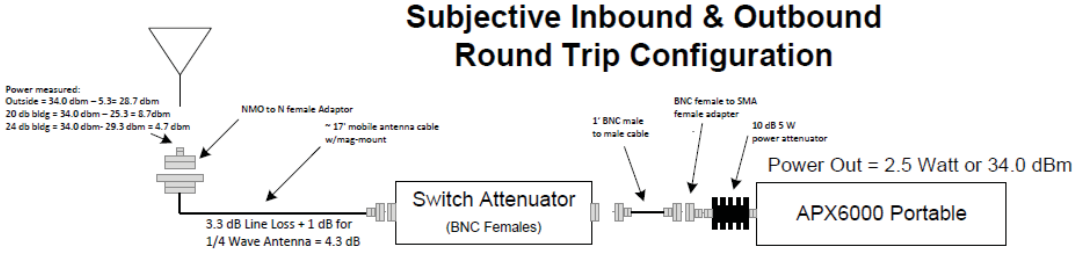
Broward County CATP



Objective Inbound & Outbound BER Configuration



Subjective Inbound & Outbound Round Trip Configuration



Broward CATP Attenuation 20 db area Calculations:
1. APX w/RSM on hip (swivel or equivalent) = -8.6 dB
2. Building Loss = -20 dB
3. 5.0' Test Antenna Height (standard sedan roof) = -1 dB
4. Mag Mount & 1/4 wave antenna = +4.3 dB
5. Net Attenuation at Receiver Input = 25.3 dB

Broward CATP Attenuation 24 db area Calculations:
1. APX w/RSM on hip (swivel or equivalent) = -8.6 dB
2. Building Loss = -24 dB
3. 5.0' Test Antenna Height (standard sedan roof) = -1 dB
4. Mag Mount & 1/4 wave antenna = +4.3 dB
5. Net Attenuation at Receiver Input = 29.3 dB

Broward CATP Attenuation street area Calculations:
1. APX w/RSM on hip (swivel or equivalent) = -8.6 dB
2. Building Loss = 0 dB
3. 5.0' Test Antenna Height (standard sedan roof) = -1 dB
4. Mag Mount & 1/4 wave antenna = +4.3 dB
5. Net Attenuation at Receiver Input = 5.3 dB

1.13.8 30-Day Operational Test

A. Provider shall perform a 30-calendar-day operational test of the system to ensure that all hardware and software defects have been corrected prior to entering final proof-of-performance testing. The fully integrated operation of the system, including all individual subsystems, shall be demonstrated during these tests. The tests shall be designed to demonstrate the reliability, long-term stability and maintainability of the systems. A failure of any critical component of the system during this test will cause the test to restart after the repair is completed. Providerand the County shall agree on what constitutes a critical failure prior to commencing this test.

B. The follow is a non-exclusive listing of items that define a critical failure:

1. System loses controller connectivity (loss of wide-area trunking or console connectivity)
2. Mobiles or portables receiving a denial or busy tone
3. More than one dispatch console operator position off the air
4. The loss of voice communications
5. The loss of data communications
6. Failure of the trunked system switch/controller
7. Greater than two (2) channel resources down, with the exception of unavoidable interference from others
8. A simulcast failure affecting one (1) or more sites or more than two (2) channels
9. Loss or failure of system configuration database
10. Loss or failure of user database
11. Systems not properly transferring to standby generator (if applicable)
12. UPS/DC plant not providing a sufficient buffer during power transfer (if applicable)
13. UPS/DC plant fails to initialize during a power transfer
14. Failures not specifically defined as minor, at the discretion of the County
15. Failures that prevent acceptance criteria from being achieved

C. Provider shall provide a 30-day operational test plan during the preliminary design phase.

When the system installation, optimization, CATP and ATP have all been completed and the system is ready for use, a 30 day operational test will be started. The details of this procedure will be discussed and agreed to by the County and Motorola Solutions during CDR. This usually involves a group of users designated by the County's user groups to begin using the system for non-mission critical operation to determine if the system appears to be operational and ready for mission critical users. During this 30 day test, the system alarms will be gathered and further evaluated at the end of the test period. The outcome of this evaluation will determine if the system is ready for users to begin using the system.

Prior to the test, a list of critical system failures will be developed and agreed upon between Motorola and Broward County. If a critical error occurs during the 30-Day Operational Test,

the error must be corrected and the test must be restarted. Acceptance will only be provided by Broward County once the system is operational for 30 days without a critical failure.

1.13.9 Preliminary Acceptance Testing

A. Prior to Radio System Preliminary Acceptance testing, the Provider shall verify and document that all equipment, hardware and software are upgraded to the latest factory revision. Multiple revision levels among similar equipment are not acceptable. The County shall be given two weeks written notice that the system is ready for final acceptance testing.

B. FATP:

1. Provider shall propose a Final Acceptance Test Plan (FATP) for the County's review and approval. Motorola must ensure that the FATP has been pre-performed and all tests have been successful before the County witnesses the official FATP. The FATP shall be signed and dated by Providerand County representatives following completion of all tests. All tests in the FATP shall be marked as either pass, fail, or pass qualify.

2. Provider shall provide all necessary technical personnel and test equipment to conduct FATP tests. All deviations, anomalies, and test failures shall be resolved at Provider's expense.

3. Failed tests shall be documented, corrected and retested. All defective components shall be replaced and retested. Defective components that cannot be corrected shall be replaced at Provider's expense.

4. Retest of individual failed FATP tests or the entire plan shall be at the County's discretion.

5. The fully executed and completed FATP document shall be provided to the County.

The FATP will essentially be the same tests that will be performed at the factory staging with additional tests that cannot be performed at the factory. The factory tests and the field /final testing will be determined and agreed to prior to contract signing. These additional tests would include the following:

1. Test all connected alarms reporting to the UEM by simulation of the sensor device.
   - Open/close contacts.
   - Disconnect serial cables reporting serial connectivity alarms.
2. DC Power System on RF sites and any new UPS on system controller sites.
3. Generator operation.
4. Complete field testing of the microwave transport using the microwave ATP.

5. Completed CATP.
6. 30 day functional test completed.

1.13.10 As-Built Documentation

At the completion of the installation phase, Provider shall provide complete as-built documentation in Microsoft Visio as outlined below:

A. Equipment provided
B. Plan and elevation drawings of all equipment, including antennas on towers
C. Cabling and terminations
D. Block and system-level diagrams
E. Fleet mapping and programming
F. Setup and alignment information
G. Successfully completed, signed and dated SATP
H. Antenna system drawings, including complete tower drawings with final tower configuration post-implementation
I. Cable matrix and punch block documentation
J. Completed R56 audits for each location

A complete set of maintenance and operations manuals shall be provided at each radio site.

Motorola Solutions will provide “As Built” documentation two times during the project. The first will be the CCSI documentation which will include the following at a minimum:

1. Completed Factory Acceptance Testing Procedure documents.
2. Complete system inventory.
3. Complete rack drawings for all sites.
4. System block diagrams.
5. Complete system software documents.

The second “As Built” documentation will consist of updated rack drawings that may have changed slightly and include items that are installed in the field that were not staged. In addition, the field documentation will add the following at a minimum:

1. Final rack locations and updated floor plans for each site.
2. Final HVAC and electrical loads for each site.
3. Antenna locations for all sites.
4. Final optimization of all equipment documentation.

A. The Provider shall submit three final and complete sets of as-built documentation in their native editable formats and PDF, including the following:

1. Documentation index
2. Field test reports, with dates and actual readings

3. Coverage test reports
4. Warranty documentation
5. Detailed list of materials for each site
6. A copy of all redline documents for each site prior to issuance of the as-built documentation
7. As-built system-level and block diagrams (in Visio format and PDF)
8. As-built site drawings, including all cabling and terminations (in Visio format and PDF)
9. Site layout drawings, as appropriate (in Visio format and PDF)
10. Tower drawings showing any new installations (in Visio format and PDF)

1.13.11 Final Acceptance

The County shall deem the System ready for Final Acceptance following successful completion and approval of the following:

A. Final design submittals
B. SATP
C. System installation
D. Final inspection and punch-list resolution
E. As-built documentation
F. FATP, including CATP
G. 30-day operational test completion
H. 60-day full-load test post-cutover
I. Training

System functional acceptance tests will be performed when the system optimization is complete. The functional acceptance tests verify the functionality tested at Factory Testing. These tests will verify the entire system in operation, including radio system roaming and subscriber affiliation. Successful completion, with open items, will constitute system acceptance. Final Project Acceptance will be granted when all items that failed any test have successfully passed each applicable test.

If deficiencies are found during the testing, both the deficiencies and resolutions to the deficiencies will be documented and agreed upon. Motorola Solutions will remain responsible for the resolution of the documented deficiencies using a punchlist as a controlling document for resolution planning.

Once the system is accepted, including final documentation, both parties will finalize the system acceptance.

1.13.12 Decommissioning

A. Following the successful cutover to the new system, Provider will be responsible for the decommissioning of the County's existing radio and microwave networks.

B. At the County's direction, decommissioned equipment shall either be discarded or taken to a location specified by the County

C. Provider will be responsible for the removal of all radio and microwave antennas, feedlines, and waveguides and associated tower mounting brackets and connectors

D. Provider shall remove all equipment and cables at each radio site.

E. Provider shall seal any entry ports for which transmission cables were removed.

F. Provider shall remove existing Gold Elite dispatch consoles and associated electronics in the dispatch center equipment rooms.

G. Provider shall remove all equipment located at the Broward County Public Safety Building, including the existing system Master Site, Prime Site, Network Management Terminals, and microwave equipment.

H. Provider shall update circuit breaker panels current circuit labeling

I. Provider shall remove UPS systems and associated transfer switches from remote radio sites

J. Provider shall remove unused equipment racks.

K. Provider shall fill any holes in the floor or ceiling from removed equipment.

FACTORY ACCEPTANCE TEST PLAN

AGENDA

- **ARRIVAL AND INTRODUCTIONS (conference room).**
- **FACTORY ACCEPTANCE TEST OVERVIEW / WHAT TO EXPECT / REVIEW FAT PLAN.**
- **SYSTEM TOUR AND FAMILIARIZATION.**
- **FACTORY ACCEPTANCE TEST (FAT)**
  (Unless otherwise specified, tests will be performed on several sites selected at the time of FAT)

  DAY 1

  1. **PERFORM A VISUAL INSPECTION AND INVENTORY EQUIPMENT.**
  2. **VERIFY SOFTWARE VERSIONS.**
  3. **VERIFY TRANSMITTER AND RECEIVER FREQUENCIES.**
  4. **VERIFY RADIO TRANSMIT POWER OUTPUT AT TOP OF RACK (TOR).**
  5. **VERIFY RECEIVER THRESHOLDS.**
  6. **VERIFY END-TO-END CIRCUIT ASSIGNMENTS AND CONTINUITY AT ALL SITES.**
  7. **PERFORM A LONG TERM BER TEST (overnight test).**

     Objective: The residual BER test shall be made under NO FADE CONDITIONS. The test period shall be 12 hours with BER not to exceed the test objective of Nx10E-12, where "N" is equal to the number of radio hops (one way).

  DAY2

  8. **CHECK LONG TERM BER OVERNIGHT TESTING.**
  9. **VERIFY TRANSMITTER AND RECEIVER SWITCH OPERATION.**
  10. **DACGE CARD TESTING: ETHERNET THROUGHPUT.**
  11. **DEMONSTRATE OPERATION OF ASSENTARIA SITE BOSS 550.**
  12. **DEMOSTRATE OPERATION OF CONFIGURATION AND MANAGEMENT TOOL (PORTAL).**
  13. **DEMONSTRATE PROVISION NMS- OPERATIONAL CAPABILITIES TO INCLUDE ALARMS REPORTING, CONTROLS FUNCTIONALITY.**

- **REVIEW FAT RESULTS AND AGREE ON "ACTION ITEMS" (conference room).**
- **DISCUSS PLANS FOR SHIPMENT (conference room).**
- **AUTHORIZATION FOR SHIPMENT. SIGN-OFF ON CERTIFICATE OF ACCEPTANCE (conference room).**

❑ FACTORY ACCEPTANCE TEST (FAT)

▫ OVERVIEW

Prior to Factory Acceptance Test, all Equipment is staged on the factory floor and connections are made to simulate network connections and system layout per System documentation. Transmission measurements are conducted between coordinating radio assemblies to assess the overall radio equipment operation. TDM channels and/or Ethernet channels are provisioned per the channel plan and each channel is tested to the specification using appropriate test sets and procedures. For all equipment, tests are conducted in accordance with recommendations stated in the appropriate product manual(s). Network Management System monitoring and control functionalities are verified using the Provision NMS provided for the system or verified using factory provided Provision NMS if NMS is not provided for the system.

▫ SCOPE OF WORK

Provider staff will perform the tests as outlined. Any exceptions, additions, or deletions will be noted in the appropriate section of the FAT document. The customer representative(s) that witnessed the FAT test process will initial each test of the master copy of FAT document upon completion of the test. The Provider representative will also initial each test as the test program progresses. The primary representative for each party will sign the Certificate of Acceptance upon completion of the tests. The signatories are stating that they have witnessed the FAT as defined in this document, and that witnessed test values were within the specification of recorded test results on factory test data forms.

▫ ETHERNET TESTING

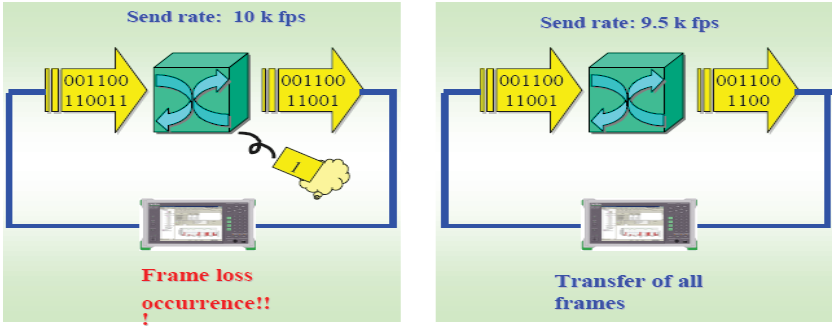
The RFC2544 Throughput Test method is used for evaluating the transfer performance of the equipment.

Throughput

Throughput is a measure of how many input frames the network equipment can transfer without dropped frames. Throughput is measured by inputting frames to the device under test (DUT) at a known rate and checking whether or not the transferred frames are lost. The input frame rate is changed to measure the maximum rate at which frames can be transferred without loss.
Here's a concrete example.

First, frames are input to the DUT at a rate of 10 k fps The DUT is not able to transfer all the input frames and part of the frames seem to be lost. In this case, the frame input frame is lowered to 9.5 k fps and the test is performed again. In this case all the frames are transferred. As a result, the DUT Throughput is evaluated as being between 9.5 and 10 K fps. Naturally, if all the frames are transferred without loss in the first test, the frame input rate is raised and the test is rerun. The frame transfer performance is measured at different rates at different frame sizes and the maximum rate at which frames are transferred without frame loss is the Throughput.

RFC2544 Throughput Measurement Method



9.5 k fps <= Throughput < 10 k fps

- **TEST FAILURE HANDLING PROCESS**

In the unlikely event that any component should fail during factory acceptance testing, or fail to meet the criteria specified to pass a specific test:

a) Where a failed component can be immediately replaced, it will be and testing will continue as per the test procedure.
b) If a system test should fail, factory engineers will be given an opportunity to remedy the problem. A re-test will then be performed

- **ACCEPTANCE CRITERIA**

A punch list of open items will be prepared.

Upon conclusion and satisfactory completion of this Factory ATP and after all punch list items have been resolved, a Certificate of Acceptance will be signed by County representative and Provider representative to certify that the equipment has been approved for delivery.



- **PRODUCT(s)**
  a) Eclipse IRU 600
  b) Asentria S550

- **REFERENCES**
  a) Instruction Manuals

- **TEST EQUIPMENT**

#	Description	Model Number*	Serial Number*	Calibration Due Date*
1	POWER METER (HP435 or Equivalent)			
2	STD POWER HEAD (HP8481A or equivalent)			
3	HI POWER HEAD (HP8481B or equivalent)			
4	LOW POWER HEAD (HP8481D or equivalent)			
5	PATH ATTENUATORS			
6	ETHERNET TESTER (SMB600B or equivalent)			
7	BER TESTERS:			
8	Other:			

*to be filled during Factory Acceptance Test

- **PROCEDURE**

1. **VISUAL INSPECTION AND INVENTORY:**
   - **1.1. Visual inspection**
     - 1.1.1. **Verify that equipment is installed per Rack Profiles.**
     - 1.1.2. **Verify labeling of racks**
     - 1.1.3.
     - 1.1.4. **Using bill of material list (Rack Build report), inventory all hardware for completeness and accuracy.**
   - **1.2. Mechanical Inspection**
     - 1.2.1. **Check that the shelves are secure and free of defects or damages.**
     - 1.2.2. **Check that all power wiring are properly secured and aligned.**
     - 1.2.3. **Check that there are no broken, bent or mis-aligned connectors.**
     - 1.2.4. **Check that there are no misaligned, dented or twisted shelves.**
     - 1.2.5. **Check that there is no broken or damaged equipment (connectors, wiring, etc.)**
     - 1.2.6. **Check that all cabling and wirings are terminated and secured in place.**
   - **1.1. Mechanical Inspection**
     - 1.1.1. **Check that the shelves are secure and free of defects or damages.**
     - 1.1.2. **Check that all power wiring are properly secured and aligned.**
     - 1.1.3. **Check that there are no broken, bent or mis-aligned connectors.**
     - 1.1.4. **Check that there are no misaligned, dented or twisted shelves.**
     - 1.1.5. **Check that there is no broken or damaged equipment (connectors, wiring, etc.)**
     - 1.1.6. **Check that all cabling and wirings are terminated and secured in place.**

RACK #	SITE NAME	VISUAL INSPECTION	MECHANICAL INSPECTION
		(√)	(√)

COMMENTS: _____

_____

INITIALS:

SYSTEMS INTG. TECH.		**CUSTOMER REP.**	

2. **VERIFY SOFTWARE VERSIONS:**
   - 2.1. **Using Sales Order Specific documents, configuration/management tool and/or Provision NMS, check software versions.**
   - 2.2. **Verify capacity license(s) and future licenses, if any.**
   - 2.3. **Record.**

SW Versions	

Part	Part Number	Description	(√)
Software License	EZE-08001	NODE SW LICENSE, 50 Mbps TOTAL RADIO PAYLOAD CAPACITY	
Software License	EZE-08006	NODE SW LICENSE, 400 Mbps TOTAL RADIO PAYLOAD CAPACITY	

COMMENTS: _____

_____

INITIALS:	SYSTEMS INTG. TECH.		CUSTOMER REP.	

3. **VERIFY TRANSMITTER AND RECEIVER FREQUENCIES:**
Using "Aviat Portal" or Provision NMS, verify that transmit and receive frequencies are programmed per requirements.

RESULTS:

RACK	SITE NAME	RADIO	TRANSMIT FREQUENCY (MHZ)			RECEIVE FREQUENCY (MHZ)		
			PROGRAMMED	TX #1	TX #2	PROGRAMMED	RX #1	RX
				(√)	(√)		(√)	(√)

COMMENTS: _____

_____

INITIALS:				
	SYSTEMS INTG. TECH.		**CUSTOMER REP.**	

4. **TRANSMIT POWER OUTPUT (TOR)**
   - 4.1. **Mute Transmitter.**
   - 4.2. **Install a wave-guide to N-type adapter to the TOR wave-guide flange.**
   - 4.3. **Connect calibrated high power head to adapter.**
   - 4.4. **Unmute transmitter.**
   - 4.5. **Measure/record Power Output at the TOR.**
   - 4.6. **Record the "Portal" reading.**
   - 4.7. **Mute Transmitter.**
   - 4.8. **Disconnect calibrated high power head and remove N-type adaptor.**
   - 4.9. **Restore RF Connection.**
   - 4.10. **Unmute the "Transmitter".**

TEST EQUIPMENT: POWER METER, HIGH POWER HEAD

REQUIREMENT:

					Transmitter Power Output (dBm)[x]	
Freq Band (GHz)	*Modulation (QAM)*	*Capacity (Mbps)*	*BW (MHz)*	*STD/HIGH*	*NP*	*HSB TX #1&#2*
6	128	157 (OC3)	30	HIGH	≥ +30.5	≥ +30.1
6	64	40 (25T1's)	10	HIGH	≥ +31.5	≥ +31.1

* Guaranteed at antenna flange port of ACU for "Maximum System Gain". Deduct 0.1dB for each piece of WG Extension/Expansion kit

RESULTS:

RACK	SITE NAME	RADIO	TX #1 (DBM)			TX #2 (DBM)			(√)
			SPEC	MEASURED	PORTAL	SPEC	MEASURED	PORTAL	

COMMENTS: _____

_____

INITIALS:

SYSTEMS INTG. TECH.		CUSTOMER REP.	

5. **RECEIVER THRESHOLD**
   - 5.1. **Connect path simulator between coordinating racks.**
   - 5.2. **Calibrate path simulator over the dynamic range and note the attenuator settings vs. Received Signal Level (RSL) at TOR.**
   - 5.3. **Fade the path until BER reading is 1X10-6.**
   - 5.4. **Record the measured value.**
   - 5.5. **Repeat for other units under test.**

TEST EQUIPMENT: BER TESTER, LOW POWER HEAD, PATH SIMULATOR

REQUIREMENT:				**Threshold[x] (dBm) @ BER = 1 x10^{-6}**		
Freq Band (GHz)	***Modulation (QAM)***	***Capacity (Mbps)***	***BW (MHz)***	***NP/SD/FD***	***MHSB-Uneq RCVR # 1***	***MHSB-Uneq RCVR # 2***
6	128	157 (OC3)	30	≤ – 72.00	≤ – 71.90	≤ – 65.0
6	64	40 (25T1's)	10	≤ – 79.25	≤ – 78.15	≤ – 72.15

* Guaranteed at antenna flange port of ACU for "Maximum System Gain". Deduct 0.1 dB for each piece of WG Extension/Expansion kit.

RESULTS:

RACK	SITE NAME	RADIO	COORD.	RCVR #1 (DBM)		RCVR #2 (DBM)		
				SPEC	MEASURED	SPEC	MEASURED	(√)

COMMENTS: _____

_____

INITIALS:			
SYSTEMS INTG. TECH.		**CUSTOMER REP.**	

6. **END-TO-END CIRCUIT ASSIGNMENTS PER CHANNEL PLAN AND CONTINUITY AT ALL SITES.**
   - 6.1. **Connect Ethernet testers to the circuit under test.**
   - 6.2. **Check end-to-end IP circuit continuity.**

TEST EQUIPMENT: Ethernet TESTER.

REQUIREMENT: Traffic continuity per channel plan.

Passed: **Yes____** **No____**

COMMENTS: _____

_____

INITIALS:	**SYSTEMS INTG. TECH.**		**CUSTOMER REP.**	

7. **LONG TERM BER TEST**
   - 7.1. **Restore all connections.**
   - 7.2. **Set RF paths to nominal level (about –45 dBm TOR RSL).**
   - 7.3. **Set PORTAL BER counter for the circuit(s) under test.**
   - 7.4. **Run the test for at least 12 HRS.**

TEST EQUIPMENT: INTERNAL BER TESTER

CIRCUIT #	DATE/TIME

COMMENTS: _____

_____

INITIALS:	**SYSTEMS INTG. TECH.**		**CUSTOMER REP.**	

END OF DAY1

8. **LONG TERM BER TEST RESULT**
   - 8.1. **Check BER result for bit error(s) and bit-error-rate. There should not be any other error(s), i.e. SL, FL.**
   - 8.2. **Record results**

REQUIREMENT: Nx10E-12 where "N" is equal to the number of radio hops.
(For a single radio hop for 12 hours 28DS1s connected in tandem, there should be no more than 3 errors for a BER of 10E-12).

RESULT:

CIRCUIT #	DURATION	ERRORS	BER	DATE/TIME

Passed: **Yes____** **No____**

COMMENTS: _____

_____

INITIALS:	**SYSTEMS INTG. TECH.**		**CUSTOMER REP.**	

9. TRANSMITTER/RECEIVER SWITCH OPERATION

9.1. Using Portal or Provision NMS, mute on-line transmitter or switch to off-line transmitter.
9.2. Observe switching to the other transmitter.
9.3. Restore to normal operation.
9.4. Using Portal or Provision NMS, switch to off-line RAC.
9.5. Observe switching to the other receiver.
9.6. Using Portal or Provision NMS, switch to off-line DAC.
9.7. Observe switching to the other receiver.
9.8. Restore to normal operation.

TEST EQUIPMENT: BER TESTER

REQUIREMENT: Traffic continuity after switching occurs.

NODE(S) TESTED: _____

Passed: **Yes____** **No____**

COMMENTS: _____

_____

INITIALS:				
	SYSTEMS INTG. TECH.		**CUSTOMER REP.**	

10. DAC GE CARD – ETHERNET THROUGHPUT TESTING

10.1. This test would attempt to find the highest rate at which the DUT can forward frames without a loss. It uses simple algorithm to choose rates between the previous rate and a new rate; if a port drops frames, it throttles to a lower rate, and if a port doesn't drop any frame, then it throttles to a higher frame. For throughput test, the following parameters will be used:

10.1.1. **Initial rate of 100% of maximum DUT Data rate**

10.1.2. **Maximum rate of 100% of maximum DUT Data rate**

10.1.3. **Minimum rate of 50% of maximum DUT Data rate**

10.2. Run test for 64 to 1518 packet sizes

10.3. Record results

Frame size used (byte)	Typical Expected Throughput	Passed Rate	Packets/Sec
64	≥ 92%		
1518	≥ 92%		

PASS if the throughput for each packet size is consistent with the allocated bandwidth, FAIL otherwise (*There is no PASS / FAIL criterion for RFC2544*).

TEST EQUIPMENT: ETHERNET TESTER

REQUIREMENT: Typical Expected Throughput is ≥ 92% of allocated bandwidth.

Passed: **Yes____** **No____**

COMMENTS: _____

_____

INITIALS:	**SYSTEM INTG. TECH.**	**CUSTOMER REP.**

11. **ASENTRIA S550**

11.1. Verify set-up and configuration.

11.1. Verify operation of relays.

NODE(S) VERIFIED: _____

11.2. Verify operation of digital inputs.

NODE(S)/DIGITAL INPUT(S) VERIFIED: _____

Passed: **Yes____** **No____**

COMMENTS: _____

_____

INITIALS:	**SYSTEMS INTG. TECH.**		**CUSTOMER REP.**	

12. **CONFIGURATION AND MANAGEMENT**

Demonstrate operation of PC based configuration and diagnostics tool "PORTAL":

12.1. **Verify configuration functionality.**

12.2. **Verify control functionality.**

12.3. **Verify alarm reporting capabilities.**

12.4. **Demonstrate diagnostic futures.**

Passed: **Yes____** **No____**

COMMENTS: _____

_____

INITIALS:	**SYSTEMS INTG. TECH.**		**CUSTOMER REP.**	

13. **PROVISION NMS**

13.1. **Verify set-up and configuration of Provision NMS.**

13.2. **Verify IP addresses and IP connectivity of NEs by causing alarms or pinging.**

13.3. **Verify NMS system interoperation:**

13.3.1. **Generate events in the NE(s) and observe results in NMS.**

NODE(S)/EVENT(S) VERIFIED: _____

_____

_____

13.3.2. **From NMS, change the configuration of NE(s). Verify the change. Put NE back to original configuration.**

NODE(S)/CONFIGURATION(S) VERIFIED:

_____

_____

Passed: **Yes____** **No____**

COMMENTS: _____

_____

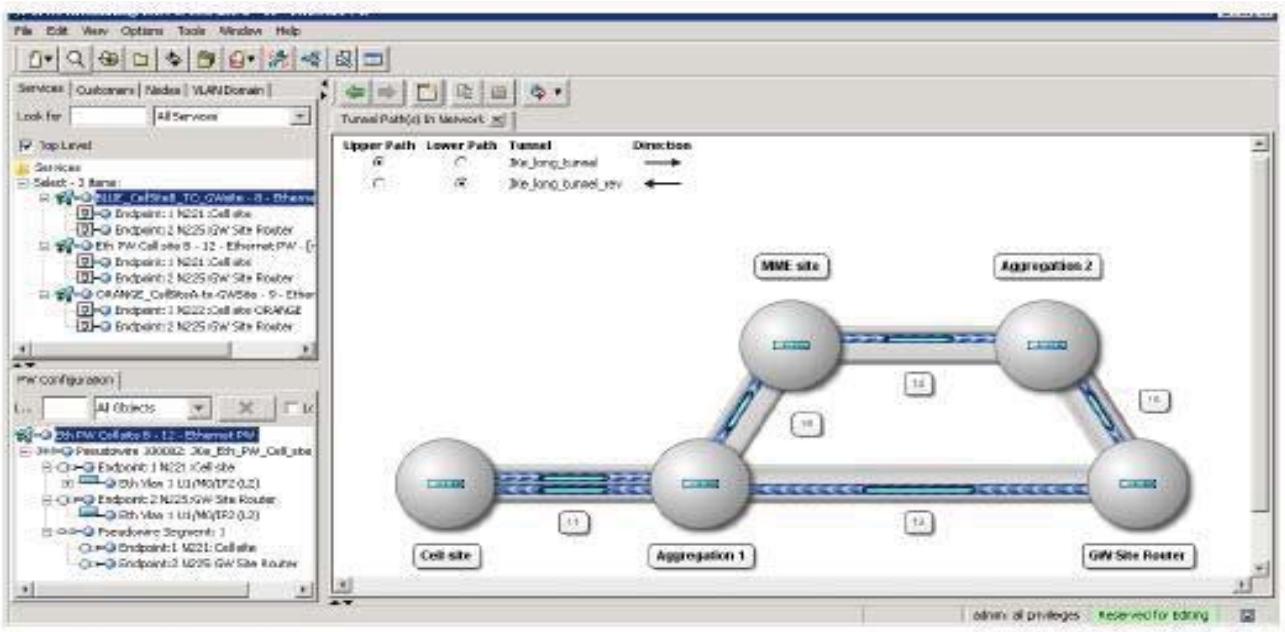
INITIALS:				
	SYSTEMS INTG. TECH.		**CUSTOMER REP.**	

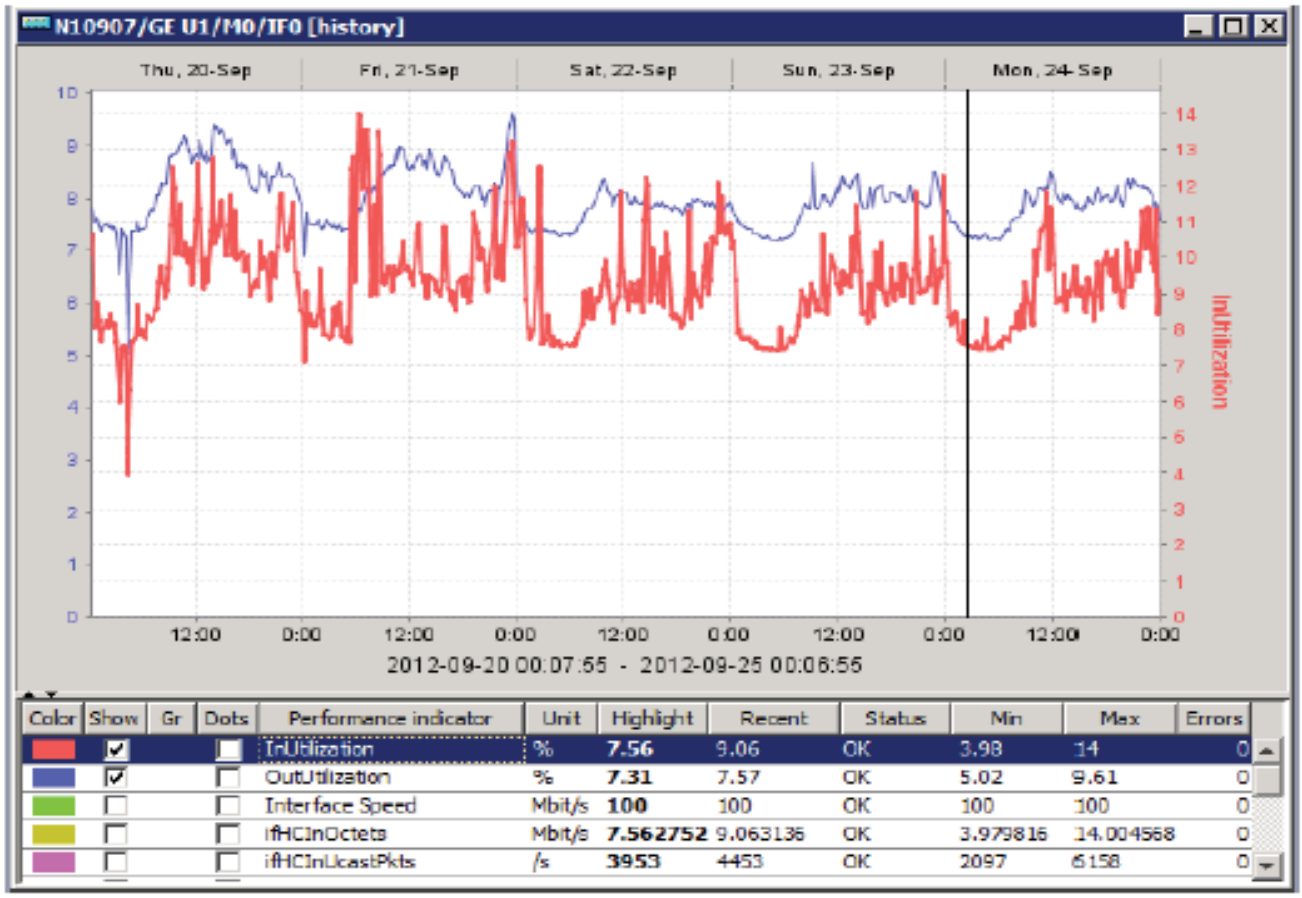
14. Verify redundant routing via MPLS (in addition to loop protection)

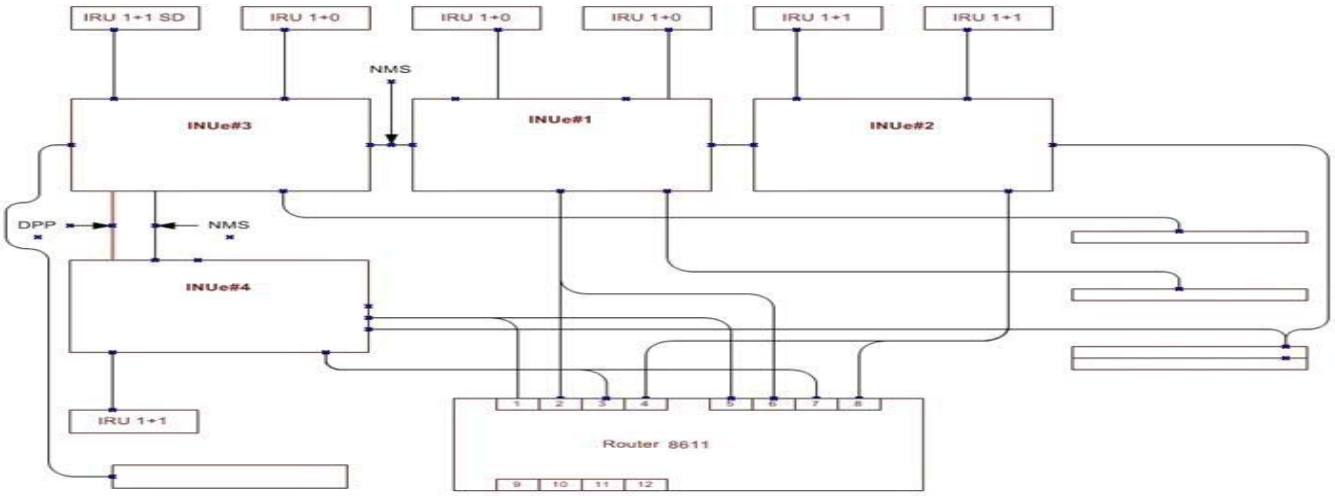
- **CTR 8611 ROUTER**
  - Verify set-up and configuration.
  - Program host name and password.
  - Enable SSH.
  - IP interface configuration per IP plan.
  - OSPF configuration, flat area 0.
  - BFD for OSFP enabled between all MW router connections.
  - QoS
  - MPLS L3VPN.
  - MPLS PW
  - Verify static routes in VRF between site router and MW router.
  - Configure Static LAG configuration between router and DAC GEv3.
  - Ping between MW routers to verify global connection.
  - Ping between site routers to verify VRF connections.
  - Sample RFC 2544 test between selected remote sites and Primary Site.
  - Redundant Power supply verification.






MME site
Aggregation 2
Cell site
Aggregation 1
GW Site Router


N10907/GE U1/M0/IF0 [history]
Thu, 20-Sep
Fri, 21-Sep
Sat, 22-Sep
Sun, 23-Sep
Mon, 24-Sep
InUtilization
2012-09-20 00:07:55 - 2012-09-25 00:06:55
Color Show Gr Dots Performance indicator Unit Highlight Recent Status Min Max Errors
InUtilization % 7.56 9.06 OK 3.98 14 0
OutUtilization % 7.31 7.57 OK 5.02 9.61 0
Interface Speed Mbit/s 100 100 OK 100 100 0
ifHCInOctets Mbit/s 7.562752 9.063136 OK 3.979816 14.004568 0
ifHCInUcastPkts /s 3953 4453 OK 2097 6158 0



Generic 8611 Router, IRU 600 Diagram

Test #	Site Name (s)	Comments	(√)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

- **Passed:** **Yes____** **No____**
- **COMMENTS:** _____
- _____

INITIALS:

SYSTEMS INTG. TECH.	

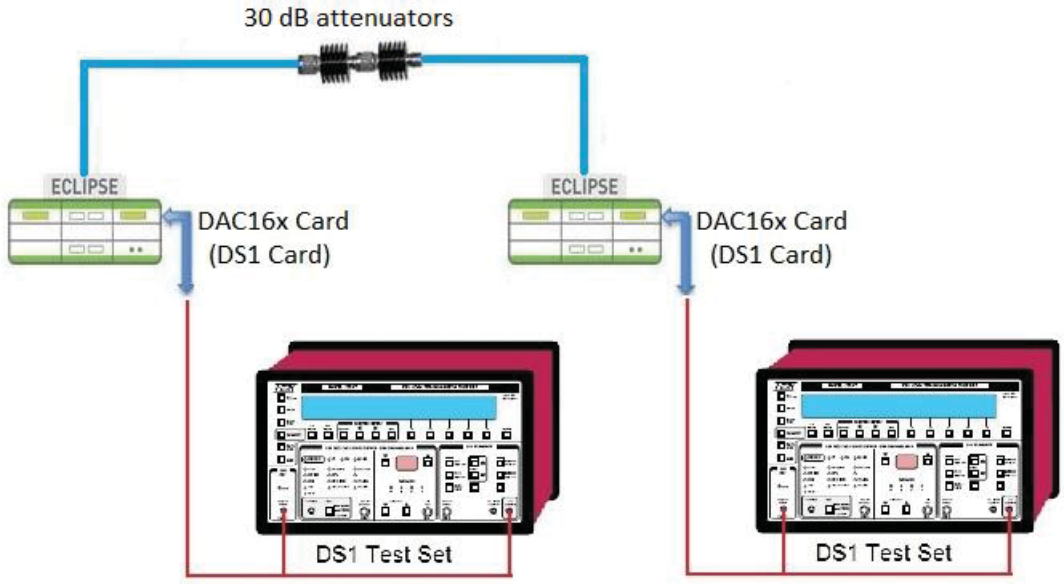
CUSTOMER REP.	

15. Verify T1 interface and throughput

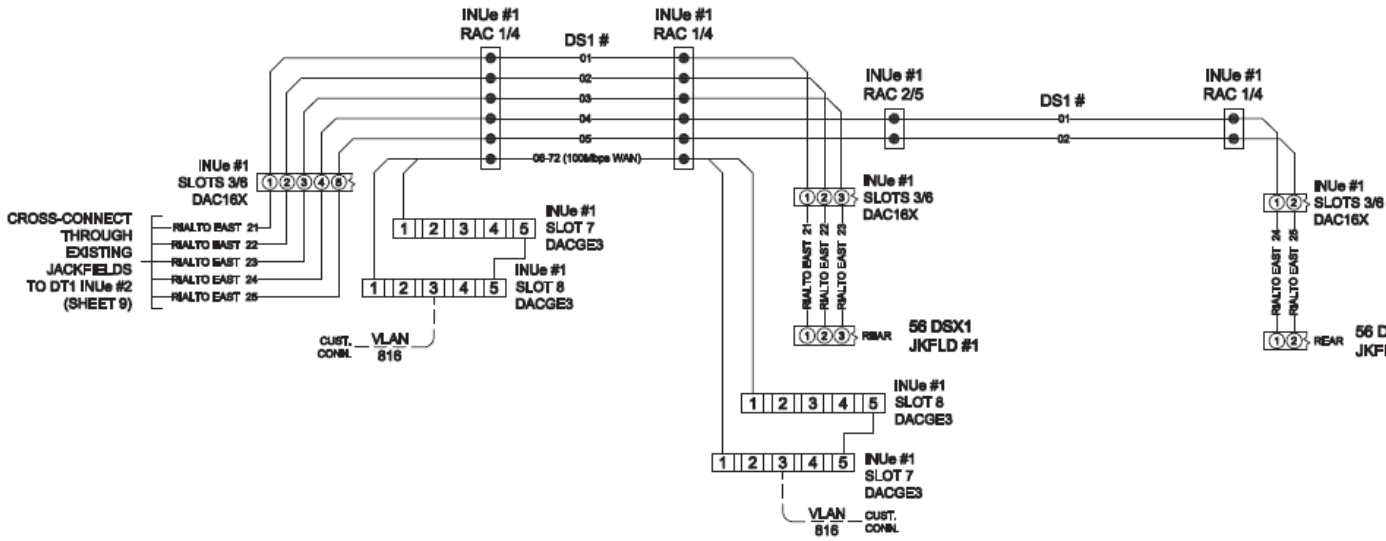
- **END-TO-END CIRCUIT ASSIGNMENTS PER CHANNEL PLAN AND CONTINUITY CHECKS**
  - Verify programming of circuits per channel plan/system documents.
  - Determine the termination points of the circuit.
  - Connect one BER tester to one end of the circuit
  - Connect another BER tester to the other end of the circuit.
  - Reset the test sets and verify error-free traffic.
  - If the circuit is protected, switch traffic to opposite direction
  - Reset the test sets and verify error-free traffic.
  - Repeat for the remaining circuits.

TEST EQUIPMENT: BER TESTER.

REQUIREMENT: Traffic continuity per channel plan.



Note: Hard copy of the Traffic Plan will be available during FAT.



Results:

From Site	To Site	Comments	√

Passed: **Yes____** **No____**

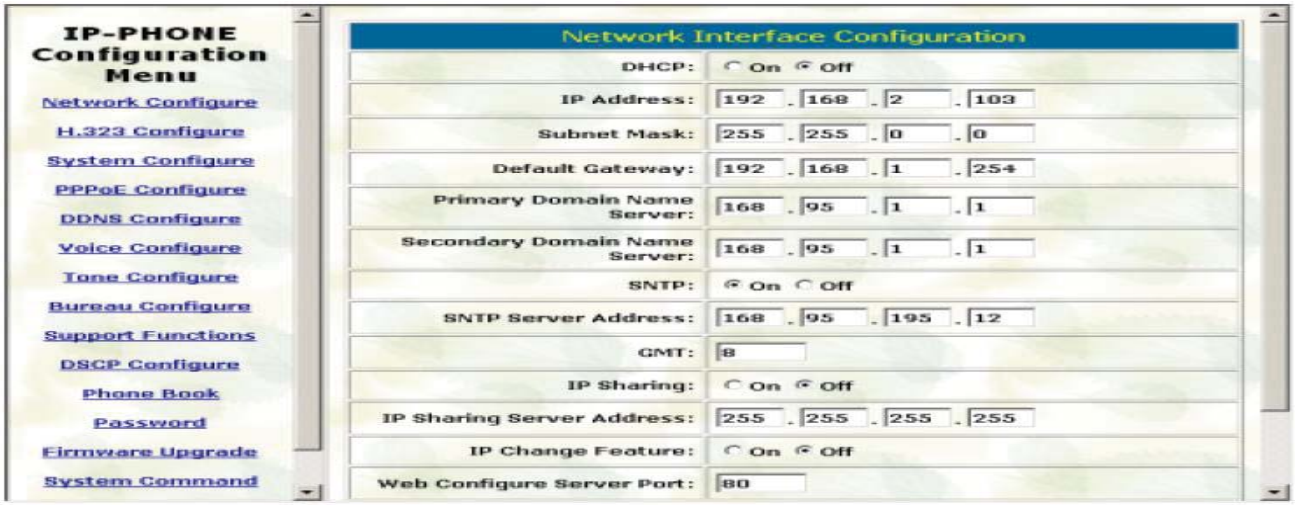
COMMENTS: _____

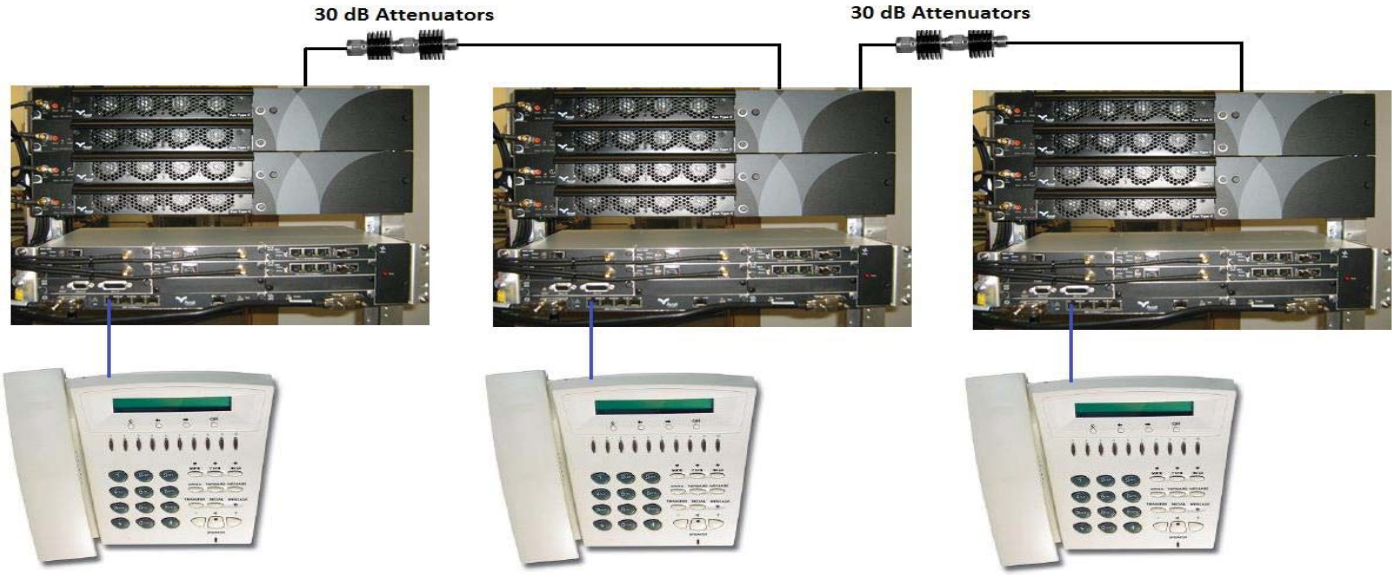
_____

INITIALS:

SYSTEMS INTG. TECH.		**CUSTOMER REP.**	

16. **VoIP PHONE (LP201)**
    - **16.1.** Verify set-up and configuration of IP Phones.
    - **16.2.** On the first IP phone, dial the second phone by its IP address (eg 10*11*12*13 to call a phone with the IP address 10.11.12.13). A ring tone should be heard from the dialed phone.
    - **16.3.** A second person is to answer the ringing IP phone and ensure clear, two-way conversation is possible. Hang up both ends to end the call.
    - **16.4.** Repeat the procedure in the opposite direction.
    - **16.5.** Record a pass result if dialing, ringing and clear two way speech is achieved in both directions.





Results:

RACK ID	Site Name	IP ADDRESS	DIALING	TALKING/RECEIVING
		(√)	(√)	(√)

REQUIREMENT: Pass if dialing, ringing and two-way communication is successful, fail otherwise.

Passed: **Yes____** **No____**

COMMENTS: _____

_____

INITIALS:

SYSTEMS INTG. TECH.		CUSTOMER REP.	

17. VERIFY PROTECTION SWITCHING.

17.1. Using Portal mute on-line transmitter or switch to off-line transmitter.
17.2. Observe switching to the other transmitter.
17.3. Restore to normal operation.
17.4. Using Portal, switch to off-line RAC.
17.5. Observe switching to the other receiver.
17.6. Using Portal, switch to off-line DAC.
17.7. Observe switching to the other receiver.
17.8. Restore to normal operation.
17.9. Using Portal, switch from Primary to Secondary "Rx Source Lock".
17.10. Verify that traffic did not take hit during this process.
17.11. Using Portal, switch from Secondary to Primary "Rx Source Lock".
17.12. Verify that traffic did not take hit during this process.
17.13. Turn off NPC and observe that INU operates on NCC only
17.14. Turn on NPC. Verify that INU operates on NCC and NPC

17.15. Turn off NCC and observe that INU operates on NPC only, with no reset or power-off
17.16. Turn on NCC.

TEST EQUIPMENT: BER TESTER

REQUIREMENT: Traffic continuity after switching occurs.

Results:

RACK ID	Site Name	Radio #	(√)				
			DC POWER	TX	RX	RAC	DAC

Passed: **Yes____** **No____**

COMMENTS: _____

_____

INITIALS:

SYSTEMS INTG. TECH.		CUSTOMER REP.	

18. Include testing of radio traffic running across links for all tests

Microwave link traffic is tested in staging by simulating the microwave path using transitions, attenuators, and cables. These will be in place to test traffic end-to-end across all links in a ring configuration.

The Microwave Radio traffic is tested during T1, Ethernet, and MPLS Testing Procedures as outlined.

19. Include testing of radio traffic running over T1 links

Microwave T1 traffic is tested on the T1s using BER test sets. Testing shall be conducted using actual channel banks to simulate real world traffic but as the current design does not include any T1 channel banks or other equipment to interface with the T1s. This equipment shall be provided to configure and test along with the microwave links. T1s are tested end-to-end as well.

Field Acceptance Test Plan

INTRODUCTION

1.1. Purpose of Document

Provider will provide for the installation and commissioning of a new digital microwave radio system for County. The purpose of this document is to outline a method of procedure to be used to test the County's Digital Microwave System at the hop level as well as at the System level.

1.2. Responsibilities

Provider will perform the testing of all microwave radios and associated ancillary or supporting equipment. Upon successful completion of the Field ATP, the County will sign off on the successful completion of the Field Acceptance Test.

1.3. System Description

In this system, the following equipment is to be tested following installation:

- Eclipse IRU600 V3
- Eclipse INUe/NTUe
- Antenna Systems
- DC Power System

1.4. Reference Drawings and other Documents

The following documents will be used during the testing and will be supplied by Provider subject to prior approval by County:

- Eclipse IRU600 User Manual
- System Layout Drawings
- Path Calculations
- Frequency Coordination Sheets
- Rack Profile Drawings
- Site Specific Diagrams
- Statement of Work
- OEM User Manuals
- Factory Test Data Sheets
- Installation Specification

TEST EQUIPMENT

Provider will have a laptop PC with the Eclipse Portal software available on-site when performing the outlined test procedures in this document. This provides access to the Eclipse radio's on-board diagnostics and real-time performance monitoring tools.

All test equipment will have a current Calibration certification, if applicable.

- Digital Volt Meter - Measures rack DC voltages.
- Clamp on ground tester (AEMC 3711 or equivalent) – Measure ground resistance
- RF Power Meter (*HP435 or equivalent*) - Measures transmitter output power.
- STD Power Head (*HP8481A or equivalent*) - Used in conjunction with the RF Power Meter.
- Hi Power Head (*HP8481B or equivalent*) - Used in conjunction with the RF Power Meter.
- Low Power Head (*HP8481D or equivalent*) - Used in conjunction with the RF Power Meter.
- Variable Attenuator with SMA connectors – Used to perform the Receiver threshold test.
- Bit Error Rate Tester – Measures the BER.
- Ethernet Tester capable of performing RFC2544/1242/4689 Test – Measures the Ethernet performance.

#	Description	Manufacturer*	Model Number*	Serial Number*	Calibration Due Date*
1	**Digital Volt Meter**				
2	**RF Power Meter (HP435 or**				

	Equivalent)				
3	**STD Power Head (HP8481A or equivalent)**				
4	**HI Power Head (HP8481B or equivalent)**				
5	**LOW Power Head (HP8481D or equivalent)**				
6	**Variable Attenuator**				
7	**Bit Error Rate Tester**				
8	**Ethernet Tester (SMB600B or equivalent)**				
9	**Ground Resistance Tester**				

* Details to be completed on site.

TESTING

3.1. Field Test Plan Overview

Equipment and System Field Testing is conducted on all Provider-supplied equipment and other ancillary equipment to demonstrate compliance with product and contract specifications.

Equipment and System Testing consists of three (3) phases:

- Inspection/ Station Test
- Hop Test
- System Test

3.2. Station Test

Upon completion of the system installation, the first phase of the Equipment and System Testing commences. This test phase verifies all site and equipment grounding as well as all Provider equipment installation and rack wiring. All work must be done in accordance with industry best practices:

3.2.1. Grounding Inspection

Use the following instructions to perform the Grounding Inspection and record the results in the corresponding fields on the Station Test sheet for each site:

3.2.1.1. Verify continuity of ground wires on the indoor equipment and their bonding by measuring from a reference ground conductor (such as the master ground bar). Measurement should be less than 1 ohm

3.2.1.2. Verify the site/tower ground is implemented properly. Measurement should be less than 5 ohms.

3.2.1.3. Verify ground connections on equipment and rack are properly fastened and the system is grounded to an appropriate ground point(s). The ground connection should measure less than 1Ω when using a clamp-on ground tester.

3.2.2. Equipment Inspection

Use the following instructions to perform the Equipment Inspection and record the results in the corresponding fields on the Station Test sheet for each site:

3.2.2.1. Perform an inventory check on all hardware using the Inventory Checklist found in the installation spec.

3.2.2.2. Perform a visual inspection of the antennas and waveguide routing outside the equipment shelter or on the antenna mounting structure/tower for proper installation and quality of workmanship.

3.2.2.3. Perform a visual inspection of the waveguide routing inside the equipment shelter for proper installation, bending, labeling and quality of workmanship.

3.2.2.4. Perform a visual inspection of the rack, floor mounting and supporting hardware for proper installation of the equipment, mechanical correctness and quality of the workmanship.

3.2.2.5. Perform a visual inspection of all installed rack circuit breakers for correct sizes and positions. Refer to the Sales Order Summary (SOS).

3.2.2.6. Perform a visual inspection of all installed equipment and cabling in the rack (including wall mounted equipment and dehydrators) for proper installation, mechanical correctness and quality of the workmanship. Refer to Rack Profiles (RP), System Block Diagrams (SBD) and Sales Order Summary (SOS).

3.2.3. DC Power System Test

This test procedure will verify proper operation of the DC Controller, Rectifiers and verify all Battery cells are good. Use the following instructions to perform the DC power system test for each new DC power system installed and record the results in the corresponding fields on the DC system test sheet.

3.2.3.1. Rack Installation Inspection

- *Verify the new DC power system is installed per the SOW and installation instructions.*
- *Verify the rack is secured.*

3.2.3.2. Measure and record the following using a DVM.

- *Measure the AC input voltage.*
- *Verify the AC input breakers for the rectifiers.*
- *Measure the DC float voltage.*
- *Compare and verify the measured float voltage to that on the charge display.*
- *Record the DC current load of the equipment.*
- *Verify the load transfer from charger to batteries and back to charger.*
- *Verify redundant operation by turning off one rectifier and note that the system continues to operate. Re-energize the rectifier and note that the system returns to redundant operation. Repeat for each installed rectifier module.*
- *Verify charger alarms are connected correctly to the alarm block.*
- *Measure the voltage of each battery cell and record the cell voltages.*

3.2.3.3. Record the battery bank reserve time

- *At the end of the station tests remove AC power to the DC power system*
- *Record the time that the power was disconnected*
- *Leave the equipment operating normally*
- *Monitor ProVision and record the time when ProVision reports alarms due to the equipment shutdown.*
- *The batteries must support the equipment for a minimum of 8 hours.*

Note: The sites must be tested sequentially to avoid isolating a site from ProVision monitoring.

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3.2.4. Dehydrator Test

Use the following instructions to test the dehydrator for each site and record the results in the corresponding fields on the Hop Test sheet.

3.2.4.1. Verify alarms on the Dehydrator.

- *Only perform this test if the system has been designed to support dehydrator alarm reporting.*
- *Verify that all the dry contact alarm connections on the dehydrator has been installed properly and in accordance with the manufacturers recommended setup instructions.*
- *Using a DVM, verify the state of the relay (NO or NC) under no alarm condition.*
- *Create a Power Fail alarm condition on the relay under test by turning the power off at the switch and verify the change in the relay state with the DVM.*
- *Restore power and observe that the alarm clears.*
- *Open the unused manifold ports and verify that the low pressure alarm occurs when the pressure drops below 1 psi. Note the time that the compressor starts to run.*
- *Leave the ports open and allow the compressor to run. After ten minutes of run time the compressor run time alarm will activate.*
- *Close the ports and observe that the alarms clear when the system regains pressure and the compressor cycles off.*
- *Restore configuration to the original settings once completed.*
- *If the dehydrator has been configured to report alarms through SNMP, confirm operation of the alarms through the ProVision Test.*

3.3. Hop Test

Upon completion of the Station Tests, the second phase of the Equipment and System Testing commences. This test phase verifies all Provider equipment operation including alarm and control points, DC power, and Provider provided OEM equipment, as applicable:

3.3.1. Microwave Equipment Test

Use the following instructions to perform the Microwave Equipment Test for each rack and record the results in the corresponding fields on the Hop Test sheet:

3.3.1.1. Verify the redundancy of the power supply if the INU is fitted with the Node Protection Card (NPC). Power protection switching is hitless.

- *Ensure that the Eclipse INU is powered up.*
- *Ensure that the NCC and NPC Status LED are green. The NPC Protect LED should be unlit.*
- *Disconnect the -48Vdc supply from the NCC and remove the NCC card from the chassis. Eclipse should not lose power.*
- *Power is now provided by the NPC. The NPC Protect LED should now be lit.*
- *Re-insert the NCC card and power to the NCC.*

3.3.1.2. Verify INU IP Address as per the NMS Plan and the Sales Order Summary (SOS).

- *Using Provider Portal/ProVision software, log into the INU using the assigned IP Address.*
- *Verify the Portal/Networking page has been configured correctly and proper IP addresses, subnet masks, OSPF/RIP settings, DHCP Server settings, static routing and trap destinations has been assigned where applicable.*

3.3.1.3. Verify INU and RFU firmware versions.

3.3.1.4. Record Transmitter (Tx) and receiver (Rx) ACU Insertion Losses are configured as per the labels on the ACU units.

3.3.2. IRU Transmit Power Output Test

Use the following instructions to perform the IRU Transmit Power output Test for each microwave radio and record the results in the corresponding fields on the Hop Test sheet:

Verify Transmitter (Tx) Power Output. Refer to the Eclipse/IRU600 Transmitter output power specification datasheet for the expected Tx output power level as per modulation configuration of the RFU/ODU under test.

- *Zero out and calibrate the power meter and set correct power factor setting for the frequency band under test.*
- *Attach a 20dB attenuator to the power sensor and enter it's attenuation as the Power Meter offset.*
- *Remove the ACU front panel cover of the IRU600 shelf.*
- *In the Portal Diagnostics/System/Controls screen, send a Tx mute to the RFU under test.*
- *Disconnect the RFU Tx output cable and connect the power sensor (with 20dB attenuator) to the RFU Tx output.*
- *In the Portal Diagnostics/System/Controls screen, turn off Tx mute and click send.*
- *Tx power setting can be adjusted in the Portal radio plug-in screen in 0.1 dB steps. Tx power output accuracy is +/- 2dB.*
- *Compare the measured Tx output power to the Detected Tx power displayed in Portal.*
- *To measure the Tx output level of the Diversity radio, send a Tx protection switch to the secondary radio using Portal. Repeat steps 4 to 9 above.*
- *To return to the original setup, mute the Tx, disconnect the power sensor, restore the Tx output cables and unmute the Tx.*

3.3.3. IRU Receive Signal Level (RSL) Test

Use the following instructions to record the IRU RSL for each microwave hop and record the results in the corresponding fields on the Hop Test sheet:

Verify Receiver (Rx) Received Signal Level (RSL).

- *Measure the top of rack (TOR) RSL at receiver filters output with the power meter.*
- *Compare RSL TOR to path calculation datasheet.*
- *Compare RSL measurement to the RSL level measured by Portal. On protected terminals repeat for standby radio.*
- *Measurement must be within +/- 2dB of calculated value.*

3.3.4. IRU Receiver Threshold (Fade Margin) and Interference Test

Use the following instructions to perform the IRU Receiver Fade Margin and Interference Test for each microwave hop and record the results in the corresponding fields on the Hop Test sheet:

3.3.4.1. Verify Receiver (Rx) Threshold (fade margin). Refer to the Eclipse/IRU600 Receiver Specification datasheet for the expected Rx threshold level as per modulation configuration of the RFU/ODU under test.

- *Measure insertion loss (Idb) of calibrated variable attenuator equipped with SMA cables at minimum attenuation.*
- *In the Portal Diagnostics/System/Controls screen, send a Tx mute to the RFU under test.*
- *Insert variable attenuator assembly between the transceiver Tx out and the Tx filter.*
- *In the Portal Diagnostics/System/Controls screen, turn off Tx mute and click send.*

- *Connect the BER tester to a DS1 port looped back at the far end site and check DS1 continuity and absence of errors.*
- *Increase variable attenuator down to 10^{-6} BER and note attenuation (AdB).*
- *Calculate fade margin (dB): FM = AdB (attenuation) + IdB (insertion loss)*
- *Repeat test inserting the variable attenuator between the transceiver Tx out and the Tx filter.*
- *Compare to margin given in the path calculation sheets. On protected terminals, repeat for standby radio.*

☐ *Margin must be +/- 2dB from calculation.*

3.3.4.2. Verify the absence of Interference. Refer to the Eclipse/IRU600 Receiver Specification datasheet for the expected Rx threshold level as per modulation configuration of the RFU/ODU under test.

- *In the Portal Diagnostics/System/Controls screen, initiate a Tx mute to the far end RFU under test.*
- *Note the RSL level measured by Portal.*
- *Restore configuration to original settings.*

☐ *RSL reading, if any, should be below the 10^{-3} BER threshold of the radio.*

Note: The RSSI filter is 56 MHz wide. The Portal RSL reading may indicate an on-path adjacent channel signal that is not an interference signal. A true interference signal would cause degradation in performance at low RSL levels and result in a 10^{-6} BER threshold degradation. If the 10^{-6} BER threshold in step 3.3.5.1 is met, there is no interference on the path.

3.3.5. Transmitter/Receiver Switching Test

Use the following instructions to perform the Transmitter and Receiver Switching Test of protected terminals for each microwave hop and record the results in the corresponding fields on the Hop Test sheet:

3.3.5.1. Verify Transmitter (Tx) switching when online Tx is removed or fails. Note that Tx switching is not hitless but traffic continuity should be observed after the switch.

- *Connect the BER tester to a DS1 port looped back at the far end site and check DS1 continuity and absence of errors.*
- *In the Portal Diagnostics/System/Controls screen, send a Tx mute to the RFU under test or switch to the off-line transmitter.*
- *Verify switching to other transmitter was successful.*
- *Verify traffic continuity.*
- *Restore configuration to original settings.*

3.3.5.2. Verify Receiver (Rx) switching when source Rx is removed or fails. Note that Rx switching is hitless and traffic continuity should be observed after the switch.

- *Connect the BER tester to a DS1 port looped back at the far end site and check DS1 continuity and absence of errors.*
- *In the Portal Diagnostics/System/Controls screen, switch to the off-line transmitter or remove the on-line RAC card from the chassis.*
- *Verify switching to other receive was successful.*
- *Verify traffic continuity and the absence of BER errors.*
- *Restore configuration to the original settings once completed.*

3.3.6. Ethernet Test

Use the following instructions to perform the Ethernet Throughput and Latency Test for each microwave hop and record the results in the corresponding fields on the Hop Test sheet.

- RFC2544 Throughput Testing
- RFC2544 Latency Testing
- RFC2544/RFC1242 Frame Loss Testing

3.3.6.1. Verify RFC2544 Throughput on the system.

- *Verify the microwave equipment is configured as per the SOS.*
- *Configure the Ethernet test set profile to perform RFC2544 throughput measurement that meets the following criteria:*

☐ *Frame sizes: 64 and 1518 Bytes.*
☐ *Test Duration: 60s*
☐ *Accuracy: 0.01%*
☐ *Errors: 0*
☐ *Trials to average: 1*
☐ *Nr of validations: 1*

3.3.6.2. Verify RFC2544 Latency on the system.

- *Verify the microwave equipment is configured as per the SOS.*
- *Verify whether measurement will be done using the store and forward method or the bit forwarding method.*
- *Configure the Ethernet test set profile to perform RFC2544 latency measurement that meets the following criteria:*

☐ *Method: Store and Forward (SaF) or Bit Forwarding (BF).*
☐ *Frame sizes: 64 and 1518 Bytes.*
☐ *Test Duration: 120s*
☐ *Nr of measurements: 1*

3.3.6.3. Verify RFC2544/RFC1242 Frame Loss on the system.

- *Verify the microwave equipment is configured as per the SOS.*
- *Verify that the first trial is run at a frame rate that corresponds to 100% of the maximum rate for the frame size on the input media.*
- *Repeat the procedure for the rate that corresponds to 10% less of the previous trial until there are two successive trials in which no frames are lost.*
- *Configure the Ethernet test set profile to perform RFC1242 frame loss measurement that meets the following criteria:*

☐ *Trial Rates : 100%, 90%, 80%, 70%, 60%, 50%, 40%, 30%, 20%, 10%*
☐ *Test Duration: 100s*
☐ *Max Granularity: 10%*

3.3.7. AUX Alarm/Data Card Test

Use the following instructions to perform the AUX alarm Test and AUX Data Test on the optional AUX plug-in card for each microwave radio and record the results in the corresponding fields on the Hop Test sheet.

Verify configuration and functionality of the AUX alarms.

- *Using Portal, verify that the correct relay contacts have been configured for specific alarm conditions as per the design documentation.*
- *Using a DVM, verify the state of the relay (NO or NC) under no alarm condition.*
- *Create an alarm condition on the relay under test to occur and verify the change in the relay state with the DVM.*
- *Restore configuration to the original settings once completed.*

3.3.8. Bit Error Rate (BER) Test

Use the following instructions to perform a one (1) hour Bit Error Rate (BER) test on the main radio and a one (1) hour BER test on the standby radio, if equipped, and record the results in the corresponding fields on the Hop Test sheet. This test should be performed after the final alignment of the antennas for each hop. Note that DS1's on a single hop may be "daisy-chained" to test all DS1's at the same time. No radio configuration should be performed while the BER test is in progress.

3.3.8.1. One (1) hour Bit Error Rate (BER) Test on Main radio.

- *Verify the microwave equipment is configured as per the SOS, SBD and DS1 plan.*
- *Connect the BER tester to a DS1 port looped back at the far end site and check DS1 continuity and absence of errors.*
- *Perform a one (1) hour BER test at the DS1 level for the provisioned DS1.*
- *Performance objective: 1x10^{-10} BER one-way, under no fade conditions.*

3.3.8.2. One (1) hour Bit Error Rate (BER) Test on the standby radio.

- *Verify the microwave equipment is configured as per the SOS, SBD and DS1 plan.*
- *Connect the BER tester to a DS1 port looped back at the far end site and check DS1 continuity and absence of errors.*
- *Verify that radio traffic has been switched to the standby radio and that the main radio is offline.*
- *Perform a one (1) hour BER test at the DS1 level for the provisioned DS1.*
- *Performance objective: 1x10^{-10} BER one-way, under no fade conditions.*

3.4. System Test

The system level tests will be performed after all sites have been hop tested. Some tests will require personnel at more than one site. Tests may be conducted out of sequence to accommodate site logistics.

3.4.1. Ring Wrapping Test

Use the following instructions to perform the Eclipse ring wrapping for each microwave hop and record the results in the corresponding fields on the System Test sheet. Note that this test only applies to the ring portion of the network where the system has been configured for ring protection on a DS1 level.

Radio Ring wrapping using Eclipse Ring Protection.

- *Verify that the microwave equipment has been configured for ring protection as per the design documentation.*
- *Connect the BER tester to the DS1 under test and verify continuity and absence of errors in one direction.*
- *Create an alarm on the working channel and verify that the software switches the DS1 traffic to the protected channel.*
- *Clear the alarm on the working channel and verify that the traffic switches back in accordance with the restore time settings in the radio configuration.*
- *Restore configuration to the original settings once completed.*

3.4.2. Network Continuity Test

Use the following instructions to perform the Network Continuity Test and record the results in the corresponding fields on the System Test sheet. Note that this test only applies to systems utilizing out-of-band management. For in-band management systems, the test should be done in conjunction with the Ethernet test.

Perform Network Continuity Test.

- *Verify the microwave equipment is configured as per the SOS.*
- *Verify laptop is connected to the NMS ports on the NCC.*

- *Using a DOS prompt, send a ping command to the IP Address of the first radio and note the success reply.*
- *Continue sending ping commands to the remainder of the radios in the network as per the SOS and note the success replies.*

3.4.3. Provision Element Management System Test

Use the following instructions to verify that the ProVision Element Management System is reporting the new sites correctly after installation. The field testing will include verification of any new OEM equipment alarms.

3.4.3.1. Basic ProVision Element Operation

- *Start ProVision Client software*
- *Log in as admin (password admin). It is recommended that you change the admin password immediately.*
- *Check that ProVision opens and displays the tree, map and event panes correctly.*
- *Deploy a segment of the County's network including sites and Provider devices.*
- *Establish communications with the Provider devices.*
- *Record the embedded software version running on the Provider devices under test.*
- *Ensure that lost communications notification is successful.*

3.4.3.2. Functionality Tests

- *Use the event browser to view, acknowledge, or clear network alarms. Use PreFilters, Event Groups, and Scoreboards.*
- *Use the configuration screen to change device parameters.*
- *Review device hardware inventory data.*
- *Enable 15-minute data collection and review RSSI and G.826 history and performance trends.*

3.4.3.3. OEM Alarm Reporting

- *Use the event browser to view, acknowledge, or clear alarms from each of the DC power systems.*

3.4.4. Ethernet Ring Protection (ERP, ITU-T G.8032) Verification

Use the following instructions to test the Ethernet protection switching on the loop and record the results in the corresponding fields on the System Test sheet.

Measure ERP ring switching time

- *Log into the appropriate INUe and verify that "NodeState" is in idle*
  - *Show Ethernet ring G.8032 brief*
- *Configure the test sets for packet loss test.*
- *Start the packet loss test.*
- *Simulate a RF link failure by muting the transmitter on the path to South EMS.*
- *Verify switching. "NodeState" should be in "Protection".*
- *Show Ethernet ring G.8032 brief.*
- *Calculate the number of lost packets in order to determine the switching time*
  - *Each lost packet represents 1 msec.*
- *Restore the path and measure the ERP revertive switching time.*

3.4.5. 24-Hour Main Radio BER Test

Use the following instructions to perform a twenty four (24) hour Bit Error Rate (BER) test on the main radio and record the results in the corresponding fields on the System Test sheet. This test should be performed after all the individual radio hops have been tested and the Hop Test Sheet been filled out.

In order to perform this test, a DS1 circuit off the INU is selected and physically or electronically patched through at the middle and/or repeater sites to the far end site where the circuit is physically or electronically looped back. Note that no radio configuration should be performed while the BER test is in progress.

Perform a twelve (12)-hour BER (Bit Error Rate) Test at the DS1 level on the Main radio end-to-end with the DS1 looped back.

- *Perform the twelve (12) hour test on the linear spur S-5 - S-33, with the test set at S-5 and the loopback at S-33.*
- *Perform the twelve (12) hour test on the loop S-5 – S-15 – S-11 – S-7 – S-8, with the test set at the S-5 radio to S-15 and the loopback at the S-15 radio continue test on a per hop basis. Both loops would need to have this testing completed*

Performance Objective: BER not to exceed test objective of N X 10^{-10}, where "N" is equal to the number of radio hops, (i.e. for a single hop looped at one end, N=2; for two hops looped at one end, N=4, and so on).

- *For the linear spur = 6 x 10^{-10}*
- *For the loop = 1.4 x 10^{-9}*

3.4.6. ROUTER TESTING

- Verify set-up and test configuration.
- Verify IP addresses and IP connectivity by pinging.
- Dashboard
- Node Manager
- OSPF
- MPLS
- BGP
- VPN provisioning tool
- L3VPN
- Test using INM
- Test using external test set (Spirent Smartbits 6000 or JDSU)

3.5. Additional Tests

3.5.1 Verify redundant routing via MPLS (in addition to loop protection)

- Routing/MPLS Connectivity Test

  Use the following instructions to validate routing/MPLS connectivity, at each MPLS router, to the adjacent routers (Ping Test) and record the results.

  - Connect to the router CLI interface
  - Verify that the network ports are up (east and west directions)
  - Use the ping command to validate IP connectivity to the loopback IP address of each adjacent router and note the successful reply.

- Routing/MPLS redundant routing Test

  Use the following instructions to validate redundant routing to the adjacent routers (Ping Test) and record the results.

  - Connect to the router CLI interface
  - Verify that the network ports are up
  - Shutdown one network port - facing the east direction
  - Use the ping command to validate IP connectivity to the loopback IP address of each adjacent router and note the successful reply.
  - Bring up the network port facing the east direction
  - Wait until the routing table is updated and showing the shortest path to the adjacent router in the east direction
  - Shutdown the other network port - facing the west direction
  - Use the ping command to validate IP connectivity to the loopback IP address of each adjacent router and note the successful reply.
  - Bring up the network port facing the west direction

- End to End Service Test

  Use the following instructions to validate end-to-end redundancy for the VPN service at the site:

  - Connect an Ethernet test set to the VPN port at the local site
  - Connect an Ethernet test set to the VPN port at the remote end (prime or master site)
  - Run an IP traffic stream in each direction. Verify that the traffic flow is error free
  - Connect to the router CLI interface
  - Check which network port is carrying traffic to the remote end (via the routing table or using the network port interface statistics)
  - Shutdown one network port - facing the east direction
  - Validate that the test set traffic continues to pass in both directions after a brief interruption
  - Measure and record service down time.
  - Bring up the network port facing the east direction
  - Wait until the routing table is updated and showing the shortest path to the adjacent router in the east direction
  - Validate that the test set traffic continues to pass in both directions

3.5.2 **Verify T1 interface and throughput**

Note: T1 Circuits are Native T1's and will have a native T1 throughput of 1.544 Mbps as seen on the T1 Test Set. Interface and Throughput verified during the following test.

Use the following instructions to perform a one (1) hour Bit Error Rate (BER) test on the main radio and a one (1) hour BER test on the standby radio, if equipped, and record the results in the corresponding fields on the Hop Test sheet. This test should be performed after the final alignment of the antennas for each hop. DS1 #28 must be configured as a test circuit for each path. The far end should be placed in loopback. After testing, leave the DS1 circuit programmed for use in the system level BER test. No radio configuration should be performed while the BER test is in progress.

One (1) hour Bit Error Rate (BER) Test on Main radio.

Verify the microwave equipment is configured as per the SOS, SBD and DS1 plan.

Connect the BER tester to a DS1 port looped back at the far end site and check DS1 continuity and absence of errors.

Perform a one (1) hour BER test at the DS1 level for the provisioned DS1.

Performance objective: $1x10^{-10}$ BER one-way, under no fade conditions.

One (1) hour Bit Error Rate (BER) Test on the standby radio.

Verify the microwave equipment is configured as per the SOS, SBD and DS1 plan.

Connect the BER tester to a DS1 port looped back at the far end site and check DS1 continuity and absence of errors.

Verify that radio traffic has been switched to the standby radio and that the main radio is offline.

Perform a one (1) hour BER test at the DS1 level for the provisioned DS1.

Performance objective: $1x10^{-10}$ BER one-way, under no fade conditions.

3.5.3 Verify proper operation of VoIP Phone

Use the following instructions to test the site-to-site calling functionality of the IP Phone for each microwave hop and record the results in the corresponding fields on the Hop Test sheet.

Verify IP Phone site-to-site calling.

Verify that the IP Phone is configured as per the manufacturers recommended configuration instructions and that the phone is connected to the microwave equipment as per the System Block Diagram (SBD).

Verify that the IP Phone powers up on boot up of the microwave equipment. If an external wall power supply has been provided, verify that the phone is powered up before the radio boot up.

On the first IP phone, dial the second IP phone by its IP address. A ring tone should be heard from the dialed phone.

A second person is to answer the ringing IP phone and ensure clear two way conversations is possible. Hang up both ends to end the call.

Repeat the procedure in the opposite direction.

3.5.4 Verify power failures to any component in system (Ethernet, T1, 4wire)

Power protection switching is hitless.

Ensure that the Eclipse INU is powered up.

Ensure that the NCC and NPC Status LED are green. The NPC Protect LED should be unlit.

Disconnect the -48Vdc supply from the NCC and remove the NCC card from the chassis. Eclipse should not lose power.

Power is now provided by the NPC. The NPC Protect LED should now be lit.

Re-insert the NCC card and power to the NCC.

3.5.5 Verify continuous operation with failure to any module (Ethernet, T1, 4wire)

VERIFY PROTECTION SWITCHING.
Using Portal mute on-line transmitter or switch to off-line transmitter.
Observe switching to the other transmitter.
Restore to normal operation.
Using Portal, switch to off-line RAC.
Observe switching to the other receiver.
Using Portal, switch to off-line DAC.
Observe switching to the other receiver.
Restore to normal operation.
Using Portal, switch from Primary to Secondary “Rx Source Lock”.

Verify that traffic did not take hit during this process.
Using Portal, switch from Secondary to Primary “Rx Source Lock”.
Verify that traffic did not take hit during this process.
Turn off NPC and observe that INU operates on NCC only
Turn on NPC. Verify that INU operates on NCC and NPC
Turn off NCC and observe that INU operates on NPC only, with no reset or power-off
Turn on NCC.

TEST EQUIPMENT: BER TESTER

REQUIREMENT: Traffic continuity after switching occurs.

3.5.6 Testing of radio traffic running across links for all tests

Microwave traffic is tested end-to-end through the MPLS routers or T1 circuits to test the Motorola demarcation. Additional testing is conducted on the microwave network via Motorola’s testing of the P25 radios.

The Microwave Radio traffic is tested during T1, Ethernet, and MPLS Testing Procedures as outlined.

3.5.1 Testing of radio running over T1 links

Testing of the T1 circuits on the microwave link will be executed using the Larus loop switch. The Larus Loop Switch will provide the ability to cut-over half the protected circuit without impacting active traffic. While temporarily decommissioning the primary circuit, traffic will remain active on the protected circuit until the primary is restored on the new microwave equipment. At that time the payload can be restored on the Larus to the primary circuit (now on the new microwave network) with the redundant circuit following migration after primary circuit has been functional for a sufficient period of time.

The Microwave Radio traffic is tested during T1, Ethernet, and MPLS Testing Procedures as outlined.

FIELD ACCEPTANCE

After all field testing has been successfully completed (including resolution of any punch list items to the reasonable satisfaction of County) and the required test documents have been signed and dated, the Provider Representative and the County Contract Administrator will complete, sign and date the FIELD ACCEPTANCE TEST COMPLETION REPORT enclosed in this document. All punchlist items must be resolved to County's satisfaction prior to sign-off of the system.

FIELD TEST DATA FORMS

Test Data forms follow.

Station Test Sheet

Customer:	Customer/Customer					
Project:	Microwave System Replacement					
Site Name:	S-5	Facing Site:	Site 2 -, Site 8 - Site 15 - -S-25			
Rack #:	A1	Radio #:	☒ #1	☒ #2	☒ #3	☒ #4
3.2.1	**Grounding Inspection**					
3.2.1.1	Ground Continuity Test		Pass	Fail	N/A	
3.2.1.2	Rack Grounding (<1 ohm)		Criteria	Measured	Pass/Fail	
			<1Ω			Ohm
3.2.2	**Equipment Inspection**					
3.2.2.1	Inventory Check		Pass	Fail	N/A	
3.2.2.2	Visual Inspection of Antennas and Waveguide on tower		Pass	Fail	N/A	
3.2.2.3	Visual Inspection of Waveguide/Coax routing inside equipment shelter		Pass	Fail	N/A	
3.2.2.4	Visual Inspection of Rack		Pass	Fail	N/A	
3.2.2.5	Visual Inspection of Rack Breakers		Pass	Fail	N/A	
3.2.2.6	Visual Inspection of Installed Equipment		Pass	Fail	N/A	
3.2.3	**DC Power System Test**					
3.2.3.1	Rack Installation Inspection		Pass	Fail	N/A	
3.2.3.2	AC Input Voltage		Calculated	Measured	Pass/Fail	
						Volt
	AC Input Breakers		Pass	Fail	N/A	
	DC Float Voltage		Calculated	Measured	Pass/Fail	
						Volt
	DC Float Voltage compared to Charge Display		Measured	Display	Pass/Fail	
						Volt
	DC Current Load		Calculated	Measured	N/A	
						Amp
	Load Transfer from Charger to Batteries and back to Charger		Pass	Fail	N/A	
	Charger Alarms Connected to Alarm Block		Pass	Fail	N/A	
	Battery Cell Voltages		Calculated	Measured	Pass/Fail	
		Cell #1				Volt
		Cell #2				Volt
		Cell #3				Volt
		Cell #4				Volt
		Cell #5				Volt
		Cell #6				Volt
		Cell #7				Volt
		Cell #8				Volt
		Cell #9				Volt

		Cell #10			Volt
		Cell #11			Volt
		Cell #12			Volt
		Cell #13			Volt
		Cell #14			Volt
		Cell #15			Volt
		Cell #16			Volt
		Cell #17			Volt
		Cell #18			Volt
		Cell #19			Volt
		Cell #20			Volt
		Cell #20			Volt
		Cell #20			Volt
		Cell #20			Volt
		Cell #24			Volt
3.2.3.3	Battery Reserve Time	Start Time	Stop Time	Pass/Fail	
					hrs.
3.2.4	**Dehydrator Test**				
3.2.4.1	Dehydrator Alarms	Pass	Fail	N/A	

COMMMENTS:

PROVIDER REPRESENTATIVE		**COUNTY REPRESENTATIVE**	
Signed:		**Signed:**	
Name:		**Name:**	
Title:		**Title:**	
Date:		**Date:**	

Hop 1 Test Sheet

County:	County/County				
Project:	Microwave System Replacement				
Site Name:	S-5	Facing Site:	Site 2		
Rack #:	A1	Radio #:	☒ #1	☐ #2	☐ #3

3.3.1	**Microwave Equipment Test**				
3.3.1.1	INU Redundancy	Pass	Fail	N/A	
3.3.1.2	INU IP Address Configuration as per NMS Plan and SOS	Pass	Fail	N/A	
3.3.1.3	Firmware Versions	INU	RFU/ODU	RFU/ODU	
	Main:				
	Diversity:				
3.3.1.4	ACU Insertion Loss			ACU	
			Tx Main:		dB
			Tx Diversity:		dB
			Rx Main:		dB
			Rx Diversity:		dB
3.3.2	**IRU Transmit Power Output Test**				
	Tx Power Output	Spec	Measured	Portal	
	Main:				dB
	Diversity:				dB
3.3.3	**IRU Receive Signal Level Test**				
	RSL	Calculated	Measured	Portal	
	Main:				dB
	Standby:				dB
3.3.4	**IRU Receiver Threshold (Fade Margin) and Interference Test**				
3.3.4.1	Rx Threshold	Spec	Measured	Portal	
	Main:				dB
	Standby:				dB
3.3.4.2	Interference	Spec	Measured	Portal	
	Main				dBm
3.3.5	**Transmitter/Receiver Switching Test**				
3.3.5.1	Transmitter Switching	Pass	Fail	N/A	
3.3.5.2	Receiver Switching	Pass	Fail	N/A	
3.3.6	**Ethernet Test**				
3.3.6.1	RFC2544 Throughput Test	Frame Size (Bytes)	Throughput (Mbps)	Error Free (Y/N)	
		64			
		1518			
3.3.6.2	RFC2544 Latency Test	Frame Size (Bytes)	Latency (ms)	Method (SaF/BF)	
		64			
		1518			

3.3.6.3	RFC 2544/1242 Frame Loss Test	Frame Size (Bytes)	Rates (%)	Frame Loss (%)	
			100		
			90		
			80		
			70		
			60		
			50		
			40		
			30		
			20		
			10		
3.3.7	**AUX Alarm/Data Card Test**				
	AUX Alarm Test	Pass	Fail	N/A	
3.3.8	**One (1) Hour BER Test**				
3.3.8.1	One (1) Hour BER Test on Main Radio	Calculated	Measured	Pass/Fail	
		>1x10^{-10}			dB
3.3.8.2	One (1) Hour BER Test on Standby Radio	Calculated	Measured	Pass/Fail	
		>1x10^{-10}			dB

COMMMENTS:

PROVIDER REPRESENTATIVE		**COUNTY REPRESENTATIVE**	
Signed:		**Signed:**	
Name:		**Name:**	
Title:		**Title:**	
Date:		**Date:**	

Provider Field Acceptance Test Completion Report

County:	County
Project:	Microwave System

Comments (if any):

(Use additional sheets if required)

ADDITIONAL COMMENTS:

PROVIDER REPRESENTATIVE		**COUNTY REPRESENTATIVE**	
Signed:		**Signed:**	
Name:		**Name:**	
Title:		**Title:**	
Date:		**Date:**	

SOW A-2 Facilities and Infrastructure Development

SECTION 1 OVERVIEW

Unless otherwise approved by the Contract Administrator in writing, eight of the County's ten existing tower sites will be utilized for the new Systems, and seven additional tower sites will be added by Provider to improve coverage. Provider is responsible for and will provide all necessary civil work to upgrade existing towers and support facilities, as well as to develop new radio sites and towers for the expanded network.

Provider's solution for the County's radio system includes a comprehensive scope of work, repeatable methodology, and experienced subcontractors to avoid unexpected costs and to implement Motorola Solutions' best-in-class site design. Motorola shall ensure that all services and work provided under this SOW A-2 comply with all of the requirements, standards, and specifications set forth herein.

Unless otherwise agreed by the Parties in writing, County shall issue separate Notices to Proceed for each of the following stages of each Site: (1) Design, (2) Permitting, and (3) Construction. Motorola shall not commence the applicable work at any Site without the applicable Notice to Proceed.

1.1 General

A. Provider shall be responsible for all required permitting, environmental/historical filings, FAA/FCC filings, and any other steps necessary to provide a "turnkey" solution for the development of all radio site facilities and infrastructure.

B. For the Final Design as referenced in A-1, the Provider shall provide detailed drawings including all structures and foundations, sealed by the DB-Firm Consultant, who must be a professional engineer licensed in the State of Florida.

1. Motorola shall provide detailed drawings containing dimensions in native file format and PDF, which show all system components and locations.

2. Motorola shall provide drawings and specifications that shall describe all auxiliary equipment.

3. Manufacturer slick sheets of all equipment used also shall be provided.

C. Code Compliance: Motorola shall perform the following:

1. Installation of all electrical equipment, power distribution, lighting assemblies, and associated wiring shall comply with the most recent edition of the NEC and

Occupational Safety and Health Administration (OSHA) regulations.

2. All electrical equipment shall be listed or approved by Underwriters Laboratories (UL).

3. Provider shall comply with all codes and industry best practices and guidelines stipulated in Section 1.8.1, Standards and Guidelines.

D. Provider shall assume total responsibility for maintaining liability insurance covering the following items:

1. Project design
2. Implementation
3. Licenses
4. Shipping
5. Receiving
6. All required site work
7. Any other items required for Provider or any subcontractors

E. Prior to any excavations, Provider and its subcontractors shall follow the applicable procedures outlined at the following website: www.sunshine811.com.

F. Provider will coordinate with the applicable utility companies for all utility-related items, such as electrical service hookups and disconnects.

G. Concrete:

1. For all foundations and concrete work, Provider shall provide to the DB-Firm Consultant a test sample of each mix of concrete demonstrating that it has been tested for compliance with the foundation specifications set forth by the requisite Facilities and Infrastructure engineer. Provider shall provide written reports certifying the strength of the concrete with each test cylinder.

2. If any concrete used in the foundation does not meet specifications, Provider shall remove the foundation and pour a new foundation using compliant materials and utilizing the test sample procedure identified above in G.1, at no expense to the County.

1.2 Towers.

Provider shall be responsible for the following, unless otherwise expressly stated:

A. General:

1. If it is determined that additional towers are required or existing towers must be replaced or modified, Provider shall update the proposed solutions during the negotiation period.

2. Provider shall guarantee the structural integrity of all towers utilized for the System for a period of not less than 20 years from the date of Final Acceptance.

B. Tower Loading:

1. The tower and foundation shall be designed for all proposed equipment, legacy equipment, appurtenances, ancillary equipment, and initial antenna loading plus 50 percent future antenna system growth, without addition to or modification of the finished tower or foundation.

2. The tower structures shall be designed and installed in accordance with latest revision of the ANSI/EIA-222 standard.

C. Towers shall include the following:

1. Ice Bridge – A 24-inch, open mesh-type horizontal transmission line ice bridge, extending from the tower cable ladder to the equipment building, including 24 four-inch-diameter line entry ports shall be provided.

2. Transmission Line Support – A vertical transmission line support system shall be provided to securely attach the antenna transmission lines. Holes shall be provided in the tower support members, tower hanger adapter plates, or separate ladder structures to allow installation of bolt-in cable hangers at maximum 3-foot intervals. The mounting holes shall be precision punched or drilled and sufficiently separated to accommodate the snap-in or bolt-in hangers.

3. Climbing Access – A ladder, beginning at a point at least ten feet off the ground, shall be provided as an integral part of the tower to permit access by authorized personnel. The tower shall be equipped with an OSHA-approved anti-fall safety device in accordance with ANSI/EIA-222. This device must not interfere with the climber's ease of reach by hand or foot from one rung of the ladder to the next, either going up or coming down. Two safety climbing belts shall be supplied with each new tower.

4. Lighting:

a. Tower lighting shall be supplied as required by the applicable determination as issued by the FAA for this project and fully compliant with FAA AC 70/7460-1K, latest revision.

b. Tower lights shall be LED-based where permitted by the FAA.

c. The system control circuitry shall provide synchronization and intensity control of the obstruction lighting system, and shall monitor the overall integrity of the lighting system for component failures or improper operation.

d. Provider shall wire all alarms to the provided Type 66 block located in the communications shelter or equipment room. All alarms shall be clearly labeled.

5. A lightning ground rod shall be installed at the very top of the tower to extend at least 2 feet above the top of the tower or lighting fixture.

6. Labeling shall be clearly provided near the base of all new towers for the following:

   a. Make
   b. Model
   c. Serial number
   d. Tower height
   e. Latitude and longitude
   f. FAA and FCC identification numbers (if applicable)

D. Construction:

1. All welding must be done in the factory prior to the galvanizing process. Field welding is not acceptable.

2. The tower shall be constructed of high-strength steel. All components and hardware shall be hot-dip galvanized with a zinc coating after fabrication, per EIA standards. A zinc coating shall be permanently fused to the steel, both inside and outside, so that all surfaces are protected and no painting is required for rust protection.

3. Prior to galvanization, each piece of steel and every weld must be deburred and smooth-finished.

E. Final Testing and Acceptance – Upon completion of the work, documentation detailing final inspection and testing shall be submitted, documenting the following:

1. Steel structure:

   a. Vertical alignment and plumbness
   b. All bolts tight and torqued to specification
   c. No damaged or missing structural members
   d. All surface scratches and damage to the galvanization repaired
   e. No signs of stress or vibration
   f. All climbing ladders and other devices installed correctly

g. Labels and tags

2. Foundation:

    a. Concrete finish needs to exhibit no cracks or blemishes
    b. Grouting, if used, shall have drain holes if the tower uses hollow leg construction or monopole design
    c. Backfilling and grading shall be conducted

3. Grounding – Shall meet applicable standards such as Motorola R56, Grounding Guidelines; items include, but are not limited to:

    a. Verify lugs and exothermic welds
    b. Test and record ground resistance
    c. Install lightning ground rod at top of tower

4. Ice Bridge – Install per tower manufacturer specifications

5. Lighting and controls:

    a. Inspect conduit and wiring installation and correct if necessary
    b. Verify proper lamp operation and correct if necessary
    c. Verify alarm contact operation and correct if necessary
    d. Verify labeling and correct if necessary

6. Photographs – Motorola shall furnish photographs to the County for the final configuration of the following prior to system acceptance:

    a. Overall structure from north, east, south, and west
    b. Footers
    c. Grounding

1.3 Shelters.

Provider shall provide all of the following, unless otherwise expressly stated:

A. General:

1. Shelters shall be prefabricated and preassembled. The shelter can be constructed from concrete.

B. Size:

1. Shelter dimensions shall correspond with the Final Design.

2. Minimum shelter size shall be 12 feet x 30 feet, with a minimum interior height of 9 feet.

C. Foundation – The foundation for the shelter shall consist of concrete piers or a poured concrete slab constructed by Provider that will properly support and secure the shelter. Foundation drawings recommended by the shelter manufacturer shall be the criteria by which the foundation is constructed.

D. Flooring:

1. Provider shall ensure that each structure has a floor or solid foundation that features a minimum uniform load rating of 200 pounds per square foot with no more than 3,000 pounds over any 4-square-foot area. This rating shall be increased in sections as necessary to support heavyweight equipment, including the requested DC power supply. If the shelter is delivered with the floor already assembled, the floor shall exhibit a minimum 90-pounds-per-square-foot, uniform live-load capacity while the building is being lifted.

2. Floors shall be insulated to a minimum R-11 rating. Insulation shall be secured in place to prevent shifting during construction and transportation.

3. Exterior covering of the floor shall be included to prevent rodent infestation.

4. The floor shall be covered by a high-quality, industrial- or commercial-grade asphalt or vinyl tile. All edges shall be covered by wall molding.

E. Walls:

1. Walls shall be constructed to a minimum **160**-mile-per-hour (MPH) wind-load rating, including overturning moments.

2. Bullet Proof – Walls shall withstand the effects of bullets or other projectiles equivalent to a .30-06 high-power rifle load fired from a distance of 50 feet with no penetration to the inner cavity of the wall and with no interior damage sustained including, without limitation, to insulation, interior walls, or any interior equipment or portions of the structure.

3. The outside walls shall be finished with concrete or an aggregate composition.

4. A wall feed-through bushing with 24 four-inch-diameter openings shall be provided on the tower side of the building to accommodate elliptical waveguide and coaxial transmission lines. The openings shall be properly booted to provide a good weather seal. The wall feed-through bushing shall be bonded to the site ground system per guidelines specified in Section 1.8.1, Standards and Guidelines.

5. The inside walls shall be finished with minimum 5/8-inch plywood (or equivalent) to allow mounting of panels, blocks, etc., and shall be trimmed with coordinated molding.

6. High-performance insulation shall provide a minimum insulation factor of R-11.

F. Roof:

1. The shelter roof shall support a minimum 100-pounds-per-square-foot uniform live load.

2. The roof shall be pitched to facilitate run-off of water.

3. The roof shall be sufficient to withstand the impact of ice falling from the adjacent tower without suffering any damage and provide 150 PSF loading.

4. High-performance insulation shall provide a minimum insulation factor of R-19.

G. Door:

1. The shelter shall have one 42-inch x 84-inch insulated door, with three stainless-steel, tamper-proof hinges, passage-style lever handle, deadbolt lockset, and fiberglass weather hood or awning. The door shall be equipped with a hydraulic door closer.

2. The exterior door shall be of aluminum or steel (stainless or galvanized) construction with a finish to match the building finish.

3. The door shall be sufficient to withstand the effects of bullets or other projectiles equivalent to a .30-06 high-power rifle load fired from a distance of 50 feet with no penetration to the inner cavity of the door and with no damage to the interior including, without limitation, insulation, interior walls, and any interior equipment or contents.

4. The door sill shall be of stepped construction so as to prevent rain water from entering the shelter at the bottom of the door or from around the door frame. The door frame shall have a weather seal around the door to limit air and water intrusion.

H. Finishing:

1. The interior and exterior finishes shall be described by the Vendor. Color and finishes shall be selected by the County.

2. All joints shall be sealed with a compressible, resilient sealant.

I. Alternating Current (AC) Power System:

1. Provider shall deliver the building complete with a 400-ampere-capacity, 240-volt, single-phase electrical panel box with a ground bar.

2. This panel shall be equipped with a 200-ampere-capacity main circuit breaker used to supply power for all electrical functions related to the site.

3. Overall panel size shall be determined by the need to provide the number of individual breakers required, plus a reserve of at least six 240-volt slots.

4. Breakers for shelter air-conditioning shall be of the bolt-down, not snap-in, type.

5. Receptacles:

a. Receptacles shall meet current Motorola R56 standards, or Harris AEA-123 4618/1, Grounding Guidelines, or equivalent.

b. Each radio equipment unit (or rack) shall be supplied with two 20-ampere circuits, each terminated at a typical NEMA 20-ampere, twist-lock receptacle. Receptacles shall be mounted to the side of the overhead cable tray.

c. Service receptacles shall be mounted on the walls at 6-foot intervals or less.

d. One weatherproof ground fault interrupter (GFI) exterior power receptacle shall be provided with each shelter, to be mounted near air-conditioning units.

e. Each receptacle shall be fed from an individual breaker. The feeding breaker shall be identified at the receptacle and the receptacle shall be identified at the breaker. All breakers or circuits shall be 20-ampere, unless otherwise noted.

J. Power Line Surge Suppression:

1. AC surge protection shall be provided and installed inside the shelter.

2. An acceptable unit shall be an in-line type such as the AC Data Systems "integrated load center." An alternate unit must meet or exceed all of the capabilities of this model unit.

3. Minimum surge protector requirements:

    a. Built-in redundancy of dual stages per phase with filtering
    b. Surge energy shunted to ground, not to neutral
    c. Front panel indicator lamps
    d. Remote/local status contacts
    e. Fusible link protected so as not to interrupt power
    f. Field replacement protection blocks and fuses, if needed
    g. UL-Listed components
    h. 45 kiloampere (kA) per phase, ANSI C62.1 8/20 waveform
    i. Electromagnetic interference/radio frequency interference (EMI/RFI) filtering per MIL-STD-220
    j. Capable of handling the full 240-volt, 200-ampere capacity of the electrical system

K. Wiring Methods:

1. Shall meet all applicable local, state, and national standards.

2. All wiring noted on the site drawings or otherwise included by Provider shall be installed in conduit or ductwork. Where no protection method is specified, conduit shall be used.

3. All conduits and ducts shall be securely surface-mounted and supported by approved clamps, brackets, or straps as applicable, and held in place with properly selected screws. No wiring shall be imbedded inside any walls, floors or ceilings. Entrance power, outside light, air-conditioning outlet, and telecommunications company (telco) are the only wiring that may penetrate shelter walls or floor.

4. All wire raceways, conduits, etc., shall be mechanically joined and secured.

5. Flexible steel conduit or armored cable shall protect wiring connected to motors, fans, etc., and other short runs where rigid conduit is not practical.

6. Unless otherwise specified, all power wiring shall be minimum 12 American wire gauge (AWG) size, solid copper conductors with insulation rated for 600 volts AC.

L. Light Fixtures:

1. Ceiling-mounted, 4-foot fluorescent light fixtures (two 40-watt bulbs per fixture) with RFI ballasts shall be supplied for the equipment shelters. A sufficient quantity of light fixtures shall be supplied to provide a uniform light level throughout the building of 150 foot candles at four feet above the floor.

2. Light fixtures shall be fed as a gang from a common breaker and controlled by an on/off switch near the door.

M. Outdoor Lighting:

1. An exterior 100-watt, wall-mounted light shall be mounted on the front entrance of the shelter.

2. The exterior lighting system shall be fed from a separate, appropriately rated breaker and controlled by an on/off switch mounted near the door.

N. Heating, Ventilation and Air-Conditioning (HVAC):

1. Provider shall provide an HVAC system for each shelter, which system will include dual AC units with a lead-lag controller. Each AC unit shall be sized for 100 percent of the building's required cooling capacity, as determined by the British thermal unit (BTU) analysis.

2. Provider shall perform a BTU analysis (heat-load calculations) for all shelter equipment during preliminary design to verify HVAC system size. All calculations shall include a 50-percent expansion factor, and all assumptions regarding power consumption, duty factor, and heat loading shall be thoroughly explained. Provider shall ensure that each shelter's HVAC system has all needed additional capacity.

3. Each unit shall be capable of maintaining an inside ambient temperature range between 65 and 85 degrees Fahrenheit (F). Each unit shall be sized to maintain temperatures inside the shelter at 70 degrees F.

4. The HVAC system shall be controlled by a wall-mounted thermostat. The thermostat shall turn the heater on when the temperature inside the shelter drops to 65 degrees F and off when it rises to 68 degrees F. It shall turn on the air-conditioner when the interior temperature reaches 78 degrees F and off when the temperature drops below 75 degrees F. Thermostat control shall be adjustable within the range of 45 to 85 degrees F.

O. Antenna Cable Conduit Entry – Provider shall supply a bulkhead panel to accommodate coaxial transmission lines between 1/2-inch and 1 5/8-inch diameter elliptical

waveguides. A minimum of 12 transmission lines shall be accommodated with 4-inch openings. The building manufacturer shall seal the conduits into the wall to assure that they are watertight.

P. Cable Tray – All new shelters shall be equipped with the cable trays. Provider shall install a minimum 18-inch-wide cable tray system above the equipment.

Q. Shelters shall be supplied by Provider with at least one 10-pound carbon dioxide (CO_2) fire extinguisher, an approved eyewash station, and a first-aid kit.

1.4 Generator and Automatic Transfer Switch (ATS)

This section provides the specifications and requirements for standby power systems to supply electrical power in the event that the normal supply fails. Provider shall provide all necessary equipment and services to ensure that each radio site (new and existing) has power systems that meet all of the requirements stated herein.

A. Provider shall provide an emergency generator system at each radio communications site (both new and existing) for backup power.

B. Standby power systems shall consist of a liquid-cooled engine, an AC alternator and system controls with all necessary accessories for a complete operating system, including but not limited to the items as specified.

C. Provider shall perform electrical-loading analysis for shelter equipment, including HVAC subsystems, during preliminary design to verify generator size and fuel-tank capacity. All electrical-loading calculations shall include a 50-percent expansion factor, and all assumptions regarding power consumption and duty factor shall be thoroughly explained.

D. In the event of a commercial power outage, the emergency generator shall provide power to the entire shelter without a system outage.

E. Quality Assurance – The standby power system shall be supplied by a manufacturer that is currently and has been regularly engaged in the production of engine-alternator sets, ATS, and associated controls for the past ten years, thereby identifying one source of supply and responsibility.

F. The generator system and all accessories and ancillary equipment shall comply with the following standards:

1. NFPA 37, Flammable and Combustible Liquids Code
2. NFPA 55, Standard for the Storage and Handling of Compressed Gases
3. NFPA 70, National Electrical Code, with particular attention to Article 700, “Emergency Systems”
4. NFPA 110, Requirements for Level 1 Emergency Power Supply System
5. NFPA 101, Code for Safety to Life From Fire in Buildings and Structures

6. ANSI/NEMA MG 1, Motor and Generators
7. ANSI/NEMA AB 1, Molded Case Circuit Breakers
8. ANSI/NEMA 250, Enclosures for Electrical Equipment (1,000 Volts Maximum)

G. Labeling and Identification – All wiring harnesses and connectors shall be clearly identified by number and function according to the associated schematic diagrams and documentation provided by Provider.

H. Factory Testing:

1. Before shipment of the equipment, the generator set shall be tested under rated load for performance and proper functioning of control and interfacing circuits. Tests shall include:

   a. Verification that all safety shutdowns are functioning properly
   b. Verification of single-step load pick-up per NFPA 110-1996, paragraph 5-13.2.6
   c. Verification of transient and voltage-dip responses and steady-state voltage and speed (frequency) checks
   d. Full load test for a minimum of one hour

2. Provider shall provide complete report(s) of all testing performed.

I. Startup and Checkout:

1. Motorola's subcontractor providing the electricity-generating plant and associated items covered herein shall provide factory-trained technicians to check the completed installation and to perform an initial startup inspection to include:

   a. Ensuring that the engine starts (both hot and cold) within the specified timeframe.

   b. Verifying that engine parameters are within specification.

   c. Verification of no-load frequency and voltage adjustment, if required.

   d. Testing of all generator automatic shutdowns.

   e. Performing a simulation of power failure to test generator startup and the ability of the ATS to pick up building load correctly.

   f. Returning to commercial power and testing the generator and ATS to demonstrate correct cycling to normal commercial power.

g. Performing a load test of the generator, to ensure full-load frequency and voltage is within specification when using building load. This test shall be run for a minimum of one hour.

h. Testing and verifying all remote indicators and controls.

2. Provider shall provide complete report(s) of all testing performed.

1.4.1 Diesel Generator

A. Provider shall supply a Diesel Generator system at each new radio site and at the County's existing Markham Park, Davie, and Miramar locations.

B. The prime mover shall be a liquid-cooled, diesel engine.

C. The engine shall have a sufficient horsepower rating to drive the generator to full output power without a gear box between the engine and generator.

D. The engine shall have a battery-charging DC alternator with a solid-state voltage regulator.

E. The generator shall meet temperature-rise standards for Class "H" insulation, operating within Class "F" standards for extended life.

F. The alternator shall have internal thermal-overload protection and an automatic reset field circuit breaker.

G. One-step load acceptance shall be 100 percent of the generator set nameplate rating, and shall meet the requirements of NFPA 110, paragraph 5-13.2.6.

H. The electricity-generating plant shall be mounted with vibration isolators on a welded-steel base that shall permit suitable mounting to any level surface.

I. A main-line-output circuit breaker carrying the UL mark shall be factory installed.

1. Form C auxiliary contacts rated at 250-volt AC/10 amps shall be provided to allow remote sensing of the breaker status.

2. A system utilizing manual-reset field circuit breakers and current transformers is unacceptable.

J. An alternator strip heater shall be installed to prevent moisture condensation from forming on the alternator windings.

K. Controls:

1. All engine alternator controls and instrumentation shall be designed, built, wired, tested and shock-mounted in a NEMA 1 enclosure mounted to the generator set by the manufacturer. It shall contain panel lighting, a fused DC circuit to protect the controls and a +/- 5 percent voltage-adjusting control.

2. The generator set shall contain a complete 2-wire automatic engine start-stop control that starts the engine on closing contacts and stops the engine on opening contacts.

3. A programmable cyclic cranking limiter shall be provided to open the starting circuit after four attempts if the engine has not started within that time. Engine control modules must be solid-state plug-in type for high reliability and easy service.

4. The panel shall include:

    a. Analog meters to monitor
        i) AC voltage
        ii) AC current
        iii) AC frequency
    b. A phase selector switch
    c. Emergency stop switch
    d. Audible alarm
    e. Battery charger fuse
    f. Programmable engine control
    g. Monitoring module

5. The programmable module shall include:

    a. Manual on/off/auto switch
    b. Four LED status lights to indicate
        i) Not in Auto
        ii) Alarm Active
        iii) Generator Running
        iv) Generator Ready

6. The module shall display all pertinent unit parameters including:

    a. Generator Status – on/off/auto

    b. Instrumentation – Real-time readouts of the following engine and alternator analog values:
        i) Oil pressure

ii) Coolant temperature
iii) Fuel level
iv) DC battery voltage
v) Run-time hours

c. Alarm Status:
i) High or low AC voltage
ii) High or low battery voltage
iii) High or low frequency
iv) High or low oil pressure
v) Low water level
vi) High or low water temperature
vii) High and pre-high engine temperature
viii) High, low and critical-low fuel levels (where applicable)
ix) Over crank
x) Over speed
xi) Unit not in automatic mode

L. Unit Accessories:

1. Weather-protective enclosure:

a. The generator set shall be factory enclosed in a heavy-gauge steel enclosure constructed with 12-gauge corner posts, uprights and headers.

b. The enclosure shall be coated with electrostatically applied powder paint, baked and finished to manufacturer's specifications.

c. The enclosure shall have large, hinged doors to allow access to the engine, alternator and control panel.

2. The exhaust silencer(s) shall be provided of at least the size recommended by the generator manufacturer and shall be of critical grade.

3. The generator set shall include an automatic dual-rate battery charger manufactured by the generator set supplier. The battery charger shall be factory installed on the generator set. Due to line voltage drop concerns, a battery charger mounted in the transfer switch is unacceptable.

4. A heavy-duty, lead-acid, 12-volt DC battery shall be provided by the generator set manufacturer. The generator set shall have a frame suitable for mounting the battery and include all connecting battery cables.

1.4.2 Automatic Transfer Switch

A. Motorola shall install a transfer switch at each new location, and replace transfer switches at existing sites if necessary to maintain compatibility with the site generator.

B. The ATS shall be compatible with the generator set so as to maintain system compatibility and local service responsibility for the complete emergency power system.

C. Representative production samples of the ATS supplied shall have demonstrated through tests the ability to withstand at least 10,000 mechanical operation cycles. One operation cycle is defined as the electrically operated transfer from normal to emergency and back to normal.

D. Wiring must comply with NEC table 373-6(b). The manufacturer shall furnish schematic and wiring diagrams for the particular ATS proposed and a typical wiring diagram for the entire system.

E. Ratings and Performance:

1. The ATS shall be adequately sized to match the generator and shelter electrical systems.

2. The ATS shall be a 2-pole design rated for 600-volt AC, 200-amperes continuous operation in ambient temperatures of -20 degrees F (-29 degrees Celsius) to +140 degrees F (+60 degrees Celsius).

3. The operating mechanism shall be a single operating coil design, electrically operated and mechanically held in position.

4. A provision shall be supplied to be able to manually operate the switch in the event of logic or electrical coil failure.

F. Controls:

1. A solid-state under-voltage sensor shall monitor all phases of the normal source and provide adjustable ranges for field adjustments for specific application needs.

   a. Pick-up and drop-out settings shall be adjustable from a minimum of 70 percent to a maximum of 95 percent of nominal voltage.

   b. A utility-sensing interface shall be used, stepping down system voltage of 120/240-volt AC 1 phase to 24-volt AC, helping to protect the printed circuit board from voltage spikes and increasing personnel safety when troubleshooting.

2. Controls shall signal the generator set to start in the event of a power interruption.

    a. A solid-state time delay start, adjustable from 0.1 to 10 seconds, shall delay this signal to avoid nuisance start-ups on momentary voltage dips or power outages.

3. Controls shall transfer the load to the generator set after it reaches proper voltage.

    a. Adjustable from 70–90 percent of system voltage.

    b. Adjustable from 80–90 percent of system frequency.

    c. A solid-state time delay, adjustable from 5 seconds to 3 minutes, shall delay this transfer to allow the generator to warm up before application of load.

    d. There shall be a switch to bypass this warm-up timer when immediate transfer is required.

4. Controls shall retransfer the load to the line after normal power restoration.

    a. A return-to-utility timer, adjustable from 1 to 30 minutes, shall delay this transfer to avoid short-term normal power restoration.

5. The operating power for transfer and retransfer shall be obtained from the source to which the load is being transferred.

6. Controls shall signal the generator to stop after the load retransfers to normal.

    a. A solid-state engine cool-down timer, adjustable from 1 to 30 minutes, shall permit the engine to run unloaded to cool down before shutdown.

    b. Should the utility power fail during this time, the switch shall immediately transfer back to the generator.

7. The transfer switch shall have a time-delay-neutral feature to provide a time delay, adjustable from 0.1 to 10 seconds, during the transfer in either direction, during which time the load is isolated from both power sources. This allows residual voltage components of motors or other inductive loads (such as transformers) to decay before completing the switching cycle.

8. A switch shall be provided to bypass all transition features when immediate transfer is required.

9. The transfer switch shall have an in-phase monitor, which allows the switch to transfer between live sources if their voltage waveforms become synchronous within 20 electrical degrees within 10 seconds of the transfer-initiation signal.

    a. If the in-phase monitor will not allow such a transfer, the control must default to time-delay-neutral operation.

10. Front-mounted controls shall include a selector switch to provide for a NORMAL TEST mode with full use of time delays; FAST TEST mode that bypasses all time delays to allow for testing the entire system in less than one minute; or AUTOMATIC mode to set the system for normal operation.

    a. The controls shall provide bright lamps to indicate the transfer switch position in either UTILITY (white) or EMERGENCY (red). A third lamp is needed to indicate STANDBY OPERATING (amber). These lights must be energized from the utility source or the generator set.

    b. The controls shall provide a manually operated handle to allow for manual transfer. This handle must be mounted inside the lockable enclosure and accessible only by authorized personnel.

    c. The controls shall provide a safety disconnect switch to prevent load transfer and automatic engine start while performing maintenance. This switch also shall be used for manual transfer switch operation.

    d. The controls shall provide LED status lights to give a visual readout of the operating sequence including:
        i) Utility on
        ii) Engine warm-up
        iii) Standby ready
        iv) Transfer to standby
        v) In-phase monitor
        vi) Time delay neutral
        vii) Return to utility
        viii) Engine cool down
        ix) Engine minimum run

1.4.3 Diesel Fuel System

A. Provider shall provide a complete fuel system, including without limitation all tanks and all associated piping, valves, controls, and other equipment for each new tower site.

B. Above-ground tanks shall be bullet-proof and housed within a locked enclosure. Tanks shall withstand the effects of bullets or other projectiles equivalent to a .30-06 high-

power rifle load fired from a distance of 50 feet with no penetration to the inner cavity of the tank and with no interior damage sustained.

C. Tank and fuel system components shall be sized to provide a minimum of 72 hours of run time at full load.

D. Clear access shall be provided for refueling by a fuel truck of sufficient capacity to provide 100% refueling of the on-site fuel tanks in a single fueling.

E. Controls and Monitoring Equipment:

1. Fuel capacity gauge with low-fuel-level alarm contact closure
2. Multi-valve for filling, pressure relief and gauging

1.5 Site Preparation

A. The Provider shall perform all appropriate preparations for site improvements, including, at a minimum, the site preparation detailed herein. Work includes, but is not limited to the following:

1. Protecting existing plants and grass to remain
2. Removing existing plants and grass as necessary
3. Clearing and grubbing
4. Stripping and stockpiling topsoil
5. Removing above- and below-grade site improvements
6. Disconnecting, capping or sealing, and removing site utilities
7. Temporary erosion and sedimentation control measures
8. Access road development

B. The following Construction Specifications Institute (CSI) standard sections are referenced and incorporated as if fully set forth in this specifications document:

1. Division 1 Section, Temporary Facilities and Controls – for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and temporary erosion and sedimentation control procedures

2. Division 1 Section, Execution Requirements – for verifying utility locations and for recording field measurements

3. Division 1 Section, Selective Demolition – for partial demolition of buildings or structures undergoing alterations

4. Division 2 Section, Building Demolition – for demolition of buildings, structures, and site improvements

5. Division 2 Section, Tree Protection and Trimming – for protecting trees remaining onsite that are affected by site operations

6. Division 2 Section, Earthwork – for soil materials, excavating, backfilling, and site grading

7. Division 2 Section, Lawns and Grasses – for finish grading including preparing and placing planting soil mixes and testing of topsoil material

C. Provider and its subcontractors shall comply with local guidelines for erosion and sedimentation (E&S) control.

D. Provider shall carefully examine and study existing conditions, difficulties and utilities affecting execution of work. Later claims for additional compensation due to additional labor, equipment or materials required due to difficulties encountered or underground water conditions will not be considered.

E. Provider shall verify that existing plant life to remain and clearing limits are clearly tagged, identified and marked in such a manner as to ensure the safety of said plant life throughout construction operations.

F. Protection:

1. Provider shall protect and maintain benchmark, monument, property corner, and other reference points, reestablishing them by Registered Professional Surveyor if disturbed or destroyed, at no cost to the County.

2. Provider shall locate and identify existing utilities that are to remain and protect them from damage, reestablishing them if disturbed or destroyed, at no cost to the County.

3. Provider shall protect trees, plant growth and features to remain as final landscape. Branches or roots of any trees that are to remain shall not be disturbed. Adequate guards, fences, lighting, warning signs and similar items shall be provided and maintained as required.

4. Provider shall install protection such as fencing, boxing of tree trunks, or other measures as approved by the Project Engineer.

5. Provider shall conduct operations with minimum interference to public or private accesses and facilities; maintain ingress and egress at all times; and clean or sweep

any roadways daily or as required by the governing authority. At such times as deemed necessary by the County, dust control shall be provided by water-sprinkling systems or equipment provided by Provider.

6. Provider shall provide any and all necessary traffic control in accordance with Contract documents, the U.S. Department of Transportation "Manual of Uniform Traffic Control Devices" and the Florida Department of Transportation requirements.

G. Clearing:

1. Provider shall clear areas required for access to the site and execution of work.

2. Unless otherwise indicated, Provider shall remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with the installation of new construction. Removal includes digging out stumps, roots and root material. Depressions caused by clearing and grubbing operations are to be filled to sub-grade elevation to avoid water pooling. Satisfactory fill material shall be placed in horizontal layers not exceeding 8-inches loose depth, and thoroughly compacted per fill requirements of this section and CSI Division 2-Site Construction-Section 02200.

3. Provider shall remove grass, trees, plant life, stumps and all other construction debris from the site to a location that is suitable for handling such material according to State laws and regulations.

H. Demolition – Provider shall remove existing pavement, utilities, curbing and shrubbery as necessary for construction of improvements.

I. Topsoil Excavation:

1. Provider shall strip topsoil from areas that are to be filled, excavated, landscaped or regraded to such a depth that it prevents intermingling with underlying subsoil or questionable material.

2. Provider shall stockpile topsoil in storage piles in areas not scheduled for construction, job trailer location or equipment lay-down areas, or where directed by the Project Engineer. Storage piles shall be constructed to freely drain surface water. Storage piles shall be covered as required to prevent windblown dust. Unsuitable soil shall be disposed of as specified for waste material, unless otherwise indicated by the County. Excess topsoil shall be removed from the site by Provider.

3. Final topsoil coatings shall consist of organic soil applied in depth of not less than six inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones and other objects greater than two inches in diameter, as well as weeds, roots and other objectionable material.

J. Access Roads:

1. To the extent necessary at any Site (including without limitation West Lake Park, West Hollywood, Parkland, Tamarac, Deerfield, and Fire Station 106), Provider shall construct and maintain a 12-foot-wide access road to the perimeter fence gate at new sites.

2. Road beds shall be prepared, rolled and provided with six inches of aggregate base course.

3. Roads shall be graded appropriately for proper drainage and minimal erosion.

1.6 Fencing

A. The Provider shall provide, install and maintain chain-link fencing around the perimeter of all new sites.

B. Framework: Type I or Type II steel pipe

1. Type I – Schedule 40 steel pipe with 1.8 ounces of zinc coating per square foot of surface area conforming to ASTM F1083.

2. Type II – Pipe manufactured from steel conforming to ASTM A569. External surface triple coated per ASTM F1234. Type II pipe shall demonstrate the ability to resist 1,000 hours of exposure to salt spray with a maximum of 5 percent red rust in a test conducted in accordance with ASTM B117.

3. All coatings are to be applied inside and out after welding.

4. Unless otherwise noted, Type II framework shall be provided.

5. Pipe shall be straight, true to section and conform to the following weights:

Table 1: Type I and Type II Steel Pipe Specifications

Pipe Size Outside Diameter (O.D.)	Type I Weight Lbs./Ft.	Type II Weight Lbs./Ft.
1 5/8”	2.27	1.84
2”	2.72	2.28
2 ½”	3.65	3.12
3”	5.79	4.64
3 ½”	7.58	5.71

4”	9.11	6.56
6 5/8”	18.97	N/A

C. Fabric:

1. Aluminized fabric shall be manufactured in accordance with ASTM A491 and coated before weaving with a minimum of 0.4 ounces of aluminum per square foot of surface area. The steel wire and coating shall conform to ASTM A817. Fabric shall be 9-gauge wire woven in a 2-inch diamond mesh. The top selvage shall be twisted and barbed. The bottom selvage shall be knuckled.

2. Zinc-coated fabric shall be galvanized after weaving with a minimum of 1.2 ounces of zinc per square foot of surface area, and shall conform to ASTM A392, Class I. Fabric shall be 9-gauge wire woven in a 2-inch diamond mesh. The top selvage shall be twisted and barbed. The bottom selvage shall be knuckled.

D. Fence Posts:

Table 2: Fence Post Specifications

Fence Posts TYPE I - II		
Fabric Height	**Line Post O.D.**	**Terminal Post O.D.**
Under 6’	2”	2 ½”
6’-9’	2 ½”	3”
9’-12’	3”	4”

E. Gate Posts:

Table 3: Gate Posts Specifications

Gate Posts Type II		
Single Gate Width	**Double Gate Width**	**Post O.D. Type II**
Up to 6’	Up to 12’	3”
7’ to 12’	13’ to 25’	4”

F. Rails and Braces: 1 5/8-inch outside diameter (O.D.)

G. Gates: Frame assembly of 2-inch O.D. pipe (Type I or Type II) with welded joints. Weld areas shall be repaired with zinc-rich coating applied per manufacturer's directions. The fence fabric shall match the fence posts, gateposts and gates. Gate accessories, hinges, latches, center stops, keepers and necessary hardware shall be of a quality required for

industrial and commercial application. Latches shall permit padlocking. Provider shall provide one padlock for each gate with three keys for each padlock. All padlocks shall be keyed alike.

H. Installation:

1. General – Fence installation shall conform to ASTM F567, Standard Practice for Installation of Chain-Link Fence.

2. Height – Fence height shall be as indicated on Contract drawings. If no height is indicated, the fence shall be 7-feet high, plus one foot for barbed wire.

3. Post Spacing – Line posts shall be uniformly spaced between angle points at intervals not exceeding 10 feet.

4. Bracing – Gate and terminal posts shall be braced back to adjacent line posts with horizontal brace rails and diagonal truss rods.

5. Top Rail – The top rail shall be installed through the line post loop caps, connecting sections with sleeves to form a continuous rail between terminal posts.

6. Fencing shall have a bottom rail instead of a tension wire.

7. Fabric – The fabric shall be pulled taut with the bottom selvage two inches above grade. The fabric shall be fastened to the terminal posts with tension bars threaded through mesh and secured with tension bands at maximum 15-inch intervals. The fabric shall be tied to the line posts and top rails with tie wires spaced at a maximum of 12 inches on posts and 24 inches on rails. The fabric shall be attached to the bottom rail with top rings at maximum 24-inch intervals.

8. Barbed Wire – Barbed wire shall be anchored to the terminal extension arms, pulled taut and firmly installed in the slots of the line post extension arms.

9. Valleys – Should the fence cross a ditch or drainage swell, 3/8-inch diameter aluminum alloy rods shall be driven vertically 18 inches into the ground on 4-inch centers, and woven through the fence fabric to provide security for these areas.

10. Vegetation stop and aggregate shall be applied to the entire compound area (the area inside the fencing) and six inches beyond the fencing. Vegetation stop shall be constructed with weed barrier geotextile and aggregate shall be applied three inches in depth and consist of American Association of State Highway and Transportation Officials (AASHTO) #10 coarse aggregate.

1.7 DC Power System

Provider shall provide a -48 VDC power system to support P25 equipment, microwave equipment, and ancillary site equipment at proposed sites. The DC power system for the three regional public safety answering points (PSAPs), the Emergency Operations Center (EOC) site, and the EMS site shall only be required to support microwave equipment.

A. Provider shall provide dedicated 220 VAC/30-amp circuits for each pair of rectifiers on the DC plant, and provide electrical connections and grounding to the DC plant.

B. Provider shall perform electrical loading analysis for shelter equipment, excluding HVAC subsystems, during preliminary design to verify the DC system size required. All assumptions regarding power consumption and duty factor shall be thoroughly explained and approved in advance by County Contract Administrator.

C. Provider shall appropriate distribution breakers and circuits for DC power to each designated row of equipment racks. Equipment installed within those racks shall be immediately accessible to the DC power source.

D. Provider shall provide an N+1 redundancy scheme for all voltage levels.

E. Quality Assurance:

1. Electrical components, devices, and accessories shall be listed and labeled, as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. UL compliance shall be listed and labeled under UL 1778 by a nationally recognized testing laboratory (NRTL).

3. NFPA compliance shall identify uninterruptible power supply (UPS) components as suitable for installation in computer rooms according to NFPA 75, Standard for the Protection of Information Technology Equipment.

F. Performance Requirements:

1. Input:

a. Single-phase, 3-wire
b. Voltage: 120/240 V nominal
c. Frequency: 50/60 Hz +/- 3 Hz

2. Output:

    a. Capacity: Assumed at 1,000 amperes, to be finalized during the design phase
    b. Voltage: -24/-48 VDC, 12 VDC, and 120 VAC with minimum 10 Amp surplus supply current at each voltage level

3. Minimum Duration of Supply – The DC power system shall provide eight hours of runtime at 50 % load and four hours of runtime at 100 % load with a 25-percent equipment growth factor.

4. EMI Emissions – Comply with FCC Rules and Regulations and with Title 47 of the Code of Federal Regulations (CFR), Part 15 for Class A equipment.

5. Electronic Equipment – Solid-state devices using hermetically sealed semiconductor elements. Devices include rectifier-charger, inverter, and system controls.

6. Surge Suppression – Protect internal DC components from surges that enter at each AC power input connection, and protect controls and output components.

7. The DC power system shall include a bypass switch to permit technician access to batteries and rectifiers without power interruption.

8. The DC power system shall include alarm contacts to be interfaced to the site alarming system.

G. Tests and Inspections: Provider with perform the following tests and inspections in compliance with the following details. Provider shall properly remedy (including by repair or replacement) any portion of the DC power system that fails, in whole or in part, any test or inspection.

1. Comply with manufacturer's written instructions.

2. Inspect interiors of enclosures, including the following:

    a. Integrity of mechanical and electrical connections
    b. Component type and labeling verification
    c. Ratings of installed components

3. Test manual and automatic operational features, as well as system-protection and alarm functions.

4. Provide inspection reports.

H. Demonstration: Train County's maintenance personnel to adjust, operate, and maintain the DC power system, including at each site to the extent of any variations between sites.

1.8 48VDC Power System Overview

Unless otherwise approved by County in advance, Motorola Solutions' subcontractor, ARM Electrical Services, will provide and install the required -48vdc Eltek DC Power system for each RF site. This system consists of a charger-rectifier and battery plant that will provide the required 8 hours of reserve power to the RF sites assuming 50% average transmit time for base repeaters on each site. In addition, the system will provide over 4 hours of reserve power assuming all trunked stations on site are running continuous transmit. In both scenarios, the DC system includes a 25% growth factor for future additions and the required N for 1 redundancy for rectifier modules, and includes all equipment at each site as of the Effective Date.

The Eltek charger-rectifier will be factory racked, wired and tested. The assembly will contain individual DC circuit breaker distribution panel(s), voltage and current continuous metering capabilities, high/low DC voltage disconnect switching and all necessary maintenance and management alarm and control functions. The charger will be provided in redundant arrangement with units of identical capacity and type working on a load-sharing basis during normal operation. Solid state monitoring by the power board will be continuous and automatic switchover employed in the event of failure of either unit. Upon switchover the surviving rectifiers will be able to carry the entire site load and provide 24-hour recharge in the event of any loss of AC power.

Each RF site has the required additional redundant voltage outputs of +12 vdc, -24 vdc and 120 vac all rated at a minimum of 10 amps each. These dc converters and AC inverters operate from the main charger-rectifier using the -48vdc input.

The DC distribution circuit breaker panels and the main -48 VDC ground (return) buss will be isolated in this rack as part of the Eltek power board assembly. The main distribution circuit breaker panel will provide the main bus feeds for the radio racks. Each 19 inch radio rack will have a split breaker sub-panel for the various radio equipment breakers.

The battery plants are built using EnerSys PowerSafe DDm series batteries designed using proven gas recombination technology which removes the need for water addition by controlling the evolution of hydrogen and oxygen during charging. The batteries will be rack mounted in battery racks for floor space conservation.

1.9 Site Development Schedule

The site development schedule is fully integrated into the overall Project Schedule (set forth in Schedule 10) that includes milestones for key project tasks. Provider and DB-Firm shall comply with the Project Schedule for all Services under this SOW A-2, unless otherwise approved in writing by the Contract Administrator.

SECTION 2 RADIO SITES

Provider shall perform all services and provide all equipment to ensure that each Radio Site meets the specifications and standards set forth herein and in the applicable System and Site Attachments Table for each site.

For all new towers identified herein, Provider will provide the site engineering and complete all obligations set forth under Section 3.1.1 below for new sites.

Any design details, diagrams, specifications, or other information detailed herein may be modified upon further review by the Parties only upon written confirmation by both Parties. Any such modification shall not require an amendment, change order, or work authorization, provided that there is no additional cost to County.

2.1 Site Name: Core

Core is an existing Broward County Radio site. In accordance with Solicitation R1422515P1 Appendix B- Addendum 2, a new 24’ X 32’ pre-cast shelter will be installed in addition to the existing 24' X 32' shelter. A new DC Power System will be installed in the new shelter, along with a new generator and transfer switch. The existing shelter will utilize the existing UPS and existing generator.



Figure 2-1: Core

Site Details:

Site Engineering:

- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the construction activity, and perform all actions necessary to alleviate or remedy that impact.
- Provide a structural engineering analysis for antenna support structure to support the antenna system.
- Provide tower climbing and tower mapping services to collect information about structural members and existing equipment.

Antenna and Transmission Line:

- Install five antennas for the RF system.
- Supply and install side arm(s) for all antenna and dish mounts.
- Install two tower top amplifiers.
- Install 1/2-inch transmission line as required.
- Install 7/8-inch transmission line as required.
- Install 1-1/4-inch transmission line as required.
- Install three Microwave Dishes.
- Install Elliptical waveguide as required.
- Perform alignment of each of the microwave paths to ensure that the microwave dishes are optimally positioned.
- Perform sweep tests on transmission lines.
- Supply and install one ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work:

- Fabricate steel weight distribution plate and make electrical modifications in order for the existing shelter to receive the new DC Power System.
- Upgrade site grounding to the latest revision of R56
- Provide all necessary equipment and services necessary to fully cutover users from the old system to the new system
- Upgrade shelter and supporting systems to optimal conditions, including the following:
    - Ensure roof is in good condition and free of leaks
    - Repair any damaged flooring or siding to building
    - Seal building to prevent pest entry
    - Service all HVAC units and upgrade or, if necessary to ensure proper cooling of equipment, replace. (County may elect to replace as part of Optional Services, if the HVAC units are not required to be replaced to ensure proper cooling of equipment.)

Table 2-1: System and Site Improvements

SYSTEM				
Ground Elevation (Ft.)	10			
Site Acquisition	No			
Zoning	No			
A&E Services	Yes			
Latitude	Longitude			
26 08 56.5	80 11 18.8			
Site Owner				
Broward County, FL				
Existing Tower Ht (Ft.)	Existing Tower Type			
296	Self-supported tower			
SITE IMPROVEMENTS				
New Compound/Expansion Size				
Width (Ft).	Length (Ft.)	Clearing Type		
N/A	N/A	N/A		
New Ice Bridge Length (Ft.)				
N/A				
New Shelter Type				
N/A				
New Shelter Width (Ft.)	New Shelter Length (Ft.)			
N/A	N/A			
New Fuel Tank (Gal.)	New Fuel Tank (Type)			
N/A	N/A			
New Generator / Transfer Switch	New Generator (Type)			
N/A	N/A			
New Electrical Circuits				
Amps/Volts	Type	Cable (Ft.)		
N/A	N/A	N/A		
New Antenna: RF	New Antenna: TTA	New MW Dish:		
5	2	2		
New RF Lines (Linear Ft.)[1]				
/2-inch	7/8-inch	1-1/4-inch	1-5/8-inch	Wave Guide
975	975	1500	N/A	440

[1] Or as required.

2.2 Site Name: Coconut Creek

Coconut Creek is an existing Broward County Radio site. In accordance with Solicitation R1422515P1 Appendix B- Addendum 2, the existing 24' X 32' shelter, tower and generator will be used. A new DC Power System will be installed. The existing UPS will be decommissioned and removed.



Figure 2-2: Coconut Creek

Site Details:

Site Engineering:

- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the construction activity.
- Provide a structural engineering analysis for antenna support structure, to support the antenna system.
- Provide tower climbing and tower mapping services to collect information about structural members and existing equipment.

Antenna and Transmission Line:

- Install eight antennas for the RF system.
- Supply and install side arm(s) for all antenna and dish mounts.
- Install three tower top amplifiers.
- Install 1/2-inch transmission line as required.
- Install 7/8-inch transmission line as required.
- Install 1-1/4-inch transmission line as required.
- Install two Microwave Dishes,
- Install Elliptical waveguide as required.
- Perform alignment of each of the microwave paths to ensure that the microwave dishes are optimally positioned.
- Perform sweep tests on transmission lines.
- Supply and install one ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work:

- Fabricate steel weight distribution plate and make electrical modifications in order for the existing shelter to receive the new DC Power System.
- Upgrade site grounding to the latest revision of R56
- Provide all necessary equipment and services necessary to fully cutover users from the old system to the new system
- Upgrade shelter and supporting systems to optimal conditions, including the following:
  - Ensure roof is in good condition and free of leaks
  - Repair any damaged flooring or siding to building
  - Seal building to prevent pest entry
  - Service all HVAC units and upgrade or, if necessary to ensure proper cooling of equipment, replace. (County may elect to replace as part of Optional Services, if the HVAC units are not required to be replaced to ensure proper cooling of equipment.)

Table 2-2: System and Site Improvements

SYSTEM				
Ground Elevation (Ft.)	10			
Site Acquisition	No			
Zoning	No			
A&E Services	Yes			
Latitude	Longitude			
26 18 12.4	80 11 43.8			
Site Owner				
Broward County, FL				
Existing Tower Ht (Ft.)	Existing Tower Type			
400	Self-supported tower			
SITE IMPROVEMENTS				
New Compound/Expansion Size				
Width (Ft).	Length (Ft.)	Clearing Type		
N/A	N/A	N/A		
New Ice Bridge Length (Ft.)				
N/A				
New Shelter Type				
N/A				
New Shelter Width (Ft.)	New Shelter Length (Ft.)			
N/A	N/A			
New Fuel Tank (Gal.)	New Fuel Tank (Type)			
N/A	N/A			
New Generator / Transfer Switch	New Generator (Type)			
N/A	N/A			
New Electrical Circuits				
Amps/Volts	Type	Cable (Ft.)		
N/A	N/A	N/A		
New Antenna: RF	New Antenna: TTA	New MW Dish:		
8	3	2		
New RF Lines (Linear Ft.)[2]				
1/2-inch	7/8-inch	1-1/4-inchor l	1-5/8-inch	Wave Guide
1720	1290	2025	320	200

[2] Or as required.

2.3 Site Name: Markham Park

Markham Park is an existing Broward County Radio site. In accordance with Solicitation R1422515P1 Appendix B- Addendum 2, a new 24' X 32' pre-cast shelter will be installed, in addition to the existing shelter. A new DC Power System will be installed in the new shelter, along with a new generator and transfer switch. The existing UPS and generator will remain as is. The existing guyed tower will be utilized.



Figure 2-3: Markham Park

Site Details:

Site Engineering:

- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the construction activity.
- Provide a structural engineering analysis for antenna support structure, to support the antenna system.
- Provide tower climbing and tower mapping services to collect information about structural members and existing equipment.

Antenna and Transmission Line:

- Install five antennas for the RF system.
- Supply and install side arm(s) for all antenna and dish mounts.
- Install two tower top amplifiers.
- Install 1/2-inch transmission line as required.
- Install 7/8-inch transmission line as required.
- Install 1-1/4-inch transmission line as required.
- Install three Microwave Dishes.
- Install Elliptical waveguide as required.
- Perform alignment of each of the microwave paths to ensure that the microwave dishes are optimally positioned.
- Perform sweep tests on transmission lines.
- Supply and install one ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work:

- Install one new 80kW diesel generator and automatic transfer switch.

- Fabricate steel weight distribution plate and make electrical modifications in order for the existing shelter to receive the new DC Power System.
- Upgrade site grounding to the latest revision of R56
- Provide all necessary equipment and services necessary to fully cutover users from the old system to the new system
- Upgrade shelter and supporting systems to optimal conditions, including the following:
  - Ensure roof is in good condition and free of leaks
  - Repair any damaged flooring or siding to building
  - Seal building to prevent pest entry
  - Service all HVAC units and upgrade or, if necessary to ensure proper cooling of equipment, replace. (County may elect to replace as part of Optional Services, if the HVAC units are not required to be replaced to ensure proper cooling of equipment.)

Table 2-3: System and Site Improvements

SYSTEM				
Ground Elevation (Ft.)	9			
Site Acquisition	No			
Zoning	No			
A&E Services	Yes			
Latitude	Longitude			
26 08 43.1	80 11 43.8			
Site Owner				
Broward County, FL				
Existing Tower Ht (Ft.)	Existing Tower Type			
415	Guyed tower			
SITE IMPROVEMENTS				
New Compound/Expansion Size				
Width (Ft).	Length (Ft.)	Clearing Type		
60	80	lIGHT		
New Ice Bridge Length (Ft.)				
15				
New Shelter Type				
Precast				
New Shelter Width (Ft.)	New Shelter Length (Ft.)			
24	32			
New Fuel Tank (Gal.)	New Fuel Tank (Type)			
1000	Diesel			
New Generator / Transfer Switch	New Generator (Type)			
175KW	Outdoor			
New Electrical Circuits				
Amps/Volts	Type	Cable (Ft.)		
600-amp; 120/240-volt, three-phase	Underground	50		
New Antenna: RF	New Antenna: TTA	New MW Dish:		
5	2	3		
New RF Lines (Linear Ft.)[3]				
/2-inch	7/8-inch	1-1/4-inch	1-5/8-inch	Wave Guide
850	850	1200	N/A	540

[3] Or as required.

2.4 Site Name: Playa

Playa Condominiums is an existing Broward County Radio site. In accordance with Solicitation R1422515P1 Appendix B- Addendum 2, the existing Roof top equipment room and generator will be used. A new DC Power System will be installed. The existing UPS will be decommissioned and removed.



Figure 2-4: Playa

Site Details:

Site Engineering:

- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter one, subsection 1.1307 that may be potentially impacted by the construction activity.
- Provide a structural engineering analysis for antenna support structure, to support the antenna system, including an x-ray analysis of the walls.
- Provide tower climbing and tower mapping services to collect information about structural members and existing equipment.

Antenna and Transmission Line:

- Install five antenna(s) for the RF system.
- Supply and install side arm(s) for all antenna and dish mounts.
- Install two tower top amplifiers.
- Install 1/2-inch transmission line as required.
- Install 7/8-inch transmission line as required.
- Install two Microwave Dishes.
- Install Elliptical waveguide as required.
- Perform alignment of each of the microwave paths to ensure that the microwave dishes are optimally positioned.
- Perform sweep tests on transmission lines.
- Supply and install one ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work:

- Fabricate steel weight distribution plate and make electrical modifications in order for the existing shelter to receive the new DC Power System.
- Upgrade site grounding to the latest revision of R56
- Provide all necessary equipment and services necessary to fully cutover users from the old system to the new system
- Upgrade shelter and supporting systems to optimal conditions, including the following:
  - Ensure roof is in good condition and free of leaks
  - Repair any damaged flooring or siding to equipment room
  - Seal equipment room to prevent pest entry
  - Service all HVAC units and upgrade or, if necessary to ensure proper cooling of equipment, replace. (County may elect to replace as part of Optional Services, if the HVAC units are not required to be replaced to ensure proper cooling of equipment.)

Table 2-4: System and Site Improvements

SYSTEM				
Ground Elevation (Ft.)	10			
Site Acquisition	No			
Zoning	No			
A&E Services	Yes			
Latitude	Longitude			
26 10 32.3	80 05 52.2			
Site Owner				
Playa				
Existing Tower Ht (Ft.)	Existing Tower Type			
280	Roof Top			
SITE IMPROVEMENTS				
New Compound/Expansion Size				
Width (Ft).	Length (Ft.)	Clearing Type		
N/A	N/A	N/A		
New Ice Bridge Length (Ft.)				
N/A				
New Shelter Type				
N/A				
New Shelter Width (Ft.)	New Shelter Length (Ft.)			
N/A	N/A			
New Fuel Tank (Gal.)	New Fuel Tank (Type)			
N/A	N/A			
New Generator (kW)	New Generator (Type)			
N/A	N/A			
New Electrical Circuits				
Amps/Volts	Type	Cable (Ft.)		
N/A	N/A	N/A		
New Antenna: RF	New Antenna: TTA	New MW Dish:		
5	2	2		
New RF Lines (Linear Ft.)[4]				
1/2-inch	7/8-inch	1-1/4-inch	1-5/8-inch	Wave Guide
200	500	N/A	N/A	200

[4] Or as required.

2.5 Site Name: Davie

Davie is an existing Broward County Radio site. In accordance with Solicitation R1422515P1 Appendix B-Addendum 2, the existing 12' X 32' shelter and tower will be used. A new DC Power System will be installed, along with a new generator and transfer switch. The existing generator, automatic transfer switch and UPS will be decommissioned. The transfer switch and UPS will be removed.



Figure 2-5: Davie

Site Details:

Site Engineering:

- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter one, subsection 1.1307 that may be potentially impacted by the construction activity.
- Provide a structural engineering analysis for antenna support structure, to support the antenna system.
- Provide tower climbing and tower mapping services to collect information about structural members and existing equipment.

Antenna and Transmission Line:

- Install eight antenna(s) for the RF system.
- Supply and install side arm(s) for all antenna and dish mounts.
- Install three tower top amplifiers.
- Install 1/2-inch transmission line as required.
- Install 7/8-inch transmission line as required.
- Install 1-1/4-inch transmission line as required.
- Install three Microwave Dishes.
- Install Elliptical waveguide as required.
- Perform alignment of each of the microwave paths to ensure that the microwave dishes are optimally positioned.
- Perform sweep tests on transmission lines.
- Supply and install one ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work:

- Install one new 80kW diesel generator and automatic transfer switch.
- Fabricate steel weight distribution plate and make electrical modifications in order for the existing shelter to receive the new DC Power System.

- Upgrade site grounding to the latest revision of R56
- Provide all necessary equipment and services necessary to fully cutover users from the old system to the new system
- Upgrade shelter and supporting systems to optimal conditions, including the following:
  - Ensure roof is in good condition and free of leaks
  - Repair any damaged flooring or siding to building
  - Seal building to prevent pest entry
  - Service all HVAC units and upgrade or, if necessary to ensure proper cooling of equipment, replace. (County may elect to replace as part of Optional Services, if the HVAC units are not required to be replaced to ensure proper cooling of equipment.)

Table 2-5: System and Site Improvements

SYSTEM				
Ground Elevation (Ft.)	7			
Site Acquisition	No			
Zoning	No			
A&E Services	Yes			
Latitude	Longitude			
26 03 54.7	80 20 19.2			
Site Owner				
Broward County, FL				
Existing Tower Ht (Ft.)	Existing Tower Type			
315	Self Supported			
SITE IMPROVEMENTS				
New Compound/Expansion Size				
Width (Ft).	Length (Ft.)	Clearing Type		
N/A	N/A	N/A		
New Ice Bridge Length (Ft.)				
N/A				
New Shelter Type				
N/A				
New Shelter Width (Ft.)	New Shelter Length (Ft.)			
N/A	N/A			
New Fuel Tank (Gal.)	New Fuel Tank (Type)			
500	Diesel			
New Generator /Transfer Switch	New Generator (Type)			
80kw / 400 A	Outdoor			
New Electrical Circuits				
Amps/Volts	Type	Cable (Ft.)		
N/A	N/A	N/A		
New Antenna: RF	New Antenna: TTA	New MW Dish:		
8	3	3		
New RF Lines (Linear Ft.)[5]				
1/2-inch	7/8-inch	1-1/4-inch	1-5/8-inch	Wave Guide
975	975	1200	N/A	660

[5] Or as required.

2.6 Site Name: Points of America

Points of America Condominiums is an existing Broward County Radio site. In accordance with Solicitation R1422515P1 Appendix B- Addendum 2, the existing Roof top equipment room and backup power will be used. A new DC Power System will be installed. The existing UPS will be decommissioned and removed.



Figure 2-6: Points of America

Site Details

Site Engineering:

- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter one, subsection 1.1307 that may be potentially impacted by the construction activity.
- Provide a structural engineering analysis for antenna support structure, to support the antenna system.
- Provide tower climbing and tower mapping services to collect information about structural members and existing equipment.

Antenna and Transmission Line:

- Install five antennas for the RF system.
- Supply and install side arm(s) for all antenna and dish mounts.
- Install two Tower Top Amplifiers
- Install 1/2-inch transmission line as required.
- Install 7/8-inch transmission line as required.
- Install two Microwave Dishes.
- Install Elliptical waveguide as required.
- Perform alignment of each of the microwave paths to ensure that the microwave dishes are optimally positioned.
- Perform sweep tests on transmission lines.
- Supply and install one ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work:

- Fabricate steel weight distribution plate and make electrical modifications in order for the existing shelter to receive the new DC Power System.

- Upgrade site grounding to the latest revision of R56
- Provide all necessary equipment and services necessary to fully cutover users from the old system to the new system
- Upgrade equipment and supporting systems to optimal conditions, including the following:
  - Ensure roof is in good condition and free of leaks
  - Repair any damaged flooring or siding to equipment room
  - Seal equipment room to prevent pest entry
  - Service all HVAC units and upgrade or, if necessary to ensure proper cooling of equipment, replace. (County may elect to replace as part of Optional Services, if the HVAC units are not required to be replaced to ensure proper cooling of equipment.)

Table 2-6: System and Site Improvements

SYSTEM				
Ground Elevation (Ft.)	10			
Site Acquisition	No			
Zoning	No			
A&E Services	Yes			
Latitude	Longitude			
26 05 48.0	80 06 26.0			
Site Owner				
Points of America				
Existing Tower Ht (Ft.)	Existing Tower Type			
250	Roof Top			
SITE IMPROVEMENTS				
New Compound/Expansion Size				
Width (Ft).	Length (Ft.)	Clearing Type		
N/A	N/A	N/A		
New Ice Bridge Length (Ft.)				
N/A				
New Shelter Type				
N/A				
New Shelter Width (Ft.)	New Shelter Length (Ft.)			
N/A	N/A			
New Fuel Tank (Gal.)	New Fuel Tank (Type)			
N/A	N/A			
New Generator /Transfer Switch	New Generator (Type)			
N/A	N/A			
New Electrical Circuits				
Amps/Volts	Type	Cable (Ft.)		
N/A	N/A	N/A		
New Antenna: RF	New Antenna: TTA	New MW Dish:		
5	2	2		
New RF Lines (Linear Ft.)[6]				
1/2-inch	7/8-inch	1-1/4-inch	1-5/8-inch	Wave Guide
200	500	N/A	N/A	200

[6] Or as required.

2.7 Site Name: Miramar

Miramar is an existing Broward County Radio site. In accordance with Solicitation R1422515P1 Appendix B- Addendum 2, a new 12' X 32' pre-cast shelter with a new DC Power System will be installed in addition to the existing shelter. The existing tower will be used. A new DC Power System will be installed for the new shelter, along with a new generator and transfer switch. The existing generator, automatic transfer switch and UPS will not be decommissioned.



Figure 2-7: Miramar

Site Details

Site Engineering:

- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the construction activity.
- Provide a structural engineering analysis for antenna support structure, to support the antenna system.
- Provide tower climbing and tower mapping services to collect information about structural members and existing equipment.

Antenna and Transmission Line:

- Install five antennas for the RF system.
- Supply and install side arm(s) for all antenna and dish mounts.
- Install two tower top amplifiers.
- Install 1/2-inch transmission line as required.
- Install 7/8-inch transmission line as required.
- Install 1-1/4-inch transmission line as required.
- Install two Microwave Dishes.
- Install Elliptical waveguide as required.
- Perform alignment of each of the microwave paths to ensure that the microwave dishes are optimally positioned.
- Perform sweep tests on transmission lines.
- Supply and install one ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work:

- Fabricate steel weight distribution plate and make electrical modifications in order for the existing shelter to receive the new DC Power System.

- Install one new 80kW diesel generator and automatic transfer switch.
- Upgrade site grounding to the latest revision of R56
- Provide all necessary equipment and services necessary to fully cutover users from the old system to the new system
- Upgrade shelter and supporting systems to optimal conditions, including the following:
  - Ensure roof is in good condition and free of leaks
  - Repair any damaged flooring or siding to building
  - Seal building to prevent pest entry
  - Service all HVAC units and upgrade or, if necessary to ensure proper cooling of equipment, replace. (County may elect to replace as part of Optional Services, if the HVAC units are not required to be replaced to ensure proper cooling of equipment.)

Table 2-7: System and Site Improvements

SYSTEM				
Ground Elevation (Ft.)	10			
Site Acquisition	No			
Zoning	No			
A&E Services	Yes			
Latitude	Longitude			
25 57 30.7	80 20 18.5			
Site Owner				
Broward County, FL				
Existing Tower Ht (Ft.)	Existing Tower Type			
315	Self Supported			
SITE IMPROVEMENTS				
New Compound/Expansion Size				
Width	Length (Ft.)	Clearing Type		
60	80	Light		
New Ice Bridge Length (Ft.)				
15				
New Shelter Type				
Precast				
New Shelter Width (Ft.)	New Shelter Length (Ft.)			
12	32			
New Fuel Tank (Gal.)	New Fuel Tank (Type)			
650	Diesel			
New Generator /Transfer Switch	New Generator (Type)			
100kw / 00 A	Outdoor			
New Electrical Circuits				
Amps/Volts	Type	Cable (Ft.)		
400-amp - 120/240-volt, single-phase	Underground	50		
New Antenna: RF	New Antenna: TTA	New MW Dish:		
5	2	2		
New RF Lines (Linear Ft.)[7]				
1/2-inch	7/8-inch	1-1/4-inch	1-5/8-inch	Wave Guide
650	650	900	N/A	305

[7] Or as required.

2.8 Site Name: Channel 2

Channel 2 is an existing Broward County Radio site. In accordance with Solicitation R1422515P1 Appendix B- Addendum 2, a new 24' X 32' pre-cast shelter with a new DC Power System and with a new generator will be installed. The existing shelter will be demolished and removed. A new 300' Self supported tower will be installed.



Figure 2-8: Channel 2

Site Details:

Tower Work:

- Construct drilled pier tower foundation including excavation, rebar, and concrete
- Erect new 300-foot self-supported tower.
- Supply and install grounding for the tower base.

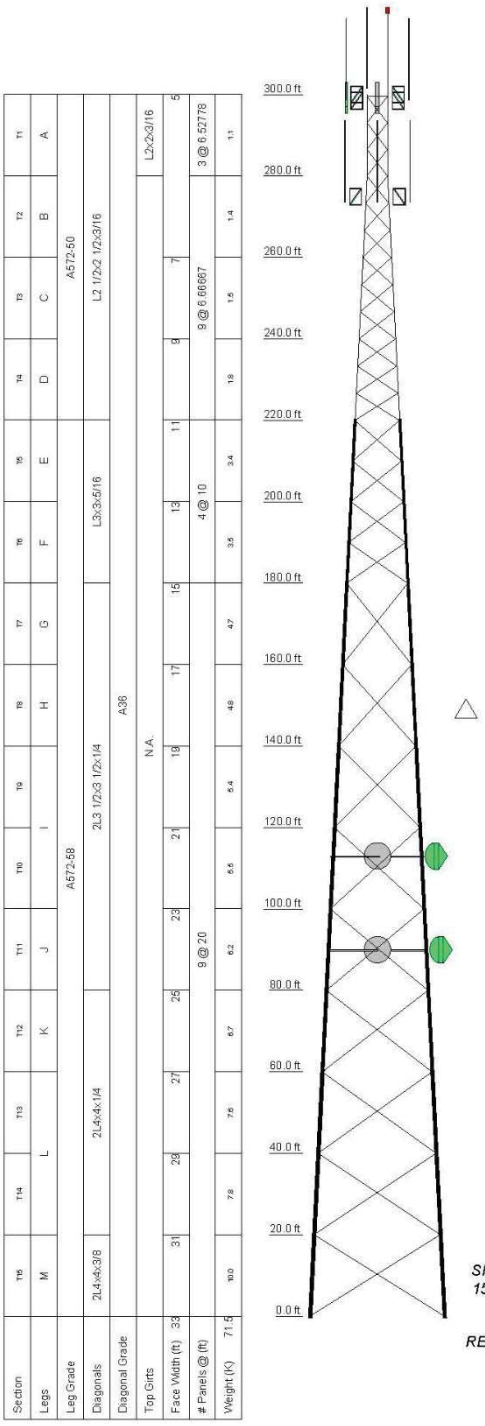
Antenna and Transmission Line:

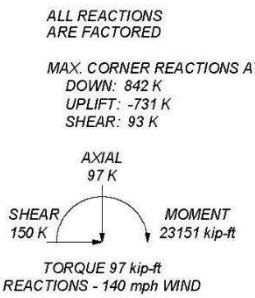
- Install eight antennas for the RF system.
- Supply and install side arm(s) for all antenna and dish mounts.
- Install three tower top amplifiers.
- Install 1/2-inch transmission line as required.
- Install 7/8-inch transmission line as required.
- Install 1-1/4-inch transmission line as required.
- Install two Microwave Dishes.
- Install Elliptical waveguide as required.
- Perform alignment of each of the microwave paths to ensure that the microwave dishes are optimally positioned.
- Perform sweep tests on transmission lines.
- Supply and install one ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Table 2-8: System and Site Improvements

SYSTEM				
Ground Elevation (Ft.)	10			
Site Acquisition	No			
Zoning	No			
A&E Services	Yes			
Latitude	Longitude			
25 58 49.3	80 11 45.8			
Site Owner				
Broward County, FL				
Existing Tower Ht (Ft.)	Existing Tower Type			
390	Guyed			
SITE IMPROVEMENTS				
New Compound/Expansion Size				
Width (Ft).	Length (Ft.)	Clearing Type		
60	80	Light		
New Ice Bridge Length (Ft.)				
25				
New Shelter Type				
Custom pre-cast				
New Shelter Width (Ft.)	New Shelter Length (Ft.)			
24	32			
New Fuel Tank (Gal.)	New Fuel Tank (Type)			
1000	Diesel			
New Generator /Transfer Switch	New Generator (Type)			
175 kw / 600 A	Outdoor			
New Electrical Circuits				
Amps/Volts	Type	Cable (Ft.)		
600-amp - 208-240-volt, three-phase	Underground	50		
New Antenna: RF	New Antenna: TTA	New MW Dish:		
8	3	2		
New RF Lines (Linear Ft.)[8]				
1/2-inch	7/8-inch	1-1/4-inch	1-5/8-inch	Wave Guide
990	990	1525	N/A	375

[8] Or as required.





ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 842 K
UPLIFT: -731 K
SHEAR: 93 K

TORQUE 97 kip-ft
REACTIONS - 140 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
21' LRE with 7'-6" lightning rod (arm=11.5')	300	CC807-11	275
		6' Universal Side Arm (84" pipe)	275
Beacon	300	CC807-11	275
20' Beacon Extender	300	6' Universal Side Arm (84" pipe)	275
CC807-11	300	CC807-11	275
6' Universal Side Arm (84" pipe)	300	6' Universal Side Arm (84" pipe)	275
CC807-11	300	CC807-11 (50% future)	275
6' Universal Side Arm (84" pipe)	300	6' Universal Side Arm (84" pipe) (50% future)	275
Bird Technologies 428E-83I-01-T	300		
6' Pivot Side Arm (50" pipe)	300	CC807-11 (50% future)	275
Bird Technologies 428E-83I-01-T	300	6' Universal Side Arm (84" pipe) (50% future)	275
6' Pivot Side Arm (50" pipe)	300		
CC807-11 (50% future)	300	CC807-11 (50% future)	275
6' Universal Side Arm (84" pipe) (50% future)	300	6' Universal Side Arm (84" pipe) (50% future)	275
CC807-11 (50% future)	300	2-1/2" x 22' Sch. 40	113
6' Universal Side Arm (84" pipe) (50% future)	300	2-1/2" x 22' Sch. 40	113
		PAD6-59BC (w/ Radome Assumed)	113
Bird Technologies 428E-83I-01-T (50% future)	300	PAD6-59BC (w/ Radome Assumed) (50% future	113
6' Pivot Side Arm (50" pipe) (50% future)	300	3" x 24' Sch. 40	90
		PAD6-59BC (w/ Radome Assumed)	90
Bird Technologies 428E-83I-01-T (50% future)	300	3" x 24' Sch. 40	90
		PAD6-59BC (w/ Radome Assumed) (50% future	90
6' Pivot Side Arm (50" pipe) (50% future)	300		

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	P- 4.00"- 0.75" conn.-20'-C-Trans-8B-4B-(Pirod 226184)	H	#12ZG-58 -2.00" - 0.875" conn. (Pirod 195639)
		I	#12ZG-58 -2.25" - 0.875" conn. (Pirod 195960)
B	P- 5.00"- 0.75" conn.-Trans-20'-C-(Pirod 226200)	J	#12ZG-58 - 2.50" - 0.875" conn.-TR4-(Pirod 195962)
C	P- 5.00"- 0.75" conn.-20'-C-(Pirod 226192)		
D	P- 6.00"- 0.75" conn.-HBD-Trans-20'-C-(Pirod 229377)	K	#12ZG-58 - 2.50" - 0.875" conn. (Pirod 195964)
		L	#12ZG-58 - 2.75" - 0.875" conn. (Pirod 196299)
E	#12ZG-58 - 1.75" - 1.00" conn.-TR1-(Pirod 195213)	M	#12ZG-58 -3.00" - 0.875" conn. (Pirod 196521)
F	#12ZG-58 - 1.75" - 1.00" conn. (Pirod 195217)		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A572-58	58 ksi	75 ksi
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

1. Tower is located in Broward County, Florida.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 140 mph basic wind in accordance with the TIA-222-G Standard.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 99.5%

Valmont	Job: *Quotation 334251-02*		
1545 Pidco Drive	Project: *V-33 x 300'*		
Plymouth, IN	Client: Motorola Solutions	Drawn by: SKK	App'd:
Phone: 574-936-4221	Code: TIA-222-G	Date: 04/06/17	Scale: NTS
FAX:	Path:		Dwg No. E-1

2.9 Site Name: Deerfield

Deerfield is a new Broward County Radio site. In accordance with Solicitation R1422515P1 Appendix B- Addendum 2, the site will receive a new 24’ X 32’ precast shelter with a new DC Power System, generator and a new 300' self-supported tower.



Figure 2-9: Deerfield

Site Details

Tower Work:

- Construct drilled pier type tower foundations including excavation, rebar, and concrete
- Erect new 300-foot self-supported tower.
- Supply and install grounding for the tower base.

Antenna and Transmission Line:

- Install five antennas for the RF system.
- Supply and install side arm(s) for all antenna and dish mounts.
- Install two tower-top amplifier.
- Install 1/2-inch transmission line as required.
- Install 7/8-inch transmission line as required.
- Install 1-1/4 inch transmission line as required.
- Install two Microwave Dishes.
- Install Elliptical waveguide as required.
- Perform alignment of each of the microwave paths to ensure that the microwave dishes are optimally positioned.
- Perform sweep tests on transmission lines.
- Perform alignment of each of three microwave paths to ensure that the microwave dishes are optimally positioned.
- Supply and install one ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Table 2-9: System and Site Improvements

SYSTEM				
Ground Elevation (Ft.)	15			
Site Acquisition	No			
Zoning	No			
A&E Services	Yes			
Latitude	Longitude			
26 17 31.6	80 06 29.4			
Site Owner				
Broward County				
New Tower Ht (Ft.)	New Tower Type			
300	Self Supported			
SITE IMPROVEMENTS				
New Compound/Expansion Size				
Width (Ft).	Length (Ft.)	Clearing Type		
60	80	Light		
New Ice Bridge Length (Ft.)				
15				
New Shelter Type				
Custom pre-cast				
New Shelter Width (Ft.)	New Shelter Length (Ft.)			
24	32			
New Fuel Tank (Gal.)	New Fuel Tank (Type)			
1000	Diesel			
New Generator (kW)	New Generator (Type)			
175 kw / 600 A	Outdoor			
New Electrical Circuits				
Amps/Volts	Type	Cable (Ft.)		
600-amp - 208-240-volt, three-phase	Underground	50		
New Antenna: RF	New Antenna: TTA	New MW Dish:		
5	2	2		
New RF Lines (Linear Ft.)[9]				
1/2-inch	7/8-inch	1-1/4-inch	1-5/8-inch	Wave Guide
660	660	915	N/A	265

[9] Or as required.

2.10 Site Name: Tamarac

Tamarac is a new Broward County Radio site at the existing Tamarac location. In accordance with Solicitation R1422515P1 Appendix B- Addendum 2, the site will receive a new 24’ X 32’ precast shelter with a new DC Power System, generator and a new 300' self-supported tower.



Figure 2-10: Tamarac

Site Details:

Tower Work:

- Construct drilled pier type tower foundations including excavation, rebar, and concrete.
- Erect new 300’ self-supporting tower (or, if determined appropriate by County, a 180’ monopole tower, with the commensurate reduction in cost applied toward other services, including Optional Services).
- Supply and install grounding for the tower base.

Antenna and Transmission Line:

- Install five antennas for the RF system.
- Supply and install side arm(s) for all antenna and dish mounts.
- Install one tower-top amplifier.
- Install 1/2-inch transmission line as required.
- Install 7/8-inch transmission line as required.
- Install 1-1/4-inch transmission line as required.
- Install two Microwave Dishes.
- Install Elliptical waveguide as required.
- Perform alignment of each of the microwave paths to ensure that the microwave dishes are optimally positioned.
- Perform sweep tests on transmission lines.
- Perform alignment of each of three microwave paths to ensure that the microwave dishes are optimally positioned.
- Supply and install one ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Table 2-10: System and Site Improvements

SYSTEM				
Ground Elevation (Ft.)	10			
Site Acquisition	No			
Zoning	No			
A&E Services	Yes			
Latitude	Longitude			
26 12 43.5	80 16 20.5			
Site Owner				
City of Tamarac				
New Tower Ht (Ft.)	New Tower Type			
300	Self Supported			
SITE IMPROVEMENTS				
New Compound/Expansion Size				
Width (Ft).	Length (Ft.)	Clearing Type		
60	80	Light		
New Ice Bridge Length (Ft.)				
15				
New Shelter Type				
Custom pre-cast				
New Shelter Width (Ft.)	New Shelter Length (Ft.)			
24	32			
New Fuel Tank (Gal.)	New Fuel Tank (Type)			
100	Diesel			
New Generator (kW)	New Generator (Type)			
175 kw / 600 A	Outdoor			
New Electrical Circuits				
Amps/Volts	Type	Cable (Ft.)		
600-amp - 208-240-volt, three-phase	Underground	50		
New Antenna: RF	New Antenna: TTA	New MW Dish:		
5	1	2		
New RF Lines (Linear Ft.)[10]				
1/2-inch	7/8-inch	1-1/4-inch	1-5/8-inch	Wave Guide
660	660	1005	N/A	330

[10] Or as required.

2.11 Site Name: West Lake Park

West Lake Park is a new Broward County Radio site. In accordance with Solicitation R1422515P1 Appendix B- Addendum 2 the site will receive a new 24’ X 32’ precast shelter with a new DC Power System, generator and a new 300' Self Supported tower.



Figure 2-11: West Lake Park

Site Details:

Tower Work:

- Construct drilled pier type tower foundations including excavation, rebar, and concrete.
- Erect new 300-foot self-supported tower.
- Supply and install grounding for the tower base.

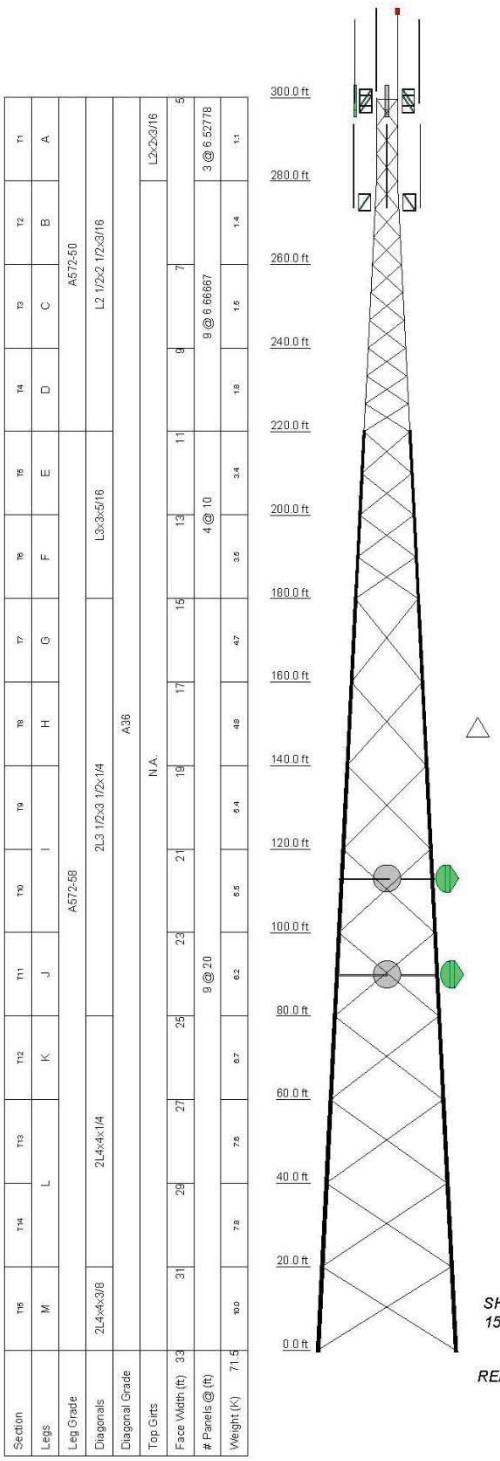
Antenna and Transmission Line:

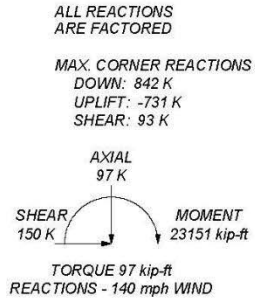
- Install five antennas for the RF system.
- Supply and install side arm(s) for all antenna and dish mounts.
- Install two tower-top amplifiers.
- Install 1/2-inch transmission line as required.
- Install 7/8-inch transmission line as required.
- Install 1-1/4-inch transmission line as required.
- Install 2 Microwave Dishes.
- Install Elliptical waveguide as required.
- Perform alignment of each of the microwave paths to ensure that the microwave dishes are optimally positioned.
- Perform sweep tests on transmission lines.
- Perform alignment of each of three microwave paths to ensure that the microwave dishes are optimally positioned.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Table 2-11: System and Site Improvements

SYSTEM				
Ground Elevation (Ft.)	7			
Site Acquisition	No			
Zoning	No			
A&E Services	Yes			
Latitude	Longitude			
26 01 57.9	80 07 45.7			
Site Owner				
Broward County				
New Tower Ht (Ft.)	New Tower Type			
300	self-supported			
SITE IMPROVEMENTS				
New Compound/Expansion Size				
Width (Ft).	Length (Ft.)	Clearing Type		
60	80	Light		
New Ice Bridge Length (Ft.)				
15				
New Shelter Type				
Custom pre-cast				
New Shelter Width (Ft.)	New Shelter Length (Ft.)			
24	32			
New Fuel Tank (Gal.)	New Fuel Tank (Type)			
1000	Diesel			
New Generator (kW)	New Generator (Type)			
175 kw / 600 A	Outdoor			
New Electrical Circuits				
Amps/Volts	Type	Cable (Ft.)		
600-amp - 208-240-volt, three-phase	Underground	50		
New Antenna: RF	New Antenna: TTA	New MW Dish:		
5	2	2		
New RF Lines (Linear Ft.)[11]				
1/2-inch	7/8-inch	1-1/4-inch	1-5/8-inch	Wave Guide
660	660	915	N/A	263

[11] Or as required.





ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 842 K
UPLIFT: -731 K
SHEAR: 93 K

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
21' LRE with 7'-6" lightning rod (arm=11.5')	300	CC807-11	275
		6' Universal Side Arm (84" pipe)	275
Beacon	300	CC807-11	275
20' Beacon Extender	300	6' Universal Side Arm (84" pipe)	275
CC807-11	300	CC807-11	275
6' Universal Side Arm (84" pipe)	300	6' Universal Side Arm (84" pipe)	275
CC807-11	300	CC807-11 (50% future)	275
6' Universal Side Arm (84" pipe)	300	6' Universal Side Arm (84" pipe) (50% future)	275
Bird Technologies 428E-83I-01-T	300	CC807-11 (50% future)	275
6' Pivot Side Arm (50" pipe)	300	6' Universal Side Arm (84" pipe) (50% future)	275
Bird Technologies 428E-83I-01-T	300	CC807-11 (50% future)	275
6' Pivot Side Arm (50" pipe)	300	6' Universal Side Arm (84" pipe) (50% future)	275
CC807-11 (50% future)	300	2-1/2" x 22' Sch. 40	113
6' Universal Side Arm (84" pipe) (50% future)	300	2-1/2" x 22' Sch. 40	113
		PAD6-59BC (w/ Radome Assumed)	113
Bird Technologies 428E-83I-01-T (50% future)	300	PAD6-59BC (w/ Radome Assumed) (50% future	113
6' Pivot Side Arm (50" pipe) (50% future)	300	3" x 24' Sch. 40	90
		PAD6-59BC (w/ Radome Assumed)	90
Bird Technologies 428E-83I-01-T (50% future)	300	3" x 24' Sch. 40	90
		PAD6-59BC (w/ Radome Assumed) (50% future	90
6' Pivot Side Arm (50" pipe) (50% future)	300		

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	P- 4.00"- 0.75" conn.-20' -C-Trans-6B-4B-(Pirod 226184)	H	#12ZG-58 -2.00" - 0.875" conn. (Pirod 195639)
		I	#12ZG-58 -2.25" - 0.875" conn. (Pirod 195960)
B	P- 5.00"- 0.75" conn.-Trans-20' -C-(Pirod 226200)	J	#12ZG-58 - 2.50" - 0.875" conn.-TR4-(Pirod 195962)
C	P- 5.00"- 0.75" conn.-20' -C-(Pirod 226192)		
D	P- 6.00"- 0.75" conn.-HBD-Trans-20' -C-(Pirod 229377)	K	#12ZG-58 - 2.50" - 0.875" conn. (Pirod 195964)
E	#12ZG-58 - 1.75" - 1.00" conn.-TR1-(Pirod 195213)	L	#12ZG-58 - 2.75" - 0.875" conn. (Pirod 196299)
		M	#12ZG-58 -3.00" - 0.875" conn. (Pirod 196521)

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A572-58	58 ksi	75 ksi
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

1. Tower is located in Broward County, Florida.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 140 mph basic wind in accordance with the TIA-222-G Standard.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 99.5%

Valmont 1545 Pidco Drive Plymouth, IN Phone: 574-936-4221 FAX:	Job: Quotation 334251-02		
	Project: V-33 x 300'		
	Client: Motorola Solutions	Drawn by: SKK	App'd:
	Code: TIA-222-G	Date: 04/06/17	Scale: NTS
	Path:		Dwg No E-1

Figure 2-12: West Lake Park Tower

2.12 Site Name: Sunrise Dispatch

Sunrise Dispatch is an existing dispatch site. Any services or work necessary to be performed at this site to achieve the specifications of the System and meet the other requirements of the Agreement shall be completed by Motorola as part of the scope of services hereunder.



Figure 2-13: Sunrise Dispatch Tower

2.13 Site Name: Coconut Creek Dispatch

Coconut Creek Dispatch is an existing dispatch site. Any services or work necessary to be performed at this site to achieve the specifications of the System and meet the other requirements of the Agreement shall be completed by Motorola as part of the scope of services hereunder.

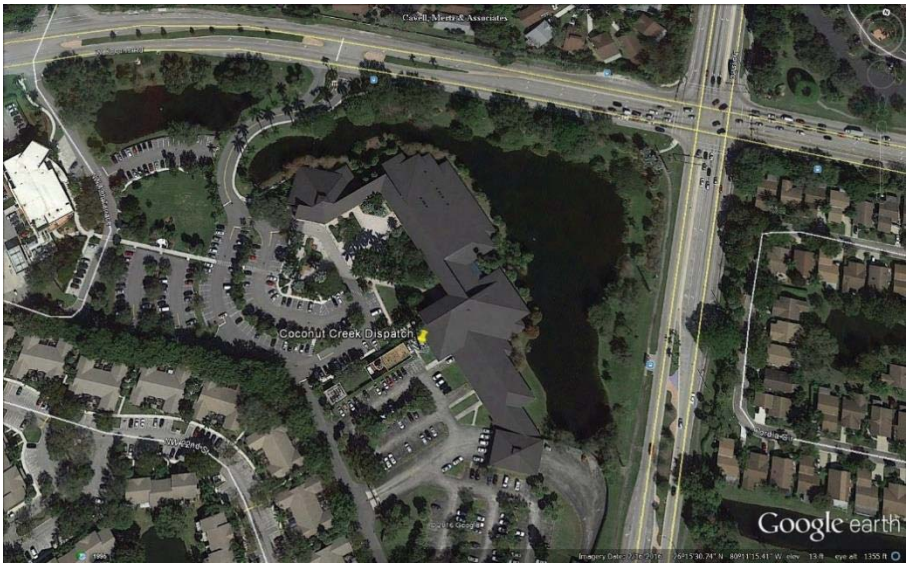


Figure 2-14: Coconut Creek Dispatch

2.14 Site Name: Pembroke Pines Dispatch

Pembroke Pines Dispatch is an existing dispatch site. Any services or work necessary to be performed at this site to achieve the specifications of the System and meet the other requirements of the Agreement shall be completed by Motorola as part of the scope of services hereunder.

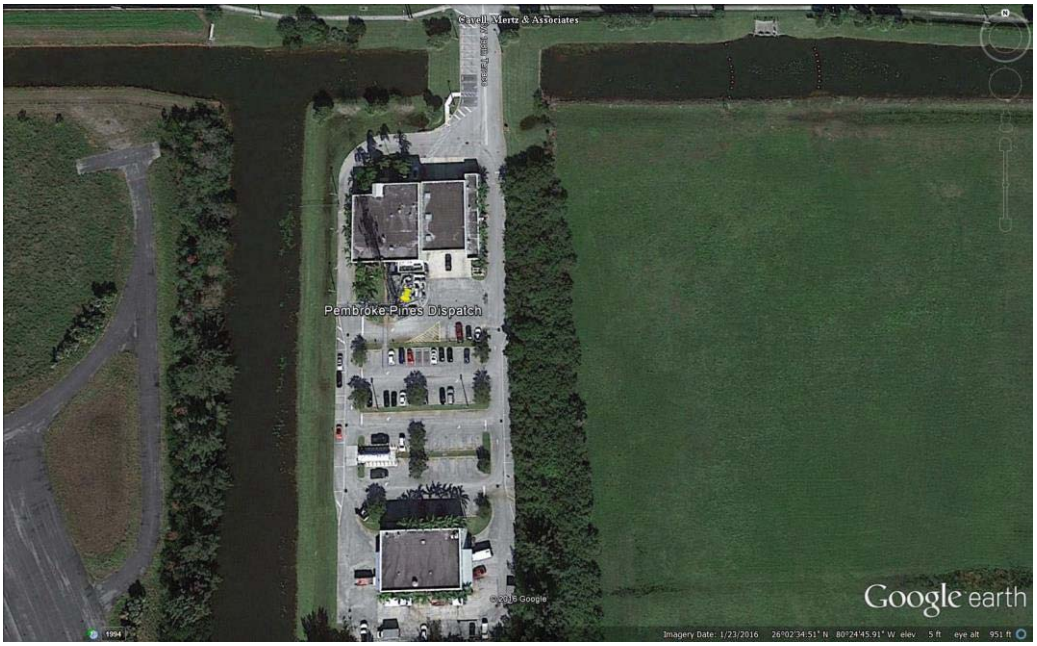


Figure 2-15: Pembroke Pines Dispatch

2.15 Site Name: FS 106

Broward County FS 106 is a new Broward County Radio site. In accordance with Solicitation R1422515P1 Appendix B- Addendum 2, the site will receive a new 24' X 32' precast shelter with a new DC Power System, generator and a new 300' self-supported tower.

Any services or work necessary to be performed at this site to achieve the specifications of the System and meet the other requirements of the Agreement shall be completed by Motorola as part of the scope of services hereunder.

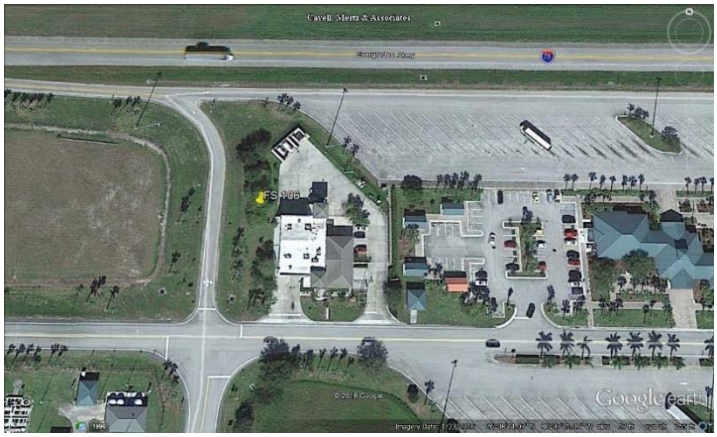


Figure 2-16: FS 106

Site Details:

Tower Work:

- Construct drilled pier type tower foundations including excavation, rebar, and concrete
- Erect new 300' self-supported tower.
- Supply and install grounding for the tower base.

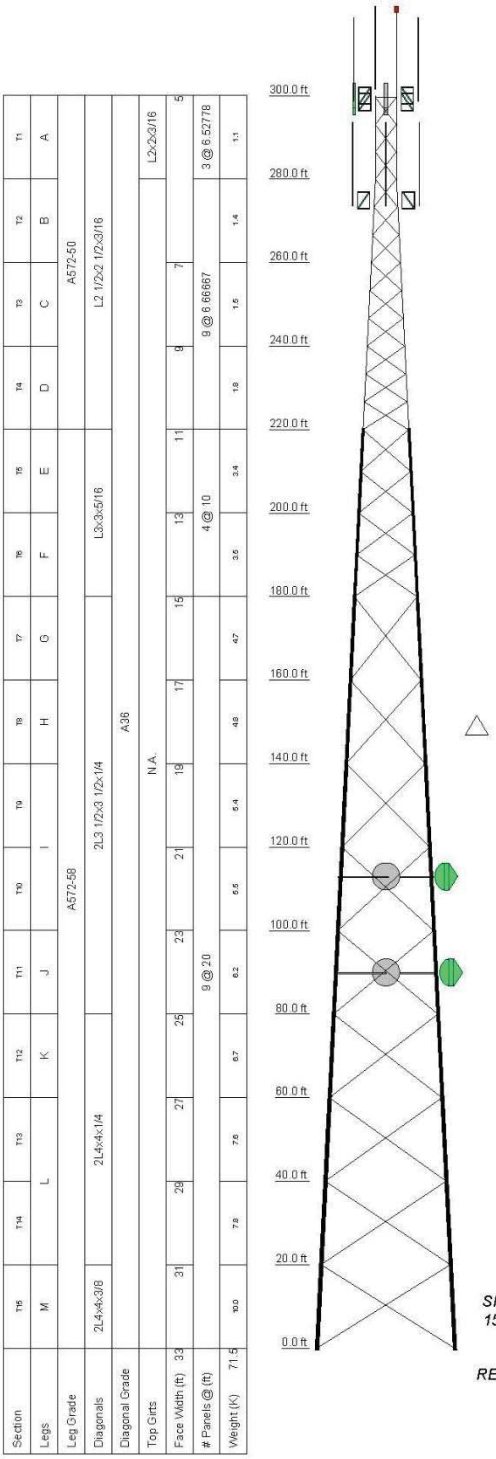
Antenna and Transmission Line:

- Install 4 antennas for the RF system.
- Supply and install side arm(s) for all antenna and dish mounts.
- Install two tower-top amplifiers.
- Install 1/2-inch transmission line as required.
- Install 7/8-inch transmission line as required.
- Install 1-1/4-inch transmission line as required.
- Install four Microwave Dishes.
- Perform sweep tests on transmission lines.
- Install Elliptical waveguide as required.
- Perform alignment of each of the microwave paths to ensure that the microwave dishes are optimally positioned.
- Perform sweep tests on transmission lines.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Table 2-12: System and Site Improvements

SYSTEM				
Ground Elevation (Ft.)	17			
Site Acquisition	No			
Zoning	No			
A&E Services	Yes			
Latitude	Longitude			
26 08 44.2	80 37 42.5			
Site Owner				
Broward County				
New Tower Ht (Ft.)	New Tower Type			
300	Self Supported			
SITE IMPROVEMENTS				
New Compound/Expansion Size				
Width (Ft).	Length (Ft.)	Clearing Type		
60	80	Light		
New Ice Bridge Length (Ft.)				
15				
New Shelter Type				
Custom pre-cast				
New Shelter Width (Ft.)	New Shelter Length (Ft.)			
24	32			
New Fuel Tank (Gal.)	New Fuel Tank (Type)			
1000	Diesel			
New Generator (kW)	New Generator (Type)			
175 kw / 600 A	Outdoor			
New Electrical Circuits				
Amps/Volts	Type	Cable (Ft.)		
600-amp - 208-240-volt, three-phase	Underground	50		
New Antenna: RF	New Antenna: TTA	New MW Dish:		
4	2	4		
New RF Lines (Linear Ft.)[12]				
1/2-inch	7/8-inch	1-1/4-inch	1-5/8-inch	Wave Guide
660	660	660	N/A	560

[12] Or as required.



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
21' LRE with 7'-6" lightning rod (arm=11.5')	300	CC807-11	275
		6' Universal Side Arm (84" pipe)	275
Beacon	300	CC807-11	275
20' Beacon Extender	300	6' Universal Side Arm (84" pipe)	275
CC807-11	300	CC807-11	275
6' Universal Side Arm (84" pipe)	300	6' Universal Side Arm (84" pipe)	275
CC807-11	300	CC807-11 (50% future)	275
6' Universal Side Arm (84" pipe)	300	6' Universal Side Arm (84" pipe) (50% future)	275
Bird Technologies 428E-83I-01-T	300		
6' Pivot Side Arm (50" pipe)	300	CC807-11 (50% future)	275
Bird Technologies 428E-83I-01-T	300	6' Universal Side Arm (84" pipe) (50% future)	275
6' Pivot Side Arm (50" pipe)	300		
CC807-11 (50% future)	300	CC807-11 (50% future)	275
6' Universal Side Arm (84" pipe) (50% future)	300	6' Universal Side Arm (84" pipe) (50% future)	275
CC807-11 (50% future)	300	2-1/2" x 22' Sch. 40	113
6' Universal Side Arm (84" pipe) (50% future)	300	2-1/2" x 22' Sch. 40	113
		PAD6-59BC (w/ Radome Assumed)	113
Bird Technologies 428E-83I-01-T (50% future)	300	PAD6-59BC (w/ Radome Assumed) (50% future	113
6' Pivot Side Arm (50" pipe) (50% future)	300	3" x 24' Sch. 40	90
		PAD6-59BC (w/ Radome Assumed)	90
Bird Technologies 428E-83I-01-T (50% future)	300	3" x 24' Sch. 40	90
		PAD6-59BC (w/ Radome Assumed) (50% future	90
6' Pivot Side Arm (50" pipe) (50% future)	300		

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	P- 4.00"- 0.75" conn.-20' -C-Trans-8B-4B-(Pirod 226184)	H	#12ZG-58 -2.00" - 0.875" conn. (Pirod 195639)
		I	#12ZG-58 -2.25" - 0.875" conn. (Pirod 195960)
B	P- 5.00"- 0.75" conn.-Trans-20' -C-(Pirod 226200)	J	#12ZG-58 - 2.50" - 0.875" conn.-TR4-(Pirod 195962)
C	P- 5.00"- 0.75" conn.-20' -C-(Pirod 226192)		
D	P- 6.00"- 0.75" conn.-HBD-Trans-20' -C-(Pirod 229377)	K	#12ZG-58 - 2.50" - 0.875" conn. (Pirod 195964)
		L	#12ZG-58 - 2.75" - 0.875" conn. (Pirod 196299)
E	#12ZG-58 - 1.75" - 1.00" conn.-TR1-(Pirod 195213)	M	#12ZG-58 -3.00" - 0.875" conn. (Pirod 196521)
F	#12ZG-58 - 1.75" - 1.00" conn. (Pirod 195217)		

MATERIAL STRENGTH

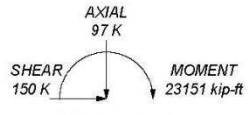
GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A572-58	58 ksi	75 ksi
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

1. Tower is located in Broward County, Florida.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 140 mph basic wind in accordance with the TIA-222-G Standard.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 99.5%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 842 K
UPLIFT: -731 K
SHEAR: 93 K



TORQUE 97 kip-ft
REACTIONS - 140 mph WIND

Valmont	Job: Quotation 334251-02		
1545 Pidco Drive	Project: V-33 x 300'		
Plymouth, IN	Client: Motorola Solutions	Drawn by: SKK	App'd:
Phone: 574-936-4221	Code: TIA-222-G	Date: 04/06/17	Scale: NTS
FAX:	Path:		Dwg No. E-1

Figure 2-17: FS 106 Tower

2.16 Site Name: Parkland

Parkland is a new Broward County Radio site. In accordance with Solicitation R1422515P1 Appendix B- Addendum 2, the site will receive a new 24' X 32' precast shelter with a new DC Power System, generator and a new 300' self-supported tower.

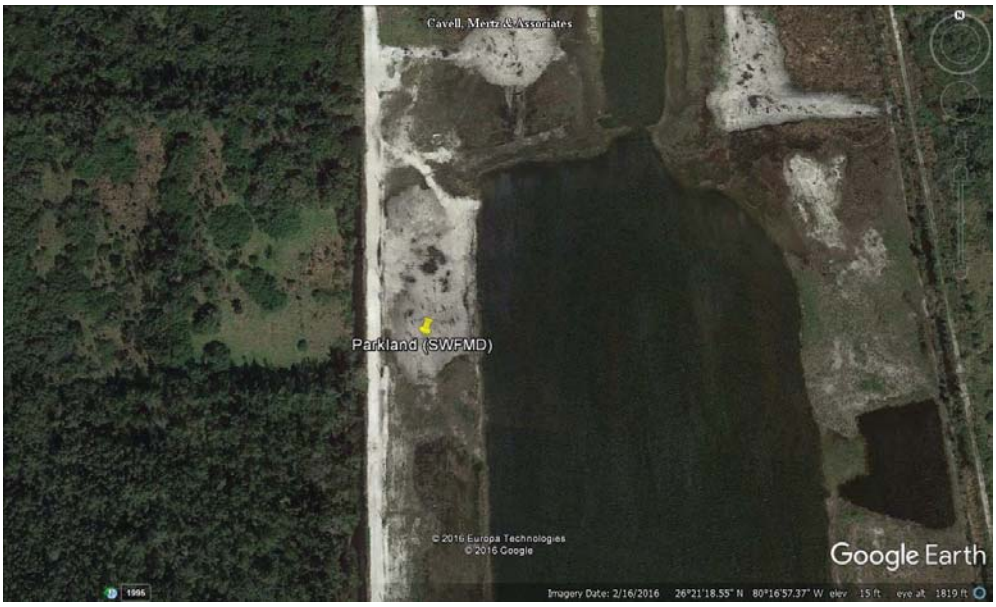


Figure 2-18: Parkland

Site Details:

Tower Work:

- Construct pier and pad type tower foundations including excavation, rebar, and concrete
- Erect new 300' self-supported tower.
- Supply and install grounding for the tower base.

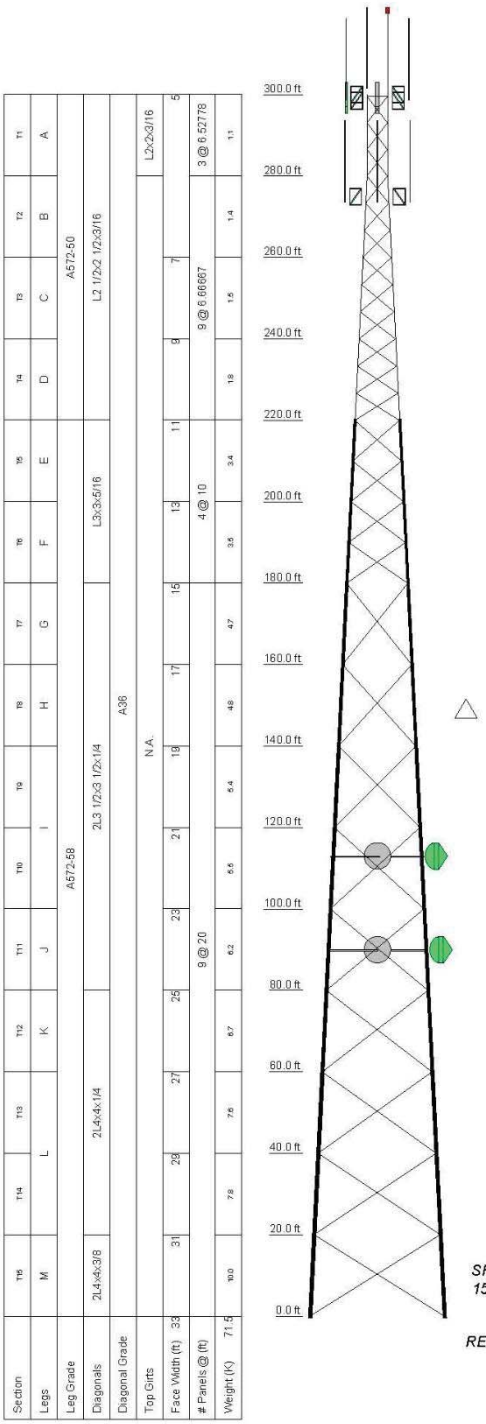
Antenna and Transmission Line:

- Install five antennas for the RF system.
- Supply and install side arm(s) for all antenna and dish mounts.
- Install two tower-top amplifiers.
- Install 1/2-inch transmission line as required.
- Install 7/8-inch transmission line as required.
- Install 1-1/4-inch transmission line as required.
- Install 4 Microwave Dishes.
- Perform sweep tests on transmission lines.
- Install Elliptical waveguide as required.
- Perform alignment of each of the microwave paths to ensure that the microwave dishes are optimally positioned.
- Perform sweep tests on transmission lines.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Table 2-13: System and Site Improvements

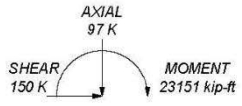
SYSTEM				
Ground Elevation (Ft.)			17	
Site Acquisition			No	
Zoning			No	
A&E Services			Yes	
Latitude			Longitude	
26 21 17.8			80 16 59.2	
Site Owner				
Broward County				
New Tower Ht (Ft.)			New Tower Type	
300			Self Supported	
SITE IMPROVEMENTS				
New Compound/Expansion Size				
Width (Ft).	Length (Ft.)		Clearing Type	
60	80		Light	
New Ice Bridge Length (Ft.)				
15				
New Shelter Type				
Custom pre-cast				
New Shelter Width (Ft.)		New Shelter Length (Ft.)		
24		32		
New Fuel Tank (Gal.)		New Fuel Tank (Type)		
1000		Diesel		
New Generator (kW)		New Generator (Type)		
175 kw / 600 A		Outdoor		
New Electrical Circuits				
Amps/Volts	Type		Cable (Ft.)	
600-amp - 208-240-volt, three-phase	Underground		50	
New Antenna: RF	New Antenna: TTA		New MW Dish:	
5	2		4	
New RF Lines (Linear Ft.)[13]				
1/2-inch	7/8-inch	1-1/4-inch	1-5/8-inch	Wave Guide
660	660	915	N/A	630

[13] Or as required.



ALL REACTIONS
ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 842 K
UPLIFT: -731 K
SHEAR: 93 K



TORQUE 97 kip-ft
REACTIONS - 140 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
21' LRE with 7'-6" lightning rod (arm=11.5')	300	CC807-11	275
		6' Universal Side Arm (84" pipe)	275
Beacon	300	CC807-11	275
20' Beacon Extender	300	6' Universal Side Arm (84" pipe)	275
CC807-11	300	CC807-11	275
6' Universal Side Arm (84" pipe)	300	6' Universal Side Arm (84" pipe)	275
CC807-11	300	CC807-11 (50% future)	275
6' Universal Side Arm (84" pipe)	300	6' Universal Side Arm (84" pipe) (50% future)	275
Bird Technologies 428E-83I-01-T	300		
6' Pivot Side Arm (50" pipe)	300	CC807-11 (50% future)	275
Bird Technologies 428E-83I-01-T	300	6' Universal Side Arm (84" pipe) (50% future)	275
6' Pivot Side Arm (50" pipe)	300		
CC807-11 (50% future)	300	CC807-11 (50% future)	275
6' Universal Side Arm (84" pipe) (50% future)	300	6' Universal Side Arm (84" pipe) (50% future)	275
CC807-11 (50% future)	300	2-1/2" x 22' Sch. 40	113
6' Universal Side Arm (84" pipe) (50% future)	300	2-1/2" x 22' Sch. 40	113
		PAD6-59BC (w/ Radome Assumed)	113
Bird Technologies 428E-83I-01-T (50% future)	300	PAD6-59BC (w/ Radome Assumed) (50% future	113
6' Pivot Side Arm (50" pipe) (50% future)	300	3" x 24' Sch. 40	90
		PAD6-59BC (w/ Radome Assumed)	90
Bird Technologies 428E-83I-01-T (50% future)	300	3" x 24' Sch. 40	90
6' Pivot Side Arm (50" pipe) (50% future)	300	PAD6-59BC (w/ Radome Assumed) (50% future	90

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	P- 4.00"- 0.75" conn.-20'-C-Trans-8B-4B-(Pirod 226184)	H	#12ZG-58 -2.00" - 0.875" conn. (Pirod 195639)
		I	#12ZG-58 -2.25" - 0.875" conn. (Pirod 195960)
B	P- 5.00"- 0.75" conn.-Trans-20'-C-(Pirod 226200)	J	#12ZG-58 - 2.50" - 0.875" conn.-TR4-(Pirod 195962)
C	P- 5.00"- 0.75" conn.-20'-C-(Pirod 226192)		
D	P- 6.00"- 0.75" conn.-HBD-Trans-20'-C-(Pirod 229377)	K	#12ZG-58 - 2.50" - 0.875" conn. (Pirod 195964)
		L	#12ZG-58 - 2.75" - 0.875" conn. (Pirod 196299)
E	#12ZG-58 - 1.75" - 1.00" conn.-TR1-(Pirod 195213)	M	#12ZG-58 -3.00" - 0.875" conn. (Pirod 196521)
F	#12ZG-58 - 1.75" - 1.00" conn. (Pirod 195217)		

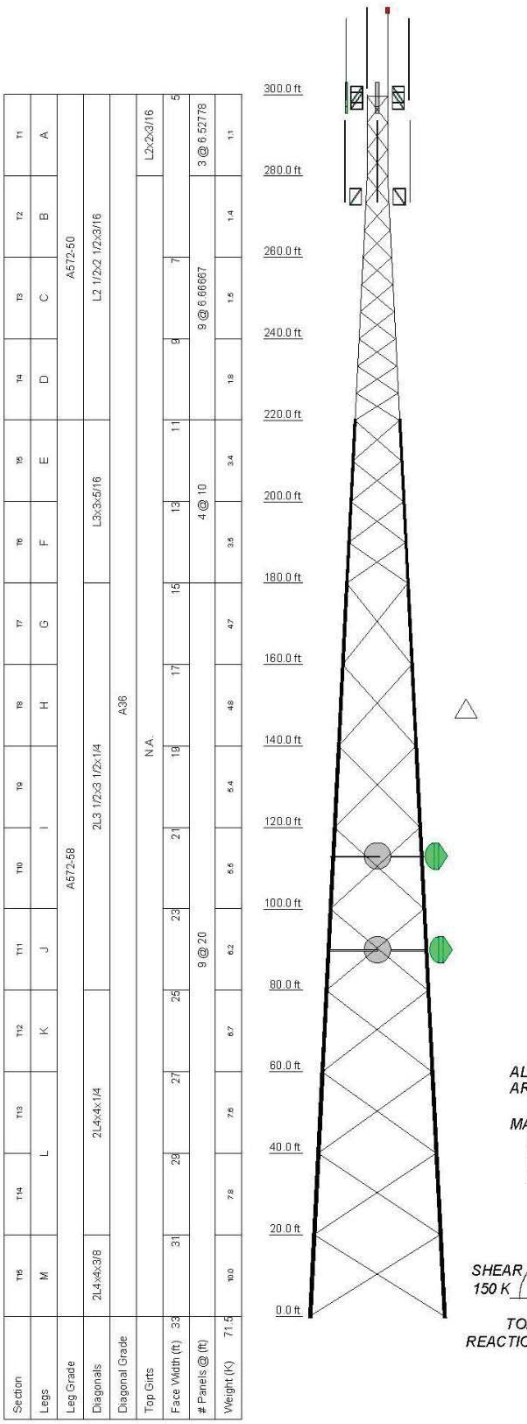
MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A572-58	58 ksi	75 ksi
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

1. Tower is located in Broward County, Florida.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 140 mph basic wind in accordance with the TIA-222-G Standard.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 99.5%

Valmont 1545 Pidco Drive Plymouth, IN Phone: 574-936-4221 FAX:	Job: *Quotation 334251-02*		
	Project: *V-33 x 300'*		
	Client: Motorola Solutions	Drawn by: SKK	App'd:
	Code: TIA-222-G	Date: 04/06/17	Scale: NTS
	Path:		Dwg No. E-1



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
21' LRE with 7'-6" lightning rod (arm=11.5')	300	CC807-11	275
		6' Universal Side Arm (84" pipe)	275
Beacon	300	CC807-11	275
20' Beacon Extender	300	6' Universal Side Arm (84" pipe)	275
CC807-11	300	CC807-11	275
6' Universal Side Arm (84" pipe)	300	6' Universal Side Arm (84" pipe)	275
CC807-11	300	CC807-11 (50% future)	275
6' Universal Side Arm (84" pipe)	300	6' Universal Side Arm (84" pipe) (50% future)	275
Bird Technologies 428E-83I-01-T	300		
6' Pivot Side Arm (50" pipe)	300	CC807-11 (50% future)	275
Bird Technologies 428E-83I-01-T	300	6' Universal Side Arm (84" pipe) (50% future)	275
6' Pivot Side Arm (50" pipe)	300		
CC807-11 (50% future)	300	CC807-11 (50% future)	275
6' Universal Side Arm (84" pipe) (50% future)	300	6' Universal Side Arm (84" pipe) (50% future)	275
CC807-11 (50% future)	300	2-1/2" x 22' Sch. 40	113
6' Universal Side Arm (84" pipe) (50% future)	300	2-1/2" x 22' Sch. 40	113
		PAD6-59BC (w/ Radome Assumed)	113
Bird Technologies 428E-83I-01-T (50% future)	300	PAD6-59BC (w/ Radome Assumed) (50% future	113
6' Pivot Side Arm (50" pipe) (50% future)	300	3" x 24' Sch. 40	90
		PAD6-59BC (w/ Radome Assumed)	90
Bird Technologies 428E-83I-01-T (50% future)	300	3" x 24' Sch. 40	90
		PAD6-59BC (w/ Radome Assumed) (50% future	90
6' Pivot Side Arm (50" pipe) (50% future)	300		

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	P- 4.00"- 0.75" conn.-20'-C-Trans-8B-4B-(Pirod 226184)	H	#12ZG-58 -2.00" - 0.875" conn. (Pirod 195639)
		I	#12ZG-58 -2.25" - 0.875" conn. (Pirod 195960)
B	P- 5.00"- 0.75" conn.-Trans-20'-C-(Pirod 226200)	J	#12ZG-58 - 2.50" - 0.875" conn.-TR4-(Pirod 195962)
C	P- 5.00"- 0.75" conn.-20'-C-(Pirod 226192)		
D	P- 6.00"- 0.75" conn.-HBD-Trans-20'-C-(Pirod 229377)	K	#12ZG-58 - 2.50" - 0.875" conn. (Pirod 195964)
		L	#12ZG-58 - 2.75" - 0.875" conn. (Pirod 196299)
E	#12ZG-58 - 1.75" - 1.00" conn.-TR1-(Pirod 195213)	M	#12ZG-58 -3.00" - 0.875" conn. (Pirod 196521)
F	#12ZG-58 - 1.75" - 1.00" conn. (Pirod 195217)		

MATERIAL STRENGTH

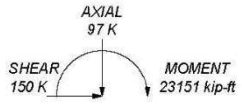
GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A572-58	58 ksi	75 ksi
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

1. Tower is located in Broward County, Florida.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 140 mph basic wind in accordance with the TIA-222-G Standard.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 99.5%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 842 K
UPLIFT: -731 K
SHEAR: 93 K



TORQUE 97 kip-ft
REACTIONS - 140 mph WIND

Valmont	Job: *Quotation 334251-02*		
1545 Pidco Drive	Project: ***V-33 x 300'***		
Plymouth, IN	Client: Motorola Solutions	Drawn by: SKK	App'd:
Phone: 574-936-4221	Code: TIA-222-G	Date: 04/06/17	Scale: NTS
FAX:	Path:		Dwg No. E-1

2.17 Site Name: West Hollywood

West Hollywood is a new Broward County Radio site. In accordance with Solicitation R1422515P1 Appendix B- Addendum 2, the site will receive a new 24’ X 32’ precast shelter with a new DC Power System, generator and a new 300' self-supported tower.



Figure 2-19: West Hollywood

Site Details:

Tower Work:

- Construct pier and pad type tower foundations including excavation, rebar, and concrete
- Erect new 300’ self-supported tower.
- Supply and install grounding for the tower base.

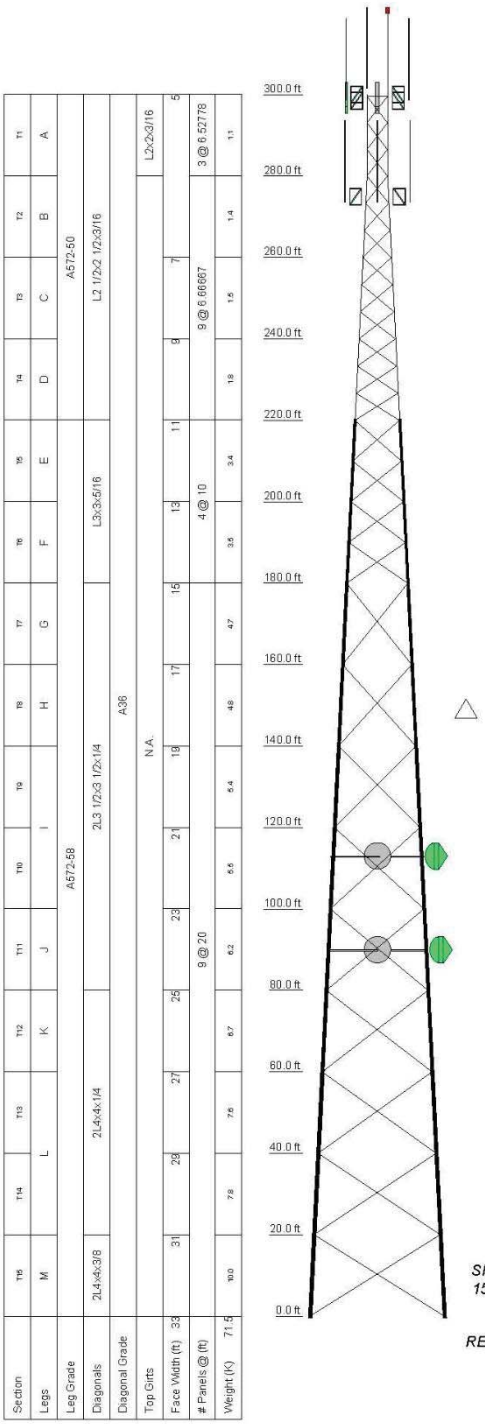
Antenna and Transmission Line:

- Install five antennas for the RF system.
- Supply and install side arm(s) for all antenna and dish mounts.
- Install two tower-top amplifiers.
- Install 1/2-inch transmission line as required.
- Install 7/8-inch transmission line as required.
- Install 1-1/4-inch transmission line as required.
- Install two Microwave Dishes.
- Perform sweep tests on transmission lines.
- Install Elliptical waveguide as required.
- Perform alignment of each of the microwave paths to ensure that the microwave dishes are optimally positioned.
- Perform sweep tests on transmission lines.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Table 2-14: System and Site Improvements

SYSTEM				
Ground Elevation (Ft.)	17			
Site Acquisition	No			
Zoning	No			
A&E Services	Yes			
Latitude	Longitude			
26 03 37.2	80 12 00.0			
Site Owner				
Broward County				
New Tower Ht (Ft.)	New Tower Type			
300	Self Supported			
SITE IMPROVEMENTS				
New Compound/Expansion Size				
Width (Ft).	Length (Ft.)	Clearing Type		
60	80	Light		
New Ice Bridge Length (Ft.)				
15				
New Shelter Type				
Custom pre-cast				
New Shelter Width (Ft.)	New Shelter Length (Ft.)			
24	32			
New Fuel Tank (Gal.)	New Fuel Tank (Type)			
1000	Diesel			
New Generator (kW)	New Generator (Type)			
175	Outdoor			
New Electrical Circuits				
Amps/Volts	Type	Cable (Ft.)		
600-amp; 120/240-volt, three-phase	Underground	50		
New Antenna: RF	New Antenna: TTA	New MW Dish:		
5	2	2		
New RF Lines (Linear Ft.)[14]				
1/2-inch	7/8-inch	1-1/4-inch	1-5/8-inch	Wave Guide
660	660	915	N/A	335

[14] Or as required.



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
21' LRE with 7'-6" lightning rod (arm=11.5')	300	CC807-11	275
		6' Universal Side Arm (84" pipe)	275
Beacon	300	CC807-11	275
20' Beacon Extender	300	6' Universal Side Arm (84" pipe)	275
CC807-11	300	CC807-11	275
6' Universal Side Arm (84" pipe)	300	6' Universal Side Arm (84" pipe)	275
CC807-11	300	CC807-11 (50% future)	275
6' Universal Side Arm (84" pipe)	300	6' Universal Side Arm (84" pipe) (50% future)	275
Bird Technologies 428E-83I-01-T	300		
6' Pivot Side Arm (50" pipe)	300	CC807-11 (50% future)	275
Bird Technologies 428E-83I-01-T	300	6' Universal Side Arm (84" pipe) (50% future)	275
6' Pivot Side Arm (50" pipe)	300		
CC807-11 (50% future)	300	CC807-11 (50% future)	275
6' Universal Side Arm (84" pipe) (50% future)	300	6' Universal Side Arm (84" pipe) (50% future)	275
CC807-11 (50% future)	300	2-1/2" x 22' Sch. 40	113
6' Universal Side Arm (84" pipe) (50% future)	300	2-1/2" x 22' Sch. 40	113
		PAD6-59BC (w/ Radome Assumed)	113
Bird Technologies 428E-83I-01-T (50% future)	300	PAD6-59BC (w/ Radome Assumed) (50% future	113
6' Pivot Side Arm (50" pipe) (50% future)	300	3" x 24' Sch. 40	90
		PAD6-59BC (w/ Radome Assumed)	90
Bird Technologies 428E-83I-01-T (50% future)	300	3" x 24' Sch. 40	90
6' Pivot Side Arm (50" pipe) (50% future)	300	PAD6-59BC (w/ Radome Assumed) (50% future	90

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	P- 4.00"- 0.75" conn.-20'-C-Trans-8B-4B-(Pirod 226184)	H	#12ZG-58 -2.00" - 0.875" conn. (Pirod 195639)
		I	#12ZG-58 -2.25" - 0.875" conn. (Pirod 195960)
B	P- 5.00"- 0.75" conn.-Trans-20'-C-(Pirod 226200)	J	#12ZG-58 - 2.50" - 0.875" conn.-TR4-(Pirod 195962)
C	P- 5.00"- 0.75" conn.-20'-C-(Pirod 226192)		
D	P- 6.00"- 0.75" conn.-HBD-Trans-20'-C-(Pirod 229377)	K	#12ZG-58 - 2.50" - 0.875" conn. (Pirod 195964)
		L	#12ZG-58 - 2.75" - 0.875" conn. (Pirod 196299)
E	#12ZG-58 - 1.75" - 1.00" conn.-TR1-(Pirod 195213)	M	#12ZG-58 -3.00" - 0.875" conn. (Pirod 196521)
F	#12ZG-58 - 1.75" - 1.00" conn. (Pirod 195217)		

MATERIAL STRENGTH

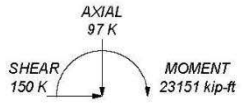
GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A572-58	58 ksi	75 ksi
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

1. Tower is located in Broward County, Florida.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 140 mph basic wind in accordance with the TIA-222-G Standard.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 99.5%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 842 K
UPLIFT: -731 K
SHEAR: 93 K



TORQUE 97 kip-ft
REACTIONS - 140 mph WIND

Valmont	Job: *Quotation 334251-02*		
1545 Pidco Drive	Project: *V-33 x 300'*		
Plymouth, IN	Client: Motorola Solutions	Drawn by: SKK	App'd:
Phone: 574-936-4221	Code: TIA-222-G	Date: 04/06/17	Scale: NTS
FAX:	Path:		Dwg No. E-1

2.18 Site Name: Pompano Beach Club

Pompano Beach Club is a new Broward County Radio site. In accordance with Solicitation R1422515P1 Appendix B- Addendum 2, the existing Roof top equipment room and building backup power (generator) will be used. A new DC Power System will be installed. The equipment room will be modified to support the equipment.

Any services or work necessary to be performed at this site to achieve the specifications of the System and meet the other requirements of the Agreement shall be completed by Motorola as part of the scope of services hereunder.



Figure 2-20: Pompano Beach Club

Site Details

Site Engineering:

- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter one, subsection 1.1307 that may be potentially impacted by the construction activity.
- Provide a structural engineering analysis for antenna support structure, to support the antenna system.
- Provide tower climbing and tower mapping services to collect information about structural members and existing equipment.

Antenna and Transmission Line:

- Install five antennas for the RF system.
- Supply and install side arm(s) for all antenna and dish mounts.
- Install two tower top amplifiers.
- Install 1/2-inch transmission line as required.
- Install 7/8-inch transmission line as required.
- Install two Microwave Dishes.
- Install Elliptical waveguide as required.

- Perform alignment of each of the microwave paths to ensure that the microwave dishes are optimally positioned.
- Perform sweep tests on transmission lines.
- Supply and install one ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work:

- Fabricate steel weight distribution plate and make electrical modifications in order for the existing shelter to receive the new DC Power System.
- Upgrade site grounding to the latest revision of R56
- Provide all necessary equipment and services necessary to fully cutover users from the old system to the new system
- Upgrade equipment and supporting systems to optimal conditions, including the following:
  - Ensure roof is in good condition and free of leaks
  - Repair any damaged flooring or siding to equipment room
  - Seal equipment room to prevent pest entry
  - Service all HVAC units and upgrade and/or replace as necessary to ensure proper cooling of equipment

- Replace existing 200 amp electric panel with new panel
- Interface to existing 3 Phase transformer

Table 2-15: System and Site Improvements

SYSTEM				
Ground Elevation (Ft.)	10			
Site Acquisition	No			
Zoning	No			
A&E Services	Yes			
Latitude	Longitude			
26 05 48.0	80 06 26.0			
Site Owner				
Pompano Beach Club				
Existing Tower Ht (Ft.)	Existing Tower Type			
300	Roof Top			
SITE IMPROVEMENTS				
New Compound/Expansion Size				
Width (Ft).	Length (Ft.)	Clearing Type		
N/A	N/A	N/A		
New Ice Bridge Length (Ft.)				
N/A				
New Shelter Type				
N/A				
New Shelter Width (Ft.)	New Shelter Length (Ft.)			
N/A	N/A			
New Fuel Tank (Gal.)	New Fuel Tank (Type)			
N/A	N/A			
New Generator /Transfer Switch	New Generator (Type)			
N/A	N/A			
New Electrical Circuits				
Amps/Volts	Type	Cable (Ft.)		
N/A	N/A	N/A		
New Antenna: RF	New Antenna: TTA	New MW Dish:		
5	2	2		
New RF Lines (Linear Ft.)[15]				
1/2-inch	7/8-inch	1-1/4-inch	1-5/8-inch	Wave Guide
200	500	N/A	N/A	200

[15] Or as required.

2.19 Site Name: EMS

EMS is an existing Broward County Radio site. In accordance with Solicitation R1422515P1 Appendix B- Addendum 2, the existing 24' X 32' shelter, tower and generator will be used. A new DC power system will be provided. The existing UPS will be decommissioned and removed.



Figure 2-21: EMS

Site Details:

Site Engineering:

- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the construction activity.
- Provide a structural engineering analysis for antenna support structure, to support the antenna system.
- Provide tower climbing and tower mapping services to collect information about structural members and existing equipment.
- Decommission antennas, feed lines, and equipment associated with the "backup" system for the existing system

Antenna and Transmission Line:

- Install three antennas for the RF system.
- Supply and install side arm(s) for all antenna and dish mounts.
- Install one tower-top amplifiers.
- Install 1/2-inch transmission line as required.
- Install 7/8-inch transmission line as required.
- Install 1-1/4-inch transmission line as required.
- Install three Microwave Dishes.
- Perform sweep tests on transmission lines.
- Install Elliptical waveguide as required.
- Perform alignment of each of the microwave paths to ensure that the microwave dishes are optimally positioned.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition

Table 2-16: System and Site Improvement

SYSTEM				
Ground Elevation (Ft.)	10			
Site Acquisition	No			
Zoning	No			
A&E Services	Yes			
Latitude	Longitude			
26 09 14.4	80 10 38.3			
Site Owner				
Broward County, FL				
Existing Tower Ht (Ft.)	Existing Tower Type			
400	Guyed tower			
SITE IMPROVEMENTS				
New Compound/Expansion Size				
Width (Ft).	Length (Ft.)	Clearing Type		
N/A	N/A	N/A		
New Ice Bridge Length (Ft.)				
N/A				
New Shelter Type				
N/A				
New Shelter Width (Ft.)	New Shelter Length (Ft.)			
N/A	N/A			
New Fuel Tank (Gal.)	New Fuel Tank (Type)			
N/A	N/A			
New Generator (kW)	New Generator (Type)			
N/A	N/A			
New Electrical Circuits				
Amps/Volts	Type	Cable (Ft.)		
N/A	N/A	N/A		
New Antenna: RF	New Antenna: TTA	New MW Dish:		
3	1	3		
New RF Lines (Linear Ft.)[16]				
1/2-inch	7/8-inch	1-1/4-inch	1-5/8-inch	Wave Guide
450	450	900	N/A	355

[16] Or as required.

2.20 Site Name: EOC

Emergency Operations Center (EOC) is an existing Broward County facility. In accordance with Solicitation R1422515P1, Appendix B- Addendum 2, this will be a Microwave site on the system.

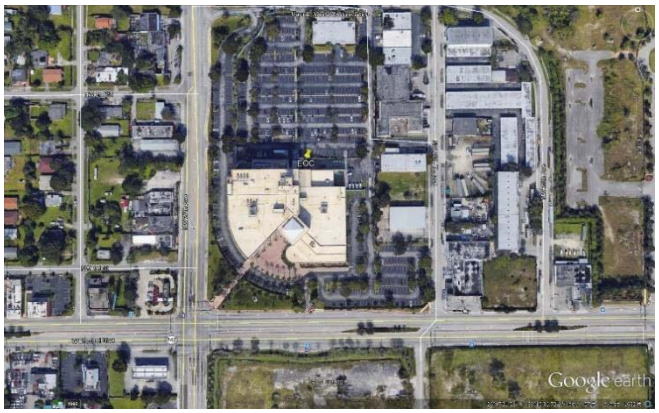


Figure 2-22: EOC

Site Details:

Site Engineering:

- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the construction activity.
- Provide a structural engineering analysis for antenna support structure, to support the antenna system.
- Provide tower climbing and tower mapping services to collect information about structural members and existing equipment.

Antenna and Transmission Line:

- Supply and install side arm(s) for all antenna and dish mounts.
- Install 2 Microwave Dishes.
- Perform sweep tests on transmission lines.
- Install Elliptical waveguide as required.
- Perform alignment of each of the microwave paths to ensure that the microwave dishes are optimally positioned.
- Perform sweep tests on transmission lines.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Table 2-17: System and Site Improvements

SYSTEM				
Ground Elevation (Ft.)	9			
Site Acquisition	No			
Zoning	No			
A&E Services	Yes			
Latitude	Longitude			
26 07 22.5	80 10 37.5			
Site Owner				
Broward County, FL				
Existing Tower Ht (Ft.)	Existing Tower Type			
180	Monopole			
SITE IMPROVEMENTS				
New Compound/Expansion Size				
Width (Ft).	Length (Ft.)	Clearing Type		
N/A	N/A	N/A		
New Ice Bridge Length (Ft.)				
N/A				
New Shelter Type				
N/A				
New Shelter Width (Ft.)	New Shelter Length (Ft.)			
N/A	N/A			
New Fuel Tank (Gal.)	New Fuel Tank (Type)			
N/A	N/A			
New Generator (kW)	New Generator (Type)			
N/A	N/A			
New Electrical Circuits				
Amps/Volts	Type	Cable (Ft.)		
N/A	N/A	2		
New Antenna: RF	New Antenna: TTA	New MW Dish:		
N/A	N/A	2		
New RF Lines (Linear Ft.)[17]				
1/2-inch	7/8-inch	1-1/4-inch	1-5/8-inch	Wave Guide
N/A	N/A	N/A	N/A	260

[17] Or as required.

SECTION 3 RESPONSIBILITIES AND ASSUMPTIONS

The following description of responsibilities and assumptions is provided to clarify the parties' respective responsibilities. In the event of a conflict between anything set forth herein and the Specifications or the Final Acceptance Criteria, the Specifications and the Final Acceptance Criteria shall govern the responsibilities of Provider and the requirements for Final Acceptance.

3.1 Motorola Solutions Responsibilities

Motorola shall be responsible for the following:

3.1.1 Site Engineering for New Sites

- Prepare site construction drawings showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Perform a boundary and topographic survey for the property on which the communication site is located or will be located.
- Prepare a site exhibit and sketch of the site to communicate to the property owner of the lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform construction staking around the site to establish reference points for proposed construction.
- Perform NEPA Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 CFR Chapter 1, subsection 1.1307 that may potentially be impacted by the construction activity. This does not include the additional field investigations to document site conditions if it is determined that the communication facility "may have a significant environmental impact" and thus require additional documentation, submittals, or work. Regional Environmental Review (RER) report submittals if required by FEMA have not been included. Perform Cultural Resource study as needed to identify sensitive historical and archaeological monuments that might be impacted by construction.
- Conduct soil boring tests at tower locations and prepare geotechnical report of soil conditions at the location of tower foundations.
- Conduct construction inspection of foundation steel prior to pour, materials testing of concrete and field density tests of backfill to ensure quality construction.
- Check tower erection for plumbness, linearity and alignment after installation.
- Perform inspection of the site and the work performed by the Contractor to document that the site is built in accordance with the "Site Plans" and document any deviations or violations.
- Prepare, submit and track application for local permit fees (zoning, electrical, building, etc.), prepare FAA filings, and procure information necessary for filing.

- Any other required site preparation activities identified in the specifications or not immediately identified as a Broward County responsibility.

3.1.2 Site Preparation for New Sites

- Obtain the permits such as electrical, building, and construction permits, and coordinate any inspections with local authorities that may be needed to complete site development work.
- Provide mobilization costs for the construction crews.
- Perform light clearing of brush, grubbing, and disposal of vegetation and shrub growth in the site compound area.
- Grade the site compound and 10-foot path around it to provide a level, solid, undisturbed surface for installation of site components.
- Supply and install gravel surfacing to a depth of six inches, including herbicide treatment and geotextile fabric installation within the fenced in site compound area, and a three-foot path around it.
- Provide silt fence around the compound to control soil erosion.
- Supply and install eight-foot-high chain-link fencing with gate around the shelter compound.
- Perform site touch-up (fertilize, seed, and straw) disturbed areas not covered with gravel after completion of construction work.
- Secure power connection to the site, associated permitting and installation of a meter and disconnect within 50 feet of the shelter location. County will assist with interacting with the applicable utilities to the extent reasonably requested by Motorola, but all services shall be provided at no cost to County. Demarcation points shall be as determined by the applicable utilities.
- Any other required site preparation activities identified in the specifications or not immediately identified as a Broward County responsibility.

3.1.3 Site Component Installation for New Sites (New shelter sites are Channel 2, Deerfield, Tamarac, West Lake Park, FS 106, Pompano Beach, West Hollywood and Parkland)

- Construct one reinforced concrete foundation necessary for a 24-foot X 32-foot shelter (all new shelters shall be 24 x 32 where physically possible, unless otherwise agreed by the parties).
- Construct concrete slab for above-ground diesel tanks at 3000 psi with reinforcing steel necessary for foundations (except for Channel 2 site).
- Supply and install one prefabricated 24-foot X 32-foot shelter as specified in Section 5.3 Shelters. (Note: Motorola Solutions agrees with the county in that falling ice impacting the roof of the shelters will not be an issue. However, Motorola Solutions has chosen to exceed the roof loading in order to comply with the intent of the shelter specs (5.3 Shelters, F. Roof, F). As such, Motorola Solutions has increased the roof load by 50% to 150 psf.).
- Supply and install diesel fuel tanks, and connect to the generators (except for Channel 2 site).

- Supply and install fuel tank monitors on the tanks to monitor low fuel in tanks and run alarm wiring to the building located within 50 feet of the tank (except for Channel 2 site).
- Supply and install one standby power generator as noted and ATS, including interconnection wiring between the generator, transfer switch, and site electrical service mains (except for Channel 2 site).
- Provide a protected CMU enclosure as noted surrounding the generator and fuel tank (except for Channel 2 site).
- Supply and install one single-phase meter pedestal (see individual sites for amperage) and hook-up for electrical service by the local utility.
- Provide all trenching, conduit, and cabling necessary for underground hook-up of power to the shelter from nearby utility termination located within 50 cable feet of the shelter.
- Supply and install a perimeter grounding system around the compound, shelter and tower (where applicable). The ground system is to tie to the fence and all new metal structures within the compound to meet current Motorola Solutions' R56 standards.
- Conduct one three-point ground resistance test of the site.
- Supply and install one freestanding 24-inch-wide cable/ice bridge from the tower to the shelter.
- Any other required site preparation activities identified in the specifications or not immediately identified as a Broward County responsibility.

3.1.4 Motorola Responsibilities for Existing Sites

- Upgrading existing site grounding systems to the latest revisions of R56, including internal shelter grounding, external shelter grounding, tower grounding, and subterranean grounding
- Reinforce flooring as necessary to support the DC power system
- Evaluate heating and cooling for existing HVAC systems and provide any enhancements necessary
- Evaluate floor loading and upgrade floors if necessary to accommodate the weight of the equipment, including the DC plant
- Ensure a sufficient number of entry ports, and add additional ports if necessary
- Add additional support facilities for the proposed radio network, including but not limited to cable ladders, ice bridge, ground bus bars, etc.
- All applicable environmental and permitting (NEPA, SHPO, building permits, etc.)
- Provide any facility upgrades necessary to support the cutover, including temporary shelters, entry ports, ice bridge, cable ladders, etc.
- Decommission old antennas and feedlines at the conclusion of the project
- Reconfigure site power distribution system for DC
- Upgrade site electrical system in order to comply with NFPA 70, Article 708
- Provide a site structural analysis for each site
- Perform tower mapping to validate existing antenna systems and heights for use in the structural analysis
- Motorola will provide electrical upgrades, with respect to breaker panels and circuit breakers in order to accommodate the new DC power system for the new radio system.

- Perform electrical and heat loading to determine the full impact at each site, and provide the necessary remediation, if required.
- Upgrade shelter and supporting systems to optimal conditions, including the following:
    - Ensure roof is in good condition and free of leaks
    - Repair any damaged flooring or siding to building
    - Seal building to prevent pest entry
    - Service all HVAC units and upgrade or, if necessary to ensure proper cooling of equipment, replace. (County may elect to replace as part of Optional Services, if the HVAC units are not required to be replaced to ensure proper cooling of equipment.)
- Any other required site preparation activities identified in the specifications or not immediately identified as a Broward County responsibility.

3.1.5 Additional Requirements for all Sites

- Ensure a fully functioning automatic fire suppression system exists at all sites which is fully compliant with NFPA and all other applicable codes.

3.2 Broward County Responsibilities

County shall be responsible for the following:

3.2.1 Broward County Responsibilities for Existing Sites

- Pay for the usage costs of power, leased lines, and generator fueling both during the construction/installation effort and on an ongoing basis.
- Pay for application fees, taxes, and recurring payments for ownership of the property.
- Maintain existing access roads in order to provide clear and stable entry to the site for heavy-duty vehicles and cranes. Sufficient space must be available at the site for these vehicles to maneuver under their own power, without assistance from other equipment.
- Arrange for space on the structure for installation of new antennas at the heights on designated existing antenna-mounting structures. The towers will meet all applicable EIA/TIA-222 G structural, foundation, ice, wind, and twist and sway requirements.
- Provide any previously procured and currently available as-built structural and foundation drawings of the structure and site location(s) along with geotechnical report(s) if available solely for Motorola reference in conjunction with Motorola Solutions' obligation to conduct a structural analysis and tower mapping at each site.
- Allow use of existing support facilities for the antenna cables (cable ladder, entry ports) from the antenna to the equipment room.

3.2.2 Broward County Responsibilities for New Sites

- Review site design drawings within thirty calendar days of submission by Motorola Solutions or its subcontractor(s). Should a re-submission be required, the Broward County shall review and approve the re-submitted plans within seven calendar days from the date of submittal.
- Pay for application fees, taxes, and recurring payments for ownership of the property.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola Solutions.
- Provide a right of entry letter from the site owner for Motorola Solutions to conduct field investigations.

3.2.3 Broward County Responsibilities for All Sites

- All recurring and non-recurring utility costs including, but not limited to, generator fuel (except first fill), electrical, and Telco, will be borne by Broward County or site owner.

3.3 Assumptions

The following assumptions were utilized by Provider in estimating the schedule and work required, and are stated here solely for clarification purposes. Failure of any assumption stated in this Section 3.3 shall not diminish or alleviate any obligation of Provider or modify the scope of services or the cost to County of the services required under this Agreement, unless expressly approved by the County in writing.

3.3.1 Assumptions for Existing Sites

- No prevailing wage, certified payroll, or mandatory minority workers are required for this work, other than to the extent expressly set forth in the Agreement.
- All site work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).

3.3.2 Assumptions for New Sites

- All site work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- Site will have adequate electrical service for the new shelter and tower. Utility transformer, transformer upgrades, line, or pole extensions have not been included.
- Hazardous materials are not present at the work location prior to commencement of work by Motorola. Testing and removal of pre-existing hazardous materials found during site investigations, construction or equipment installation will be the responsibility of the Broward County.

- The schedule is based on a maximum of 30 days will be required for obtaining approved building permits from time of submission. Motorola is responsible for obtaining building permits, and will not hold the County responsible for delays in the permitting process.
- Based on Motorola Solutions' assessments during site walks, no improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access. Therefore, Motorola will be responsible for these upgrades if the determination made during the site walks was incorrect.
- Subsurface conditions for tower design are based on Presumptive Sand soil parameters, as defined by EIA/TIA-222-G. Motorola will be responsible for any additional work or materials if this assumption is incorrect.
- The new tower locations will pass the FAA hazard study, zoning, FCC, and environmental permitting. To the extent any failure is due to design, construction, or any work undertaken by Motorola under this Agreement, Motorola will be responsible for rectifying any failures.
- Tower and foundation sizing is based on the tower loading requirements as a result of the RF Antenna System design and the Microwave Antenna System design (i.e., dish sizes and locations obtained from paper path studies). If as a result of NEPA studies, any jurisdictional authority should determine that a communications facility "may have a significant environmental impact," the environmental impact studies or field testing and evaluation related to such determination have not been included.
- A waiver to zoning requirements like setbacks, tower height limitations, etc. required by the Final Design can be obtained.
- The soil resistivity at the site is sufficient to achieve resistance of ten ohms or less. Communications site grounding will be designed and installed per Motorola Solutions' Standards and Guidelines for Communications Sites (R56). Motorola will be responsible for any additional work or materials if this assumption is incorrect.
- Underground utilities are not present in the construction area, and as such no relocation will be required.
- Spoils from the tower foundations can and will be transported to a proper facility away from the site by Motorola.

SECTION 4 SUBSTANTIAL AND FINAL COMPLETION ACCEPTANCE CRITERIA

Each site will be deemed separately tested and determined to have achieved Substantial Completion upon written notice by the County Contract Administrator of successful completion of the Substantial Completion Criteria set forth below. Each Site will also be separately tested and determined to have achieved Final Completion upon written notice by the County Contract Administrator of successful completion of the Final Completion Criteria set forth below.

Substantial Completion Criteria

- Site development completed per issued for construction (IFC) drawings, project requirements, and contractual obligations (including any Broward County/Motorola Solutions approved changes) and approved by the County:

- This shall be confirmed by DB-Firm and reviewed with Motorola Solutions construction manager and project manager before inspections occur.

- All jurisdictional and contractual required testing and inspections to be performed by the DB-Firm. (Contractual testing and inspections defined and agreed to with project team and Broward County prior to project kickoff; Provider is solely responsible for conducting, coordinating, and paying for all jurisdictional testing and inspections).
- Motorola Solutions site development checklist shall be completed and signed off by DB-Firm prior to Broward County inspection (review with project team and Broward County and amend checklist as required at project kickoff or before work begins).
- R56 audit completed by third party and checklist approved by Broward County, with all issues resolved by Provider and checklist approved by Broward County.
- Pictures demonstrating compliance with all acceptance criteria
- Site turnover package completed by Provider and turned over to Motorola Solutions (as defined and agreed to with the project team and Broward County).
- All punch list and deficiencies shall be completed by Provider prior to Broward County and Motorola Solutions inspections.
- Written certification by Consultant and Contract Administrator, in their reasonable sole discretion, that the work at each Site is at a level of completion in substantial compliance with the Agreement and SOW A-2 such that all conditions of permits and regulatory agencies have been satisfied and County can enjoy use or occupancy and can use or operate the Site in all respects for its intended purpose. A Certificate of Occupancy (or a Temporary Certificate of Occupancy or other alternate municipal/county authorization for limited or conditional occupancy acceptable to the Contract Administrator) must be issued for Substantial Completion to be achieved, however, the issuance of a Certificate of Occupancy or the date thereof are not to be determinative of the achievement or date of Substantial Completion.

Final Completion Criteria:

- All Sites have achieved Substantial Completion.
- Successful completion of thirty (30) day Burn-in Period without Severity 1 or 2 Event.
- Any and all action items identified in the R56 audit gaps, including without limitation gaps in compliance, recommendations to bring site up to standard, or other recommended corrective action, have be addressed and fully resolved by Provider and such resolution verified and approved by Broward County.
- All punch list items are fully resolved to County's reasonable satisfaction prior to Final Completion.
- Any acceptance criteria that was not fully met for Substantial Completion has been fully completed.

SOW A-3
Microwave System

SECTION 1 DIGITAL MICROWAVE NETWORK

A. The Microwave System shall consist of the following components:

1. Point-to-point digital microwave radios
2. Microwave antennas
3. Antenna systems
4. Alarms
5. Network Management System

B. The digital microwave network shall be implemented in accordance with the Project Schedule.

C. The Software and Equipment provided as part of this SOW A-2 are included in Schedule 1 and Schedule 2.

D. The Microwave System shall be implemented in parallel with the Radio System, unless otherwise approved by the Contract Administrator.

E. The Microwave System shall support the full set of backhaul requirements for the Radio System defined in SOW A-1.

1.1 Minimum Requirements

A. The digital microwave backhaul network shall consist of monitored hot standby (MHSB) or ring-protected, point-to-point licensed microwave hops.

B. Microwave terminal equipment shall include transmitter, receiver, modem, power supply, automatic switching device, multiplexer, service channel(s), and all associated interconnections to provide a complete and functional system.

C. The radio shall deliver two-frequency, full-duplex operation. Space diversity configurations are acceptable, if necessary, to meet reliability requirements.

D. The network shall support MPLS routing to support seamless integration and ad-hoc routing with landline-based Ethernet connections.

E. Microwave connectivity shall be provided to all radio site and dispatch locations.

F. The microwave configuration shall include a minimum of two loops, with each loop serving an evenly divided number of locations.

G. Redundant landline-based Ethernet connectivity shall be provided (utilizing circuits provided by AT&T through Broward County) to all critical infrastructure locations (system controllers, prime controllers, dispatch locations) as well as the EMS, Coconut Creek, Channel 2, and Davie locations identified in Appendix B. Radio backhaul must seamlessly route and self-heal between the combined microwave and landline network. Motorola shall be responsible for the interface to the circuits provided by Broward County.

H. Capacity:

1. Each hop shall be equipped for the radio network requirements for the equipment defined in SOW A-1, and existing legacy radio system channels to include the County's 28-channel SmartX system using the T1 protocols, the County's 4-site alphanumeric paging system, and any other equipment mutually agreed to by the Provider and the County..

2. Each hop shall deliver a minimum Ethernet payload capacity of 155 megabits per second (Mbps) or more, as required to serve the network identified in SOW A-1. All path designed for 155 Mbps airlink capacity, the common path to both rings can deliver 254 Mbps capacity.

3. Provider shall cutover the microwave system in advance of the radio system.

I. Performance Objectives:

1. Each microwave hop shall be designed to meet or exceed a one-way, end-to-end, per-path availability of 99.999% for 10-6 BER at the required capacity.

2. The mean time between failures (MTBF) for the MHSB transceiver equipment shall exceed 25 years.

3. The expected minimum field MTBF is as follows:

ECLIPSE MTBF VALUES

INU MODULES

Assembly	Expected Minimum Field MTBF, Years
Indoor Chassis, IDC	930
Indoor Chassis Extended, IDCe	603
Network Controller Card	162
FAN Card (1RU)	2829
FAN Card (2RU)	1281
Node Protection Card (NPC)	237
AUX Card (AUX)	408
Radio Access Card (RAC60/6X)	240
Data Access Card (4x)	897
Data Access Card (16x)	612
Data Access Card (3xDS3)	1110
Data Access Card (1x155o)	218
Data Access Card (2x155o)	134
Data Access Card (2x155e)	705
Data Access Card (1x155oM)	330
Data Access Card (GE3)	432
Network Convergence Module (NCM)	369

INDOOR RADIO FREQUENCY UNITS (IRU)

Assembly	Expected Minimum Field MTBF, Years
IRU 600 (v3)	117.9
IRU 600 EHP	87.6

* *This IRU600 MTBF figure does not include the removable FAN module, which is assumed to be a maintenance item, replaceable every 3 years.*

Assembly	Expected Minimum Field MTBF, Years
IDC + NCC + FAN + RAC60 + DACGE3 + ODU600	30
IDCe + NCC + 2xFAN + RAC60 + DACGE3 + DAC16x + IRU600v3	40
IDCe + NCC + 2xFAN + RAC60 + DACGE3 + DAC16x + IRU600 EHP	36

J. Frequency:

1. Provider is responsible for all microwave frequency research, prior coordination and preparation of all associated FCC license applications, and submittals on behalf of the County.

2. The County shall be responsible for coordination fees and licensing fees, if any, and signatures, if applicable.

3. The Provider shall utilize the 6 GHz and 11 GHz frequency bands for each hop based on the design in section 1.1.5 and FCC Part 101 regulations.

K. Data Rates:

1. DS1 bit rate – 1.544 Mbps (as defined by Bellcore GR-499-CORE, Section 9.3; ANSI T1.102; ITU-T 703)
2. DS3 bit rate – 44.736 Mbps (as defined by Bellcore GR-499-CORE; ANSI T1.102; ITU-T 703)
3. OC-3 Optical bit rate – 155.52 Mbps (as defined by ANSI T1.106/88)
4. Ethernet Interface bit rate – 10/100/1000 Mbps (as defined by IEEE 802.3)

L. Transmitter:

1. Provider shall provide transmit output power referenced to the antenna port.
   L6 GHz 30 MHz/128 QAM Tx out: 28/31/37 dBm SP/HP/EHP
   11 GHz 40 MHz/256 QAM Tx out: 22.5/25.5/32 dBm SP/HP/EHP
2. Transmit output power shall be software adjustable.
3. Automatic Transmit Power Control (ATPC) shall be available.
4. A switch from the main transmitter to the standby transmitter shall not result in a system outage. Provider shall describe expected switchover time.
5. Transmit Switching is not hitless, but It is within 50 ms for local alarms

6. Radios shall be equipped with redundant power amplifiers. Switching between power amplifiers shall not result in a system outage.

M. Receiver:

1. Provider shall provide a guaranteed receiver threshold.
   L6 GHz 30 MHz/128 QAM Threshold: -72.25 dBm
   11 GHz 40 MHz/256 QAM Threshold: -64.75 dBm

2. Provider shall provide performance criteria of the microwave radios for the following:

   a. Co-channel interference
   b. Adjacent-channel interference
   c. Dispersive fade margin
      DFM: 50/40 L6 GHz profiles above/11 GHz profiles above

3. The receiver shall be designed so as to ensure that the receiver with the better performance is operational at any given moment. Provider shall equip radios with a 10:1 split to prevent frequent switching.

4. Transfer to the backup receiver shall not result in a system outage.

N. Antenna System:

1. Microwave antennas shall be compatible with the radio frequency bands and conform to applicable FCC requirements. Solid parabolic type, Category A antennas shall be used in accordance with FCC Part 101.115 for use in public safety-grade communications systems. Provider shall utilize the smallest dish sizes possible that will satisfy the link reliability requirements.

2. A pressurized elliptical waveguide shall be used. Connectors shall be standard, premium type, and compatible with the antenna and EIA radio interfaces.

3. The following mounting equipment shall be installed per manufacturer specifications:

   a. Hanger kits (no snap-on kits)

b. Hoisting grips
c. Cable boots
d. 2 Stiff Arms per dish antenna

4. An automatic dehydrator/pressurization system shall be provided to maintain at least 5 pounds per square inch gauge (psig) positive pressure of conditioned air in the elliptical waveguide and antenna feed unit. Individual pressure gauges on a distribution manifold shall be provided for each line.

5. All installed antenna/transmission lines shall be purged, pressure tested, and tested for low voltage standing wave ratio (VSWR) using return loss measurements. The minimum VSWR shall be 1.5:1 with a return loss of 14 dB.

6. All RF paths shall be tested to demonstrate proper antenna alignment by measuring the net path loss between sites as measured at the equipment rack interface.

O. Channel Bank/Multiplex equipment:

1. The Provider shall provide digital channel bank multiplex equipment or equivalent. (T1 cards provided on the radio to provide native T1 interface to the existing system.)

a. If necessary, the Provider shall provide multiplex equipment (M13 mux) to convert DS3 signals to 28 DS1s.

b. All multiplex equipment shall be equipped with standby switching and alarms. The equipment also shall be capable of remote alarm/control.

c. The system must support an interface to the existing Motorola TeNsr channel banks and Larus route switch for ease of integration with the existing radio system.

P. Microwave NMS:

1. Provider shall provide a single service channel, or order wire, for each microwave terminal. The service channel shall be accessible via a single RS 232C data circuit and provide a single voice circuit.

2. A modern VOIP Digital Orderwire is included and shall be provided by Motorola.

1.2 Microwave Engineering

A. Provider shall conduct physical path surveys to assure that all paths meet proper clearance criteria.

B. Provider also shall conduct mandatory site visits at all sites and notify the County of any site modifications necessary for the microwave hop.

C. Provider shall provide antenna centerline mounting height recommendations, based upon the information gathered during the physical path surveys and site visits.

D. Provider shall include fade margin calculations with the proposal, showing the preliminary antenna sizes, system gains, and system losses.

E. Radomes shall be provided for each microwave antenna.

F. The equipment shall be type accepted for licensing under Part 101 of the FCC Rules and Regulations.

1.3 Remote Terminal Units (RTUS)

A. RTUs shall be provided in sufficient quantities to monitor the entire network, which equipment is included in the itemized Equipment list set forth in Schedule 1 to SOW A-1, including:

1. Microwave radios, channel banks, etc.
2. Data network equipment, including routers, switches, etc.
3. Dehydrator
4. Any other alarmable component of the microwave system
5. Site environmental alarms are not required.

B. RTUs shall be fully compatible with network management terminals (NMTs) supplied

C. RTUs shall support the following points:

1. Status/alarms – 48 minimum, expandable to 256 points
2. Control outputs – 8 minimum, expandable to 32

3. Analog inputs – 8 minimum, expandable to 16

D. RTUs shall provide time stamp and system time synchronization.

E. Terminations for all points shall be provided on suitable terminal blocks providing ease of installation, testing, and maintenance.

1.4 Microwave Backhaul Design

To provide reliable connectivity between the radio system sites and the dispatch locations, the microwave system is a state of the art MPLS Layer 3 backhaul network using Aviat Eclipse IRU600 v3 radios and CTR 8611 MPLS routers. The system shall include NO SINGLE POINT OF FAILURE, including IP, T1, or any other protocols that will support the new or legacy radio systems. The microwave backhaul network consists of 18 microwave links, operating in the 6 and 11 GHz bands, which have been configured in two interconnected rings. The rings have been designed with a shared path between them (EMS to Core), rather than intersecting at a single site, with the rest of the sites distributed between rings with nine and ten sites per ring. This will provide additional reliability to the network, by preventing a single site failure from separating the rings. The link that will be shared between the two rings was selected due to its short distance, which will allow it to operate at a higher modulation and reliability. This will allow for that link to provide a higher capacity than the other links under most operating conditions. The network layout used in the design has been provided in the figure below.

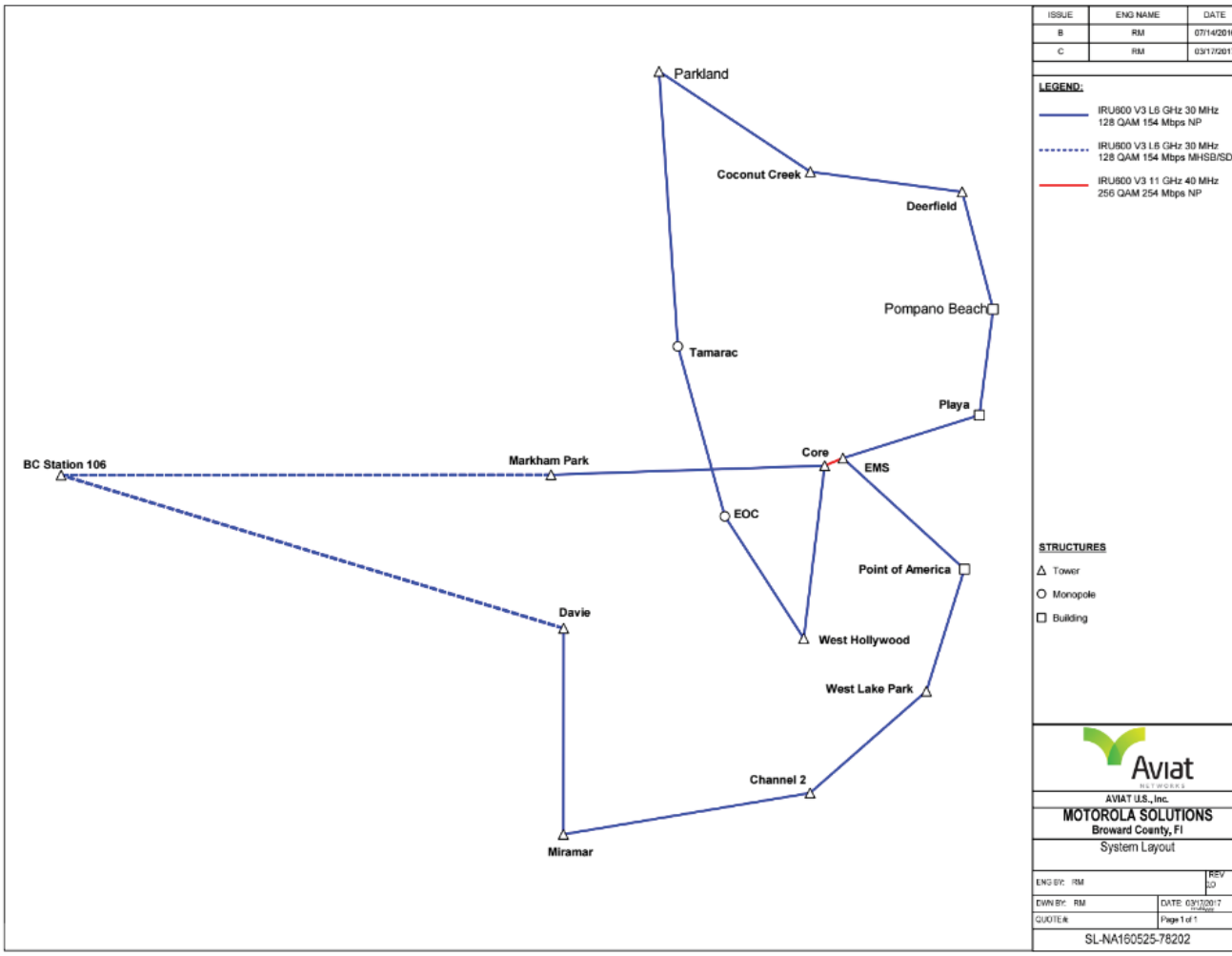
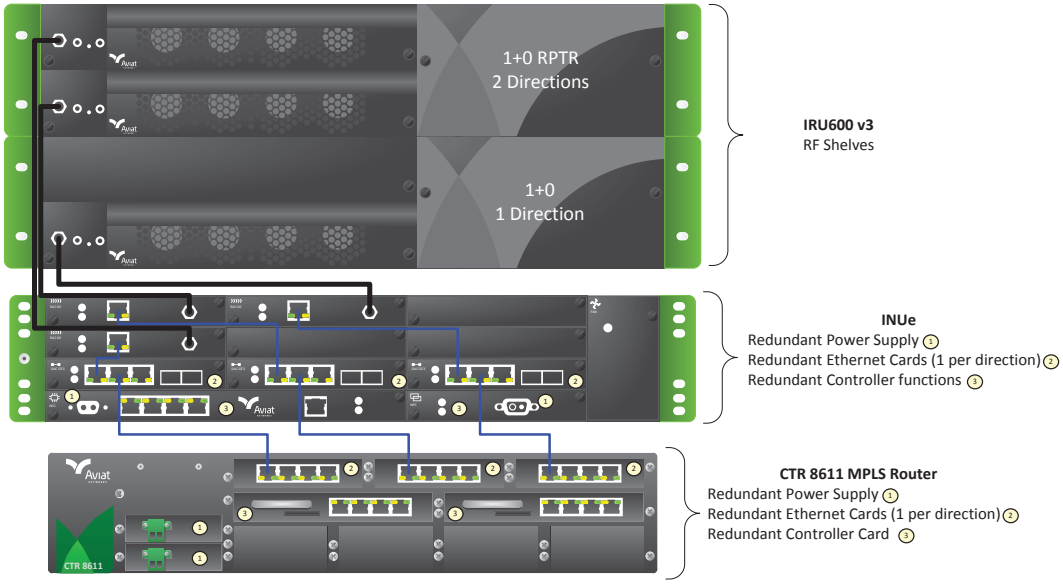
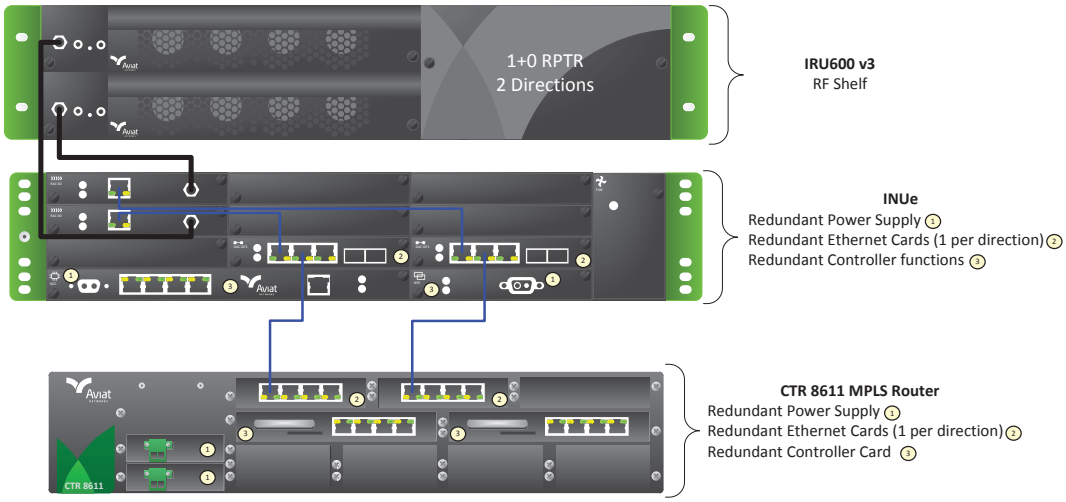

Parkland
Coconut Creek
Deerfield
Pompano Beach
Tamarac
Playa
BC Station 106
Markham Park
Core
EMS
EOC
Point of America
Davie
West Hollywood
West Lake Park
Channel 2
Miramar
ISSUE
ENG NAME
DATE
B
RM
07/14/2016
C
RM
03/17/2017
LEGEND:
IRU600 V3 L6 GHz 30 MHz 128 QAM 154 Mbps NP
IRU600 V3 L6 GHz 30 MHz 128 QAM 154 Mbps MHSB/SD
IRU600 V3 11 GHz 40 MHz 256 QAM 254 Mbps NP
STRUCTURES
Tower
Monopole
Building
Aviat
AVIAT U.S., Inc.
MOTOROLA SOLUTIONS
Broward County, Fl
System Layout
ENG BY: RM
REV
00
DWN BY: RM
DATE: 03/17/2017
QUOTE #:
Page 1 of 1
SL-NA160525-78202

Figure 1-1.

Typical 3-Direction Site



Typical 2-Direction Site



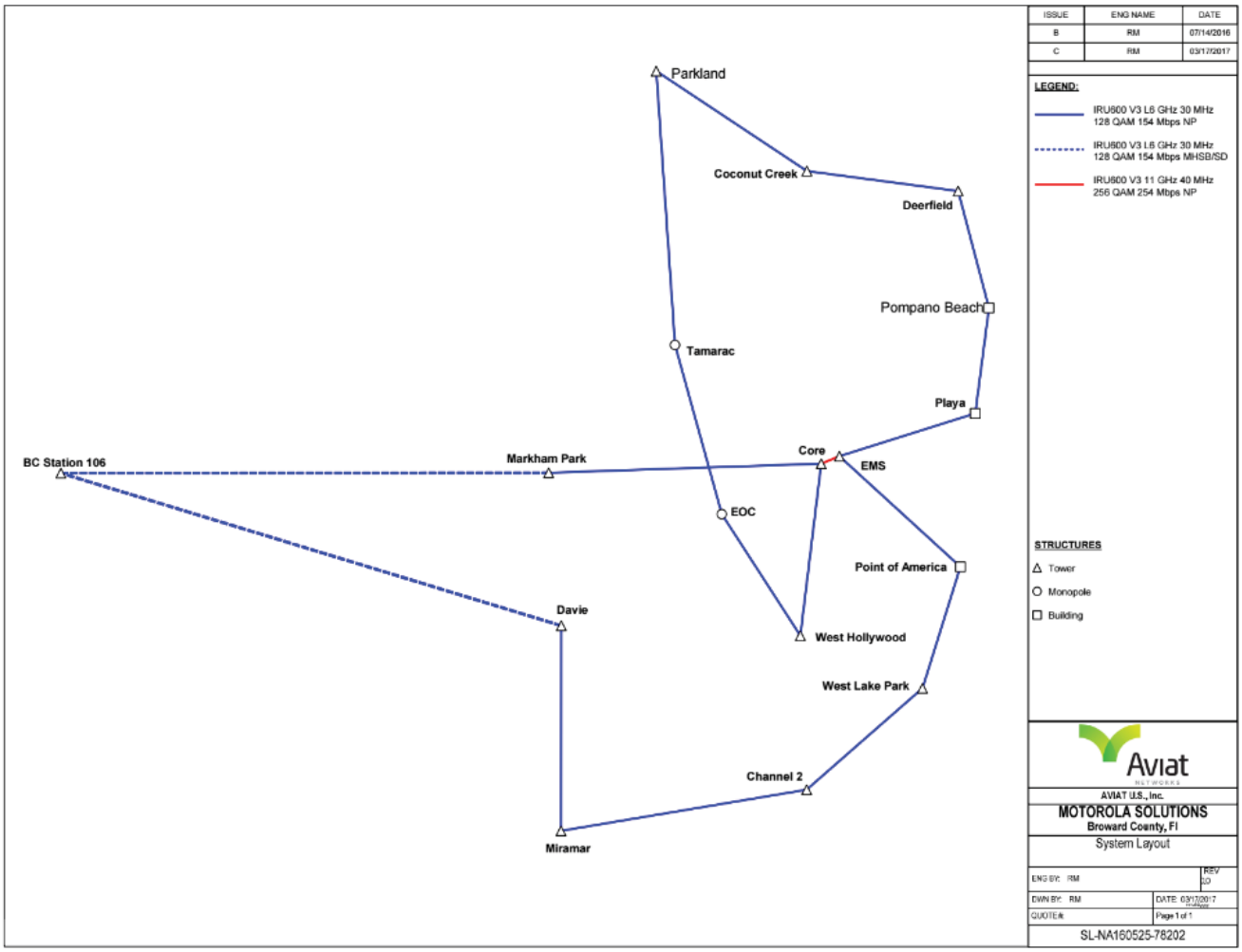


Figure 1-1: Microwave System Layout

Provider will configure the backhaul network as an IP/MPLS overlay on the microwave transport. All microwave paths have been designed with the Aviat IRU600 radio in an all indoor configuration with the non-standby transceivers and CTR 8611 MPLS routers. The ring configuration used in the design, along with the fast path restoration and network reconvergence capabilities of the MPLS assures high availability on the links and minimizes service disruption due to an interconnection failure. This will provide the reliability, quality of service, and bandwidth optimization necessary to support the mission critical needs of the ASTRO 25 radio system.

1.5 Microwave Path Design

All microwave paths used in the transport shall exceed Broward County's RFP requirements. All of the paths shall exceed the 155 Mbps of available network throughput required by Broward County, while still maintaining a one-way path availability exceeding 99.999% on all links. The

path from EMS to Core, which is the intersection point between the two rings, shall maximize bandwidth and reliability, which will allow that link to deliver 254 Mbps of available network throughput.

Preliminary Path Profiles are generated from NED digital Terrain Database. Preliminary antenna heights/centerlines were derived based the clearance criteria, which are 100%F1@K=1.33, and 30%F1@K=0.67 for main path and 60%F1@K=1.33 for the diversity path. Antenna centerlines are based on clutter data and assuming 80 ft. obstructions along the paths. The Vigants 1975 reliability model was used for the paths as it is the most robust option when compared to other models. These paths were designed to meet or exceed 99.999% annual one-way reliability per hop at BER threshold of 10-6. Path calculations are based on the radio **guaranteed specifications** and assuming no diffraction loss on the paths. Antennas are RFS 6ft Standard PAD6-59 and SC3-W100 which meets FCC Class A requirements. The antennas chosen are preliminary and one or more of these antennas may change to high performance or even ultra-high performance models during frequency coordination depending on frequency congestion in the area.

1.6 Racks, Jackfields and DC Power Plants

Motorola Solutions will supply the new Eclipse microwave radio system and networking equipment for each site integrated (prewired and pre-tested) through Provider's Factory Systems Integration and Configuration engineering services in a 7.5ft x 19in standard aluminum rack. Each rack will be equipped with one Trimm Breaker panel which is the standard power distribution panel used for the Eclipse platform. The Trimm Breaker Panel will be wired and configured for a redundant power supply with 6A/6B positions. Trimm SNAPAK circuit breakers will be supplied with each panel for the microwave radio system, Jackfields and MPLS routers.

Motorola will provide the necessary -48 VDC power input for the microwave radio system.

1.7 VOIP Orderwire

The Eclipse platform has the built in capabilities to operate a Voice Over IP (VOIP) Orderwire; each site is equipped with an IP Phone connecting to one of the Eclipse INUe controller card NMS ports. The VOIP packets are transported from site to site out of- band over the Eclipse radio NMS overhead channel. At the site connection point, a Netvanta 7100 IP PBX for VOIP OW is provided. It can support up to 30 SIP phones (upgrade available to 100 SIP phones) and maintain 30+ simultaneous calls. At each site, one rack mounted VOIP Phone is included with a POE injector.

1.8 MPLS Router (CTR 8611)

The CTR 8611 router will be provided at all sites to support Ethernet Traffic and providing IP/MPLS capabilities. The CTR 8611 is a modular router that has two slots for hot swappable Switching and Control Modules (SCM), two slots for hot swappable power feeds, four slots for

line modules and three slots for hot swappable High Speed Modules (HM) providing a forwarding capacity of up to 7.5 Gbps.

1.9 IRU 600 Radio

The Aviat Eclipse IRU 600 being provided by Provider is an all-indoor microwave radio that delivers mission critical communications for mobile operators, public safety agencies, governments, and utilities. The IRU 600 delivers superior RF performance and flexible configuration options. The IRU 600 is the latest in a long line of all-indoor microwave solutions from Aviat Networks that delivers market-leading transmitter power performance, with a low loss antenna coupling unit featuring a transmit switch for protected applications, all in an compact form factor and ultra-low power consumption. IRU 600 has been specifically designed with high system gain to lower microwave total cost of ownership by minimizing antenna sizes to lower installation and tower leasing costs. The Eclipse platform is validated to FIPS 140-2 Level 2 and FIPS 197, making it the most secure microwave radio on the market for transporting sensitive data and safeguarding against unwanted and unlawful access. FIPS 140-2 Level 2 validation is the cornerstone for a complete security solution, including Secure management, Payload encryption and RADIUS authentication – especially important for mobile, public safety and government networks that need a comprehensive security solution.

1.10 Network Management System

The Eclipse digital microwave radio system being provided by Provider supports network management environments via a Simple Network Management Protocol (SNMP) based Element Management System. The management system for the Eclipse is Aviat Networks ProVision EMS (Element Management System). Provider will provide all necessary software licenses, hardware, and services to meet the RFP requirements and provide a fully functional network management system.

ProVision provides full compatibility for monitoring all Aviat Networks products that supports SNMP. This includes the Eclipse, Truepoint 5200, and Constellation microwave radio products. All Legacy (Harris/Farinon) products that are managed only via the proprietary SCAN protocol can also be remotely monitored and managed by ProVision with the use of a FarScan Proxy software not included at this time.

ProVision is the strongest element management system available for the Eclipse platform. ProVision support features include:

- GUI-based end-to-end Eclipse circuit discovery and provisioning.
- Detailed Ethernet throughput monitoring for Capacity Management. Inventory reports capturing all serial and part numbers for every Eclipse nodes and their installed modules in the network.
- Automatic back up of Eclipse configuration files Strong Security Performance Data Collection and Network Health Reports for trends analysis.

- Remote Software loading and activation Alarm/Event notifications with support for email, SMS and paging, plus audio and visual pop-up notifications.

1.11 Demarcation Points Provided

Provider will provide and configure all the interfaces necessary to support the Ethernet interface requirements of the ASTRO 25 radio system design, as well as the legacy radio system T1 requirements.

1.12 Remote Terminal Units (RTUs)

The Radio System design includes Remote Terminal Units (RTU) at each location in the system, including sites that have only microwave equipment. The RTUs identified in the Radio Design will be utilized for the microwave system.

1.13 Project Schedule

Provider's installation of the Microwave System shall be in accordance with the Project Schedule, unless otherwise approved in writing by the Contract Administrator. Generally, installation begins as soon as site construction work is completed at each site. The radio system FNE installation begins once Microwave is completely installed at all sites.

SECTION 2 BACKHAUL SYSTEM IMPLEMENTATION

Motorola Solutions will provide the microwave backhaul network to support the P25 system. Motorola Solutions will align the rollout and configuration of Aviat's MPLS-based microwave network consistent with the implementation schedule provided to ensure an efficient system deployment and to comply with the Project Schedule outlined in SOW A-1.

Responsibilities and deliverables for Motorola Solutions and the County are defined in the chart below.

Table 2-1: Responsibility Matrix

Task	Responsibility	Deliverable
Motorola Solutions to finalize the backhaul network design and installation.	Motorola Solutions	Microwave Installation is Complete
Motorola Solutions to configure the backhaul network according to the design at each ASTRO 25/backhaul network demarcation point.	Motorola Solutions	Backhaul Results are Available for Review
Motorola Solutions to provide backhaul test results to the County, demonstrating network performance.	Motorola Solutions	Test Results Provided that demonstrate network performance in compliance with the Specifications
County to review the results for approval.	Broward County	Review of results is complete and results are acceptable and approved.
Motorola to secure FCC licenses for the microwave system.	Motorola Solutions	Documentation of FCC call signs with associated grant dates, construction buildout dates, and expiration dates.
All Microwave paths are not final and guaranteed until the physical path surveys have been completed.	Motorola Solutions	Physical path survey

2.1 Microwave Network Installation

Dual Loop 18 Path MPLS Microwave System

To provide the required site connectivity for the Motorola Solutions P25 radio system, Motorola Solutions will provide and install Aviat's digital microwave system.

Motorola Solutions will perform parallel microwave installation pending the outcome of the structural analysis for the existing towers. If a parallel operation is not possible due to excessive loading, the microwave installation will be completed on a site-by-site and hop-by-hop basis. If this approach is required, Motorola will have sole responsibility for interfacing the new IP microwave system with the legacy TDM microwave system to ensure a seamless microwave cutover without loss of legacy radio connectivity at any point in time. The existing SMARTX SmartZone radio system sites will be connected to the network at the completion of the new microwave acceptance testing.

SECTION 3 PRELIMINARY ACCEPTANCE CRITERIA

The Microwave System will be deemed preliminarily accepted upon written notice by the County Contract Administrator of successful completion of the following acceptance test criteria (test criteria may be modified only by written approval of both parties):

1. Factory Acceptance Test Plan (Schedule 11)
2. Field Acceptance Test Plan (Schedule 12)
3. Verification of Path Calculations and Profiles

Factory and Field Testing is conducted on all Aviat Networks-supplied equipment and other ancillary equipment to demonstrate compliance with product and contract specifications.

Factory and Field Acceptance Testing consists of three (3) phases:

- Station Test
- Hop Test
- System Test
- MPLS Router Verification

Station Test: deals with station grounding integrity, Equipment inspection including inventory and visual inspections of breakers/fuses, cables, cards and any OEM equipment.

Hop Tests: verifies all Aviat Networks Equipment operation including alarm and control points, DC power and any provided OEM. It includes Antenna system test, DC power test, Microwave equipment test including equipment protection, transmit output power, Receive Signal Level (RSL), Receiver Threshold (Fade Margin) test, Transmitter/Receiver Switch test, Ethernet test, BER test (for T1s) and Service Channel test.

System Test: verifies loop protection functionality, VOIP OW test, network continuity test, ProVision EMS test, System BER test, MPLS L3VPN over RSTP-TE 1:1 tunnel testing.

MPLS Router Verification:

1. Use show commands to verify all routes are in the routing tables, including gobal and VRF tables
2. Ping test between MPLS router ports to verify global connection
3. Ping between Motorola Site Routers to verify VRF connections, a laptop can be used if the if site routers are not available
4. On occasion Command Line Interface (CLI) for spot check
5. Basic L2 verification
    i. LACP/LAG verification on MHSB/SD hops
6. Basic Layer 3 verification

i. Configuration verification
    1. Management Access: log in using SSH
    2. Interface configuration: verified under number 2 above
    3. Routing protocol: verified under number 2 above
7. Run Y.1564 test on selected TE tunnels, could be the longest tunnels in the system

Path Calculations and Profiles:
The Microwave System shall comply with the path calculations and profiles set forth in Schedule 9 (as modified during the design process to the extent approved by the County). The path calculations and profiles set forth in Schedule 9 are based upon Motorola's evaluation of the assessment tower locations, terrain, known obstructions, and requirements of the system, and provides the following preliminary path calculations and profiles. Any changes to these calculations and profiles shall be submitted to County for approval by the Contract Administrator. Nothing in this paragraph alleviates the obligations of Motorola to meet the system specifications and provide the System with the required coverage.

SOW A-4
Subscriber Equipment

1. OVERVIEW

There are an estimated 7,930 subscriber radios that will need to be replaced across primary system users to ensure compliance with a P25 Phase II 700/800 MHz system. Subscriber Equipment shall be available for purchase by the County as well as any municipality, local government or public safety entity on the Broward system.

As defined in Section 5.6 of the Agreement, any Eligible Purchaser may purchase Subscriber Equipment or Subscriber Equipment Maintenance set forth in this SOW A-4 in accordance with the terms of the Agreement. All such Subscriber Equipment shall meet the General Requirements set forth in Section 1.2 herein, and shall be warranted in accordance with Section 1.3 herein. Provider shall provide, to the extent elected by any Eligible Purchaser, Subscriber Equipment Maintenance in accordance with Section 1.4 herein. Eligible Purchasers may elect to terminate any Subscriber Equipment Maintenance elected hereunder on at least ninety (90) days prior notice, and may acquire new or recommence previously terminated Subscriber Equipment Maintenance with no penalty or additional cost other than set forth herein.

Eligible Purchasers are not limited to the specific products or features specified herein, but can configure and select items from Provider's entire APX product line with the same applicable discounts set forth in Section 3.0 herein to meet their agencies specific needs. Anything indicated herein as "Optional" may be elected in the sole discretion of the Eligible Purchaser at the pricing set forth herein, subject to inclusion of the applicable services by Broward County at the System level, if applicable.

2. SUBSCRIBER EQUIPMENT REQUIREMENTS

2.1 GENERAL REQUIREMENTS

All Subscriber Equipment must meet the following general requirements:

A. All Subscriber Equipment shall be of high quality and intended to provide high reliability under heavy use in severe environments. Subscriber Equipment shall be FCC type accepted in accordance with the Commission's Part 90 rules and regulations.

B. All Subscriber Equipment shall meet MIL-STD-810 C, D, E, and F.

C. All Subscriber Equipment shall be software programmable.

D. All Subscriber Equipment shall support the following operating modes:
   1. Conventional analog frequency modulation (FM) network
   2. Conventional analog FM off-network (talk around)

3. Conventional P25 Phase I network
4. Conventional P25 Phase I off-network (talk around)
5. Trunked P25 Phase I network
6. Trunked P25 Phase II network

E. All Subscriber Equipment shall be programmed for operation on the P25 Phase II 700/800 MHz system that will be implemented through this contract.

F. All fielded subscriber equipment that will be programmed to operate on the County's new system must undergo preventive maintenance to restore the radio to the manufacturer's specifications at the time the radio is programmed to operate on the new system.

G. To support a seamless cutover to the new system, subscribers shall be installed prior to system cutover and programmed with talkgroups from both the old and new systems. Once cutover to the new system has been completed, talkgroups from the old system shall be removed (second touch).

H. Any fielded radios programmed to operate on the new system must undergo Preventive Maintenance (PM) to restore the radio to the original operating specifications at the time the codeplug is updated.

2.2 PORTABLE RADIOS REQUIREMENTS

A. Features:

1. Full compliance with P25 Phase I and P25 Phase II features and operation
2. PTT button
3. Top-mounted on/off volume knob
4. Talkgroup/channel selector
5. Emergency button, protected from inadvertent activation
6. Alphanumeric display (on applicable models), minimum of eight characters
7. Transmit indicator
8. OPTIONAL – Over-the-air programming (OTAP) and associated fixed equipment
9. OPTIONAL – Over-the-air rekeying (OTAR) and associated fixed equipment
10. OPTIONAL – Subscriber radio GPS and associated fixed equipment
11. OPTIONAL – Radio management license

B. Battery:

1. Provider shall provide batteries without cadmium. Options include the following:

a. Nickel-Metal Hydride (NiMH)
b. Lithium-ion
c. Batteries certified as intrinsically safe.

2. Batteries shall provide a minimum operational use of 12 hours based on a 5-5-90 duty cycle.

3. Recharge time to full capacity shall not exceed one hour.

C. Accessories:
1. AES encryption
2. Data cables
3. Battery chargers:
   a. Single-bay battery charger
   b. Multiple-bay battery charger
   c. Vehicular charger
4. Alternate antennas
5. Remote speaker microphone
6. Remote speaker microphone with antenna
7. Headset:
   a. Wired
   b. Wireless/Bluetooth
8. Carrying cases/belt clips

2.3 MOBILE RADIOS/CONTROL STATIONS REQUIREMENTS

A. Mobile radios shall be supplied complete with microphone, external speaker, cables, fusing, mounting hardware, coaxial cable, and antennas to provide for a complete installation.

B. Control station radios shall be supplied complete with desk microphone, speaker, cables, coaxial cable, and antennas to provide for a complete working package.

C. Control stations should include up to 100 feet of ½" LDF plenum rated coaxial cable with associated RF surge suppressor, ground kits, mounting hardware, and an omnidirectional antenna to be mounted on the roof.

D. Control station configurations shall be offered with both a deskset consolette setup with built-in power supply, and as a mobile radio with a DC power supply.

E. Features:

1. Full compliance with P25 Phase I and P25 Phase II features and operation
2. Remote speaker microphones
3. Front-mounted on/off volume knob
4. Talkgroup/channel selector
5. Emergency button, protected from inadvertent activation
6. Alphanumeric display
7. Transmit indicator
8. Dash- and remote-mount configurations
9. OPTIONAL – Over-the-air programming (OTAP) and associated fixed equipment
10. OPTIONAL – Over-the-air rekeying (OTAR) and associated fixed equipment
11. OPTIONAL – Subscriber radio GPS and associated fixed equipment
12. OPTIONAL – Control station combiners for configurations supporting 4/8/12/16/32 ports

F. Accessories:
1. AES encryption
2. Cables:
   a. Data cables
   b. Extension cables
      i) Adapters
      ii) Power cables
3. Antennas
4. 7.5- and 13-watt external speakers
5. Public address kits
6. Remote speaker microphones
7. Desktop microphone (control stations only)
8. GPS functionality and associated fixed network hardware
9. Mobile data interface

3. SUBSCRIBER WARRANTY

Provider shall warrant all Subscriber Equipment purchased prior to P25 System Final Acceptance by Broward County or by any Eligible Purchaser for three years from date of purchase at no additional cost. Any Subscriber Equipment purchased on or after Final Acceptance shall be warranted for at least one year from date of purchase.

Notwithstanding the above, the following warranties and support are included at no additional cost in the following items (for clarity, the purchaser may elect to purchase additional support, if elected by the purchaser):

- APX radios: 1 year Service from the Start - Lite.
- Accessories standard warranty: 1 year Service from the Start - Lite.
- Batteries: 18 months warranty
- Extended warranty is available up to 5 years, as an option, as elected by the purchaser.

Provider shall repair any radio that fails due to manufacturer defects within the applicable warranty period at no additional cost to the County or Eligible Purchaser.

4. SUBSCRIBER EQUIPMENT MAINTENANCE

Motorola Subscriber Equipment Maintenance is provided by technicians or certified Motorola partners backed up by Motorola's technically elite team of System Technologists and our Central Systems Engineering teams. Motorola is committed to:

- Unequaled, best-in-class customer service response for critical communication solutions.
- Highly qualified and trained employees and partners focused on service delivery.
- Stable, trained and committed partners able to provide more readily deployable resources.
- A highly trained and certified technician base working our customers' radios.

Motorola Solutions delivers the quality service and enhanced customer support critical to every customer relationship. Motorola Solutions will:

- Continually improve the quality of service delivery through ongoing continuous improvement plans where goals are established, met, sustained and then re-established to push forward.
- Recognize and reward partners that continuously invest in their abilities to provide quality service to our customers.
- Audit points of presence to be sure they continue to meet the standards of the Subscriber Equipment Maintenance.
- Develop training roadmaps for both our bench and field technicians.

Motorola's Radio Support Center will either repair locally or will ship the repaired within five days or less from receipt of the radio submitted for repair to help get units back into customer hands as quickly as possible. The Eligible User will be responsible for shipment to Motorola and associated costs, and Motorola will be responsible for return shipping and associated costs.

Motorola will only use highly-qualified, dedicated and financially stable service delivery partners dedicated to the user's satisfaction.

Users can rest assured that technical support queries are dealt with promptly to ensure minimal downtime is incurred. Motorola Solutions technical experts work with the Motorola Solutions partner to isolate, diagnose and resolve potential issues, reducing the risk of the issue escalating. When it comes to repair, users' devices will be handled by one of Motorola

Solutions' certified repair technicians. State-of-the-art diagnostics equipment, repair tools, and an extensive inventory of replacement parts help us to provide expert repair on your ASTRO 25 devices. In addition, Motorola Solutions service centers are fully certified to comply with ISO9001 and TL9000 standards using proven, repeatable processes to help ensure your repair is completed right the first time and every time.

Any Motorola Solutions' service depots and field centers must meet the following requirements, designed to drive key service behaviors and performance critical to your confidence in Motorola:

- Calibration of equipment – Test equipment used by field and bench service technicians must be calibrated on a regular basis in accordance with manufacturer recommendations. This requirement is audited on a regular basis.
- Information Security Policy – Service technicians and partners have a robust policy to secure the information assets of its company, all other companies it does business with and all customers of Motorola Solutions. This policy must ensure that the our service team's technical resources are properly protected, that the integrity and privacy of confidential information is maintained, that information resources are available when they are needed and that users of these resources understand their responsibilities. Naturally, our depots follow Motorola Solutions' Information Security policies.
- Technician and installer certification – Technicians and installers must meet minimum certification requirements. The necessary certifications can vary depending on specific customer needs in the marketplace.
- Insurance/environmental health & safety Policy – All service partners must meet environmental, health and safety standards and must maintain standard business and liability insurance.
- Contract-specific benefit criteria – When a service partner provides services contracted by Motorola Solutions as part of a specific contract or series of contracts, the benefits of associated technical training, technical manuals and technical call center support will be provided for those products or series of products supported by such contract.

Motorola's personnel or subcontractors providing Subscriber Equipment Maintenance possess general technician and installer certifications obtained through Electronics Technicians Association International (ETA-I). Motorola Solutions has also developed a series of certifications geared specifically to Motorola Solutions platforms and equipment. Certifications are only achieved once a technician has successfully completed specific training programs and passed the certification exams. Motorola Solutions technical professionals are trained to specifically meet the needs of every customer's radio subscriber needs, specifically: creating templates, building codeplugs, programming, installation services and support services. Each user agency in Broward County can rest assured their needs, operational goals, security protocols and responsiveness will be meet by our team of professionals:

5. SUBSCRIBER MAINTENANCE OPTIONS

Eligible Purchasers may select from any combination of the following for some, none, or all of their purchased Subscriber Equipment:

5.1 PORTABLE, MOBILE, CONTROL STATION AND CONSOLETTE SERVICE FROM THE START - LITE:

Service from the Start - LITE provides board level service for the covered equipment. Services are performed at the Radio Support Center (RSC). In addition to board level service for the covered equipment, *Service From the Start- LITE* includes service on single mobile control heads provided that they are required for normal operation of the Equipment and are included at the point of manufacture.

Service from the Start – LITE also includes:

- Normal wear and tear repair coverage.
- 5-day repair turnaround time from Eligible Purchaser notification of defect to receipt of replacement or repaired device
- Expert technical support (7x24x365).
- Software maintenance and updates.

Service From the Start Lite includes the following to be provided by Motorola:

- Test and restore the Equipment to Motorola factory specifications, including Factory Mutual (FM), and Mine Hazard Safety Association (MHSA).
- Reprogram Equipment to original operating parameters based on the Customer template, if retrievable, or from a Customer supplied backup. If the Customer template or code plug is not usable, a generic template or code plug utilizing the latest Radio Service Software (RSS) or Customer Programming Software (CPS) version for that Equipment will be used. The Equipment will require additional programming by the Customer to Restore the original template. All Firmware is upgraded to the latest release for each individual product line.
- Clean external housing of the Equipment. External components of unit will only be replaced when functionality has been diminished.
- Motorola will pay the inbound freight charges if the Customer uses the Motorola designated delivery service (Federal Express). Motorola will pay the outbound freight charges (return to Customer).
- Provide the Motorola repair request and Inventory Adjustment Form (IAF) via Motorola On Line (MOL).
- Process inventory adjustment requests received by email or fax from Customer. If the request is received by email, Motorola will email an acknowledgement to the sender.
- Perform covered services as requested by Customer on the Motorola repair request form.
- If applicable, notify Customer of changes in Motorola designated inventory adjustment email address or fax number.

5.2 PORTABLE, MOBILE, CONTROL STATION AND CONSOLETTE SERVICE FROM THE START - COMPREHENSIVE:

Service from the Start (SFS) Comprehensive provides all component level service for the covered equipment. Services are performed at the Radio Support Center.

In addition to all the Services identified in Service from the Start – LITE, Service from the Start – Comprehensive also includes repair or replacement of cracked housings, frames, covers, crushed components, shields, missing components, circuit boards, warp circuit boards, damage to LCD screens, electrical damage, water/chemical corrosion, and contaminants visible which cannot be cleaned up reliably.

5.3 PORTABLE MOBILE, CONTROL STATION AND CONSOLETTE SUBSCRIBER LOCAL SUPPORT:

Subscriber Local Support provides an operational check of equipment that is covered under a service agreement. An operational check is an analysis of the equipment to identify external or internal defects. If the equipment has an external defect, or can be restored without opening the radio case, the equipment will be restored and returned to customer. If the equipment has an internal defect, or is not serviceable without opening the radio case, then the equipment will require additional service and will be shipped to the Motorola Depot for repair utilizing the Service from the Start or Service from the Start Comprehensive support. Subscriber Local Support is provided locally by a Motorola Authorized Service facility.

5.4 LOCAL SUPPORT:

User Agency may elect to combine subscriber support services, which are Service from the Start (Lite or Comprehensive) with Local Support. Radios will be repaired locally except when shipment is necessary to Motorola Depot. This type of service may reduce the turnaround time for radio repair.

5.5 PORTABLE, MOBILE, CONTROL STATION AND CONSOLETTE SUBSCRIBER PICK UP AND DELIVERY:

Pick Up and Delivery is an option to our Subscriber Support Services, where Motorola Solutions provides pick up and deliver services for subscribers. This service reduces the time and expense for the agencies to ship, deliver and pick up subscribers.

5.6 PORTABLE, MOBILE, CONTROL STATION AND CONSOLETTE SUBSCRIBER PREVENTATIVE MAINTENANCE:

Subscriber Preventative Maintenance (PM) provides for an operational test to ensure the customer's equipment meets and continues to meet the manufacturer's specification. This service will be provided during standard business days at the Motorola Authorized service facility.

5.7 PORTABLE, MOBILE, CONTROL STATION AND PREVENTIVE MAINTENANCE PLAN:

Preventive maintenance plan to restore the radio to the manufacturer's specifications at the following recurring intervals:

a. 6 months
b. 1 year
c. 2 years

5.8 INDIVIDUAL SUBSCRIBER SUPPORT OPTIONS

In addition to the above, Eligible Purchasers may purchase added services and coverage beyond the warranty period on a per-request fee structure, including:

1. Programming of a radio to update the radio's firmware (firmware purchased separately)
2. Reprogramming of existing radios operated by users on the Broward County system to operate on the new P25 Phase II system, including
   a) Updating radio firmware (flash) to support P25 Phase II operation and any other required feature sets
   b) Retuning radio with the updated codeplug and fleetmap for the new system
   c) Retuning radio to update codeplug and fleetmap to remove the legacy radio system talkgroups (second touch).

6. SUBSCRIBER EQUIPMENT

APX™ SERIES P25 TWO-WAY RADIOS

The APX series incorporates many new features key to ensure the safety of users, including further audio quality enhancements, ruggedization, intuitive displays and controls, and features critical to ensuring the safety of first responders and citizens throughout the County.

All the proposed portable and mobile radios are fully-compliant to the County's requirements, and offer additional capabilities and features that exceed the County's requirements.

The APX radios will work seamlessly with Broward County's current radio network and the ASTRO P25 System. This is critical to enable a seamless and more efficient user cutover as each agency will be able to use a single radio supporting operation on both the legacy and new P25 system.

Broward County and Authorized Third Party Users will be able to leverage text messaging, location services and other data enrichments that will provide increased redundancy and information sharing with Broward County's first responders.

APX Series Radios include:

- The ability for the radio to be easy-to-use/accessible [APX Ergonomics].
- The ability to talk and hear clearly in loud environments [APX Audio].
- The ability to communicate in more places [APX Coverage].
- The ability to perform in extreme situations [APX Durability].

Motorola Solutions created the APX series to redefine safety in mission critical radio communication. Every feature and function on an APX two-way radio is designed with its users in mind–from the rugged, easy-to-operate design, to the loudest, clearest audio. The result is improved safety for all mission critical users–from the firefighter in a burning building, to the police officer serving a high-risk warrant, to the paramedic racing to provide urgent medical attention. Motorola Solutions has application-tailored radios and accessories designed specifically with each of these users in mind.

Motorola Solutions' APX series portable and mobile radios provide a number of advantages over other 3rd party vendors' equipment, including but not limited to:

- Enhanced Audio (Dual-Mic/High Noise/Wind porting/increased power of speakers and RSM).
- Configurable Audio and Radio Profiles.
- Ergonomics (Size/Weight/User Interface/Color/Top Display).
- Ruggedness (Scale/Ball Drop/Dunk Tank/Endoskeleton).
- Features (Integrated GPS/Bluetooth/Man-down/Text Messaging Service).
- Phase II TDMA and software updates to include other functionalities.
- Data applications (database access, status message, location, text, POP25, OTAR, etc.).
- Best in class Noise Suppression and Audio Capabilities.

- Mission-Critical Grade Bluetooth.
- SCBA Integration.
- Text Messaging and Integrated Solutions.
- GPS/AVL API and Integrated Solutions.
- Enhanced Data with 12x data throughput for Biometrics, Telemetry, etc.
- End-to-End Encrypted Voice + Data.
- Next Generation Solutions and applications: BOLO on APX Radios, Geo-Fencing, and more...

APX Audio Design Advantages

- Adaptive Dual-mic Noise Cancelling Technology.
- Adaptive Noise Reduction Algorithms that perform in Analog & Digital Operation.
- Adjustable Audio Parameters to optimize performance in various noise environments.
- Significantly lower audio distortion for better intelligibility.
- Automatic Gain Control or analog noise suppression:
  - Non-AGC Portables may experience interoperability problems in mixed fleets due to fluctuating audio levels.

APX Feature Advantages

- P25 Radio Authentication.
- FIPS 140-2 Level 3 Certified Encryption Module.
- Demonstrated P25 Phase 2 TDMA operation.
- Secure Bluetooth.
- APX Bluetooth Near Field Pairing technology enables fast, simple, and secure encrypted pairing with any Bluetooth enabled APX.
- APX features Superior Roaming, Fastest Site Switching and ability to specify Site Priority (most/least preferred).
- Integrated Voice & Data with Text Messaging capabilities in P25 Digital operation
- Integrated GPS inside the radio.
- Man-Down automatic emergency notification in the event of user injury + GPS notification of user location upon Man-Down alarm.
- Motorola Solutions OTAP advantages:
  - Voice priority during OTAP: Users can initiate Push To Talk calls during OTAP data sessions.
  - Presence Notification + Batch Programming – which facilitates system management and improves administrative efficiency so that Radio IP addresses do not need to be entered manually one radio at a time.
  - User selected reboot following OTAP data sessions so that critical voice calls are not interrupted.
  - Pause/resume data feature with differential write: Permits OTAP data package to pick up where it left off when interrupted by voice communications – competing solutions must start over when interrupted + must be write entire software package regardless of similarity to existing software.

- Data roaming: Users can roam and maintain data session.
- P25 CAP certified on Motorola Solutions infrastructure and a wide variety of 3rd party infrastructure.
- Personnel Accountability applications with APX portables for fire-scene/SWAT team staff safety within buildings.
- More Programmable Front Buttons, Side buttons Home & Data Buttons, and Navigation Pad than competing radios.
- Support of both Tactical + Trunking OTAR.
- Customizable Channel Announcements.
- RFID option.

APX Ergonomics Advantages

- Ergonomic spacing between controls.
- Large, accessible emergency button.
- Oversized ergonomic knobs for ease of use for users with gloves.
- 3-Position Toggle and 2-Position Concentric Switches.
- Top Display for easy viewing of channel/zone information, even when on the user's hip.
- Large Color LCD Display For Better Viewing and Enables Intelligent Lighting.
- Radio Profiles/Intelligent Lighting Bar.
- Shielded PTT button.
- Universal PTT is textured with locater ridges, enabling quicker blind operation in high-stress situations.
- Multiple keypad/display options in APX models to permit customizing to agency use cases
- Light weight.
- Blind Operation/Operate by feel.

APX Ruggedization Advantages

- Gorilla Glass (TM) Lens – Tempered glass for displays which provides a wider viewing angle, plus greater scratch and heavy impact resistance than competing radios, plus prevents distorted view with polarized lenses.
- APX Endoskeleton Design Provides Improved Submersibility and Ruggedness for Internal Components.
- MIL Spec Conformance with best-in-industry shock, submerged water and scratch resistance.
- IP ratings up to optional IP67.
- Conformance to Motorola Solutions Internal 12M specifications which are even more stringent than MIL Spec.
- Motorola Solutions Accelerated Life Tests.

APX RF Performance Advantages

- APX radios significantly outperform competing radios in key RF metrics ensuring superior talk-in/talk-out capability. Motorola Solutions' best in class RF specifications for better performance in challenging/fringe coverage.
- Intermodulation Distortion/Rejection (Higher dB → better performance):
  - APX hardware is optimized to reduce Intermodulation Distortion with a spec that is 2 times better than some competitors.
  - This dramatically increases the radios coverage performance in high RF traffic environments (Cities/Urban Centers).
- Sensitivity (Lower the µV → better performance):
  - Lowest possible signal strength that a radio can intelligibly detect in a given environment (the lower the (µV) number the better).
  - Allows the radio to receive signals in difficult coverage areas such as inside buildings.
- Selectivity/Adjacent Channel Rejection (Higher dB → better performance):
  - Radio's ability to hear only the voice traffic from the desired channel, and reject other signals that are very close to that frequency.
  - Specification helps considerably when operating near other transmitters, especially in urban environments with high RF traffic.
- Audio Distortion (Lower the % distortion → better performance):
  - Measurement of the amount of audio distortion produced at a given output power level.
  - Less distortion equals clearer/crisper voice being heard from the radio especially at high audio volume.
- FM Hum and Noise (Higher dB → better performance):
  - Measurement of the radio noise floor of both Transmitter and Receiver.
  - Lower noise floor of the radio means greater the likelihood that a low-level audio signal will come through, such as when the talker is whispering.

APX Mobile Control-Head Interface Advantages

- Quick & easy to operate Siren Controls, Pursuit Knob, Light Switches, and PA Button.
- Mission critical display lens is resistant to high force impacts – competing solutions using resistive touch-screens require a soft top layer which is much more vulnerable to wear and tear, and can be easily damaged by sharp edges.
- Large Programmable One Touch Consolidated Action Buttons.
- Quick & Easy Brightness, Night Mode, and Covert Mode controls.
- Concave/Convex Integrated DEK Buttons enable easy Blind Operation.
- Tri-color Backlighting (Green, Orange & Red) for Intelligent Lighting.
- Superior IP 56 ratings for better water resistance than competing mobile control head interfaces.
- Motorola Solutions' O5 Control Head provides 5 programmable soft key buttons and 5 scroll-through menus enable up to 24 total programmable soft keys + 4-way navigation button.

- Motorola Solutions' O7 Control Head provides 4 programmable soft key buttons and 5 scroll-through menus enable up to 24 total programmable soft keys + 4-way navigation button + DTMF keypad w/pre-configured Siren/Lights/PA/Gun Lock controls.
- Motorola Solutions' O9 Control Head provides the largest available LCD display in the industry, with 5 programmable soft key buttons and 5 scroll-through menus enable up to 24 total programmable soft keys + 4-way navigation button + full 12 Button DTMF keypad, a data applications button, and Quick & easy to operate Siren Controls, Pursuit Knob, Light Switches, and PA Button controls.

Motorola Solutions' APX series of portable and mobile mission-critical grade radios provide best-in-industry performance via the above summary of unique quality differentiators, along with many other additional detailed attributes and features.

APX RADIO APPLICATIONS

APX ADVANCED DATA FEATURES

The Motorola Solutions APX Advanced Data solution set and features provide the following unique capabilities within the P25 radio industry:

- 200 Character free-form text messaging.
- Send messages to text groups.
- Choose from 150 pre-defined Quick-Access messages.
- Store-and-forward message delivery.
- System supports up to 20,000 active users.
- Up to 50,000 outbound text messages per hour.

Integrated GPS Capability

The entire APX family of portable and mobile radios offer the County users and agencies the ability to locate and track each field unit from a central location. The integrated GPS receiver in the APX transmits the outdoor location of an individual or vehicle to map-based location software that will interface with PremierOne CAD.

Text Messaging

Text messaging offers freeform and canned messaging between field users and dispatch operators. This enables selected field users to not only communicate with one another and with dispatch operators via voice transmission, but also through discreet texts. Information (such as addresses, license plates, phone numbers) communicated out via text messaging results in fewer repeat voice communications improving efficiency. Through PremierOne and the MCC7500 dispatch consoles text messaging is available for group texting situations. Motorola Solutions ASTRO 25 7.17 release offers group text from the MCC7500 without the need of additional infrastructure. In the 7.17 release the transmission of the text will occur on the control channel of the ASTRO 25 infrastructure.

POP25 Over the Air Programming (OTAP)

All proposed radios can optionally provide the County with the functional and cost benefits of Motorola Solutions' Programming-Over Project 25 (POP25) over-the-air programming (OTAP) technology. POP25 functionality reduces the time, effort, and costs needed to update radio functionality by allowing radios' configuration to be accessed and updated over the air.

Broward County's radio users will be able to continue working in the field while their radios are updated to the most current configuration. Voice communications have priority during programming. Please reference Motorola Solutions OTAP advantages in prior section. OTAP is an optional feature available on all proposed portable and mobile radios.

Outdoor Location Solution

Motorola Solutions' Outdoor Location Solution is offered on the ASTRO 25 Trunking Integrated Voice & Data (IV&D) System, It uses Global Positioning System (GPS) Satellites to provide the location of personnel and vehicles which can be fed to a map based location application to provide dispatch operators with an invaluable tool for managing and tracking personnel and resources. The ability to locate users in a mission critical situation dramatically increases user safety while improving resource allocation and responsiveness.

ASTRO Outdoor Location Server: Unified Network Services (UNS)

The Motorola Solutions Unified Network Services (UNS) application acts as a gateway for the location, telemetry, and presence information from the ASTRO radios and transfers data to back office applications. It simplifies the integration process for developers by receiving in disparate GPS protocols and translating them into a unified protocol out to the third party application. Additionally, it provides for intelligent routing of messages to the devices, and thus lowers traffic over the network.

ASTRO Presence

The Presence functionality within UNS provides the presence and absence information of subscriber radios to any compatible data applications located in the Customer Enterprise Network (CEN).

It interfaces with data applications and subscriber radios using User Datagram Protocol/Internet Protocol (UDP/IP). This allows the dispatcher to know whether or not a subscriber unit is powered on or off or located somewhere within the radio network.

Location Application Programming Interface (API)

The ASTRO 25 Location Application Programming Interface (API) contains all the necessary interface documentation that a third party application developer needs to receive location, telemetry, and presence data from the UNS. The API pushes data messages containing location, telemetry, and presence information in near real time to the third-party application and allows support for remote commands through a set of messages that can be sent to the mobile units.

ASTRO 25 Enhanced Data

ASTRO 25 voice systems have been building to portable grade coverage specifications for several years. The ASTRO 25 system provides all of the components and the wide-area system coverage necessary to perform a mobile and portable GPS reporting function. Motorola Solutions understands the customer's needs to poll for location data more frequently. Constant tracking of the locations of all field personnel has been a need for the Public Safety sector for a long time. Next generation of ASTRO 25 Integrated data benefits will provide the following benefits:

- Provide outdoor location data for all of the users with a faster polling rate.
- Increased AVL and telemetry capacity as compared to Classic P25 Integrated Data.
- Ability to have "protected", data only, Enhanced Data channels.
- Ability to prioritize data over non Emergency voice calls on Enhanced Data channels.

Enhanced Data exceeds today's P25 standards of 50 radios reporting at a 2 minute cadence. It has the potential to pull GPS coordinates for 500 radios per enhanced data channel at a 2 minute cadence (or 150 at 30 seconds, or 75 at 15 seconds). This is up to 12 times more efficient than the P25 standard and critical for optimum performance. Please note that this reporting rate of 30 seconds per user is based on specific channel criteria such as user loading, channel availability and other message traffic on the Enhanced Data channel(s).

PremierOne CAD Integration

ASTRO 25, APX series radios and PremierOne CAD have true integration benefits to benefit all users such as:

- APX Texting:
  - Send and receive messages to APX radios.
  - Query databases from APX radios.
  - Receive dispatch information to APX radios.
  - Administer Status updates with APX radios.
- Unit Location:
  - Allows APX radios to be placed onto CAD MAP.
  - GPS Cadence received directly with PremierOne CAD.
  - GPC location services work with Portable and Mobile radios:
    - Ability to track vehicles and individuals.
- GeoFence creation aids in incident command.

APX RADIO MANAGEMENT AND PROGRAMMING

Motorola Solutions' Radio Management is an optional solution unique to Motorola Solutions APX subscriber radios and Motorola Solutions ASTRO 25 infrastructure that comprehensively manages radio configuration and subscriber radios, and will dramatically reduce the Total Cost of Ownership.

Key Radio Management Features include:

- Radio Inventory.
- Centralized Radio Configuration and Codeplug Management.
- Automated Radio Updates of BOTH Codeplugs and Software Flash Versions.
- Only Motorola Solutions Infrastructure can Batch Program Motorola Solutions APX Radios over a P25 System.
- No Missed Calls with OTAP due to Voice Priority with Motorola Solutions' Infrastructure.

Motorola Solutions' Radio Management tool simplifies the configuration and management of radios. With an order of a Motorola Solutions radio, an electronic order with the serial number is generated. The serial numbers from the electronic order can then be entered into the Radio Management application. The radios associated with the serial number can then be assigned a codeplug template in the Radio Management Application, and a job can be scheduled to program the radios. Once the radios arrive, a group of radios can be programmed at one time. Radio Manager will track which radios have been successfully programmed.

When codeplug updates occur, the radio codeplug database is stored on a cloud server. This allows remote programmers to access and program radios, and share codeplug templates across multiple radios. Changes to codeplug templates can be automatically applied to all affected radios. Radio programming jobs can be scheduled ahead of time. The programming of radios can occur via a USB port on a PC on the LAN/WAN network or with Over The Air Programming (OTAP) on an ASTRO 25 radio network.

The APX Radio Management application can program up to 16 radios at one time and track which radios have been successfully programmed, providing a clear view of the entire radio fleet and a codeplug history for each radio.

Radio Management batch programming of APX radios via OTAP can only occur with a Motorola Solutions ASTRO® 25 Project 25 system, which has voice priority over data, so a user's call, emergency notifications or critical communications will not be interrupted with OTAP. Should an OTAP session be interrupted with communications, programming will resume after the call without the need to restart, expediting the process.

APX INTEROPERABILITY AND COMPATIBILITY

Motorola Solutions APX subscribers offer the highest degree of interoperability and compatibility.

Trunking Support

All Motorola Solutions high-performance mobile and portable radios are compatible with the Project 25 Phase II standards for TDMA digital trunking. They all support conventional analog and digital operation, as well as trunked digital operation in the same radio. In addition, they support Project 25 features for interoperability with systems from both Motorola Solutions and other manufacturers. They are ideally suited to situations where County users and agencies need instant interoperability on different systems.

Backwards and Forwards Compatibility

Motorola Solutions' current P25 radio portfolio is designed with both backwards and forwards compatibility. The radios in our portfolio have been designed to operate on analog conventional, Project 25 conventional, and Project 25 trunking systems, and can also operate on systems using Motorola Solutions Project 16 analog trunking, SMARTNET, SmartX and SmartZone technology.

Project 25 Phase 1 FDMA and Phase 2 TDMA Operation

The APX mobile and portable radios can operate in both Project 25 Phase 1 FDMA and optionally Project 25 Phase 2 TDMA trunking modes.

Using Motorola Solutions' unique Dynamic Dual Mode (DDM) capability, APX radios can dynamically switch between FDMA and TDMA without the user having to change channels. This provides interoperability on demand with existing and future networks.

Interoperability in 700/800 MHz and VHF Frequencies

APX multi-band radios can operate on both 700/800 MHz, VHF and UHF frequencies to enable instant interoperable communications for improved coordination, response, and first responder safety. In addition, this provides an easy way to seamlessly transition from the County's legacy SmartZone system to a new ASTRO 25 system.

In mission critical situations, agencies from different jurisdictions often operate on different frequency bands – requiring personnel to carry two radios in order to communicate with one another. With dual/all-band APX portable and mobile radios, the County users and agencies can purchase one radio for instant communication over multiple frequency bands. This eliminates the need for field users to carry multiple radios, and reduces the amount of equipment that must be maintained and installed.

APX COMPLIANCE TO STANDARDS

Motorola Solutions recognizes the importance of P25 standards development and follows the P25 standard documents to ensure interoperability of our system and subscriber equipment with system and subscriber equipment of other P25 compliant manufacturers.

Motorola Solutions' ASTRO 25 network and APX subscribers conform to all applicable P25 specifications as outlined in Motorola Solutions P25 Conformance documents.

MOTOROLA SOLUTIONS APX TECHNOLOGY - DETAILS

APX Series Vocoder — Audio Engineering Design Principles

Motorola Solutions' audio engineering design begins with Digital Signal Processor (DSP) technology, with added custom high-power loudspeakers and precise acoustic microphones to achieve outstanding noise cancelling, exceptional loudness and clarity, and unparalleled intelligibility for mission critical communications.

Motorola Solutions APX series vocoders use the new AMBE+2 Vocoder per the P25 Phase 2 standard.

- P25 vendors utilize the IMBE or the AMBE+2 vocoders from DVSI.
- AMBE+2 is a new vocoder and is required for all new P25 Radios.
- AMBE+2 Comes with Noise Suppression Algorithm.
- IMBE and AMBE+2 are fully compatible.

APX Durability

Durability is central to the design of Motorola Solutions radios – For example, due to the way the battery slides into the frame of the radio instead of simply clipping onto the back, Motorola Solutions APX portable radios can survive larger drops and not lose power.

In addition to standardized testing, Motorola Solutions has meticulously engineered these radios to survive the harshest of durability and environmental tests, including: numerous drops onto concrete with the same radio, vibration, extreme temperature fluctuations, humidity, electric discharge, repeated button presses, screen impacts, and more.

These tests are all performed sequentially with the same radio having to go through and pass all test before a passing grade is achieved. All this cumulates into a rugged radio that the County's first responders can rely on no matter the circumstances.

Motorola Solutions public safety radios meet applicable Military Specifications 810, C, D, E, F, and G. Using MacroBlend housing material, they are designed to survive severe shock and vibration, and exposure to damaging environments such as temperature shock, salt fog, UV radiation, dust, blowing rain, and electrostatic discharge (ESD).

Motorola Solutions radios are tested and exposed to extreme conditions to simulate years of abuse. We also perform functional and parametric testing to verify that the radios still work after they are exposed to the environment. Our testing standards and methods include:

- Military Specification MIL-STD 810 C, D, E, F, G.
- European "IP" specs.
- Motorola internal 12M specifications.
- Motorola Accelerated Life Tests.

Motorola Solutions' internal 12M specifications are more stringent than industry-standard testing. For example, Military Specifications for a drop test calls for the unit to be dropped onto a plywood surface. Motorola Solutions' drop tests utilize a steel landing surface, which increases the severity of the test. It is Motorola Solutions procedure that each test unit should be subjected to every environmental test, rather than using a different unit for each test. This ensures that our radios perform to specification regardless of the amount and type of abuse they receive.

Motorola Solutions goes well above and beyond standard durability testing and performs a large suite of APX Accelerated Life Tests on each model subscriber radio. A subset of these tests include:

- Temperature Cycle (-30 to +60 C/3 Days).
- Temperature Shock (-40 to +85 C/2 Hours).
- Portable and Mobile Vibration.
- 40G Crash Test for Mobile Mounting.
- Electrostatic Discharge.
- Solar Radiation (120F/Vehicle Dash/8 Hours).
- Portable Drop (4 Feet/Steel Plate/All Sides/64x).
- Steel Ball Drop (1 Meter).
- Water Immersion (2 Meters/2 Hours).
- Salt Fog.
- Dust Chamber (MS Limestone, 2 Hours).
- Driven Rain (60 Kmph).
- Truck Bed Packaging Vibration and Drop Test (Freeze/6 Sides/8 Corners).

Motorola Solutions performs rigorous testing and subjects each model radio to unrealistically harsh conditions for one reason – to ensure that the County's users responders can trust their radio to perform when they need it most.

APX ADVANCED HARDWARE FEATURES

Motorola Solutions offers a large number of standard and optional hardware features to enhance the usability of APX radios for the County's users. These hardware features include:

GPS Location

Integrated GPS receiver can transmit the outdoor location of an individual or vehicle to map-based location software. Motorola Solutions APX series radios feature GPS internal to the portable radio – users do not depend on an external RSM for GPS to function.

Enlarged Buttons

Enlarged and ergonomic emergency button, PTT button, display, and keypad controls. Increased spacing between controls increases ease of use for users. Optional XE series for added robustness and ergonomics with gloves.

Color Display

Resists scratches, wear and tear, and tested for durability against cracks. Optimized to provide contrast without glare and provide increased viewing from angles.

Radio Authentication

Providing an extra, secure level of verification every time a radio registers onto a system.



Mission Critical Wireless

A unique Bluetooth solution that provides an encrypted link to high performance accessories and applications to support different mission critical environments. Supports commercial off the shelf (COTS) and personal area network (PAN) devices. Motorola Solutions APX series radios include Bluetooth functionality for the County users and agencies. No additional costs are required for the County's users and agencies to utilize Bluetooth functionality.

APX ADVANCED SOFTWARE FEATURES

Motorola Solutions offers a large number of standard and optional software features to enhance the usability of APX radios for the County's users and agencies. A handful of these software features are summarized below.

Radio Profiles

Radio profiles enable users to customize their radios' interface to their environments and activities, including the radio's default audio level, lighting and tone alerts. For example, a user in bright sunlight or high-noise environments can increase the lighting or audio level or if the user is conducting ongoing, covert surveillance, they can create a profile that provides lower lighting with subdued alert tones and audio.

Intelligent Lighting

Motorola Solutions APX radios can offer a high resolution display that uses color and lighting to indicate radio mode, potential emergencies, or specific events. Intelligent lighting is a standard feature that enables users to see critical information at a glance, regardless of the amount of ambient lighting.

In addition, the following software features are available:

- **Text Messaging** – Offers a freeform or canned messaging solution so you can efficiently and discreetly send and receive messages to and from subscribers or dispatch operators.
- **Unified Call List** – Consolidates all call lists underneath one unified list so you can easily access all information associated with a particular contact.
- **Voice Announcement** – Allows users to navigate through channels, talkgroups, and zones in the radio while an audible, pre-recorded voice file provides a description of the selected channel or zone. Standard feature on all model radios.
- **P25 TDMA Capable** – Provides twice the voice capacity, so you can add more users to your system without the need for additional frequencies or infrastructure.
- **Multiband Operation** – Multiple frequency bands supported with best-in-class transceiver specifications and performance.
- **Seamless Scan** – Seamless scanning of multiple protocols including FDMA and TDMA systems and multiple RF bands.
- **Enhanced Data** – Enhanced Data provides up to 12x higher data throughput than traditional classic P25 Data. Enhanced Data supports rapid GPS reporting cadences with up to 150 radio users reporting GPS status every 30 seconds – in a single radio channel. Provides for substantial savings on infrastructure cost for Land Mobile Radio data communications, and enables new higher-throughput data applications on mobile radios.
- **Site-Selectable Alert** – Continuous tones sent to alert sites of evacuation of sites, vehicle stops, fire-hall alerting, or other pre-determined actions.

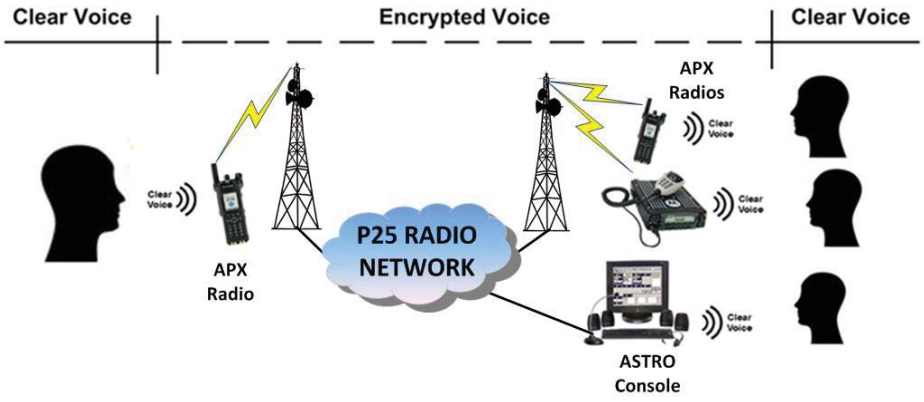
APX END-TO-END VOICE ENCRYPTION

The Subscriber Equipment offers unsurpassed encryption and information privacy mechanisms, going beyond the required standards. The Motorola Solutions APX family of radios all utilize the Motorola Advanced Cryptographic Engine (MACE). The MACE has the capability to not only store the County's encryption keys but will also protect those keys from being accessed by unauthorized users through physical or electronic means. This capability allows the APX Family of Radios to meet Federal Information Processing Standard Publication (FIPS) encryption standards FIPS 140.2 Level 3 and FIPS 197. The radios support multi-algorithm Project 25 and legacy encryption capabilities, including AES and optionally DES / DES-XL / DES-OFB / DVP-XL / ADP for increased interoperability with other systems.

Encryption and decryption services are provided by the system’s secure endpoints: consoles, logging interfaces, and field radio units. Communications remains completely secure between the source and the destination. No decoding of information occurs at any other intermediate point along the communications path, ensuring a much higher level of security. Encryption keys are distributed to consoles and subscribers, and that is the only place the audio is decrypted

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point along the communications path, ensuring a much higher level of security. Encryption keys are distributed to consoles and subscribers, and that is the only place the audio is decrypted.



To increase the effectiveness of encryption, users have the ability to be able to update encryption keys while radios and their users can stay in the field. Motorola Solutions' over-the-air rekeying (OTAR) feature offers the users the benefit of real-time, ongoing security for deployed APX subscribers.

APX END-TO-END DATA ENCRYPTION

The optional Encrypted Integrated Data (EID) feature adds security to data sent between a radio and an agency data application (eg. data server, wireless applications, GPS location updates, etc). In other words, any packet data flowing to or from a radio are ciphered and then deciphered in the radio and Customer Enterprise Network (CEN) premises. This solution ensures that agency data sent wirelessly is secure and immune to compromise throughout the entire route, secured using AES or other selected APX encryption algorithm from end to end.

APX TRANSMITTER AND RECEIVER PERFORMANCE

Motorola Solutions APX portables and mobiles offer industry-leading transmitter and receiver performance specifications. The end result is simple – increased coverage and better audio for end users.

Paired with a Motorola Solutions trunked simulcast radio system, users can be assured of uncompromising coverage and audio performance from APX subscribers.

APX 4000 PORTABLE RADIOS

The APX 4000 provides users with a feature-rich portable radio with a unique form factor in a compact and rugged design. The APX 4000 operates on both Project 25 Phase 1 and Phase 2 TDMA trunking systems. The radio also operates on analog and Project 25 conventional systems. The APX 4000 is the smallest and lightest P25 Phase 2 TDMA radio on the market.

The APX 4000 portable can be ordered in two different models; the APX 4000 Model 2 (front display and limited keypad) and a Model 3 (front display with full keypad). The portable can support a variety of software capabilities & features to best meet your user's needs.

The APX 4000 offers the voice and data capabilities with a color display and speaker in a compact, rugged design.

APX 4000 Model 2 Features

- Top-mounted orange display.
- Three programmable side buttons for easy access features.
- Push-to-talk button designed for easy activation.
- Rugged GCAI accessory connector for improved audio accessories.
- Alphanumeric display featuring 3-line x 14-character, 1 line of icons, and 1 line of soft menu.
- 3 x 2 keypad to navigate through menus.
- Cellular-style user interface and color display.
- Easy access emergency button.
- Meets Military Specs 810 (C, D, E, F and G).

APX 4000 Model 3 Features

The Model 3 has all the features as the Model 2 with the addition of a 3 x 6 keypad with up to 24 programmable soft keys utilizing the navigational button.

*Due to its unique design the APX 4000 portable radio is compatible with existing APX remote speaker microphones (RSM), display RSM, and existing APX customer programming software (CPS) and programming cables. It is not compatible with public safety microphones (PSM) and supports a different set of batteries and chargers than the APX6000 and APX8000 radios.

The APX 4000 portable supports the following APX advanced feature sets.

Advanced Data Capabilities

With Integrated Voice & Data (IV&D), the APX 4000 can be utilized for various applications:

- **Programming over Project 25 (POP25)** – Motorola Solutions' POP25 solution allows subscriber radios to be programmed over the air via ASTRO 25 systems, while remaining in the field.
- **Text Messaging** - Text messaging offers a free form or canned messaging solution so that users can efficiently send and receive messages to and from subscribers or dispatch operators.
- **Integrated GPS** – The Integrated GPS receiver can transmit the outdoor location of the portable to a map-based location application.

Technology Rich

The APX 4000 radios are designed with advanced hardware components that allow for the following features:

- **Multiple Protocols for Enhanced Interoperability** – The APX Series radios support Analog, Digital Conventional, P25 Phase 1 FDMA, and P25 Phase 2 TDMA.
- **Seamless Scan** – Seamless scanning of multiple protocols including FDMA and TDMA systems.

Advanced Software Features

The advanced software features listed below allow for easy and efficient usability and configuration of the subscribers:

- **Intelligent Lighting** – Intelligent lighting uses color to notify the user of the radio mode, triggered emergencies, or specific events. Color alerts provide information at a glance.
- **Radio Profiles** – Radios can be configured with multiple user-selected or automated operating behaviors, such as audio level, lighting and tones. Whether on surveillance or working in bright sunlight, the user can customize settings as needed with these radio profiles.
- **Unified Call List** – Consolidates all call lists underneath one unified list. Users can easily access all information associated to a particular contact.
- **Adaptive Dual-Microphone Noise Reduction** – An intelligent dual-microphone noise cancellation implemented to aggressively reduce background noise, source location, or microphone used during the transmission.

APX 4500 MOBILE RADIO

The APX 4500 brings together powerful technology in a compact, rugged, mobile radio. Its control head can be used in either dash-mount or remote-mount configurations, and offers the following user interface features:

- O2 control head support.
- Can be ordered with a 3 x 6 keypad microphone accessory with three programmable soft keys.
- Four programmable soft key buttons and five scroll-through menus with up to 20 programmable soft keys, utilizing the navigational button on the keypad microphone only.
- Dual function knob that supports both channel selection and volume control.
- Recessed orange emergency button.
- Meets Military Specs 810 (C, D, E, F and G).

Outlined below is a list of the various features and benefits specific to the APX 4500 mobile.

Enhanced Interoperability

The APX 4500 series supports the following system and operational modes, and capabilities:

- Motorola SmartZone trunking.
- Project 25 Phase 1 FDMA trunking.
- Project 25 Phase 2 TDMA trunking.
- 12.5/20/25 kHz bandwidth receiver – analog capable.
- 12.5 kHz bandwidth receiver – digital capable.

  The APX 4500 is a single-band mobile offering that supports operation on either Motorola SMARTNET/SmartZone trunking or APCO Project 25 (FDMA and TDMA)

trunked systems. However, it cannot be programmed to support both 3600 & 9600 system types at the same time.

Operating Modes and Features

The APX 4500 series supports 512 talkgroups/modes as well as the following features and functionality:

- Conventional channels.
- Talk-around channels.
- Supports up to 20 trunking systems, and 100 personalities.
- Scan and priority scan available.
- Dynamic regrouping capable.
- Call-alert paging and individual call.
- Transmit or receive by Unit ID or alias.
- Features share the unified call list.

Encryption Capabilities

The APX 4500 supports multiple encryption algorithms including software-based and FIPS-approved UCM-based solutions.

- AES.
- Single-algorithm/multi-key support.
- Minimum of 48 encryption keys/radio with the multi-key option.
- Hardware and software encryption (ADP).
- FIPS 140-2 Level 3 certification with AES encryption module.

Data Capabilities

The APX 4500 uses ASTRO 25 infrastructure's Integrated Voice & Data capabilities to support the following optional data applications:

- Over- the-Air Programming (POP25).
- Integrated GPS for personnel location.
- Text Messaging.

APX 6000 PORTABLE RADIOS

The APX 6000 is Motorola’s fourth-generation P25 portable and was designed with direct input from first responders. Engineered with high performance technology and utilizing innovative designs, the APX 6000 provides users with an ergonomic and rugged device that delivers superior audio performance with real-time information in a smaller package. The APX 6000 is easy to use, allowing personnel to focus on their job at hand, rather than the technology. In addition, the APX 6000 equips first responders with the clearest audio of any Motorola Solutions portable on the market.

The APX 6000 comes standard with IP67 submersibility (1m/30mins) and is upgradable to Delta T submersibility (2m/2hrs). The APX 6000 offers yellow or green color housing options, as well as the standard black housing.

The APX 6000 offers voice and data capabilities with a color display, top display, keypad, and best-in-class audio in a compact rugged design. Its unique T-Grip form factor provides secure and easy handling. The APX 6000 portable can support a variety of software capabilities and feature sets to best meet your radio user's needs, and is available in three different models:

- Model 1.5 (top display).
- Model 2.5 (Dual-Display and limited Keypad).
- Model 3.5 (dual display with full keypad)

APX 6000 Model 1.5

The Model 1.5 is equipped with the following features:

- A monochrome LCD top-mounted display with 1 line/8 characters and one row for icons.
- Large angled Volume On/Off knob and large Channel selector knob for easy gloved operation.
- Top-mounted orange emergency button.
- Three programmable side buttons for easy feature access.
- Large Universal Push-to-Talk button backlit for easy activation.
- Rugged GCAI accessory connector for improved audio accessories.
- Meets Military Specs 810 (C, D, E, F and G).

APX 6000 MODEL 2.5

The Model 2.5 has all the features that are included in Model 1.5, with the addition of the following:

- Alphanumeric display with 4-line, 14-characters and 2 rows for icons.
- 3 x 2 keypad to navigate through menus.
- Cellular style user interface and color display.
- Easy Access Emergency Button.

APX 6000 MODEL 3.5

The model 3.5 has all the features that the model 2.5 has with the addition of the following features:

- 4-line, 14-character, with 2 rows for icons alphanumeric display.
- 3 x 6 keypad, with up to 24 programmable soft keys.

APX 6000 offers various benefits, feature sets and capabilities. Outlined below is a list of the various features and benefits specific to all APX 6000 portable radios.

System Compatibility and Supported Operation Modes

The portables support the following system and operation modes and capabilities:

- Clear or encrypted APCO Project 16 SMARTNET/SmartZone systems.
- Project 25 Phase 1 FDMA and Phase 2 TDMA trunking systems.
- 3600 and/or 9600 band trunking interoperability.
- 12.5/30/25 kHz bandwidth receiver – analog systems.
- 12.5 kHz bandwidth receiver – digital systems.
- 6.25e TDMA.

Operating Modes and Features

The APX 6000 portables supports up to 870 talkgroups/modes. In addition, the following features and functionality are offered:

- Conventional channels.
- Talk-around channels.
- Can support up to 35 trunking systems, and 200 personalities.
- Scan and Priority Scan available.
- Dynamic Regrouping capable.
- Call-Alert Paging and Individual Call:
  - Transmit or Receive by Unit ID or Alias.
  - Features share the Unified Call List.
- Maximum of 1500 aliases.

Unsurpassed Encryption Capabilities

The APX 6000 supports single encryption algorithm, including both software-based and FIPS approved UCM based solutions:

- Multi-Algorithm/Multi-Key Support.
- Tactical OTAR and P25 OTAR capability
- Minimum of 64 Encryption Keys/Radio.
- Hardware and Software Encryption:
  - 40kbit RSA Software Encryption (ADP).
  - Type III/IV Hardware UCM Encryption.
  - FIPS140 Certification with Encryption Module.

Optional Data Capabilities

With the integrated voice & data (IV&D) standard option the APX 6000 can support the following data applications:

- Over-the-Air Programming (POP25).
- Integrated GPS for personnel location.
- Text Messaging.

APX 6500 MOBILE RADIO

The APX 6500 P25 mobile allows users to choose from 4 control heads; mid- and high-power models and multiple installation configurations in an easy-to-install design.

APX 6500 mobiles support multiple configurations to best support installation requirements and user needs.

- Easy and efficient serviceability – The high-power mobile's new trunion design provides secure engagement, it is also includes a new handle design that allows the radio to be removed without having to remove the cables.
- Enhanced Interoperability – System Compatibility & Supported Operation Modes.



APX 6500 Mobile Radio

The mobiles support the following system and operation modes and capabilities:

- Clear or encrypted APCO Project 16 SMARTNET/SmartZone systems.
- Project 25 Phase 1 FDMA and Phase 2 TDMA trunked systems.
- 3600/9600 systems interoperability.
- 12.5/20/25 kHz bandwidth receiver – analog capable.
- 12.5 kHz bandwidth receiver – digital capable.
- 6.25e TDMA.

The APX 6500 supports up to 870 talkgroups/modes, as well as the following features and functionality:

- Conventional channels.
- Talk-around channels.
- Can support up to 50 trunking systems, and 100 personalities.
- Scan and Priority Scan available.
- Dynamic Regrouping capable.
- Call-Alert Paging and Individual Call:
  - Transmit or Receive by Unit ID or Alias.
  - Features share the Unified Call List.
- Maximum of 1500 aliases.

The APX 6500 supports multiple encryption algorithms, including software based and FIPS approved UCM based solutions.

- ADP/AES/DES/DES-XL/DES-OFB/DVP-XL.
- Multi-Algorithm/Multi-Key Support.
- Over the Air Encryption Key Management OTAR.
- Tactical OTAR and P25 OTAR capability
- 96 Encryption Keys/Radio.
- Hardware and Software Encryption:
  - 40kbit RSA Software Encryption (ADP).
  - Type III/IV Hardware UCM Encryption.

- FIPS140 Certification with UCM Module.

The APX 6500 uses ASTRO 25 infrastructure's Integrated Voice & Data capabilities to support the following optional data applications:

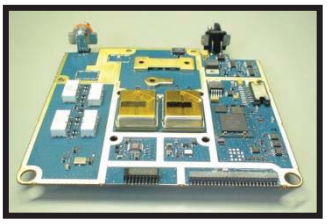
- Over-the-Air Programming (POP25).
- Integrated GPS for personnel location.
- Text Messaging.

APX 7500 MOBILE RADIO

The APX 7500 offers all of the communications features and benefits of our APX line of radios in an easy-to-install design.

Reliable Construction

The APX 7500 mobile platform dramatically improves reliability by reducing the number of discreet parts and connectors. Side connectors with hard gold contacts molded into plastic eliminate loose wires and parts, and radial silicone seals protect the internal components. The radio housing is ultrasonically welded to distribute impacts over the entire area of the radio and additional adhesive layers and gaskets prevent water intrusion.



The APX has hard gold contacts molded into plastic to eliminate loose wires and parts

Easy Vehicular Installation and Serviceability

There are two models of the APX 7500: the APX 7500 Mid-Power and APX 7500 High Power. The Mid-Power version is designed to maintain the same mounting footprint as the XTL mobile radio. This makes them easy to install and allows reuse of mounting holes and cables. The High Power version's trunion was completely redesigned to include installation guides and rails, better engagement into the tray, and enhanced handle grip. This enables the radio to be removed and installed easily and quickly, without removing the cables.

All APX 7500 mobile radios can be equipped with 12 character RFID optional tags, which provide a fast, accurate way of obtaining valuable asset tracking information without having to uninstall the radio.

Multiple Control Heads

Each APX 7500 mobile radio can be controlled by multiple control heads, with four different wired locations. There are five control heads available on the APX7500: the O2, O3, O5, O7, and the O9.

APX 7500 CONSOLETTES

Motorola's APX 7500 consolette, shown in Figure 1 provides high-tier mobile features, designed in a compact, specialized housing, with a built-in power supply.



Figure 1: Full Front Panel w/O5/Keypad/Clock/VU—L999 Model

APX 7500 Consolettes

The APX 7500 mobile supports a control station configuration including:

- Base-mount with enclosure.
- Desktop use or rack mountable.
- AC or DC powered with power cable.
- Internal speaker.
- Tone remote, digital remote or local control.
- Full front panel display with keypad, clock, and VU meter (L999 model).
- Limited front panel display with clock and VU meter (L998 model).

Consolettes are ideal for local law enforcement, utility, and transportation users who need a low cost desktop control station or wireless dispatch solution. These consolettes can also be used as an emergency backup station, a low-cost dispatch center for local agencies, and as a fire station alerting system. They are offered in local, tone remote, and digital remote control configurations.

Please note that the consolette AC power supply does not contain circuitry for charging a battery to provide back-up power for the consolette. Motorola Solutions recommends operating the consolette via AC power and UPS, or by DC power from an external DC power system with battery back-up power.

APX 8000 PORTABLE RADIO

With four RF bands and multi-mode system access, the APX 8000 allows users to communicate across borders using a single device. Use analog MDC 1200 or digital P25 mode, conventional or trunked operation, SMARTNET or SmartZone legacy systems, clear or secure - all across 7/800MHz, VHF and UHF Range 1 & 2 bands.

Adaptive Audio Engine

Whether it’s loud or windy, whether you whisper or yell, the APX 8000 adaptive audio engine and ultra-loud speaker brings clarity into every conversation. The radio dynamically changes the level of noise suppression, microphone gain, windporting, and adaptive speaker equalization to consistently produce the loudest, clearest audio in any environment.

Comfortable Design

Intuitively designed with a familiar look and feel, the compact APX 8000 is always comfortable to use, from your holster to your grip. The aggressive T-shape makes the radio easier to grip, even with wet or slippery hands. It contains four radio bands and a flexible, all-band antenna.

Rugged and Durable

The APX 8000 has a water-tight seal, drop-resistant dual battery latch, pressure-tested tempered glass display, and a shock-absorbing aluminum alloy endoskeleton, ensuring that the APX 8000 is ready for unpredictable environments. It can survive 2 meter water submersion for 2 hours, the MIL-STD 810 C, D, E, F, G procedures, and Motorola's renowned Accelerated Life Test.

Models Available for the APX8000

The APX 8000 is available in three models.



Model 1.5

Top Display



Model 2.5

Top and Front Display with Limited Keypad



Model 3.5

Top and Front Display with Full DTMF Keypad

The **Top Display** (Model 1.5) features:

- Up to 3000 Channels.
- Full Bitmap Top Display:
  - 1 line of icons.
  - 1 line x 8 characters of text.
  - Multi-color backlight.
- No keypad.
- Buttons & Switches:
  - Large PTT Button.
  - Angled On/Off volume control.

- Orange emergency button.
- 16-position top-mounted rotary switch.
- 2-position concentric switch.
- 3-position toggle switch.
- 3 programmable side buttons.

The **Top and Front Display with Limited Keypad** (Model 2.5) includes all the features of the Model 1.5, plus the following:

- Full Bitmap Display:
  - 2 lines of icons.
  - 4 lines x 14 characters of text.
  - 1 menu line x 3 menus.
  - White backlight.
- Backlit Keypad:
  - Home and Data buttons.
  - 3 soft keys.
  - 4 direction navigation key.

Finally, the **Top and Front Display with Full DTMF Keypad** (Model 3.5) includes all the features of the Model 2.5, with the addition to a 4x3 DTMF keypad.

APX XE PORTABLE RADIOS

APX Variants: XE (Extreme Edition) Series Product Advantages

The XE Mission Extreme feature addition to the APX radio line provides Fire Departments with the level of ruggedization and survivability needed in the especially harsh environments seen by Fire first responders. Motorola Solutions has included several key new innovative features to enhance personnel safety.

The APX XE series of radio solutions provides extreme rugged and ergonomic design with innovative features developed specifically for the fire market to enhance personnel safety in extreme environments.



Fire-Centric Audio Enhancements

- New Extreme One Sided Audio Profile:
  - A unique audio profile with noise reduction algorithms and filters specifically designed for the most challenging of noise environments.
- Enhanced Dual Microphone noise-cancelling.
- Adaptive and fast acting dual-sided design that allows effective noise reduction regardless of what microphone the user is talking into.
- Loudest Audio Output with least distortion.
- Large 1Watt Rated Speaker that delivers clarity 50% louder than typical P25 Radios.

Fire-Centric Ergonomic Enhancements

- Protective Bumper Ring.
- Exaggerated Knobs and Controls.
- PTT/Side Button design changes for Improved Gloved Operation:
  - Larger Ridge/Increased Texture.
  - Larger programmable side buttons.

- Rubber over mold for improved grip.
- Redesigned speaker grill for improved water porting.
- Larger emergency button.
- Taller top display for larger fonts.

Video Demonstrations of APX XE Series Performance

The following URL provides a video presentation which illustrates the advantages of APX XE series radio equipment with compelling live demonstrations of APX audio performance: http://video.motorolasolutions.com/video.aspx/motorola-s-apx-xe-remote-speaker-microphone/1094198138001.

In an effort to deliver optimal intelligible audio in the presence of high background noise, the use of "Best Practices" as defined by the International Association of Fire Chiefs (IAFC) along with optimal Customer Programming Software (CPS) audio settings in the radio, have also shown to be very beneficial in delivering improved communications.

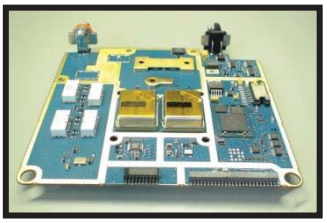
The following URL provides additional best practices for Fire agency users with Motorola APX XE series radios which have been presented to the International Association of Fire Chiefs: http://video.motorolasolutions.com/video.aspx/say-it-loud-and-clear/2203239567001.

APX 8500 MOBILE RADIO

The APX 8500 offers all of the communications features and benefits of our APX line of radios in an easy-to-install design. The APX 8500 includes four RF bands and multi-mode system access. The APX 8500 is designed to communicate across borders using a single device. The interoperability of the APX 8500 allows users to employ analog MDC 1200 or digital P25 mode, conventional or trunked operation, SMARTNET or SmartZone legacy systems, clear or secure; all across 7/800MHz, VHF and UHF Range 1 & 2 bands.

Reliable Construction

The APX 8500 mobile platform dramatically improves reliability by reducing the number of discreet parts and connectors. Side connectors with hard gold contacts molded into plastic eliminate loose wires and parts, and radial silicone seals protect the internal components. The radio housing is ultrasonically welded to distribute impacts over the entire area of the radio. Additional adhesive layers and gaskets prevent water intrusion.



The APX has hard gold contacts molded into plastic to eliminate loose wires and parts

Easy Vehicular Installation and Serviceability

The APX 8500 is a mid-power version mobile radio, designed for ease of installation. All APX 8500 mobile radios are equipped with 12 character RFID tags, which provide a fast, accurate way of obtaining valuable asset tracking information without having to uninstall the radio.

Multiple Control Heads

Each APX 8500 mobile radio can be controlled by multiple control heads, with four different wired locations. There are five control heads available: the O2, O3, O5, O7 and O9. The O2, O3, and O7 are available in dash mount and remote mount configurations. The O3 and O9 are available in remote mount configurations only, and have a screen and keypad for detailed data inputs.

APX ACCESSORIES

Remote Speaker Microphones (RSMs)

Motorola Solutions APX RSMs and PSMs deliver audio that is clearer, easier to understand, and up to 50% louder than XTS-series RSMs. That's because they have the same speaker found in our APX portable radios – for the best-in-class accessory audio available.

Some RSMs feature leading-edge IMPRES technology which communicates with the APX radio to help suppress ambient noise, improve voice intelligibility, and amplify loudness — even in noisy situations and difficult weather. Broward County agencies can rely on Motorola Solutions RSMs to carry on a conversation clearly even with traffic rushing by or pumper trucks running.

Shows Information Instantly

Select from a variety of models, including RSMs with a display. These easy-read screens let users see zone and channel information at-a-glance. Since the display mirrors the one on top of the portable, it delivers the information users need, when they need it. Many of our RSMs/PSMs give users immediate access to radio controls – from volume and channel selector to emergency and programmable buttons.

Reduce Background Noise

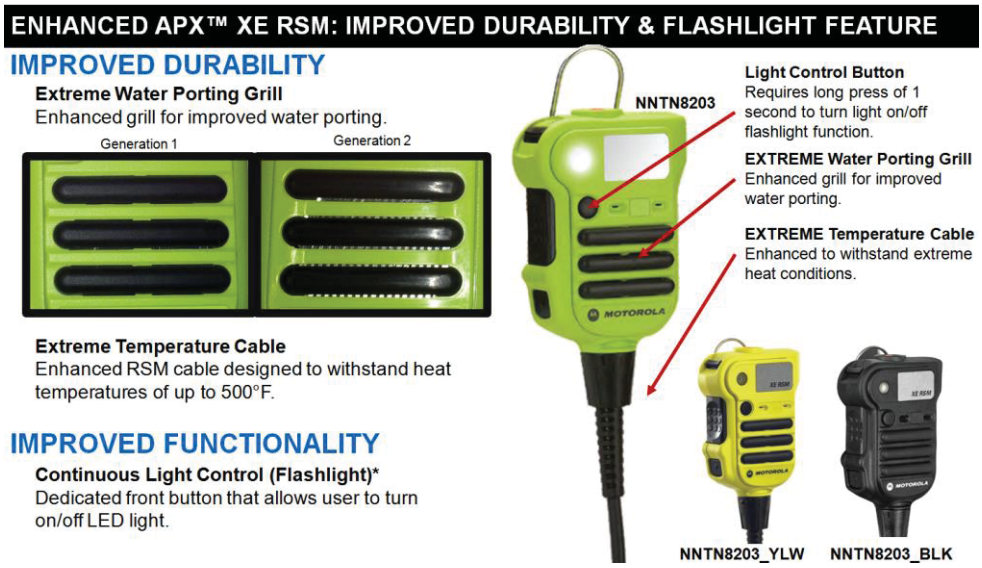
The Windporting feature on select RSMs/PSMs is specifically designed for windy outdoor environments. Windporting dramatically reduces the noise caused by howling winds and harsh weather. In addition, it prevents water from clogging the microphone and distorting transmissions. In a domed stadium or an open-air event, noise-canceling acoustics on select RSM models negate background noise so your voice comes through loud and clear anytime you speak into the microphone. Whatever the work condition, there's a microphone made for each unique situation.

Endures Adverse Conditions

Many of our RSMs and PSMs meet tough specs – IP57 submersibility ratings – to withstand water immersion longer. Even if users drop them in a puddle or wear them in the rain, they'll stay connected. Our rugged accessories take toughness further – exceeding IP57 standards for submersibility and providing an optimal level of water protection. If you're on the fireground and your RSM gets drenched by a hose, it will stand up. Display RSMs sport the first rugged, submersible audio jack so you can receive discreet communications with a separate earpiece accessory and not worry about water damaging your connection.

APX XE Remote Speaker Microphone

Firefighter safety is critical to us. Motorola Solutions has teamed up with first responders around the world to develop a rugged remote speaker microphone (RSM) that complements our APX XE radios and withstands the harshest conditions. The APX XE RSM is part of our complete portfolio of fire-specific radios and accessories, with ultra-rugged features, advanced ergonomics and special innovations to improve responder safety. From exaggerated controls to exceptional noise suppression, it's made for the noisiest, nastiest days.



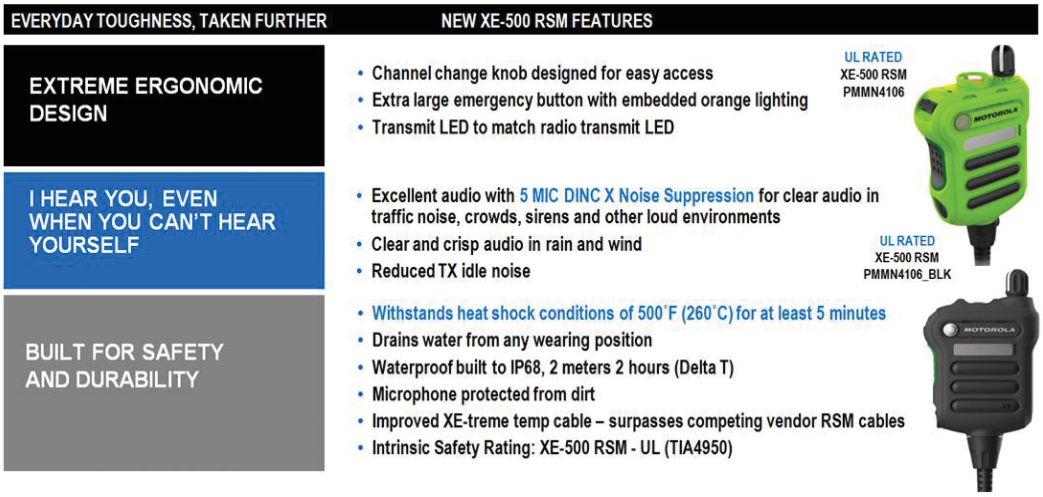
Everything about the XE RSM is designed for easy use on the fireground. From exaggerated controls, you can operate with bulky gloves to an asymmetrical shape so you can find the controls you need without looking. The large emergency button is easy to locate, but shielded so it's not accidentally activated. The prominent push-to-talk button is easy to find and press with gloves on. The easily accessible, programmable buttons and a volume switch on the corner of the RSM that "rocks up and down" to distinguish it from other controls.

The XE RSM is available in three different housing colours to meet your specific needs and includes a large metal D-ring that flips up or down so you can attach it any way you want on your turnout gear. A high visibility strobe light activates when the emergency button is pressed, this strobe has been verified by firefighters in training conditions to be visible in smoke up to 10 feet. In addition, if the RSM is sprayed with a hose or dropped in a pool of water, you will see what rugged specs and a unique water-draining speaker design really mean.

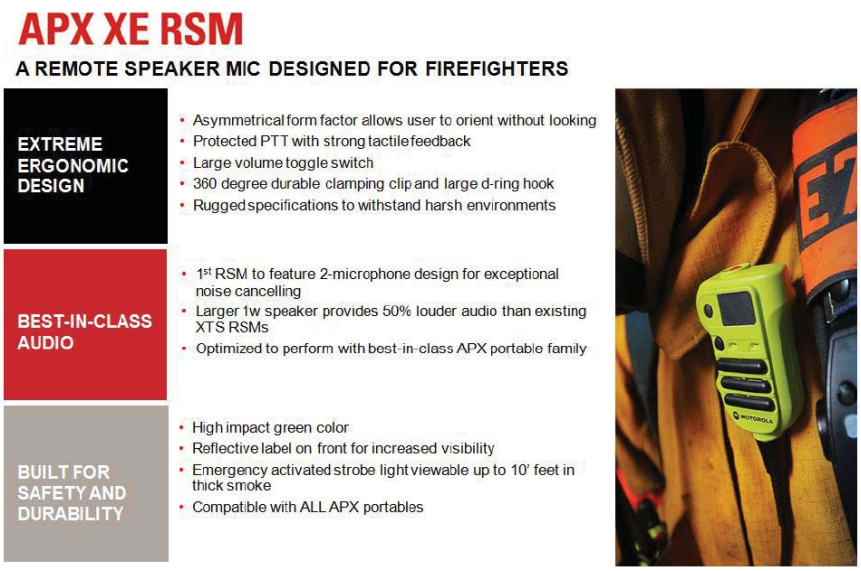
Noise Suppression at its Best

The XE RSM is the first accessory with dual microphones that locate the talker and cancel out background noise. It suppresses noise so effectively, you can be heard in the loudest environments –over roaring fire, pumper trucks and wailing sirens. A large speaker delivers the loudest, clearest accessory audio available – 50% louder and clearer than our existing XTS RSMs –so transmissions are clear and intelligible, not distorted or garbled. Because the XE RSM

leverages the exceptional noise suppression technology of our best-in-class APX radios, you can be heard and be clearly understood in all types of extremes.







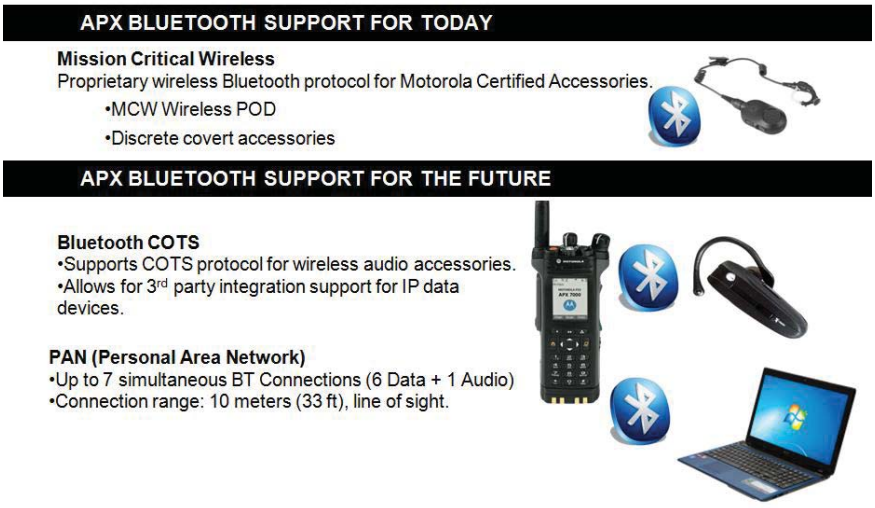
APX Extreme Performance (XP) RSM

Designed with mission critical law enforcement users in mind, the APX XP RSM suppresses noise so effectively, you can be heard over traffic noise, crowds and sirens. Its unique dual-microphone design tracks the talker's voice so that you can keep your eye on what is in front of you while still talking on the microphone.

A digital signal processor (DSP) algorithm helps suppress background noise so you can be heard clearly regardless of the noise around you. It includes a flexible 360-degree rotatable shoulder clip, designed specifically to fit comfortably on the police uniform epaulet. A D-ring provides an additional attachment option. This IMPRES RSM is the thinnest RSM in the APX portfolio and is specifically designed for tough mission critical use – buttons are enlarged for easy access, yet recessed to avoid accidental activation.

Mission Critical Wireless - Bluetooth Accessories

Motorola's APX 4000, 6000, and 8000 portable radios ship standard with Bluetooth functionality enabled. Broward County users can use COTS Off-The-Shelf Bluetooth accessories or Motorola Mission Critical Wireless accessories to meet their operational needs.





Motorola Solutions Mission Critical Wireless Advantages

- **CRITICAL VOICE ON DEMAND –** With enhanced security, quick pairing and fast push-to-talk (PTT), our APX Mission Critical Wireless portfolio stands out in meeting these most critical criteria. When you use our accessories with Bluetooth-enabled APX radios, you can be sure every data transmission and every word gets through.
- **JUST "TOUCH" AND GO –** Our accessories pair with just a "touch" and usually connect in less than 10 seconds – even around other Bluetooth devices. Grab an earpiece or earbuds, place the PTT pod within an inch of any APX portable and securely pair. There's no need to enter codes or navigate through menus.
- **EVERY TRANSMISSION IS SECURE –** While the APX radio is pairing, a Bluetooth ID and a strong 128-bit key are exchanged to encrypt the Bluetooth link.

Body-Worn Cameras/Video Speaker Mics DEMS Si500

Motorola Solutions latest innovation addresses the need for body cameras. Motorola Solutions has integrated a camera device with the APX radio creating a Video Speaker Microphone (VSM). This innovation reduces the need for additional devices for all types of responders that seek a body camera solution. Motorola Solutions is completing beta tests currently and will be releasing this product in Q3 of 2016. The advanced body cameras and cloud storage solution offers any of Broward County users the ability to leverage their current investments of APX radios, PremierOne CAD and an ASTRO 25 radio network to the fullest.

Body-Worn Camera Complete Solutions with Command Central Vault Cloud Storage

Our Solutions combines the power of Si500 VSMs with CommandCentral Vault which provides foundation for anybody–worn program.

- CommandCentral Store.
- CommandCentral Manage.
- CommandCentral Judicial.
- Flexible storage models:
  - 100GB of storage per user per year.
  - Combine all storage into one large bucket of storage for all to share.

Si500 Video Speaker Microphone

Sight and Sound Simplified—Si500

Motorola's Si Series Video Speaker Microphones (VSM) (Figure 2), enables agencies to trim down the number of devices needed for public safety personnel to do their job effectively. An extension of the high–performing Motorola APX™ radio, the Si Series is a smart interface with an integrated remote speaker microphone and body–worn camera in one. It assures the reliable voice and mission critical sight, sound and security your officers need to work more safely. The Si500 VSM combines voice communications, video, still images, and emergency alerting into one compact and easy–to–use device.



Figure 2: Si500 Video Speaker Microphone

Extend the Power of APX, Best–in–Class Performance

Like our industry–leading APX radios, every feature and function of the Si500 VSM is designed with your safety in mind: from best–in–class audio to purpose–built ergonomics.

The Si Series VSM is Ultra–rugged, IP67 and MIL–STD rated for harsh environments

The new Adaptive Audio Engine that automatically adjusts audio settings based on the user's wearing position and environment. With five integrated microphones and a loud 0.5–watt rated speaker, it provides the same audio quality of the APX™ 6000 portable radio.

Si500 Key Features

- 100+dB Audio delivers APX audio quality.
- Five integrated microphones with adaptive audio technology.
- Articulating camera optimizes your recording field of view based on officer body type and posture.
- 0.5 Lux low light performance.
- Pre–buffering to capture events prior to recording (video and/or audio).
- Automatic recording with the press of the emergency button on VSM or APX radio and with external Bluetooth sensor triggers.
- 32GB storage on the device.
- Integrated Wi–Fi for wireless video download.
- Video metadata captures time, date, and location via GPS with APX subscriber connectivity.
- Flexible energy solutions (see Figure 3, 4 and 5.



Figure3: Ergonomics of the Si500 VSM



Figure 4: Video Functionality of the Si500 VSM



Figure 5: Radio Functionality of the Si500 VSM

CommandCentral Vault

CommandCentral Vault is a cloud–based content management solution to securely store, review, manage and share all forms of digital evidence. It provides a single place to aggregate evidence from multiple sources such as fixed video, social media, body-worn cameras (such as the Si500/300), audio notes and other multimedia sources.

Supporting both automatic and manual uploads combined with end–to–end streamlined content management enables agencies to simplify workflows and the overhead of dealing with increasing amounts of content.

CommandCentral Vault is fully integrated with Motorola's Si500 VSM and supports other sources of body-worn camera video evidence.

Simplified Storage

Multimedia captured from the Si500 is seamlessly transferred into CommandCentral Vault via secure Wi–Fi network connection. Multimedia stored in CommandCentral Vault can be automatically tagged and grouped with associated call to service event from CAD and further associated to a record ID or case within your Records Management System (RMS). This will dramatically reduce manual administrative workload from the staff as compared to other systems where you would have to manually enter in this information.

CJIS Security

CommandCentral Vault uses a CJIS Government Cloud to store all content securely and is contractually committed to meeting CJIS requirements. Secure uploading of multimedia content eliminates the hassle, maintenance and security challenges of an on–site storage solution.

CommandCentral Vault Key Features

- CJIS–capable government cloud storage.
- Automated redaction, eliminating tedious frame–by–frame process.
- Dynamic watermarking to prevent unauthorized screen capturing and sharing.
- Secure chain of custody with cryptographically signed content, preventing manipulation.
- Role–based access.
- Advanced end–to–end content management: capture, review, manage, and share.
- Simplified multi–media storage and transfer from Si500/Si300 as well as external ingestion of video, photographs, and documents into the case folder.

CommandCentral Vault Capabilities

Streamlined Workflow and Redaction

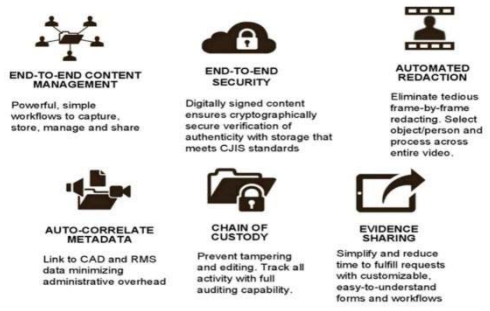
CommandCentral Vault enables users to quickly and easily search, review, annotate, mark, provide additional tags and playback content with a geospatial view to quickly identify when and where content was captured. It significantly streamlines the redaction process allowing users to simply select an object or individual and automatically apply the logic across the entire video, saving hours of administrative time.

Agency administrative personnel also have complete control over what capabilities users have to comply with their policies.

Simple Sharing

CommandCentral Vault provides streamlined end–to–end content management from the moment an incident is recorded by an officer to when it may be requested internally or externally from your government enterprise. Rapid prioritization and fulfillment saves time and delivery of content is fast and secure. From judicial requests to citizen FOIA requests, CommandCentral Vault provides customizable agency forms, workflow, and queuing tools to simplify sharing.

Maintain Chain of Custody



CommandCentral Vault ensures end–to–end security of stored content, and original content is never edited to reduce challenges to the chain of custody. Full auditing allows your agency to track all activity on content from the moment it's stored and classified.

CommandCentral Vault—Store Module

The CommandCentral Store module is the baseline package provided by CommandCentral Vault and is offered on a per user license basis. It provides licensed users the ability to seamlessly upload content from multiple sources,

including body–worn devices via secure Wi–Fi. Cloud storage that meets CJIS standards is included as well as the ability to perform the following actions on stored content:

- Annotate images and video to provide additional context during review.
- Automatic association of stored content with CAD/RMS data to group related case files and provide faster search for case related content.
- Review content and associated metadata with geospatial mapping playback.
- Chain of custody controls to preserve and verify original content.
- Mark content to adhere to retention policies.

CommandCentral Vault—Manage Module

With the optional Manage module your agency can select to enhance content management capabilities. With the Manage module your entire agency (per user licensing does not apply) is provided all the capabilities with the baseline Store module, including:

- Agency–wide content search for permitted users.
- Enhanced review functionality with playback speed controls.
- Additional administrative content restriction controls.
- Automated redaction based on facial and/or object recognition.

CommandCentral Vault—Judicial Module

With the optional judicial module your agency can rapidly share evidence and other content with legal personnel reducing administrative overhead and delays. With the Judicial module your entire agency (per user licensing does not apply) is provided all the capabilities of the Store and Manage modules, including:

- Creating video clips to provide specific evidence related to a judicial request.
- Restricted distribution to ensure only permitted individual have access to necessary content.
- Secure links to requested content to maintain chain of custody.

CommandCentral Vault—Public Information Request, FOIA Module

In addition to Store capabilities you receive:

- A secure, agency–branded web portal to enable FOIA requests from the public.
- The ability to collect payments for FOIA requests.
- The ability to tailor customizable workflow forms to your agency needs.
- Automated redaction based on facial and/or object recognition.

Batteries and Battery Chargers

Motorola Solutions created our patented IMPRES technology as an integral part of our two-way radio batteries and chargers. Users who rely on IMPRES call it innovative and indispensable. We call IMPRES the intelligent way to communicate – offering enhanced performance and exceptional capabilities for your radio, your battery and its charger, and your users.

IMPRES Smart Energy System

Our innovative IMPRES battery charging and reconditioning system streamlines and automates battery maintenance. It draws on our exclusive technology that enables communication between battery and charger to help lengthen battery life and extend talk time.

Automates Battery Maintenance

Users want to be sure they can get the most out of every battery by maximizing its life. IMPRES automates battery reconditioning, adapting the intervals to each battery's usage pattern. IMPRES batteries and chargers have the capability to exchange data. This allows the IMPRES charger to evaluate the usage pattern of an IMPRES battery and determine the optimum reconditioning interval, thus optimizing battery life.

Eliminates Overcharging

IMPRES batteries can be left in their IMPRES chargers for extended periods without heat damage from the charger. If radios are accidentally left in the charger – overnight, over a weekend or longer – there should not be any worry about shortening the battery's life. Because the IMPRES charger automatically monitors battery capacity, batteries are safely charged to the right capacity and always ready to go.

Better Data for Better Decisions

IMPRES batteries store critical usage information. Each two-line IMPRES charger display presents data at a glance, so users and administrators can make informed decisions about battery replacement. Data includes key information such as battery capacity, time remaining to complete charging, and each battery's unique serial number. If you are operating a large fleet of batteries, IMPRES Battery Data Reader is a valuable diagnostic tool to evaluate individual IMPRES batteries. Furthermore, IMPRES Battery Fleet Management collects and consolidates that data automatically, so you can quickly and easily identify when batteries need to replaced.

Tested Tough and Proven Tough

All Motorola IMPRES batteries are Proven Tough. Time after time, in lab test after test – for Drop, Vibration and ESD (Electrostatic Discharge) – they withstand shocks, knocks, drops and shakes and outperform the leading brands. If your radio is banged on a ride, rattled by heavy equipment or shocked by static electricity, you can depend on IMPRES batteries to stay true and stand tough.

IMPRES Advantages include:

- Batteries are charged based on kit number.

- Accommodates a mixed fleet of batteries transitioning from non-IMPRES to IMPRES systems.
- Continuous monitoring of charge temperature.
- Negative pulse charge algorithm.
- Intelligent charge control allows batteries to be stored in a charger indefinitely.
- Eliminates unnecessary reconditioning that reduces life.
- Maximizes battery life.
- Enables extended warranties.

Battery Recharge Time

Under typical charge cycles, most batteries will be charged in an hour with a rapid charge. Motorola's IMPRES chargers are specifically designed to match current drain profiles of the APX portable to maximize battery life and performance over time. Max battery charge rate (min time) is governed by the cell's ability to absorb charge. The cell manufacturers spec the max charge rate and we follow their recommendations to maximize cell life.

3.0 Pricing

All Subscriber Equipment and Subscriber Equipment Maintenance shall be offered and available to the County and all Eligible Purchasers at the prices listed in the following pages, minus the applicable discount listed below. Radio pricing excludes the costs for installation and unit programming. No minimum quantity requirements apply unless expressly stated below. In the event more than on discount rate applies, only the higher discount rate will be applied.

Discount	Duration of Availability	Discounted Product(s)	Discount Rate
Standard Discount	Duration of Agreement	P25 configured subscriber radios	25%
		Subscriber accessories	23%
Migration Incentive	For two (2) years after the Effective Date of Agreement	P25 configured subscriber radios	40%
		Subscriber accessories	29%
Volume Discounts: 500-999	Duration of Agreement	P25 configured subscriber radios	30%
		Subscriber accessories	25%
Volume Discounts: 1000-1999	Duration of Agreement	P25 configured subscriber radios	33%
		Subscriber accessories	27%
Volume Discounts: 2000 and greater	Duration of Agreement	P25 configured subscriber radios	40%
		Subscriber accessories	29%

SUBSCRIBER PROGRAMMING, INSTALL AND POST WARRANTY MAINTENANCE PRCING

RADIO MANANEMENT AND PROGRAMMING SOFTWARE AND EQUIPMENT			
DESCRPTION	**LIST $**	**DISC %**	**DISC $**
RVN5224AE APX PORTABLE & MOBILE PROGRAMING SOFTWARE (3YR SUBSCRIPTION)	$399.99	0%	$399.99
HKN6184C MOBILE PROGRAMMING CABLE, USB	$52.00	23%	$40.04
PMKN4012B MOBILE PROGRAMMING CABLE	$77.00	23%	$59.29
T7914 RADIO MANAGEMENT ONLINE	$0.00	20%	$0.00
UA00049AA ADD: RADIO MANAGEMENT LICENSES ONLINE (PER RADIO)	$100.00	20%	$80.00
DESCRIPTION	**QTY**	**PRICE**	
RADIO PROGRAMMING or REFLASHING RADIO (EXLUDES THE COST OF FLASH)			
MOBILE PER RADIO	<51		$70.00
MOBILE PER RADIO	51-100		$54.00
MOBILE PER RADIO	>500		$46.00
PORTABLE PER RADIO	<51		$70.00
PORTABLE PER RADIO	51-100		$54.00
PORTABLE PER RADIO	>500		$46.00
BUILDING TWO WAY RADIO PROGRAMMING TEMPLATES	**QTY**	**PRICE**	
250 mode template with excel template	1		$620.00
REPROGRAMMING EXISTING RADIOS (EXCLUDE THE COST OF FLASH)			
RETUNING RADIO WITH UPDATED CODEPULUG AND FLEETMAP	**QTY**	**PRICE**	
PORTABLE & MOBILE	<51		$70.00
PORTABLE & MOBILE	51-100		$54.00
PORTABLE & MOBILE	>500		$46.00
RETUNING RADIO, UPDATE CODEPLUG AND FLEETMAP AND REMOVE LEGACY SYSTEM PROGRAMIING (2 TOUCH)			
PORTABLE & MOBILE	<51		$140.00
PORTABLE & MOBILE	51-100		$108.00
PORTABLE & MOBILE	>500		$92.00
DASH MOUNT RADIOS (Standard Sedan or Light Trucks)	**QTY**	**PRICE**	
INSTALLATION	1		$200.00
REMOVAL AT TIME OF NEW OR RE-INSTALLATION	1		$47.00
REMOVAL WITHOUT NEW OR RE-INSTALLATION	1		$65.00
REMOTE/ TRUNK MOUNT RADIOS (Standard Sedan or Light Trucks)	**QTY**	**PRICE**	
INSTALLATION	1		$270.00
REMOVAL AT TIME OF NEW OR RE-INSTALLATION	1		$65.00
REMOVAL WITHOUT NEW OR RE-INSTALLATION	1		$80.00
DASH MOUNT RADIOS (Ambulance or Fire Truck type vehicles)	**QTY**	**PRICE**	
INSTALLATION	1		$465.00
REMOVAL AT TIME OF NEW OR RE-INSTALLATION	1		$165.00
SECONDARY REMOVAL AT TIME OF NEW OR RE-INSTALLATION	1		$65.00
REMOVAL WITHOUT NEW OR RE-INSTALLATION	1		$195.00
SECONDARY REMOVAL WITHOUT NEW OR RE-INSTALLATION	1		$65.00

REMOTE MOUNT (Ambulance or Fire Truck type vehicles) CUSTOMER PRICING	QTY	PRICE
SINGLE CONTROL HEAD TYPE INSTALLATION	1	$465.00
DUAL CONTROL HEAD TYPE INSTALLATION REQUIRE SURVEY TO ENSURE CUSTOMER EXPECTATION IS PROPERLY MET	1	QUOTED
REMOVAL AT TIME OF NEW OR RE-INSTALLATION (SINGLE CONTROL HEAD)	1	$165.00
REMOVAL WITHOUT NEW OR RE-INSTALLATION (SINGLE CONTROL HEAD)	1	$270.00
REMOVAL AT TIME OF NEW OR RE-INSTALLATION (DUAL CONTROL HEAD)	1	$170.00
REMOVAL WITHOUT NEW OR RE-INSTALLATION (DUAL CONTROL HEAD) $	1	$285.00

CONTROL STATIONS	QTY	PRICE
INSTALLATION: (Includes penetration of (1) wall 50 ft of 1/2 inch cable, installation of cable, connectors, yagi RF antenna type antenna)	1	$500.00
REMOVAL	1	$195.00

PORTABLE SUBCRIBER SERVICE FROM THE START	LITE <500	LITE <500	COMPREHENSIVE <500	COMPREHENSIVE >500
APX4000	$50.40	$49.00	$98.40	$96.60
APX6000	$50.50	$49.00	$98.40	$96.60
APX8000	$70.50	$69.00	$118.00	$116.75

PORTABLE SUBCRIBER LOCAL SUPPORT	<500	>500		
APX4000	$66.00	$64.35		
APX6000	$66.00	$64.35		
APX8000	$78.00	$76.05		

PORTABLE SUBCRIBER PICK UP AND DELIVERY	<500	>500		
APX4000	$24.00	$23.40		
APX6000	$24.00	$23.40		
APX8000	$24.00	$23.40		

MOBILE SUBSCRIBER SERVICE FROM THE START	LITE <500	LITE <500	COMPREHENSIVE <500	COMPREHENSIVE >500
APX4500	$74.40	$72.45	$122.40	$120.60
APX6500	$74.40	$72.45	$122.40	$120.60
APX7500	$95.20	$92.84	$127.63	$125.08

MOBILE SUBSCRIBER LOCAL SUPPORT	<500	>500		
APX4500	$42.00	$40.95		
APX6500	$42.00	$40.95		
APX7500	$54.00	$52.65		

MOBILE SUBSCRIBER PICK UP AND DELIVERY	<500	>500		
APX4500	$36.00	$35.10		
APX6500	$36.00	$35.10		
APX7500	$36.00	$35.10		
CONTROL STATION SERVICE FROM THE START	**LITE <500**	**LITE <500**	**COMPREHENSIVE <500**	**COMPREHENSIVE >500**
APX4500	$116.40	N/A	N/A	N/A
APX6500	$116.40	N/A	N/A	N/A
APX7500	$149.20	N/A	N/A	N/A
APX8500	$149.20	N/A	N/A	N/A
CONTROL STATION LOCAL SUPPORT	**<500**	**>500**	**<500**	**>500**
APX4500	N/A	N/A	N/A	N/A
APX6500	N/A	N/A	N/A	N/A
APX7500	N/A	N/A	N/A	N/A
APX8500	N/A	N/A	N/A	N/A
MOTOROLA WILL WORK WITH ANY AGENCY IF SERVICES ARE DESIRED				
CONSOLETTE SERVICE FROM THE START	**LITE <500**	**LITE <500**	**COMPREHENSIVE <500**	**COMPREHENSIVE >500**
APX7500 CONSOLETTE	$95.20	$92.84	N/A	N/A
CONSOLETTE LOCAL SUPPORT	**<500**	**>500**	**<500**	**>500**
APX7500 CONSOLETTE	$54.00	$52.65	N/A	N/A
MOTOROLA WILL WORK WITH ANY AGENCY IF SERVICES ARE DESIRED				
PORTABLE PREVENTATIVE MAINTENANCE 1x ANNUAL	**<500**	**>500**		
APX4000	$50.40	$49.00		
APX6000	$50.50	$49.00		
APX8000	$70.50	$69.00		
PORTABLE PREVENTATIVE MAINTENANCE BIANNUAL	**<500**	**>500**		
APX4000	$95.75	$93.35		
APX6000	$95.75	$93.35		
APX8000	$133.95	$130.60		
PORTABLE PREVENTATIVE MAINTENANCE 1x EVERY 2 YEAR	**<500**	**>500**		
APX4000	$50.40	$49.00		
APX6000	$50.50	$49.00		
APX8000	$70.50	$69.00		
MOBILE, Control Station, or Consolette SUBSCRIBER PREVENTATIVE MAINTENANCE ANNUAL	**<500**	**>500**		
APX4500	$74.40	$72.45		

APX6500	$74.40	$72.45		
APX7500	$95.20	$92.84		
MOBILE, Control Station, or Consolette SUBSCRIBER PREVENTATIVE MAINTENANCE BIANNUAL	**<500**	**>500**		
APX4500	$148.80	$145.08		
APX6500	$148.80	$145.08		
APX7500	$190.40	$185.64		
MOBILE, Control Station or Consolette SUBSRICBER PREVENTATIVE MAINTENANCE 1x EVERY 2 YEAR	**<500**	**>500**		
APX4500	$74.40	$72.45		
APX6500	$74.40	$72.45		
APX7500	$95.20	$92.84		

APX 1000 PORTABLE RADIOS						
STANDARD RADIO BUNDLE: P25, TDMA, INTEGRATED VOICE & DATA, GPS, BLUETOOTH, WHIP ANTENNA, 1900MAH BATTERY, 3 YEAR WARRANTY						
MODEL	**DESCRIPTIONS**	**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
H84UCD9PW5 N	**APX 1000 7/800 MHZ MODEL 1.5 PORTABLE**	**1**	**25%**	**$2,875.00**	**$2,156.25**	**$1,725.00**
H84UCF9PW6 N	**APX 1000 7/800 MHZ MODEL 2 PORTABLE**	**1**	**25%**	**$3,075.00**	**$2,306.25**	**$1,845.00**
H84UCH9PW7 N	**APX 1000 7/800 MHZ MODEL 3 PORTABLE**	**1**	**25%**	**$3,275.00**	**$2,456.25**	**$1,965.00**
OPTIONS(not limited to):		**QTY**		**LIST $**	**25% DISC $**	**40% DISC $**
G996	ADD: PROGRAMMING OVER P25 (OTAP)	1	25%	$100.00	$75.00	$60.00
QA09008	ADD: GROUP SERVICES	1	25%	$150.00	$112.50	$90.00
H869	ENH: MULTIKEY	1	25%	$75.00	$56.25	$45.00
QA03399	ADD: ENHANCED DATA	1	25%	$150.00	$112.50	$90.00
QA09012	ADD: MISSION CRITICAL GEOFENCING	1	25%	$150.00	$112.50	$90.00
QA01767	ADD: P25 LINK LAYER AUTHENTICATION	1	25%	$100.00	$75.00	$60.00
QA2749	IMPRES LIION 2350MAH	1	25%	$85.00	$63.75	$51.00
QA04146	ALT: IMPRES LIION 2800MAH	1	25%	$100.00	$75.00	$60.00
QA01767	ADD: P25 LINK LAYER AUTHENTICATION	1	25%	$100.00	$75.00	$60.00
H885	ADD: 3 YEAR SERVICE FROM THE START	1	0%	$90.00	$90.00	$90.00
Q887	ADD: 5 YEAR SERVICE FROM THE START	1	0%	$162.00	$162.00	$162.00

APX 4000 SINGLE BAND PORTABLE RADIOS						
STANDARD RADIO BUNDLE: P25, TDMA, INTEGRATED VOICE & DATA, GPS, BLUETOOTH, WHIP ANTENNA, 1900MAH BATTERY, 3 YEAR WARRANTY						
MODEL	**DESCRIPTION**	**QTY**	**STD DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
H51UCF9PW6 N	**APX 4000 7/800 MHZ *MODEL 2* PORTABLE**	**1**	**25%**	**$3,988.00**	**$2,991.00**	**$2,392.80**
H51UCH9PW7 N	**APX 4000 7/800 MHZ *MODEL 3* PORTABLE**	**1**	**25%**	**$4,417.00**	**$3,312.75**	**$2,650.20**
OPTIONS(not limited to):		**QTY**	**STD DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
G996	ADD: PROGRAMMING OVER P25 (OTAP)	1	25%	$75.00	$56.25	$60.00
QA01767	ADD: P25 LINK LAYER AUTHENTICATION	1	25%	$75.00	$56.25	$60.00
QA03399	ADD: ENHANCED DATA	1	25%	$112.50	$84.38	$90.00
QA04447	ADD: APX GEOFENCE	1	25%	$112.50	$84.38	$90.00
QA09008	ADD: GROUP SERVICES	1	25%	$112.50	$84.38	$90.00
H04	ADD: TACTICAL REKEY WITH MULTIKEY	1	25%	$262.50	$196.88	$210.00
H869	ENH: MULTIKEY	1	25%	$247.50	$185.63	$198.00
Q629	ENH: AES ENCRYPTION	1	25%	$356.25	$267.19	$285.00
H499	ENH: SUBMERSIBLE (DELTA T)	1	25%	$187.50	$140.63	$150.00
QA04934	ALT: IMPRES LI-ION 2500MAH RUGGED UL BATTERY	1	25%	$37.50	$28.13	$30.00
QA02750	ALT: IMPRES LI-ION 2800MAH BATTERY	1	25%	$100.00	$75.00	$60.00
H885	ADD: 3 YEAR SERVICE FROM THE START	1	0%	$90.00	$67.50	$90.00
Q887	ADD: 5 YEAR SERVICE FROM THE START	1	0%	$162.00	$121.50	$162.00

APX 6000 PORTABLE RADIOS						
STANDARD RADIO BUNDLE: P25, TDMA, INTEGRATED VOICE & DATA, GPS, BLUETOOTH, WHIP ANTENNA, 2650MAH BATTERY, 3 YEAR WARRANTY						
MODEL	**DESCRIPTION**	**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
H98UCD9PW5 N	**APX6000 7/800 MHZ *MODEL 1.5* PORTABLE**	**1**	**25%**	**$5,175.00**	**$3,881.25**	**$3,105.00**
H98UCF9PW6 N	**APX6000 700/800 *MODEL 2.5* PORTABLE**	**1**	**25%**	**$5,496.00**	**$4,122.00**	**$3,297.60**
H98UCH9PW7 N	**APX6000 700/800 *MODEL 3.5* PORTABLE**	**1**	**25%**	**$5,925.00**	**$4,443.75**	**$3,555.00**
XTREME (XE) DELTA T/UL OPTIONS(not limited to):		**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
QA02006	ENH: APX6000XE RUGGED RADIO (standard UL battery NNTN8930 comes with option)	1	25%	$800.00	$600.00	$480.00
QA05575	ALT: LIION IMPRES2 4500MAH UL/CSA	1	25%	$165.00	$123.75	$99.00
OPTIONS(not limited to):		**QTY**	**DISC%**	**LIST $**	**DISC $**	**40% DISC $**
QA01843	ADD: MANDOWN OPERATION	1	25%	$150.00	$112.50	$90.00
QA09006	ADD: ADAPTIVE NOISE SUPPRESSION & 3 WATT SPEAKER UPGRADE	1	25%	$150.00	$112.50	$90.00
G996	ADD: PROGRAMMING OVER P25 (OTAP)	1	25%	$100.00	$75.00	$60.00
QA01767	ADD: P25 LINK LAYER AUTHENTICATION	1	25%	$100.00	$75.00	$60.00
QA00631	ADD: DVRS PSU ACTIVATION	1	25%	$100.00	$75.00	$60.00
QA03399	ADD: ENHANCED DATA	1	25%	$150.00	$112.50	$90.00
QA09012	ADD: MISSION CRITICAL GEOFENCING	1	25%	$150.00	$112.50	$90.00
QA09008	ADD: GROUP SERVICES	1	25%	$150.00	$112.50	$90.00
H869	ENH: MULTIKEY	1	25%	$330.00	$247.50	$198.00
Q15	ADD: AES/DES-XL/DES-OFB ENCRYPTION	1	25%	$799.00	$599.25	$479.40
Q629	ENH: AES ENCRYPTION	1	25%	$475.00	$363.75	$285.00
Q498	ASTRO 25 OTAR W/ MULTIKEY (INCLUDES H04 TACTICAL)	1	25%	$740.00	$555.00	$444.00
H04	ADD: TACTICAL REKEY WITH MULTIKEY	1	25%	$350.00	$262.50	$210.00
QA06304	ATL: IMPRES 2 LIION 4500MAH - UL/CSA RUGGED	1	25%	$100.00	$75.00	$45.00
QA05574	ALT: LIION IMPRES 2 UL/CSA 2650MAH	1	25%	$110.00	$82.50	$66.00
H64	ALT: PUBLIC SAFETY YELLOW HOUSING	1	25%	$25.00	$18.75	$15.00
QA01427	ALT: IMPACT GREEN HOUSING	1	25%	$25.00	$18.75	$15.00
QA09001	ADD: WI-FI CAPABILITY	1	25%	$300.00	$225.00	$180.00
H499	ENH: SUBMERSIBLE (DELTA T)	1	25%	$150.00	$112.50	$90.00
HA00022AB	ADD: 3 YEAR SERVICE FROM THE START	1	0%	$90.00	$90.00	$90.00
Q887	ADD: 5 YEAR SERVICE FROM THE START	1	0%	$162.00	$162.00	$162.00

APX 8000 PORTABLE RADIOS

STANDARD RADIO BUNDLE: P25, TDMA, INTEGRATED VOICE & DATA, GPS, BLUETOOTH, WHIP ANTENNA, 3100MAH BATTERY, 3 YEAR WARRANTY

MODEL	DESCRIPTIONS	QTY	LIST $	25% DISC $	40% DISC $
H91TGD9PW5 N	**APX 8000 *ALL BAND MODEL 1.5 PORTABLE***	**1**	**$8,547.00**	**$6,410.25**	**$5,128.20**
DUAL BAND		1	$7,747.00	$5,810.25	$4,648.20
SINGLE BAND		1	$6,947.00	$5,210.25	$4,168.20
H91TGD9PW6 N	**APX 8000 *ALL BAND MODEL 2.5* PORTABLE**	**1**	**$8,753.00**	**$6,564.75**	**$5,251.80**
DUAL BAND		1	$7,953.00	$5,964.75	$4,771.80
SINGLE BAND		1	$7,153.00	$5,364.75	$4,291.80
H91TGD9PW7 N	**APX 8000 *ALL BAND MODEL 3.5* PORTABLE**	**1**	**$9,062.00**	**$6,796.50**	**$5,437.20**
DUAL BAND		1	$8,262.00	$6,196.50	$4,957.20
SINGLE BAND		1	$7,462.00	$5,596.50	$4,477.20
XTREME (XE) DELTA T/UL OPTIONS(not limited to):		**QTY**	**LIST $**	**25% DISC $**	**40% DISC $**
QA02006	ENH: APX8000XE RUGGED RADIO (standard UL battery PMNN4504 comes with option)	1	$800.00	$600.00	$480.00
QA05595	ALT: LIION 4100MA TIA4950 UL	1	$130.00	$97.50	$78.00
OPTIONS(not limited to):		**QTY**	**LIST $**	**25% DISC $**	**40% DISC $**
QA01843	ADD: MANDOWN OPERATION	1	$150.00	$112.50	$90.00
G996	ADD: PROGRAMMING OVER P25 (OTAP)	1	$100.00	$75.00	$60.00
QA01767	ADD: P25 LINK LAYER AUTHENTICATION	1	$100.00	$75.00	$60.00
QA09012	ADD: MISSION CRITICAL GEOFENCING	1	$150.00	$112.50	$90.00
QA00631	ADD: DVRS PSU ACTIVATION	1	$100.00	$75.00	$60.00
QA09008	ADD: GROUP SERVICES	1	$150.00	$112.50	$90.00
H869	ENH: MULTIKEY	1	$330.00	$247.50	$198.00
Q498	ASTRO 25 OTAR W/ MULTIKEY (INCLUDES H04 TACTICAL)	1	$740.00	$555.00	$444.00
H04	ADD: TACTICAL REKEY WITH MULTIKEY	1	$350.00	$262.50	$210.00
QA03399	ADD: ENHANCED DATA	1	$150.00	$112.50	$90.00
Q15	ADD: AES/DES-XL/DES-OFB ENCRYPTION	1	$799.00	$599.25	$479.40
Q629	ENH: AES ENCRYPTION	1	$475.00	$356.25	$285.00
QA09001	ADD: WIFI CAPABILITY	1	$300.00	$225.00	$180.00
H64	ALT: PUBLIC SAFETY YELLOW HOUSING	1	$25.00	$18.75	$15.00
QA01427	ALT: IMPACT GREEN HOUSING	1	$25.00	$18.75	$15.00
H499	ENH: SUBMERSIBLE (DELTA T)	1	$150.00	$112.50	$90.00
QA05573	ALT: LIION IMPRES 2 5100MAH DELTA T	1	$135.00	$101.25	$81.00
QA05571	ALT: LIION 4850MAH IMPRES DELTA T	1	$115.00	$86.25	$69.00
HA00022AB	ADD: 3 YEAR SERVICE FROM THE START	1	$110.00	$110.00	$110.00
Q887	ADD: 5 YEAR SERVICE FROM THE START	1	$213.00	$213.00	$213.00

APX 1500 MOBILE RADIOS (standard whip antennas and control head cables)						
STANDARD RADIO BUNDLE: P25, TDMA, IV&D, GPS, PALM MIC, 7.5 WATT SPEAKER, 3DB LOW PROFILE ANTENNA , 3 YEAR WARRANTY						
MODEL	**DESCRIPTIONS**	**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
M36URS9PW1 N	**APX1500 7/800 *02 CONTROL HEAD, DASH MOUNT***	**1**	**25%**	**$3,881.00**	**$2,910.75**	**$2,328.60**
CONTROL STATION OPTIONS(not limited to):		**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
G91	ADD: CONTROL STATION POWER SUPPLY	1	25%	$269.00	$201.75	$161.40
W665	ADD: CONTROL STATION OPERATION	1	25%	$70.00	$52.50	$42.00
W382	ADD: CONTROL STATION DESK GCAI MIC	1	25%	$169.00	$126.75	$101.40
OPTIONS (not limited to):		**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
GA01767	ADD: APX MOBILE RADIO AUTHENTICATION	1	25%	$100.00	$75.00	$60.00
G335	ADD: ANT 1/4 WAVE 762-870MHZ	1	25%	$14.00	$10.50	$8.40
G831	ADD: SPKR 15W WATER RESISTANT	1	25%	$60.00	$45.00	$36.00
G996	ENH: OVER THE AIR PROVISIONING	1	25%	$100.00	$75.00	$60.00
G683	ADD: ONE TOUCH STATUS MESSAGING	1	25%	$75.00	$56.25	$45.00
QA03399	ADD: ENHANCED DATA	1	25%	$150.00	$112.50	$90.00
GA00226	ADD: GPS ANTENNA	1	25%	$75.00	$56.25	$45.00
GA09008	ADD: GROUP SERVICES	1	25%	$150.00	$112.50	$90.00
GA01202AA	ADD: APX GEOFENCE MOBILE	1	25%	$150.00	$112.50	$90.00
G24	ADD: 3 YEAR SERVICE FROM THE START	1	0%	$131.00	$131.00	$131.00
GA00318	ADD: 5 YEAR SERVICE FROM THE START	1	0%	$246.00	$246.00	$246.00

APX 4500 MOBILE RADIOS (standard whip antennas and control head cables)						
STANDARD RADIO BUNDLE: P25, TDMA, INTEGRATED VOICE & DATA, GPS, PALM MIC, 7.5 WATT SPEAKER, 3DB LOW PROFILE ANTENNA , 3 YEAR WARRANTY (IF REMOTE MOUNT 17FT CABLE)						
MODEL	**DESCRIPTIONS**	**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
M22URS9PW1 N	**APX4500 7/800 *02 CONTROL, HEAD DASH MOUNT***	**1**	**25%**	**$4,381.00**	**$3,285.75**	**$2,628.60**
M22URS9PW1 N	**APX4500 7/800 *02 CONTROL HEAD, REMOTE MOUNT***	**1**	**25%**	**$4,493.00**	**$3,369.75**	**$2,695.80**
CONTROL STATION OPTIONS(not limited to):		**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
G91	ADD: CONTROL STATION POWER SUPPLY	1	25%	$269.00	$201.75	$161.40
W665	ADD: CONTROL STATION OPERATION	1	25%	$70.00	$52.50	$42.00
W382	ADD: CONTROL STATION DESK GCAI MIC	1	25%	$169.00	$126.75	$101.40
OPTIONS(not limited to):		**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
GA00631	ADD: DVRS MSU ACTIVATION	1	25%	$250.00	$187.50	$150.00
G201	ADD:IMPACT GREEN COLOR HOUSING (O2)	1	25%	$25.00	$18.75	$15.00
G335	ADD: ANT 1/4 WAVE 762-870MHZ	1	25%	$14.00	$10.50	$8.40
G831	ADD: SPKR 15W WATER RESISTANT	1	25%	$60.00	$45.00	$36.00
G996	ENH: OVER THE AIR PROVISIONING	1	25%	$100.00	$75.00	$60.00
G683	ADD: ONE TOUCH STATUS MESSAGING	1	25%	$75.00	$56.25	$45.00
GA01767	ADD: APX MOBILE RADIO AUTHENTICATION	1	25%	$100.00	$75.00	$60.00
QA03399	ADD: ENHANCED DATA	1	25%	$150.00	$112.50	$90.00
GA00226	ADD: GPS ANTENNA	1	25%	$75.00	$56.25	$45.00
GA01202AA	ADD: APX GEOFENCE MOBILE	1	25%	$150.00	$112.50	$90.00
GA09008	ADD: GROUP SERVICES	1	25%	$150.00	$112.50	$90.00
G843AH	ADD: AES ENCRYPTION	1	25%	$475.00	$356.25	$285.00
W969	ADD: MULTIPLE KEY ENCRYPTION OPERATION	1	25%	$330.00	$247.50	$198.00
G618	ADD: CBL REMOTE MOUNT 10 FEET	1	25%	$10.00	$7.50	$6.00
G610	ADD: CBL REMOTE MOUNT 30 FEET	1	25%	$25.00	$18.75	$15.00
G24	ADD: 3 YEAR SERVICE FROM THE START	1	0%	$131.00	$131.00	$131.00
GA00318	ADD: 5 YEAR SERVICE FROM THE START	1	0%	$246.00	$246.00	$246.00

APX 6500 MOBILE RADIOS (standard whip antennas and control head cables)

STANDARD RADIO BUNDLE: P25, TDMA, INTEGRATED VOICE & DATA, GPS, 05 CONTROL HEAD, PALM MIC, 7.5 WATT SPEAKER, 3DB LOW PROFILE ANTENNA, 3 YEAR WARRANTY (IF REMOTE MOUNT 17FT CABLE)

MODEL	DESCRIPTIONS	QTY	DISC%	LIST $	25% DISC $	40% DISC $
M25URS9PW1 N	**APX6500 7/800 MHZ MID POWER MOBILE *05 CONTROL HEAD, DASH MOUNT***	**1**	**25%**	**$5,640.00**	**$4,230.00**	**$3,384.00**
M25URS9PW1 N	**APX6500 7/800 MHZ MID POWER MOBILE *05 CONTROL HEAD, REMOTE MOUNT***	**1**	**25%**	**$5,812.00**	**$4,359.00**	**$3,487.20**
CONTROL STATION OPTIONS(not limited to):		**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
G91	ADD: CONTROL STATION POWER SUPPLY	1	25%	$269.00	$201.75	$161.40
W665	ADD: CONTROL STATION OPERATION	1	25%	$70.00	$52.50	$42.00
W382	ADD: CONTROL STATION DESK GCAI MIC	1	25%	$169.00	$126.75	$101.40
DUAL CONTROL HEAD OPTIONS(not limited to):		**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
GA00092	ADD: DUAL-CONTRL HD HARDWARE (must add additional mic, cables & speakers)	1	25%	$570.00	$427.50	$342.00
OPTIONS(not limited to):		**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
QA00631	ADD: DVRS PSU ACTIVATION	1	25%	$100.00	$75.00	$60.00
GA00631	ADD: DVRS MSU ACTIVATION	1	25%	$250.00	$187.50	$150.00
G335	ADD: ANT 1/4 WAVE 762-870 MHZ	1	25%	$14.00	$10.50	$8.40
G831	ADD: SPKR 15W WATER RESISTANT	1	25%	$60.00	$45.00	$36.00
G996	ENH: OVER THE AIR PROVISIONING	1	25%	$100.00	$75.00	$60.00
QA03399	ADD: ENHANCED DATA	1	25%	$150.00	$112.50	$90.00
GA01202AA	ADD: APX GEOFENCE MOBILE	1	25%	$150.00	$112.50	$0.00
GA01767	ADD: APX MOBILE RADIO AUTHENTICAT	1	25%	$100.00	$75.00	$60.00
GA09008	ADD: GROUP SERVICES	1	25%	$150.00	$112.50	$90.00
GA00226	ADD: GPS ANTENNA	1	25%	$75.00	$56.25	$45.00
G298AS	ENH: ASTRO 25 OTAR W/ MULTIKEY	1	25%	$740.00	$555.00	$444.00
W969	ADD: MULTIPLE KEY ENCRYPTION OPERATION	1	25%	$330.00	$247.50	$198.00
G851	ADD: AES/DES-XL/DES-OFB ENCRYPTION	1	25%	$799.00	$599.25	$479.40
G843	ADD: AES ENCRYPTION APX	1	25%	$475.00	$356.25	$0.00
G618	ADD: REMOTE MOUNT CBL 10 FEET	1	25%	$10.00	$7.50	$6.00
G610	ADD: REMOTE MOUNT CBL 30 FEET	1	25%	$25.00	$18.75	$15.00
GA879	ADD REMOTE MOUNT CBL 115 FEET	1	25%	$55.00	$41.25	$33.00
G72	ADD: O3 HAND HELD CONTROL HEAD	1	25%	$946.00	$709.50	$567.60
GA00805AA	ADD: O7 CONTROL HEAD	1	25%	$632.00	$474.00	$379.20
GA00245AA	ADD: O9 CONTROL HEAD	1	25%	$1,200.00	$900.00	$720.00
G24	ADD: 3 YEAR SERVICE FROM THE START	1	0%	$131.00	$131.00	$131.00
GA00318	ADD: 5 YEAR SERVICE FROM THE START	1	0%	$246.00	$246.00	$246.00

APX 7500 MOBILE RADIOS (standard whip antennas and control head cables)						
STANDARD RADIO BUNDLE: P25, TDMA, INTEGRATED VOICE & DATA, GPS, PALM MIC, 7.5 WATT SPEAKER, ANTENNA (7/800 3DB LOW PROFILE, 1/4 WAVE WHIP VHF/UHF) , 3 YEAR WARRANTY (REMOTE MOUNT 17FT CABLE, CONSOLETTES DC POWER)						
MODEL	**DESCRIPTION**	**QTY**	**DISC %**	**LIST $**	**25% DISC $**	**40% DISC $**
M30TSS9PW1 N	**APX7500 *DUAL BAND MID POWER, 05 CONTROL HEAD, DASH MOUNT***	**1**	**25%**	**$7,360.50**	**$5,520.38**	**$4,416.30**
M30TSS9PW1 N	**APX7500 *DUAL BAND, MID POWER, 05 CONTROL HEAD, REMOTE MOUNT***	**1**	**25%**	**$7,532.50**	**$5,649.38**	**$4,519.50**
M30TXS9PW1 N	**APX7500 *DUAL BAND, HIGH POWER* 05, *CONTROL HEAD, REMOTE MOUNT***	**1**	**25%**	**$8,078.50**	**$6,058.88**	**$4,847.10**
CONTROL STATION OPTIONS(not limited to):		**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
G91	**ADD: CONTROL STATION POWER SUPPLY**	1	25%	$269.00	$201.75	$161.40
W665	**ADD: CONTROL STATION OPERATION**	1	25%	$70.00	$52.50	$42.00
W382	**ADD: CONTROL STATION DESK GCAI MIC**	1	25%	$169.00	$126.75	$101.40
MULTIPLE CONTROL HEAD OPTIONS(not limited to):				**LIST $**	**25% DISC $**	**40% DISC $**
GA00092	ADD: DUAL-CONTRL HD HARDWARE(must add additional mic, cables & speakers)	1	25%	$570.00	$427.50	$342.00
GA00093	ADD: APX7500 TRI-CONTROL HARDWARE(must add additional mic,cables & speakers)	1	25%	$1,000.00	$750.00	$600.00
GA00094	ADD: APX QUAD-CONTROL HARDWARE(must add additional mic, cables & speakers)	1	25%	$1,300.00	$975.00	$780.00
CONSOLETTE RADIOS (no antenna, line or combiners in bundle, only radio and internal configurations):		**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
L30URS9PW1 N	**APX7500 SINGLE BAND CONSOLETTE**	1	25%	$7,548.00	$5,661.00	$2,732.40
LIMITED FRONT PANEL		1	25%	$8,028.00	$6,021.00	$288.00
FULL FP W/05/KEYPAD		1	25%	$8,337.00	$6,252.75	$473.40
L30TSS9PW1 N	**APX7500 CONSOLETTE DUAL BAND CONSOLETTE**	1	25%	$8,548.00	$6,411.00	$2,732.40
LIMITED FRONT PANEL		1	25%	$9,028.00	$6,771.00	$288.00
FULL FP W/05/KEYPAD		1	25%	$9,337.00	$7,002.75	$473.40
CONSOLETTE OPTIONS(not limited to):		**QTY**	**DISC%**	**LIST $**	**25%DISC $**	**40% DISC $**
DSCOL54160	VHF OMNIMEANDER COLLINEAR DIRECTIONAL ANTENNA	1	8%	$ 1,921.00	$1,767.32	$1,152.60
DSCOL4570	UHF OMNI COLLINEAR DIRECTIONAL ANTENNA	1	8%	$ 912.00	$839.04	$547.20
DSANT790F2	7/800 OMNI COLLINEAR DIRECTIONAL TELEWAVE ANTENNA	1	8%	$ 1,012.00	$931.04	$607.20
100 FT 1/2 SUPERFLEX CABLE AND CONNECTORS		1	8%	$585.90	$539.03	$351.54
OPTIONS(not limited to):		**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
GA01767	APX MOBILE RADIO AUTHENTICATION	1	25%	$100.00	$75.00	$60.00
GA00631	ADD: DVRS MSU ACTIVATION	1	25%	$250.00	$187.50	$150.00
GA00805	ADD: APX O7 CONTROL HEAD.	1	25%	$632.00	$474.00	$379.20
G174	ADD: ANT 3DB LOW-PROFILE 762-870	1	25%	$43.00	$32.25	$25.80
W484	ALT: ANT 3DB GAIN 762-870MHZ	1	25%	$38.00	$28.50	$22.80
G296	ADD: 1/4 WAVE WHIP ROOF TOP 136-144	1	25%	$13.50	$10.13	$8.10
G300	ADD:1/4 WAVE ROOF TOP ANT VHF	1	25%	$13.50	$10.13	$8.10
G430	ADD: ANT 5.0DB 445-470 MHZ	1	25%	$110.00	$82.50	$66.00
G426	ADD: ANT 1/4 WAVE WHIP 450-470 MHZ	1	25%	$25.00	$18.75	$15.00
G510	ADD: ANT LOW PROFILE 450-512 MHZ	1	25%	$50.00	$37.50	$30.00
W432	ADD: AUXILARY SPKR 13W (3.2OHM)	1	25%	$71.50	$53.63	$42.90
G996	ENH: OVER THE AIR PROVISIONING	1	25%	$100.00	$75.00	$60.00
QA03399	ADD: ENHANCED DATA	1	25%	$150.00	$112.50	$90.00
GA01202	ADD: APX GEOFENCE MOBILE	1	25%	$150.00	$112.50	$90.00
GA00226	ADD: GPS ANTENNA	1	25%	$75.00	$56.25	$45.00
W969	ADD: MULTIPLE KEY ENCRYPTION OPERATION	1	25%	$330.00	$247.50	$198.00
G298	ENH: ASTRO 25 OTAR W/ MULTIKEY	1	25%	$740.00	$555.00	$444.00
G851	ADD: AES/DES-XL/DES-OFB ENCRYPTION	1	25%	$799.00	$599.25	$479.40
G843	ADD: AES ENCRYPTION APX	1	25%	$475.00	$356.25	$0.00
G609	ADD: REMOTE MOUNT CBL 50 FEET	1	25%	$35.00	$26.25	$21.00

G607	ADD:CBL REMOTE MOUNT 75 FEET	1	25%	$45.00	$33.75	$27.00
G879	ADD:REMOTE MOUNT CBL 115 FEET	1	25%	$55.00	$41.25	$33.00
G78	ADD: 3 YEAR SERVICE FROM THE START	1	0%	$168.00	$168.00	$168.00
GA00318	ADD: 5 YEAR SERVICE FROM THE START	1	0%	$319.00	$319.00	$319.00

APX 8500 MOBILE RADIOS (standard whip antennas and control head cables)						
STANDARD RADIO BUNDLE: P25, TDMA, INTEGRATED VOICE & DATA, GPS, PALM MIC, 7.5 WATT SPEAKER, ANTENNA (7/800 3DB LOW PROFILE, 1/4 WAVE WHIP VHF/UHF, ALL BAND ANTENNA) , 3 YEAR WARRANTY (REMOTE MOUNT 17FT CABLE)						
MODEL	**DESCRIPTION**	**QTY**	**DISC %**	**LIST $**	**25% DISC $**	**40% DISC $**
M37TSS9PW1 N	**APX8500 *ALL BAND* , MID POWER, *05 CONTROL HEAD, DASH MOUNT* MOBILE RADIO**	**1**	**25%**	**$8,324.00**	**$6,243.00**	**$4,994.40**
DUAL BAND		1	25%	$7,524.00	$5,643.00	$4,514.40
SINGLE BAND		1	25%	$6,724.00	$5,043.00	$4,034.40
M37TSS9PW1 N	**APX8500 *ALL BAND,* MID POWER, *05 CONTROL, HEAD REMOTE MOUNT* MOBILE RADIO**	**1**	**25%**	**$8,496.00**	**$6,372.00**	**$5,097.60**
DUAL BAND		1	25%	$7,696.00	$5,772.00	$4,617.60
SINGLE BAND		1	25%	$6,896.00	$5,172.00	$4,137.60
CONTROL STATION OPTIONS(not limited to):		**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
G91	**ADD: CONTROL STATION POWER SUPPLY**	1	25%	$269.00	$201.75	$161.40
W665	**ADD: CONTROL STATION OPERATION**	1	25%	$70.00	$52.50	$42.00
W382	**ADD: CONTROL STATION DESK GCAI MIC**	1	25%	$169.00	$126.75	$101.40
MULTIPLE CONTROL HEAD OPTIONS(not limited to):		**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
GA00092	ADD: DUAL-CONTRL HD HARDWARE(must add additional mic, cables & speakers)	1	25%	$570.00	$427.50	$342.00
GA00093	ADD: APX7500 TRI-CONTROL HARDWARE(must add additional mic,cables & speakers)	1	25%	$1,000.00	$750.00	$600.00
GA00094	ADD: APX QUAD-CONTROL HARDWARE(must add additional mic, cables & speakers)	1	25%	$1,300.00	$975.00	$780.00
OPTIONS(not limited to):		**QTY**	**DISC%**	**LIST $**	**25% DISC $**	**40% DISC $**
GA01767	APX MOBILE RADIO AUTHENTICATION	1	25%	$100.00	$75.00	$60.00
QA00631	ADD: DVRS PSU ACTIVATION	1	25%	$100.00	$75.00	$60.00
GA00805	ADD: APX O7 CONTROL HEAD.	1	25%	$632.00	$474.00	$379.20
W432	ADD: AUXILARY SPKR 13W (3.2OHM)	1	25%	$71.50	$53.63	$42.90
GA09001	ADD: WIFI	1	25%	$300.00	$225.00	$180.00
G996	ENH: OVER THE AIR PROVISIONING	1	25%	$100.00	$75.00	$60.00
QA03399	ADD: ENHANCED DATA	1	25%	$150.00	$112.50	$90.00
GA09008	ADD: GROUP SERVICES	1	25%	$150.00	$112.50	$90.00
GA00229	ENH: APX GPS ACTIVATION	1	25%	$150.00	$112.50	$90.00
GA01202	ADD: APX GEOFENCE MOBILE	1	25%	$150.00	$112.50	$90.00
W969	ADD: MULTIPLE KEY ENCRYPTION OPERATION	1	25%	$330.00	$247.50	$198.00
G298	ENH: ASTRO 25 OTAR W/ MULTIKEY	1	25%	$740.00	$555.00	$444.00
G851	ADD: AES/DES-XL/DES-OFB ENCRYPTION	1	25%	$799.00	$599.25	$479.40
G843	ADD: AES ENCRYPTION APX	1	25%	$475.00	$356.25	$0.00
G609	ADD: REMOTE MOUNT CBL 50 FEET	1	25%	$35.00	$26.25	$21.00
G607	ADD:CBL REMOTE MOUNT 75 FEET	1	25%	$45.00	$33.75	$27.00
G879	ADD:REMOTE MOUNT CBL 115 FEET	1	25%	$55.00	$41.25	$33.00
G831	ADD: SPKR 15W WATER RESISTANT	1	25%	$60.00	$45.00	$36.00
W432	ADD: AUXILARY SPKR 13W (3.2OHM)	1	25%	$71.50	$53.63	$42.90
G174	ADD: ANT 3DB LOW-PROFILE 762-870	1	25%	$43.00	$118.50	$25.80
W484	ALT: ANT 3DB GAIN 762-870MHZ	1	25%	$38.00	$28.50	$22.80
G299	ADD: 1/4 WAVE ROOF TOP 150.8-162	1	25%	$19.50	$14.63	$11.70
GA00506	ADD: ANT MCL 1/4 WAVE WHIP 425- 470	1	25%	$50.00	$37.50	$30.00
GA00226	ADD: GPS WIFI ANTENNA	1	25%	$75.00	$56.25	$45.00
G78	ADD: 3 YEAR SERVICE FROM THE START LITE	1	0%	$250.00	$250.00	$250.00
GA00318	ADD: 5 YEAR SERVICE FROM THE START LITE	1	0%	$363.00	$363.00	$363.00

ADDITIONAL EQUPMENT, ACCESSORIES AND PROGRAMMING EQUPMENT/SOFTWARE (NOT LIMITED TO)						
PORTABLE AND MOBILE ANTENNAS		**LIST $**	**DISC %**	**23% DISC $**	**29% DISC $**	**RADIO TYPE**
NAF5085A	APX 700/800 & GPS ANTENNA	$45.00	23%	$34.65	$31.95	ALL PORTABLE
NAR6595A	ANT 1/4 WAVE 7/800 STUBBY	$29.00	23%	$22.33	$20.59	ALL PORTABLE
NAG4000	APX GPS STUBBY ANTENNA	$18.00	23%	$13.86	$12.78	ALL PORTABLE
NAR6593A	ANT,HLCL,136MHZ MIN,1.577GHZ M	$38.00	23%	$29.26	$26.98	6000, 7000, 8000
PMAE4065A	UHF (380-520) GPS ANTENNA	$21.00	23%	$16.17	$14.91	6000, 7000, 8000
NAR6594A	ANT VHF 7/800/GPS	$75.00	23%	$57.75	$53.25	6000, 7000, 8000
PMAS4001A	UHF (380-520) /7-800 GPS	$31.00	23%	$23.87	$22.01	7000, 8000
KT000026A01	ANTENNA, ALL-BAND, 20CM	$108.00	23%	$83.16	$76.68	8000
PORTABLE BATTERIES		**LIST $**	**DISC %**	**23% DISC $**	**29% DISC $**	**RADIO TYPE**
NNTN8128BR	BATT IMP STD LI ION 1900M	$102.00	23%	$78.54	$72.42	1000, 4000
PMNN4424AR	BATT IMP LI ION 2300M	$117.00	23%	$90.09	$83.07	1000, 4000
PMNN4448AR	BATT IMP STD IP67 LIION 2700MAH	$127.00	23%	$97.79	$90.17	1000, 4000
NNTN8560A	BATT IMPRES LIION TIA4950 UL IP67 2500T	$155.00	23%	$119.35	$110.05	1000, 4000
NNTN8930	BATTERY PACK,LITHIUM ION,APX TIA4950 STD BATTERY	$155.00	23%	$119.35	$110.05	6000, 7000
NNTN8921	BATT IMPRES 2 LIION TIA4950 UL IP68 45OOMAH	$177.00	23%	$136.29	$125.67	6000, 7000
PMNN4485	BATT IMPRES 2 LIION R IP68 2550T	$127.00	23%	$97.79	$90.17	6000, 7000, 8000
PMMNN4486	BATT IMPRES 2 LIION R IP68 3400T	$142.00	23%	$109.34	$100.82	6000, 7000, 8000
PMNN4494	BATT IMPRES 2 LIION R IP68 5100T	$172.00	23%	$132.44	$122.12	6000, 7000, 8000
PMMNN4487	BATT IMPRES 2 LIION R IP68 4850T	$162.00	23%	$124.74	$115.02	6000, 7000, 8000
NNTN7035	BATT IMP FM R NIMH 2000M 2200T BLK	$149.00	23%	$114.73	$105.79	6000, 7000, 8000
NNTN8092	BATT IMP FM R LI ION 2300M 2350T BLK	$142.00	23%	$109.34	$100.82	6000, 7000, 8000
PMNN4504	BATT IMPRES LIION UL2054 DIV2 IP68 3400MAH	$150.00	23%	$115.50	$106.50	8000XE ONLY
PMNN4505	ALT: LIION IMPRES TIA4950 UL DELTA-T	$179.00	23%	$137.83	$127.09	8000XE ONLY
PORTABLE BATTERY CHARGERS		**LIST $**	**DISC %**	**23% DISC $**	**29% DISC $**	**RADIO TYPE**
PMPN4174A	SINGLE-UNIT IMPRES CHARGER	$69.25	23%	$53.32	$49.17	1000, 4000
NNTN8525A	TRAVEL CHARGER	$95.00	23%	$73.15	$67.45	1000, 4000
WPLN4219B	IMPRES MULIT-UNIT CHARGER W/DISPLAY	$715.00	23%	$550.55	$507.65	1000, 4000
NNTN7586	APX DUAL UNIT CHARGER WITHOUT DISPLAY	$295.00	23%	$227.15	$209.45	6000, 7000, 8000
NNTN8844A	CHARGER, MULTI-UNIT, IMPRES 2, 6-DISP, NA/LA-PLUG, ACC USB CHGR	$1,250.00	23%	$962.50	$887.50	6000, 7000, 8000
RLN6434A	APX TRAVEL CHARGER	$111.00	23%	$85.47	$78.81	6000, 7000, 8000
NNTN8860A	CHARGER, SINGLE-UNIT, IMPRES 2, 3A, 115VAC, US/NA	$150.00	23%	$115.50	$106.50	6000, 7000, 8000

PORTABLE REMOTE SPEAKER MICROPHONES		LIST $	DISC %	23% DISC $	29% DISC $	RADIO TYPE
HMN4104B	IMPRES RSM DSPLY W JACK, W CHNL	$413.00	23%	$318.01	$293.23	ALL PORTABLE
PMMN4062A	APX IMPRES RSM, NOISE CANC. EMERGENCY BUTTON 3.5MM JACK IP54	$118.00	23%	$90.86	$83.78	ALL PORTABLE
PMMN4065A	APX IMPRES RSM W/VOL, IP57	$107.00	23%	$82.39	$75.97	ALL PORTABLE
PMMN4069A	IMPRES RSM, 3.5MM AUDIO JACK	$121.00	23%	$93.17	$85.91	ALL PORTABLE
PMMN4083A	IMPRES RSM DELTA-T,	$125.00	23%	$96.25	$88.75	ALL PORTABLE
PMMN4084A	PLUS RSM NC IP54 THRD 3.5MM JACK RX	$95.00	23%	$73.15	$67.45	ALL PORTABLE
PMMN4099A	AUDIO ACCESSORY-REMOTE SPEAKER MICROPHONE,IMPRES WINDPORTING RSM, IP55	$132.00	23%	$101.64	$93.72	ALL PORTABLE
NNTN8575A	AUDIO ACCESSORY-REMOTE SPEAKER MICROPHONE,IMPRES XE RSM XT CABLE BLK, YLW, GRN	$480.00	23%	$369.60	$340.80	ALL PORTABLE
NMN6271A	IMPRES XP RSM FOR APX W/ DUAL MIC NOISE SUPPRESSION	$325.00	23%	$250.25	$230.75	ALL PORTABLE
NMN6274A	IMPRES XP RSM FOR APX W/ DUAL MIC NOISE SUPPRESSION, 3.5MM THRDJACK	$369.00	23%	$284.13	$261.99	ALL PORTABLE
PMMN4106A	IMPRES XE500 RSM GRN, YLW, BLK	$550.00	23%	$423.50	$390.50	ALL PORTABLE
PORTABLE PUBLIC SAFETY MICROPHONES		**LIST $**	**DISC %**	**23% DISC $**	**29% DISC $**	**RADIO TYPE**
PMMN4059B	PSM IP55 WITH 3.5MM JACK RX 18IN	$164.00	23%	$126.28	$116.44	ALL PORTABLE
PMMN4060B	PSM IP55 WITH 3.5MM JACK RX 24IN	$180.40	23%	$138.91	$128.08	ALL PORTABLE
PMMN4061B	PSM IP55 WITH 3.5MM JACK RX 30IN	$164.00	23%	$126.28	$116.44	ALL PORTABLE
PMAF4002	APX PSM 700/800MHZ ANTENNA	$12.00	23%	$9.24	$8.52	ALL PORTABLE
PORTABLE AND MOBILE BLUETOOTH		**LIST $**	**DISC %**	**23% DISC $**	**29% DISC $**	**RADIO TYPE**
NTN2570C	ASSEMBLY ACCESSORY WIRELESS ACCY KIT NFP 12 CABLE	$325.00	23%	$250.25	$230.75	ALL PORTABLE
RLN6554A	ACCESSORY KIT,APX WIRELESS RSM W/ DUC US/NA/JP/TW	$300.00	23%	$231.00	$213.00	ALL PORTABLE
RLN6544A	MISSION CRITICAL WIRELESS RSM W/ BATTERY AND CLIP	$250.00	23%	$192.50	$177.50	ALL PORTABLE
PMMN4097C	MOBILE MICROPHONE WITH BLUETOOTH GATEWAY	$215.00	23%	$165.55	$152.65	MOBILE ONLY
PORTABLE HEADSETS/ETC		**LIST $**	**DISC %**	**23% DISC $**	**29% DISC $**	**RADIO TYPE**
NNTN8295A	1-WIRE EARBUD,116CM CORD,BLACK	$40.00	23%	$30.80	$28.40	ALL PORTABLE
NNTN8298A	2-WIRE EARBUD,116CM CORD,BLACK	$49.95	23%	$38.46	$35.46	ALL PORTABLE
PMLN5653A	BONE CONDUCTION EAR MIC	$399.00	23%	$307.23	$283.29	ALL PORTABLE
PMLN6127A	IMPRES 2 WIRE SURVEILLANCE -BLK	$105.00	23%	$80.85	$74.55	ALL PORTABLE

PMLN6123A	IMPRES 3 WIRE W/ TRANS TUBE-BLK	$173.00	23%	$133.21	$122.83	ALL PORTABLE
PORTABLE HOLSTERS		**LIST $**	**DISC %**	**23% DISC $**	**29% DISC $**	**RADIO TYPE**
PMLN7182A	APX TWO-KNOB,SWIVEL,LEATHER CARRY CASE	$60.00	23%	$46.20	$42.60	1000, 4000
PMLN4651A	BELT CLIP 2"	$11.00	23%	$8.47	$7.81	1000, 4000
PMLN5657B	APX6000 CC 2.75 SWLBL 2900&2150MAH	$71.50	23%	$55.06	$50.77	6000, 8000
PMLN5659B	APX6000 CC 2.75 SWL BL 4200MAH	$67.00	23%	$51.59	$47.57	6000, 8000
PMLN5875	APX6000XE 2.75SWBL2900,2300&2150MAH	$65.00	23%	$50.05	$46.15	6000XE, 8000XE
PMLN5876A	APX6000XE 3 FIXBL 2900,2300&2150MAH	$62.00	23%	$47.74	$44.02	6000XE, 8000XE
PMLN5877A	APX6000XE CC 2.75 SWL BL 4200MAH	$65.00	23%	$50.05	$46.15	6000XE, 8000XE
PMLN5324C	LEATHER CASE 2.75 SWL BL 2500MAH	$65.00	23%	$50.05	$46.15	7000
PMLN5327C	LEATHER CASE 2.75 SWL BL 4200MAH	$67.00	23%	$51.59	$47.57	7000
NNTN8111B	APX7000XE CC 2.75 SWLBL2900/2150MAH	$65.00	23%	$50.05	$46.15	7000XE
NNTN8113A	APX7000XE CC 2.75 SWL BL 4100MAH	$65.00	23%	$50.05	$46.15	7000XE
RLN6486A	ACCESSORY KIT,FIREMAN'S RADIO STRAP	$37.00	23%	$28.49	$26.27	ALL PORTABLE
RLN6487A	ACCESSORY KIT,FIREMAN'S RADIO STRAP, XL	$28.50	23%	$21.95	$20.24	ALL PORTABLE
RLN6488A	ACCESSORY KIT,ANTI-SWAY STRAP	$15.00	23%	$11.55	$10.65	ALL PORTABLE
KVL 4000 KEYLOADER		**LIST $**	**DISC %**	**8% DISC $**	**10% DISC $**	**RADIO TYPE**
T7537B	KVL 4000 PDA SNAP-ON	$1,250.00	8%	$1,150.00	$1,125.00	ALL APX RADIOS
U239AD	ADD: ASTRO 25 MODE	$250.00	8%	$230.00	$225.00	ALL APX RADIOS
CA01598AA	ADD: AC LINE CORD US	$11.00	8%	$10.12	$9.90	ALL APX RADIOS
CA00182AP	ADD: AES ENCRYPTION SOFTWARE	$750.00	8%	$690.00	$675.00	ALL APX RADIOS
C543	ADD: CABLE FOR RNC, DIU, MGEG	$84.00	8%	$77.28	$75.60	ALL APX RADIOS
C725AA	ADD: KEYLOAD CABLE FOR APX PORTABLE	$75.00	8%	$69.00	$67.50	ALL APX RADIOS
CA02187	ADD: KEYLOADING CABLE ADAPTER (GCAI)	$41.50	8%	$38.18	$37.35	ALL APX RADIOS
TOTAL:		$2,461.50		$2,264.58	$2,215.35	
OPTIONS(not limited to):		**LIST $**	**DISC %**	**8% DISC $**	**10% DISC $**	**RADIO TYPE**
QA01767AA	ADD: KVL RADIO AUTHENTICATION	$500.00	8%	$460.00	$450.00	ALL APX RADIOS
X795AJ	ADD: ASN MODE	$600.00	8%	$552.00	$540.00	ALL APX RADIOS
X423AF	ADD: DES/DES-XL/DES-OFB ENCRYPTION	$1,550.00	8%	$1,426.00	$1,395.00	ALL APX RADIOS
CA02186	ADD: KEYLOAD CABLE FOR CRYPTR MICRO	$190.00	8%	$174.80	$171.00	ALL APX RADIOS
DSMT9234MUCDCX	USB MODEM BY MULTITECH - REQUIRED FOR KVL-KMF COMMUNICATION REMOTELY	$250.00	20%	$230.00	$225.00	ALL APX RADIOS
DSPSA1U1EE	RUGGED USB CLIENT TO ETHERNET ADAPTER WITH USB CABLE BUILT IN.	$226.00	20%	$207.92	$203.40	ALL APX RADIOS
Antenna, Line & Combiners (not limited to):		**LIST $**	**DISC %**	**8% DISC $**	**10% DISC $**	**RADIO TYPE**

DSCOL54160	VHF OMNIMEANDER COLLINEAR DIRECTIONAL ANTENNA	$1,921.00	8%	$1,767.32	$1,728.90	ALL MOBILE
DSCOL4570	UHF OMNI COLLINEAR DIRECTIONAL ANTENNA	$912.00	8%	$839.04	$820.80	ALL MOBILE
DSANT790F2	7/800 OMNI COLLINEAR DIRECTIONAL TELEWAVE ANTENNA	$1,012.00	8%	$931.04	$910.80	ALL MOBILE
SURGE SUPRESSOR, GROUND KITS AND		$826.00	8%	$759.92	$743.40	ALL MOBILE
RF SURGE SUPRESSOR, GROUND KITS AND		$791.00	8%	$727.72	$711.90	ALL MOBILE
DSCS0496040531	4 PORT COMBINER	$2,159.00	8%	$1,986.28	$1,943.10	ALL MOBILE
DSCS0496080531	8 PORT COMBINER	$2,421.00	8%	$2,227.32	$2,178.90	ALL MOBILE
DSCS0496160531	12 PORT COMBINER	$5,426.00	8%	$4,991.92	$4,883.40	ALL MOBILE
DSCS0496240531	16 PORT COMBINER	$8,427.00	8%	$7,752.84	$7,584.30	ALL MOBILE
DSCS0496320531	32 PORT COMBINER	$10,796.00	8%	$9,932.32	$9,716.40	ALL MOBILE

SOW A-5
Optional Services

County or any of the Eligible Subscribers may acquire any of the goods or services described herein, which shall be acquired by an appropriate purchasing document and statement of work in accordance with the terms of the Agreement.

1. P25 Radio Authentication

This functionality provides System security authentication process for radio subscribers.

2. Over the Air Off-Frequency Radio Identification

An anticipated future service offering from Motorola to provide functionality for push-to-talk users to identify out of tune or off-specification radios.

3. Additional Goods and Services

In addition to the foregoing, County may acquire as Optional Services any other goods and services reasonably related to the maintenance, operation, or configuration of the Radio System, Microwave System, Civil and Infrastructure Services, or the P25 System that Provider makes available to its customers. Any such election shall be documented through an appropriate Work Authorization negotiated and executed by the Parties, subject to the terms and conditions of the Agreement.

EXHIBIT B – PAYMENT SCHEDULE

The rates specified below shall be in effect for the entire term of the Agreement, including any renewal term, unless the contrary is expressly stated below. Any goods or services required under this Agreement for which no specific fee or cost is expressly stated in this Payment Schedule shall be deemed to be included, at no extra cost, within the costs and fees expressly provided for in this Exhibit B.

If and to the extent the County elects to remove, reduce, or exchange any of the equipment or services provided under the Agreement, the credit afforded to County to be utilized toward other purchases shall be (a) the discounted Unit Price as listed in Schedule 2 for equipment, or (b) an agreed upon reduction for services; in all instances, the credit shall be calculated without deduction for any incentive or other discounts. Any replacement or additional equipment may be acquired at the standard 25% County discount. No reduction in scope shall result in a cash refund, and may only be applied toward goods or services.

No price increase or annual escalator to the amounts due or charged under this Agreement is permitted except to the extent expressly stated herein. To the extent an annual escalator is expressly permitted herein for any fee or for any time period, the escalator shall be calculated as follows: the applicable fee may be increased by Provider on an annual basis with at least ninety (90) days' advance written notice to County, provided that such increase per annum shall not exceed the lesser of 3% or PPI. The increase or decrease in PPI shall be calculated as follows: the difference of PPI current period less PPI previous period, divided by PPI previous period, times 100. The PPI current period shall mean the most recent published monthly index prior to contract anniversary. The PPI previous period shall mean for the same month of the prior year. All PPI indices shall be obtained from the U.S. Department of Labor table for Producer Price Index – Telecommunications (Series ID PCU517---517---), with a base period of December, 2003 = 100, and not seasonally adjusted.

1. System Implementation and Services Fees

Provider shall invoice County for each Milestone other than Final System Acceptance in the amount listed below only after written notification of preliminary acceptance of that Milestone by County's Contract Administrator. The Final System Acceptance Milestone amount may be invoiced only after written notification of Final System Acceptance by County's Chief Information Office (or his or her designee) and County Contract Administrator.

Milestone	Description	% of Total System Cost	Milestone Payment
1	Completion of Contract Design Review	15%	$4,337,734.95
2	Completion of Factory System Acceptance Testing & Staging	30%	$8,675,469.90
3	Completion of FNE Installation on a site-by-site basis (radio and microwave) (see breakdown below)	25% on site by site basis	$7,229,558.25 (total all sites)
4	Completion of Acceptance Testing & Cutover	15%	$4,337,734.95
5	Final System Acceptance (Civil, Radio and Microwave)	15%	$4,337,734.95
P25 SYSTEM TOTAL			**$28,918,233.00**

Broward County P25 System Pricing Summary		
P25 Simulcast Equipment Total	**$**	**29,889,375**
P25 Simulcast SI Total	**$**	**7,711,371**
Sub Total	**$**	**37,600,746**
Performance Bond	**$**	**250,000**
Additional Features Include: **OTAR** **GPS Locationing (Includes GPS & OTAP)** **Enhanced Data** **P1 Integration (ARL) - 10,000 Radios** *Price for Additional Features includes the Technology Incentive Credit of $250,000.	**$**	**1,317,487**
System Total:	**$**	**39,168,233**
Discounts: **($10,250,000)**		
Increased Broward County Customer Loyalty Discount	**$**	**(4,250,000)**
Software Licenses	**$**	**(3,000,000)**
P25 Dynamic Dual Mode TDMA	**$**	**(1,500,000)**
SmartX and SmartZone Trade In	**$**	**(1,500,000)**
P25 System Total:	**$**	**28,918,233**

P25 System Initial Purchase Order Amount (per Agreement, Section 4.4): $ 39,138,713.57
The P25 System Initial Purchase Order Amount includes the P25 System Total, Support and Maintenance Services Fees for years 2 through 10, and $200,000.00 for additional training.

The payment milestone for completion of FNE Installation on a site-by-site basis (radio and microwave) shall be allocated among the Sites as follows:

Site	Estimated Acceptance Date	Agreed Allocation	Payment per FNE Milestone completion at Site
Core	4/20/18	5%	$361,477.91
Coconut Creek	7/9/18	5%	$361,477.91
Markham Park	8/23/18	5%	$361,477.91
Davie	7/12/18	5%	$361,477.91
EMS	7/19/18	5%	$361,477.91
EOC	5/30/18	5%	$361,477.91
Pompano Beach Club	8/2/18	10%	$722,955.83
Points of America	8/16/18	5%	$361,477.91
Playa	8/30/18	5%	$361,477.91
Miramar	8/17/18	5%	$361,477.91
Channel 2	5/4/18	5%	$361,477.91

Site	Estimated Acceptance Date	Agreed Allocation	Payment per FNE Milestone completion at Site
Deerfield	5/18/18	5%	$361,477.91
West Lake Park	6/4/18	5%	$361,477.91
West Hollywood	6/18/18	10%	$722,955.83
Tamarac	7/2/18	5%	$361,477.91
FS 106	7/17/18	5%	$361,477.91
Parkland	7/31/18	10%	$722,955.85
Total Completion of FNE Installation on a site-by-site basis			$7,229,558.25

2. Support and Maintenance Services Fees

Provider shall invoice County for the following Support and Maintenance Fees only to the extent County elects Support and Maintenance Services for that quarterly period. The amounts set forth below are annual totals; invoicing shall be quarterly in arrears.

	Total 15 Year Cost of Ownership	Year (calculated from Final Acceptance)				
Item	**Service Description**	**Year 1 Includes Warranty**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
	LIFECYCLE					
1	P25 System Upgrade Agreement (SUA II) - Motorola and third Party Hardware, Software and Labor *	**Included**	$281,806	$286,181	$288,488	$290,874
	WARRANTY/POST WARRANTY MAINTENANCE SERVICES**					
2	Remote Technical Support	**Included**	$31,421	$31,736	$32,052	$32,373
3	System Monitoring	**Included**	$36,724	$37,092	$37,463	$37,837
4	System Dispatch Service	**Included**	$13,702	$13,839	$13,977	$14,117
5	Field Technical Support (On-Site Premier)	**Included**	$170,465	$172,169	$173,891	$175,630
6	Equipment Annual Preventive Maintenance	**Included**	$40,227	$40,933	$41,646	$42,367
7	Equipment Parts Replacement (Advanced Replacement)	**Included**	$42,448	$42,873	$43,301	$43,734
8	Microwave Support and Maintenance Services	**Included**	$84,490	$86,459	$90,129	$92,217
9	Security Update Service: includes antivirus, security patches	**Included**	$66,441	$67,105	$67,776	$68,454
10	Infrastructure Repair	**Included**	$166,480	$168,145	$169,826	$171,525
11	P1 Automatic Resource Location Support Services	**Included**	$8,550	$8,636	$8,722	$8,809
12	DC Power System - Maintenance Checks	**Included**	$104,332	$105,138	$105,952	$106,774

* The software component of the SUA II is included at no cost to comply with the requirements of the RFP. Additionally, amounts for years 2 to 10 include a 3% negotiated discount.

**Amounts for years 2 to 10 include a 5% negotiated discount.

	Total 15 Year Cost of Ownership	Year (calculated from Final Acceptance)				
Item	**Service Description**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
	LIFECYCLE					
1	P25 System Upgrade Agreement (SUA II) - Motorola and third Party Hardware, Software and Labor *	$293,260	$295,885	$298,430	$301,135	$303,998
	WARRANTY/POST WARRANTY MAINTENANCE SERVICES**					
2	Remote Technical Support	$32,697	$33,024	$33,355	$33,688	$34,024
3	System Monitoring	$38,216	$38,598	$38,984	$39,374	$39,767
4	System Dispatch Service	$14,258	$14,401	$14,545	$14,690	$14,837
5	Field Technical Support (On-Site Premier)	$177,386	$179,160	$180,952	$182,761	$184,589
6	Equipment Annual Preventive Maintenance	$73,495	$74,230	$74,972	$75,722	$76,479
7	Equipment Parts Replacement (Advanced Replacement)	$44,172	$44,613	$45,060	$45,510	$45,965
8	Microwave Support and Maintenance Services	$94,368	$96,584	$98,866	$101,217	$103,637
9	Security Update Service: includes antivirus, security patches	$69,139	$69,830	$70,528	$71,234	$71,946
10	Infrastructure Repair	$173,240	$174,972	$176,722	$178,489	$180,274
11	P1 Automatic Resource Location Support Services	$8,897	$8,986	$9,076	$9,167	$9,258
12	DC Power System - Maintenance Checks	$107,604	$108,443	$109,290	$110,145	$111,009

* The software component of the SUA II is included at no cost to comply with the requirements of the RFP. Additionally, amounts for years 2 to 10 include a 3% negotiated discount.

**Amounts for years 2 to 10 include a 5% negotiated discount.

	Total 15 Year Cost of Ownership	Year (calculated from Final Acceptance)				
Item	**Service Description**	**Year 11**	**Year 12**	**Year 13**	**Year 14**	**Year 15**
	LIFECYCLE					
1	P25 System Upgrade Agreement (SUA II) - Motorola and third Party Hardware, Software and Labor *	$316,270	$319,386	$322,420	$325,700	$330,907
	WARRANTY/POST WARRANTY MAINTENANCE SERVICES**					
2	Remote Technical Support	$36,173	$36,535	$36,901	$37,270	$37,642
3	System Monitoring	$42,279	$42,702	$43,129	$43,560	$43,996
4	System Dispatch Service	$15,774	$15,932	$16,091	$16,252	$16,415
5	Field Technical Support (On-Site Premier)	$196,247	$198,210	$200,192	$202,194	$204,216
6	Equipment Annual Preventive Maintenance	$81,309	$82,122	$82,943	$83,773	$84,610
7	Equipment Parts Replacement (Advanced Replacement)	$48,868	$49,357	$49,851	$50,349	$50,853
8	Microwave Support and Maintenance Services	$111,717	$114,421	$117,205	$120,074	$123,028
9	Security Update Service: includes antivirus, security patches	$76,490	$77,255	$78,027	$78,808	$79,596
10	Infrastructure Repair	$191,660	$193,577	$195,512	$197,467	$199,442
11	P1 Automatic Resource Location Support Services	$9,843	$9,942	$10,041	$10,141	$10,243
12	DC Power System - Maintenance Checks	$117,770	$118,698	$119,635	$120,581	$121,537

* The software component of the SUA II is included at no cost to comply with the requirements of the RFP. Additionally, amounts for years 2 to 10 include a 3% negotiated discount.

**Amounts for years 2 to 10 include a 5% negotiated discount.

Years 16 to 20: The Support and Maintenance Services for Year 16 to 20 shall be calculated as follows: For Year 16, the preceding year Support and Maintenance Fees, plus $195,000 for SUA II, and then the annual escalator; for Years 17-20, the Year 16 fees plus the annual escalator.

Other than for Years 16 to 20 as set forth above, no escalator applies to the Support and Maintenance Fees. Any travel expenses or fees incurred by Provider under this Agreement shall be the sole responsibility of Provider, unless otherwise expressly stated in this Agreement or applicable Work Authorization.

3. Other Fees

Description	Term	Invoicing	Fees
Additional Equipment to the extent listed on Schedule 2	Duration of Agreement	Upon confirmation of delivery	Rates per at least the discount percentage listed Schedule 2
Subscriber Equipment	Duration of Agreement	Upon confirmation of delivery	Per SOW A-4
Subscriber Equipment Maintenance *	Annually	Quarterly in arrears	Per SOW A-4

Additional Equipment, Subscriber Equipment or Subscriber Equipment Maintenance may be ordered by County by Purchase Order (with no change in scope) or by Work Authorization negotiated by the parties (if any scope change). Equipment Maintenance for County shall be invoiced in accordance with existing invoicing schedule for Support and Maintenance Services for County, with first invoice pro rata to the extent applicable. Eligible Subscribers may negotiate alternate payment or invoicing schedules for Subscriber Equipment or Subscriber Maintenance.

No escalator applies to the above-listed Other Fees.

* Any Support and Maintenance Fees for Subscriber Equipment Maintenance elected by any Eligible Users other than the County shall be invoiced directly to the applicable Eligible User in accordance with the rates set forth in SOW A-4, unless otherwise agreed by the applicable Eligible User.

4. Labor Rates

The following rates shall apply to any additional professional or consulting services, including disaster preparedness services or disaster recovery services.

Description	Unit/Term	Invoicing	Fee
Project Manager	Hourly	Monthly in arrears	$237.00/hour
System Engineer	Hourly	Monthly in arrears	$237.00/hour
System Technologist	Hourly	Monthly in arrears	$237.00/hour
System Technician	Hourly (2 hour minimum)	Monthly in arrears	$186.00/hour business hours $279.00/hour non-business hours

The foregoing fees shall be valid through the conclusion of the System warranty period; thereafter, the prices shall be subject to the annual escalator.

5. Radio Rental Rates

Description	Unit	Invoicing	Price
Disaster Recovery Services (Radio Rentals APX 6000) Rates include: Roundtrip freight, spare battery, remote speaker mic (For quantities of 100 or greater, the 61+ Day Rate applies)	Per unit per day	Invoiced monthly in arrears	1-7 Days - $19 per Day 8-14 Days - $15.20 per Day 15-30 Days - $13.30 per Day 31-60 Days - $11.40 per Day 61+ Days - $9.50 per Day
Programing Fee -Trunked Radios	Per unit per (re)programming	Invoiced monthly in arrears	$15 per radio
Any other equipment or rentals	Per unit	Invoiced monthly in arrears	15% off Motorola list price

6. Additional Training

County may purchase any of the following additional training at the prices set forth herein which shall be valid through the conclusion of the System warranty period; thereafter, the prices shall be subject to the annual escalator.

Course	Instructor/Self	Duration	Participants	Total price per course
ASTRO 25 Fleetmapping Workshop	Instructor led	5 days	12 participants	$19,514
ASTRO 25 Systems Applied Networking	Instructor led	5 days	12 participants	$23,360
ASTRO 25 IV&D with M & L Core System Overview	Self-paced, on-line	2 hours	12 participants	No cost as pre-requisite
ASTRO 25 IV&D Introduction to Radio System Management Applications	Self-paced, on-line	2 hours	12 participants	No cost as pre-requisite
ASTRO 25 IV&D Radio System Administrator Workshop	Instructor led	5 days	6 participants	$19,514
ASTRO25 ISSI 8000 / CSSI 8000 FEATURE OVERVIEW	Self-paced, on-line	1 hour	12 participants	$1,108
ASTRO 25 IV&D Dynamic System Resilience Overview	Self-paced, on-line	2 hours	12 participants	$1,662
ASTRO 25 IV&D M&L Core Workshop	Instructor led	5 days	12 participants	$19,514
ASTRO 25 IP Simulcast with GTR 8000 Repeater Site Workshop	Instructor led	5 days	12 participants	$19,514
ASTRO 25 Radio Programming and Template Building	Instructor led	5 days	12 participants	$9,225
ASTRO 25 Subscriber Academy	Instructor led	5 days	12 participants	$19,514
MCC7500 Console Operator and Admin Upgrade Differences (includes enduser tool kit, 5 CDs of tailored file, 40 tailored operator flip books, and 40 admin flip books)	Instructor led	4 hours	40 participants (20 per)	$4,502
MCC7500 Console Operator Upgrade Differences (includes 460 tailored operator flip books, and 20 tailored plastic flip books)	Instructor led	8 hours	460 participants (20 per)	$27,860

Course	Instructor/Self	Duration	Participants	Total price per course
APX Mobile and Portable Train the Trainer (includes 20 CDs of tailored files, 2 interactive end user tool kits, 200 tailored instructor guides, and 200 quick reference cards)	Instructor led	8 hours	460 participants (20 per)	$30,446
Provision Installation, Configuration, & Management	Instructor led (Onsite)	2 days	10 participants	
Eclipse Installation Operation and Maintenance	Instructor-led (Onsite)	3 days	10 participants	

7. Optional Services

Description	Unit/Term	Invoicing	Fee
Professional Services and Consulting (including Transition & Disentanglement Services)	Hourly	Monthly in arrears	Per Labor Rates set forth above
Additional Software or Licenses	Per Work Authorization	Per Work Authorization	Per Work Authorization

8. Supplemental Pricing Sheets

The following Pricing Sheets are supplemental information and provide information on the composite pricing that is included in and substantiates the fees set forth above in this Payment Schedule.

R1422515P1
P25 System Pricing Sheets

	P25 System Primary Core <CORE Site Location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Primary Core Equipment	1	$ 2,573,897	25.00%	$ 2,027,357
2	Network Equipment (Switch, LAN, WAN)	1	$ 110,059	25.00%	$ 109,909
3	Network Time Protocol (NTP)	1	$ 26,200	25.00%	$ 26,200
4	ISSI Equipment	1	$ 412,500	25.00%	$ 375,000
5	Data Gateway Equipment		Included	25.00%	Included
9	Virtual Private Network (VPN) Equipment	1	$ 6,713	25.00%	$ 6,713
10	Alarm Monitoring Equipment	1	$ 3,795	25.00%	$ 3,795
11	Network Management	1	$ 27,173	25.00%	$ 26,198
12	Encryption Key Loader	1	$ 4,437	25.00%	$ 2,219
13					
14					
15					
16					
17					
18					
19					
20					
	System Wide Engineering & Services				
21	Project Management	Lot	$ 572,850		
22	System Engineering	Lot	$ 492,300		
23	System Staging	Lot	$ 476,923		
24	Installation and Optimization	Lot	$ 982,515		
25	Acceptance Testing	Included	Included		

	P25 System Primary Core <CORE Site Location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
26	Documentation	Included	Included		
27	Construction Manager	Lot	$ 425,230		
28	Site Construction and Development	Lot	$ 3,612,166		
29	Microwave Installation and Services	Lot	$ 794,265		
30	MPE/IM Studies	Lot	$ 37,500		
31	Equipment Storage	Lot	$ 75,000		
32	Logging Solution Installation Services	Lot	$ 26,391		
	CATP - Vehicles & Drivers	Lot	$ 18,000		
	Communications Trailer Training	Lot	$ 2,500		
	Training (List all)				
33	System Administrator Training	Lot	$ 65,157		
34	Maintenance Technician Training	Lot	$ 67,766		
35	Console Operator and Supervisor Training	Lot	$ 32,362		
36	Radio Subscriber Train the Trainer	Lot	$ 30,446		
37	Microwave System Training	Lot	Included		
	System WideSupport & Maintenance After First Year Warranty				
38	Year 2	Lot	$ 864,120		
39	Year 3	Lot	$ 874,552		
40	Year 4	Lot	$ 886,873		
41	Year 5	Lot	$ 897,623		
42	Year 6	Lot	$ 1,013,273		
43	Year 7	Lot	$ 919,620		

R1422515P1
P25 System Pricing Sheets

	P25 System Primary Core <CORE Site Location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
44	Year 8	Lot	$ 930,871		
45	Year 9	Lot	$ 942,298		
46	Year 10	Lot	$ 953,902		
47	Year 11	Lot	$ 1,070,423		
48	Year 12	Lot	$ 977,658		
49	Year 13	Lot	$ 989,814		
50	Year 14	Lot	$ 1,002,166		
51	Year 15	Lot	$ 1,014,711		

	P25 System Secondary Core <EOC Site>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Secondary Core Equipment	1	$ 219,131.25	25.00%
2	Network Equipment (Switch, LAN, WAN)	1	$ 108,221.25	25.00%
3	Network Time Protocol (NTP)	1	$ 26,200.13	25.00%
4	ISSI Equipment	1	$ 3,150.00	25.00%
5	Data Gateway Equipment	Included	Included	
6	Virtual Private Network (VPN) Equipment	1	$ 5,557.50	25.00%
7	Alarm Monitoring Equipment	Included	Included	
8	Network Management	1	$ 7,273.50	25.00%
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	

	P25 System Secondary Core <EOC Site>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
23	System Staging	Lot	Included	
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	

	P25 System Secondary Core <EOC Site>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
41	Year 5		Included	
42	Year 6		Included	
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

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P25 System Pricing Sheets

	P25 Simulcast Control System - Main Prime <Simulcast Control System - CORE>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	P25 Simulcast Control System Equipment	1	$207,818.00	25.00%	$183,997.50
2	Network Equipment (Switch, LAN, WAN)	1	$10,688.00	25.00%	$10,687.50
3	Voting Equipment	1	$459,750.00	25.00%	$459,750.00
4	Simulcast Sync Equipment	Included	Included		Included
5	Alarm Monitoring	1	$3,795.00	25.00%	$3,795.00
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	P25 Simulcast Control System - Main Prime <Simulcast Control System - CORE>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	P25 Simulcast Control System - Main Prime <Simulcast Control System - CORE>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

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P25 System Pricing Sheets

	P25 Simulcast Control System - Geo-Prime <Simulcast Control System Geo-Prime - West Hollywood>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	P25 Simulcast Control System Equipment	1	$ 93,655.00	25.00%	$96,355.50
2	Network Equipment (Switch, LAN, WAN)	1	$ 10,687.50	25.00%	$10,687.50
3	Voting Equipment	1	$ 459,750.00	25.00%	$459,750.00
4	Simulcast Sync Equipment	1	$ 26,200.13	25.00%	$26,200.13
5	Alarm Monitoring	1	$ 3,795.00	25.00%	$3,795.00
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	P25 Simulcast Control System - Geo-Prime <Simulcast Control System Geo-Prime - West Hollywood>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	P25 Simulcast Control System - Geo-Prime <Simulcast Control System Geo-Prime - West Hollywood>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

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P25 System Pricing Sheets

	P25 Simulcast Sites <Simulcast Remote Site - CHANNEL 2 location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Simulcast Controller Equipment	Included	Included		Included
2	Network Equipment (Switch, LAN, WAN)	1	$9,675.00	25.00%	$9,675.00
3	Simulcast Sync Equipment	1	$36,797.63	25.00%	$36,797.63
4	Simulcast Base Station Equipment	1	$782,627.25	25.00%	$782,627.25
5	Antenna System	1	$69,168.88	25.00%	$64,168.88
6	Advanced Power Meter (APM)	1	$4,229.25	25.00%	$4,229.25
7	Alarm Monitoring Equipment	1	$3,795.00	25.00%	$3,795.00
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	P25 Simulcast Sites <Simulcast Remote Site - CHANNEL 2 location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	P25 Simulcast Sites <Simulcast Remote Site - CHANNEL 2 location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

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P25 System Pricing Sheets

	P25 Simulcast Sites <Simulcast Remote Site - COCONUT CREEK location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Simulcast Controller Equipment	Included	Included		Included
2	Network Equipment (Switch, LAN, WAN)	1	$9,675.00	25.00%	$9,675.00
3	Simulcast Sync Equipment	1	$36,797.63	25.00%	$36,797.63
4	Simulcast Base Station Equipment	1	$782,627.25	25.00%	$782,627.25
5	Antenna System	1	$70,377.13	25.00%	$65,377.13
6	Advanced Power Meter (APM)	1	$4,229.25	25.00%	$4,229.25
7	Alarm Monitoring Equipment	1	$3,795.00	25.00%	$3,795.00
8	Equipment Other				
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	P25 Simulcast Sites <Simulcast Remote Site - COCONUT CREEK location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	P25 Simulcast Sites <Simulcast Remote Site - COCONUT CREEK location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

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P25 System Pricing Sheets

	P25 Simulcast Sites <Simulcast Remote Site - CORE location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Simulcast Controller Equipment	Included	Included		Included
2	Network Equipment (Switch, LAN, WAN)	1	$9,675.00	25.00%	$9,675.00
3	Simulcast Sync Equipment	1	$36,797.63	25.00%	$36,797.63
4	Simulcast Base Station Equipment	1	$782,627.25	25.00%	$782,627.25
5	Antenna System	1	$53,032.63	25.00%	$38,132.63
6	Advanced Power Meter (APM)	1	$4,229.25	25.00%	$4,229.25
7	Alarm Monitoring Equipment	1	$3,795.00	25.00%	$3,795.00
8	Equipment Other				
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	P25 Simulcast Sites <Simulcast Remote Site - CORE location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	P25 Simulcast Sites <Simulcast Remote Site - CORE location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

R1422515P1
P25 System Pricing Sheets

	P25 Simulcast Sites <Simulcast Remote Site - DAVIE location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Simulcast Controller Equipment	Included	Included		Included
2	Network Equipment (Switch, LAN, WAN)	1	$9,675.00	25.00%	$9,675.00
3	Simulcast Sync Equipment	1	$36,797.63	25.00%	$36,797.63
4	Simulcast Base Station Equipment	1	$782,627.25	25.00%	$782,627.25
5	Antenna System	1	$54,375.13	25.00%	$49,375.13
6	Advanced Power Meter (APM)	1	$4,229.25	25.00%	$4,229.25
7	Alarm Monitoring Equipment	1	$3,795.00	25.00%	$3,795.00
8	Equipment Other				
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	P25 Simulcast Sites <Simulcast Remote Site - DAVIE location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	P25 Simulcast Sites <Simulcast Remote Site - DAVIE location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

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P25 System Pricing Sheets

	P25 Simulcast Sites <Simulcast Remote Site - DEERFIELD location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Simulcast Controller Equipment	Included	Included		Included
2	Network Equipment (Switch, LAN, WAN)	1	$9,675.00	25.00%	$9,675.00
3	Simulcast Sync Equipment	1	$25,955.63	25.00%	$25,955.63
4	Simulcast Base Station Equipment	1	$782,627.25	25.00%	$782,627.25
5	Antenna System	1	$44,514.13	25.00%	$39,514.13
6	Advanced Power Meter (APM)	1	$4,229.25	25.00%	$4,229.25
7	Alarm Monitoring Equipment	1	$3,795.00	25.00%	$3,795.00
8	Equipment Other				
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	P25 Simulcast Sites <Simulcast Remote Site - DEERFIELD location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	P25 Simulcast Sites <Simulcast Remote Site - DEERFIELD location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

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P25 System Pricing Sheets

	P25 Simulcast Sites <Simulcast Remote Site - MARKHAM PARK location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Simulcast Controller Equipment	Included	Included		Included
2	Network Equipment (Switch, LAN, WAN)	1	$9,675.00	25.00%	$9,675.00
3	Simulcast Sync Equipment	1	$25,955.63	25.00%	$25,955.63
4	Simulcast Base Station Equipment	1	$782,627.25	25.00%	$782,627.25
5	Antenna System	1	$56,791.25	25.00%	$41,891.25
6	Advanced Power Meter (APM)	1	$4,229.25	25.00%	$4,229.25
7	Alarm Monitoring Equipment	1	$3,795.00	25.00%	$3,795.00
8	Equipment Other				
9					
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11					
12					
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17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	P25 Simulcast Sites <Simulcast Remote Site - MARKHAM PARK location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	P25 Simulcast Sites <Simulcast Remote Site - MARKHAM PARK location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

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P25 System Pricing Sheets

	P25 Simulcast Sites <Simulcast Remote Site - MIRAMAR location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Simulcast Controller Equipment	Included	Included		Included
2	Network Equipment (Switch, LAN, WAN)	1	$9,675.00	25.00%	$9,675.00
3	Simulcast Sync Equipment	1	$25,955.63	25.00%	$25,955.63
4	Simulcast Base Station Equipment	1	$782,627.25	25.00%	$782,627.25
5	Antenna System	1	$58,413.13	25.00%	$43,513.13
6	Advanced Power Meter (APM)	1	$4,229.25	25.00%	$4,229.25
7	Alarm Monitoring Equipment	1	$3,795.00	25.00%	$3,795.00
8	Equipment Other				
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	P25 Simulcast Sites <Simulcast Remote Site - MIRAMAR location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	P25 Simulcast Sites <Simulcast Remote Site - MIRAMAR location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

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P25 System Pricing Sheets

	P25 Simulcast Sites <Simulcast Remote Site - PLAYA location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Simulcast Controller Equipment	Included	Included		Included
2	Network Equipment (Switch, LAN, WAN)	1	$9,675.00	25.00%	$9,675.00
3	Simulcast Sync Equipment	1	$25,955.63	25.00%	$25,955.63
4	Simulcast Base Station Equipment	1	$782,627.25	25.00%	$782,627.25
5	Antenna System	1	$49,415.00	25.00%	$34,515.00
6	Advanced Power Meter (APM)	1	$4,229.25	25.00%	$4,229.25
7	Alarm Monitoring Equipment	1	$3,795.00	25.00%	$3,795.00
8	Equipment Other				
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	P25 Simulcast Sites <Simulcast Remote Site - PLAYA location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	P25 Simulcast Sites <Simulcast Remote Site - PLAYA location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

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P25 System Pricing Sheets

	P25 Simulcast Sites <Simulcast Remote Site - PT of AMERICA location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Simulcast Controller Equipment	Included	Included		Included
2	Network Equipment (Switch, LAN, WAN)	1	$9,675.00	25.00%	$9,675.00
3	Simulcast Sync Equipment	1	$25,955.63	25.00%	$25,955.63
4	Simulcast Base Station Equipment	1	$782,627.25	25.00%	$782,627.25
5	Antenna System	1	$50,104.81	25.00%	$35,204.81
6	Advanced Power Meter (APM)	1	$4,229.25	25.00%	$4,229.25
7	Alarm Monitoring Equipment	1	$3,795.00	25.00%	$3,795.00
8	Equipment Other				
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	P25 Simulcast Sites <Simulcast Remote Site - PT of AMERICA location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	P25 Simulcast Sites <Simulcast Remote Site - PT of AMERICA location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

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P25 System Pricing Sheets

	P25 Simulcast Sites <Simulcast Remote Site - TAMARAC location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Simulcast Controller Equipment	Included	Included		Included
2	Network Equipment (Switch, LAN, WAN)	1	$9,675.00	25.00%	$9,675.00
3	Simulcast Sync Equipment	1	$25,955.63	25.00%	$25,955.63
4	Simulcast Base Station Equipment	1	$782,627.25	25.00%	$782,627.25
5	Antenna System	1	$48,515.38	25.00%	$33,615.38
6	Advanced Power Meter (APM)	1	$4,229.25	25.00%	$4,229.25
7	Alarm Monitoring Equipment	1	$3,795.00	25.00%	$3,795.00
8	Equipment Other				
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	P25 Simulcast Sites <Simulcast Remote Site - TAMARAC location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	P25 Simulcast Sites <Simulcast Remote Site - TAMARAC location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

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P25 System Pricing Sheets

	P25 Simulcast Sites <Simulcast Remote Site - WEST LAKE location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Simulcast Controller Equipment	Included	Included		Included
2	Network Equipment (Switch, LAN, WAN)	1	$9,675.00	25.00%	$9,675.00
3	Simulcast Sync Equipment	1	$25,955.63	25.00%	$25,955.63
4	Simulcast Base Station Equipment	1	$782,627.25	25.00%	$782,627.25
5	Antenna System	1	$44,475.13	25.00%	$29,575.13
6	Advanced Power Meter (APM)	1	$4,229.25	25.00%	$4,229.25
7	Alarm Monitoring Equipment	1	$3,795.00	25.00%	$3,795.00
8	Equipment Other				
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	P25 Simulcast Sites <Simulcast Remote Site - WEST LAKE location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	P25 Simulcast Sites <Simulcast Remote Site - WEST LAKE location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

	P25 Simulcast Sites <Simulcast Remote Site - West Hollywood>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
1	Simulcast Controller Equipment	Included	Included	
2	Network Equipment (Switch, LAN, WAN)	1	$9,675.00	25.00%
3	Simulcast Sync Equipment	1	$36,798.00	25.00%
4	Simulcast Base Station Equipment	1	$787,489.00	25.00%
5	Antenna System	1	$52,828.00	25.00%
6	Advanced Power Meter (APM)	1	$4,229.00	25.00%
7	Alarm Monitoring Equipment	1	$3,795.00	25.00%
8	Equipment Other			
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	

	P25 Simulcast Sites <Simulcast Remote Site - West Hollywood>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	

	P25 Simulcast Sites <Simulcast Remote Site - West Hollywood>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

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P25 System Pricing Sheets

	P25 Simulcast Sites <Simulcast Remote Site - Pompano Beach Club North>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Simulcast Controller Equipment	Included	Included	
2	Network Equipment (Switch, LAN, WAN)	1	$9,675.00	25.00%
3	Simulcast Sync Equipment	1	$25,956.00	25.00%
4	Simulcast Base Station Equipment	1	$787,489.00	25.00%
5	Antenna System	1	$49,003.00	25.00%
6	Advanced Power Meter (APM)	1	$4,229.00	25.00%
7	Alarm Monitoring Equipment	1	$3,795.00	25.00%
8	Equipment Other			
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	

	P25 Simulcast Sites <Simulcast Remote Site - Pompano Beach Club North>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
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36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	

	P25 Simulcast Sites <Simulcast Remote Site - Pompano Beach Club North>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

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	P25 Simulcast Sites <Simulcast Remote Site - ParkLand>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Simulcast Controller Equipment	Included	Included	
2	Network Equipment (Switch, LAN, WAN)	1	$9,675.00	25.00%
3	Simulcast Sync Equipment	1	$25,956.00	25.00%
4	Simulcast Base Station Equipment	1	$787,489.00	25.00%
5	Antenna System	1	$59,683.00	25.00%
6	Advanced Power Meter (APM)	1	$4,229.00	25.00%
7	Alarm Monitoring Equipment	1	$3,795.00	25.00%
8	Equipment Other			
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10				
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19				
20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	

	P25 Simulcast Sites <Simulcast Remote Site - ParkLand>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
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35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	

	P25 Simulcast Sites <Simulcast Remote Site - ParkLand>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

	P25 Multicast Site <One Page Per Tower Site/Location - BC Station 106>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
1	Site Controller Equipment	1	$3,750.00	25.00%
2	Network Equipment (Switch, LAN, WAN)	1	$6,300.00	25.00%
3	Repeater Base Station Equipment	1	$232,388.25	25.00%
4	Antenna System	1	$36,228.75	25.00%
5	Advanced Power Meter (APM)	1	$3,630.00	25.00%
6	Alarm Monitoring Equipment	1	$3,795.00	25.00%
7	Equipment Other			
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20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	

	P25 Multicast Site <One Page Per Tower Site/Location - BC Station 106>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
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37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	

	P25 Multicast Site <One Page Per Tower Site/Location - BC Station 106>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

	P25 Simulcast Control System - Backup <Backup System Prime Site - EMS Tower>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	P25 Simulcast Control System Equipment	1	$134,883.75	25.00%
2	Network Equipment (Switch, LAN, WAN)	1	$23,400.00	25.00%
3	Voting Equipment	1	$154,650.00	25.00%
4	Simulcast Sync Equipment	1	$26,200.13	25.00%
5	Alarm Monitoring	1	$3,795.00	25.00%
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	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	

	P25 Simulcast Control System - Backup <Backup System Prime Site - EMS Tower>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	

	P25 Simulcast Control System - Backup <Backup System Prime Site - EMS Tower>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

	Backup System P25 Simulcast Sites <Backup System Remote Site - EMS Location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
1	Simulcast Controller Equipment	Included	Included	
2	Network Equipment (Switch, LAN, WAN)	Included	Included	
3	Simulcast Sync Equipment	Included	Included	
4	Simulcast Base Station Equipment	1	$333,682.50	25.00%
5	Antenna System	1	$9,618.56	25.00%
6	Advanced Power Meter (APM)	1	$3,630.00	25.00%
7	Alarm Monitoring Equipment	1	$3,727.50	25.00%
8	Equipment Other			
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20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	

	Backup System P25 Simulcast Sites <Backup System Remote Site - EMS Location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	

	Backup System P25 Simulcast Sites <Backup System Remote Site - EMS Location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

	Backup System P25 Simulcast Sites <Backup System Remote Site - CHANNEL 2 Location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
1	Simulcast Controller Equipment	Included	Included	
2	Network Equipment (Switch, LAN, WAN)	Included	Included	
3	Simulcast Sync Equipment	Included	Included	
4	Simulcast Base Station Equipment	1	$333,682.50	25.00%
5	Antenna System	1	$10,976.44	25.00%
6	Advanced Power Meter (APM)	1	$3,630.00	25.00%
7	Alarm Monitoring Equipment	1	$3,727.50	25.00%
8	Equipment Other			
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20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	

	Backup System P25 Simulcast Sites <Backup System Remote Site - CHANNEL 2 Location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	

	Backup System P25 Simulcast Sites <Backup System Remote Site - CHANNEL 2 Location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

	Backup System P25 Simulcast Sites <Backup System Remote Site - COCONUT CREEK Location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Simulcast Controller Equipment	Included	Included	
2	Network Equipment (Switch, LAN, WAN)	Included	Included	
3	Simulcast Sync Equipment	Included	Included	
4	Simulcast Base Station Equipment	1	$333,682.50	25.00%
5	Antenna System	1	$11,237.63	25.00%
6	Advanced Power Meter (APM)	1	$3,630.00	25.00%
7	Alarm Monitoring Equipment	1	$3,727.50	25.00%
8	Equipment Other			
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17				
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19				
20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	
24	Installation and Optimization	Lot	Included	

	Backup System P25 Simulcast Sites <Backup System Remote Site - COCONUT CREEK Location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
25	Acceptance Testing	Included	Included	
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	
43	Year 7		Included	
44	Year 8		Included	

	Backup System P25 Simulcast Sites <Backup System Remote Site - COCONUT CREEK Location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
45	Year 9		Included	
46	Year 10		Included	
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

	Backup System P25 Simulcast Sites <Backup System Remote Site - DAVIE Location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Simulcast Controller Equipment	Included	Included	
2	Network Equipment (Switch, LAN, WAN)	Included	Included	
3	Simulcast Sync Equipment	Included	Included	
4	Simulcast Base Station Equipment	1	$333,682.50	25.00%
5	Antenna System	1	$9,639.94	25.00%
6	Advanced Power Meter (APM)	1	$3,630.00	25.00%
7	Alarm Monitoring Equipment	1	$3,727.50	25.00%
8	Equipment Other			
9				
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12				
13				
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17				
18				
19				
20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	

	Backup System P25 Simulcast Sites <Backup System Remote Site - DAVIE Location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	

	Backup System P25 Simulcast Sites <Backup System Remote Site - DAVIE Location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

	700MHz P25 Conventional <Conventional - EMS location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Base Station Equipment	Lot	$27,600.00	25.00%
2	Antenna System	Lot	Included	25.00%
3	Advanced Power Meter (APM)	Lot	Included	25.00%
4	Alarm Monitoring Equipment	Lot	Included	25.00%
5	Equipment Other			
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20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	

	700MHz P25 Conventional <Conventional - EMS location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	

	700MHz P25 Conventional <Conventional - EMS location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

	700MHz P25 Conventional <Conventional - COCONUT CREEK location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Base Station Equipment	Lot	$27,600.00	25.00%
2	Antenna System	Lot	Included	25.00%
3	Advanced Power Meter (APM)	Lot	Included	25.00%
4	Alarm Monitoring Equipment	Lot	Included	25.00%
5	Equipment Other			
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19				
20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	

	700MHz P25 Conventional <Conventional - COCONUT CREEK location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	

	700MHz P25 Conventional <Conventional - COCONUT CREEK location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

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	700MHz P25 Conventional <Conventional - DAVIE location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Base Station Equipment	lot	$27,600.00	25.00%
2	Antenna System	lot	Included	25.00%
3	Advanced Power Meter (APM)	lot	Included	25.00%
4	Alarm Monitoring Equipment	lot	Included	25.00%
5	Equipment Other			
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20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	

	700MHz P25 Conventional <Conventional - DAVIE location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	

	700MHz P25 Conventional <Conventional - DAVIE location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

	700MHz P25 Conventional <Conventional - CHANNEL 2 location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Base Station Equipment	lot	$27,600.00	25.00%
2	Antenna System	lot	Included	25.00%
3	Advanced Power Meter (APM)	lot	Included	25.00%
4	Alarm Monitoring Equipment	lot	Included	25.00%
5	Equipment Other			
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20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	

	700MHz P25 Conventional <Conventional - CHANNEL 2 location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	

	700MHz P25 Conventional <Conventional - CHANNEL 2 location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

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	8TAC92, 8TAC93, 8TAC94 NPSPAC <CHANNEL 2 location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Simulcast Controller Equipment			
2	Network Equipment (Switch, LAN, WAN)	1	$4,837.50	25.00%
3	Simulcast Sync Equipment			
4	Simulcast Base Station Equipment	1	$38,157.00	25.00%
5	Antenna System	1	$29,790.94	25.00%
6	Advanced Power Meter (APM)	1	$3,630.00	25.00%
7	Alarm Monitoring Equipment	1	$2,868.75	25.00%
8	Voting Equipment			
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	

	8TAC92, 8TAC93, 8TAC94 NPSPAC <CHANNEL 2 location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	

	8TAC92, 8TAC93, 8TAC94 NPSPAC <CHANNEL 2 location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

	8TAC92, 8TAC93, 8TAC94 NPSPAC <COCONUT CREEK location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Simulcast Controller Equipment			
2	Network Equipment (Switch, LAN, WAN)	1	$4,837.50	25.00%
3	Simulcast Sync Equipment			
4	Simulcast Base Station Equipment	1	$38,157.00	25.00%
5	Antenna System	1	$30,056.06	25.00%
6	Advanced Power Meter (APM)	1	$3,630.00	25.00%
7	Alarm Monitoring Equipment	1	$2,868.75	25.00%
8	Equipment Other			
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	

	8TAC92, 8TAC93, 8TAC94 NPSPAC <COCONUT CREEK location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	

	8TAC92, 8TAC93, 8TAC94 NPSPAC <COCONUT CREEK location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

	8TAC92, 8TAC93, 8TAC94 NPSPAC <EMS location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Simulcast Controller Equipment			
2	Network Equipment (Switch, LAN, WAN)	1	$6,337.50	25.00%
3	Simulcast Sync Equipment			
4	Simulcast Base Station Equipment	1	$38,157.00	25.00%
5	Antenna System	1	$29,036.44	25.00%
6	Advanced Power Meter (APM)	1	$3,630.00	25.00%
7	Alarm Monitoring Equipment	1	$2,868.75	25.00%
8	Voting Equipment	1	$2,846.25	25.00%
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	

	8TAC92, 8TAC93, 8TAC94 NPSPAC <EMS location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	

	8TAC92, 8TAC93, 8TAC94 NPSPAC <EMS location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

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	8TAC92, 8TAC93, 8TAC94 NPSPAC <DAVIE location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Simulcast Controller Equipment			
2	Network Equipment (Switch, LAN, WAN)	1	$4,837.50	25.00%
3	Simulcast Sync Equipment			
4	Simulcast Base Station Equipment	1	$38,157.00	25.00%
5	Antenna System	1	$29,222.44	25.00%
6	Advanced Power Meter (APM)	1	$3,630.00	25.00%
7	Alarm Monitoring Equipment	1	$2,868.75	25.00%
8	Equipment Other			
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	

	8TAC92, 8TAC93, 8TAC94 NPSPAC <DAVIE location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	

	8TAC92, 8TAC93, 8TAC94 NPSPAC <DAVIE location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

	Network Management System <CORE location and MICROWAVE SITES>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Network Management System Equipment (Radio)	Included	Included	25.00%
2	Network Management System Equipment (Microwave)	Included	Included	25.00%
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	

	Network Management System <CORE location and MICROWAVE SITES>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
23	System Staging	Lot	Included	
24	Installation and Optimization	Lot	Included	
25	Acceptance Testing	Included	Included	
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	

	Network Management System <CORE location and MICROWAVE SITES>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
41	Year 5		Included	
42	Year 6		Included	
43	Year 7		Included	
44	Year 8		Included	
45	Year 9		Included	
46	Year 10		Included	
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

	Microwave System <EMS location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
1	Microwave Backhaul Equipment	1	$77,722.05	25.00%	$ 76,161.67
2	Microwave Antenna System Equipment	1	Included	25.00%	
3	Network Managmenet and alarm monitoring equipment	1	Included	25.00%	
4	DC Power System	1	Included	25.00%	
5	Physical Path Surveys	Included	Included		
6	MPLS Routers	1	Included	25.00%	
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	Microwave System <EMS location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	Microwave System <EMS location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

	Microwave System <POINT OF AMERICA location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Microwave Backhaul Equipment	1	$77,722.05	25.00%	$ 76,161.67
2	Microwave Antenna System Equipment	1	Included	25.00%	
3	Network Managmenet and alarm monitoring equipment	1	Included	25.00%	
4	DC Power System	1	Included	25.00%	
5	Physical Path Surveys	Included	Included		
6	MPLS Routers	1	Included	25.00%	
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	Microwave System <POINT OF AMERICA location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	Microwave System <POINT OF AMERICA location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

	Microwave System <WEST LAKE location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Microwave Backhaul Equipment	1	$77,722.05	25.00%	$ 76,161.67
2	Microwave Antenna System Equipment	1	Included	25.00%	
3	Network Managmenet and alarm monitoring equipment	1	Included	25.00%	
4	DC Power System	1	Included	25.00%	
5	Physical Path Surveys	Included	Included		
6	MPLS Routers	1	Included	25.00%	
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	Microwave System <WEST LAKE location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	Microwave System <WEST LAKE location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

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	Microwave System <CHANNEL 2 location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Microwave Backhaul Equipment	1	$77,722.05	25.00%	$ 76,161.67
2	Microwave Antenna System Equipment	1	Included	25.00%	
3	Network Managmenet and alarm monitoring equipment	1	Included	25.00%	
4	DC Power System	1	Included	25.00%	
5	Physical Path Surveys	Included	Included		
6	MPLS Routers	1	Included	25.00%	
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	Microwave System <CHANNEL 2 location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	Microwave System <CHANNEL 2 location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

	Microwave System <MIRAMAR location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Microwave Backhaul Equipment	1	$77,722.05	25.00%	$ 76,161.67
2	Microwave Antenna System Equipment	1	Included	25.00%	
3	Network Managmenet and alarm monitoring equipment	1	Included	25.00%	
4	DC Power System	1	Included	25.00%	
5	Physical Path Surveys	Included	Included		
6	MPLS Routers	1	Included	25.00%	
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	Microwave System <MIRAMAR location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	Microwave System <MIRAMAR location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

	Microwave System <DAVIE location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Microwave Backhaul Equipment	1	$77,722.05	25.00%	$ 76,161.67
2	Microwave Antenna System Equipment	1	Included	25.00%	
3	Network Managmenet and alarm monitoring equipment	1	Included	25.00%	
4	DC Power System	1	Included	25.00%	
5	Physical Path Surveys	Included	Included		
6	MPLS Routers	1	Included	25.00%	
7					
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16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	Microwave System <DAVIE location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	Microwave System <DAVIE location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

	Microwave System <BC STATION 106 location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Microwave Backhaul Equipment	1	$77,722.05	25.00%	$ 76,161.67
2	Microwave Antenna System Equipment	1	Included	25.00%	
3	Network Managmenet and alarm monitoring equipment	1	Included	25.00%	
4	DC Power System	1	Included	25.00%	
5	Physical Path Surveys	Included	Included		
6	MPLS Routers	1	Included	25.00%	
7					
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17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	Microwave System <BC STATION 106 location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	Microwave System <BC STATION 106 location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

	Microwave System <MARKHAM location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Microwave Backhaul Equipment	1	$77,722.05	25.00%	$ 76,161.67
2	Microwave Antenna System Equipment	1	Included	25.00%	
3	Network Managmenet and alarm monitoring equipment	1	Included	25.00%	
4	DC Power System	1	Included	25.00%	
5	Physical Path Surveys	Included	Included		
6	MPLS Routers	1	Included	25.00%	
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18					
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20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	Microwave System <MARKHAM location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	Microwave System <MARKHAM location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

	Microwave System <CORE location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Microwave Backhaul Equipment	1	$77,722.05	25.00%	$ 76,161.67
2	Microwave Antenna System Equipment	1	Included	25.00%	
3	Network Managmenet and alarm monitoring equipment	1	Included	25.00%	
4	DC Power System	1	Included	25.00%	
5	Physical Path Surveys	Included	Included		
6	MPLS Routers	1	Included	25.00%	
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20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	Microwave System <CORE location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	Microwave System <CORE location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

	Microwave System <West HOLLYWOOD location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Microwave Backhaul Equipment	1	$77,722.05	25.00%	$ 76,161.67
2	Microwave Antenna System Equipment	1	Included	25.00%	
3	Network Managmenet and alarm monitoring equipment	1	Included	25.00%	
4	DC Power System	1	Included	25.00%	
5	Physical Path Surveys	Included	Included		
6	MPLS Routers	1	Included	25.00%	
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20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	Microwave System <West HOLLYWOOD location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	Microwave System <West HOLLYWOOD location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

	Microwave System <EOC location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
1	Microwave Backhaul Equipment	1	$77,722.05	25.00%	$ 76,161.67
2	Microwave Antenna System Equipment	1	Included	25.00%	
3	Network Managmenet and alarm monitoring equipment	1	Included	25.00%	
4	DC Power System	1	Included	25.00%	
5	Physical Path Surveys	Included	Included		
6	MPLS Routers	1	Included	25.00%	
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20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	Microwave System <EOC location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	Microwave System <EOC location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

	Microwave System <TAMARAC location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Microwave Backhaul Equipment	1	$77,722.05	25.00%	$ 76,161.67
2	Microwave Antenna System Equipment	1	Included	25.00%	
3	Network Managmenet and alarm monitoring equipment	1	Included	25.00%	
4	DC Power System	1	Included	25.00%	
5	Physical Path Surveys	Included	Included		
6	MPLS Routers	1	Included	25.00%	
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20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	Microwave System <TAMARAC location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	Microwave System <TAMARAC location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

	Microwave System <COCONUT CREEK location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Microwave Backhaul Equipment	1	$77,722.05	25.00%	$ 76,161.67
2	Microwave Antenna System Equipment	1	Included	25.00%	
3	Network Managmenet and alarm monitoring equipment	1	Included	25.00%	
4	DC Power System	1	Included	25.00%	
5	Physical Path Surveys	Included	Included		
6	MPLS Routers	1	Included	25.00%	
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19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	Microwave System <COCONUT CREEK location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	Microwave System <COCONUT CREEK location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

	Microwave System <DEERFIELD location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Microwave Backhaul Equipment	1	$77,722.05	25.00%	$ 76,161.67
2	Microwave Antenna System Equipment	1	Included	25.00%	
3	Network Managmenet and alarm monitoring equipment	1	Included	25.00%	
4	DC Power System	1	Included	25.00%	
5	Physical Path Surveys	Included	Included		
6	MPLS Routers	1	Included	25.00%	
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20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	Microwave System <DEERFIELD location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	Microwave System <DEERFIELD location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

	Microwave System <PLAYA location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Microwave Backhaul Equipment	1	$77,722.05	25.00%	$ 76,161.67
2	Microwave Antenna System Equipment	1	Included	25.00%	
3	Network Managmenet and alarm monitoring equipment	1	Included	25.00%	
4	DC Power System	1	Included	25.00%	
5	Physical Path Surveys	Included	Included		
6	MPLS Routers	1	Included	25.00%	
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18					
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20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	Microwave System <PLAYA location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	Microwave System <PLAYA location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

	Microwave System <PARKLAND location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Microwave Backhaul Equipment	1	$77,722.05	25.00%	$ 76,161.67
2	Microwave Antenna System Equipment	1	Included	25.00%	
3	Network Managmenet and alarm monitoring equipment	1	Included	25.00%	
4	DC Power System	1	Included	25.00%	
5	Physical Path Surveys	Included	Included		
6	MPLS Routers	1	Included	25.00%	
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18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	Microwave System <PARKLAND location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	Microwave System <PARKLAND location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

	Microwave System <POMPANO BEACH location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
1	Microwave Backhaul Equipment	1	$77,722.05	25.00%	$76,161.67
2	Microwave Antenna System Equipment	1	Included	25.00%	
3	Network Managmenet and alarm monitoring equipment	1	Included	25.00%	
4	DC Power System	1	Included	25.00%	
5	Physical Path Surveys	Included	Included		
6	MPLS Routers	1	Included	25.00%	
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
	Engineering & Services				
21	Project Management	Lot	Included		
22	System Engineering	Lot	Included		
23	System Staging	Lot	Included		
24	Installation and Optimization	Lot	Included		
25	Acceptance Testing	Included	Included		

	Microwave System <POMPANO BEACH location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
26	Documentation	Included	Included		
27	Construction Manager	Lot	Included		
28	Site Construction and Development	Lot	Included		
29	Microwave Installation and Services	Lot	Included		
30	MPE/IM Studies	Lot	Included		
31	Equipment Storage	Lot	Included		
32	Logging Solution Installation Services	Lot	Included		
	Training (List all)				
33		Lot	Included		
34					
35					
36					
37					
	Support & Maintenance After First Year Warranty				
38	Year 2		Included		
39	Year 3		Included		
40	Year 4		Included		
41	Year 5		Included		
42	Year 6		Included		
43	Year 7		Included		
44	Year 8		Included		
45	Year 9		Included		
46	Year 10		Included		

	Microwave System <POMPANO BEACH location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
47	Year 11		Included		
48	Year 12		Included		
49	Year 13		Included		
50	Year 14		Included		
51	Year 15		Included		

	Dispatch Console Systems <One page per console site location> <COCONUT CREEK location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Dispatch Console Equipment	1	$694,932.00	25.00%
2	Network Equipment (Switch, LAN, WAN)	1	$11,700.00	25.00%
3	Auxiliary I/O Interfaces	1	$1,815.00	25.00%
4	Logging Recorder Interface	1	$173,217.75	25.00%
5	Conventional Channel Gateways	1	$35,782.50	25.00%
6	Equipment Other			
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	
24	Installation and Optimization	Lot	Included	

	Dispatch Console Systems <One page per console site location> <COCONUT CREEK location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
25	Acceptance Testing	Included	Included	
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	
43	Year 7		Included	
44	Year 8		Included	

	Dispatch Console Systems <One page per console site location> <COCONUT CREEK location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
45	Year 9		Included	
46	Year 10		Included	
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

	Dispatch Console Systems <One page per console site location> <PEMBROKE location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Dispatch Console Equipment	1	$761,040.00	25.00%
2	Network Equipment (Switch, LAN, WAN)	1	$11,700.00	25.00%
3	Auxiliary I/O Interfaces	1	$1,815.00	25.00%
4	Logging Recorder Interface	1	$108,468.00	25.00%
5	Conventional Channel Gateways	1	$35,782.50	25.00%
6	Equipment Other			
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	
24	Installation and Optimization	Lot	Included	

	Dispatch Console Systems <One page per console site location> <PEMBROKE location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
25	Acceptance Testing	Included	Included	
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	
43	Year 7		Included	
44	Year 8		Included	

	Dispatch Console Systems <One page per console site location> <PEMBROKE location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
45	Year 9		Included	
46	Year 10		Included	
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

	Dispatch Console Systems <One page per console site location> <SUNRISE location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Dispatch Console Equipment	1	$794,094.00	25.00%
2	Network Equipment (Switch, LAN, WAN)	1	$11,700.00	25.00%
3	Auxiliary I/O Interfaces	1	$1,815.00	25.00%
4	Logging Recorder Interface	1	$173,404.50	25.00%
5	Conventional Channel Gateways	1	$31,987.50	25.00%
6	Equipment Other			
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	
24	Installation and Optimization	Lot	Included	

	Dispatch Console Systems <One page per console site location> <SUNRISE location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
25	Acceptance Testing	Included	Included	
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	
43	Year 7		Included	
44	Year 8		Included	

	Dispatch Console Systems <One page per console site location> <SUNRISE location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
45	Year 9		Included	
46	Year 10		Included	
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

	Communications Trailer <One page per console site location> < Insert location & user department name>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Trailer with Hydraulic Brakes	1	$280,709.41	0.00%
2	GUI-based Gateway	1	$36,483.75	25.00%
3	Control Station Radios	1	$44,897.25	25.00%
4	Antenna Systems	1	$29,110.31	25.00%
5	700 MHz Conventional Repeaters	1	$33,120.00	25.00%
6	Generator and ATS			
7	Truck	1	$67,735.29	0.00%
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
	Engineering & Services			
21	Project Management	Lot	Included	
22	System Engineering	Lot	Included	
23	System Staging	Lot	Included	
24	Installation and Optimization	Lot	Included	

	Communications Trailer <One page per console site location> < Insert location & user department name>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
25	Acceptance Testing	Included	Included	
26	Documentation	Included	Included	
27	Construction Manager	Lot	Included	
28	Site Construction and Development	Lot	Included	
29	Microwave Installation and Services	Lot	Included	
30	MPE/IM Studies	Lot	Included	
31	Equipment Storage	Lot	Included	
32	Logging Solution Installation Services	Lot	Included	
	Training (List all)			
33		Lot	Included	
34				
35				
36				
37				
	Support & Maintenance After First Year Warranty			
38	Year 2		Included	
39	Year 3		Included	
40	Year 4		Included	
41	Year 5		Included	
42	Year 6		Included	
43	Year 7		Included	
44	Year 8		Included	

	Communications Trailer <One page per console site location> < Insert location & user department name>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
45	Year 9		Included	
46	Year 10		Included	
47	Year 11		Included	
48	Year 12		Included	
49	Year 13		Included	
50	Year 14		Included	
51	Year 15		Included	

NOTE: The physical truck and trailer are covered under the respective manufacturer's warranty

	Facilities & Infrastructure <One page per site location> <BC STATION 106 location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Tower (New) 200' Self Supporting				
	Tower (New) 300' Self Supporting	1	$ 126,780.00	25.00%	$126,780.00
	Tower (New) 400' Self Supporting				
2	Tower Analysis				
3	Tower upgrade				
4	Shelter	1	$ 269,287.00	25.00%	$160,605.60
5	Generator and Automatic Transfer Switch (ATS)				
6	DC Power System	1	$ 93,829.00	25.00%	$69,865.30
7	Grounding Upgrades				
8	Site Preparation and Finishing				
10	Power Distribution	1	$ 2,110.00	25.00%	
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
	Engineering & Services				
23	Project Management				

	Facilities & Infrastructure <One page per site location> <BC STATION 106 location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
24	System Engineering				
25	Documentation				
26	Other Services (list all)				
27					
28					
29					
30					
31					
32					
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45					

	Facilities & Infrastructure <One page per site location> <CHANNEL 2 location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Tower (New) 200' Self Supporting				
	Tower (New) 300' Self Supporting	1	$ 133,284	25.00%	
	Tower (New) 400' Self Supporting				
2	Tower Analysis				
3	Tower upgrade				
4	Shelter	1	$269,287.00	25.00%	$128,788.80
5	Generator and Automatic Transfer Switch (ATS)				
6	DC Power System	1	$93,829	25.00%	$69,865.30
7	Grounding Upgrades				
8	Site Preparation and Finishing				
9	Power Distribution	1	$ 2,110	25.00%	
10					
11					
12					
13					
14					
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16					
17					
18					
19					
20					
21					
22					
	Engineering & Services				

	Facilities & Infrastructure <One page per site location> <CHANNEL 2 location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
23	Project Management				
24	System Engineering				
25	Documentation				
26	Other Services (list all)				
27					
28					
29					
30					
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	Facilities & Infrastructure <One page per site location> <COCONUT CREEK location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Tower (New) 200' Self Supporting				$53,805.75
	Tower (New) 300' Self Supporting				
	Tower (New) 400' Self Supporting				
2	Tower Analysis				
3	Tower upgrade				
4	Shelter				
5	Generator and Automatic Transfer Switch (ATS)				
6	DC Power System	1	$93,829	25.00%	$69,865.30
7	Grounding Upgrades				
8	Site Preparation and Finishing				
9	Power Distribution / Surge Protection	1	$4,823.00	25.00%	$1,305.00
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19					
20					
21					
22					
	Engineering & Services				

	Facilities & Infrastructure <One page per site location> <COCONUT CREEK location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
23	Project Management				
24	System Engineering				
25	Documentation				
26	Other Services (list all)				
27					
28					
29					
30					
31					
32					
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	Facilities & Infrastructure <One page per site location> <CORE location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Tower (New) 200' Self Supporting				
	Tower (New) 300' Self Supporting				
	Tower (New) 400' Self Supporting				
2	Tower Analysis				
3	Tower upgrade				
4	Shelter	1	$ 269,287	25.00%	
5	Generator and Automatic Transfer Switch (ATS)				
6	DC Power System	1	$93,829	25.00%	$69,865.30
7	Grounding Upgrades				
8	Site Preparation and Finishing				
9	Power Distribution	1	$7,035	25.00%	$1,305.00
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19					
20					
21					
22					
	Engineering & Services				

	Facilities & Infrastructure <One page per site location> <CORE location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
23	Project Management				
24	System Engineering				
25	Documentation				
26	Other Services (list all)				
27					
28					
29					
30					
31					
32					
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45					

	Facilities & Infrastructure <One page per site location> <DAVIE location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Tower (New) 200' Self Supporting				
	Tower (New) 300' Self Supporting				
	Tower (New) 400' Self Supporting				
2	Tower Analysis				
3	Tower upgrade				
4	Shelter				
5	Generator and Automatic Transfer Switch (ATS)	1	$38,114	25.00%	$36,501.00
6	DC Power System	1	$93,829	25.00%	$69,865.30
7	Grounding Upgrades				
8	Site Preparation and Finishing				
9	Other - Surge Protection/Power Distribution	1	$3,415	25.00%	$1,305.00
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
	Engineering & Services				

	Facilities & Infrastructure <One page per site location> <DAVIE location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
23	Project Management				
24	System Engineering				
25	Documentation				
26	Other Services (list all)				
27					
28					
29					
30					
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45					

	Facilities & Infrastructure <One page per site location> <DEERFIELD location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Tower (New) 200' Self Supporting				$80,985.75
	Tower (New) 300' Self Supporting	1	$ 120,420	25.00%	
	Tower (New) 400' Self Supporting				
2	Tower Analysis				
3	Tower upgrade				
4	Shelter	1	$269,287	25.00%	$165,368.40
5	Generator and Automatic Transfer Switch (ATS)				
6	DC Power System	1	$93,829	25.00%	$69,865.30
7	Grounding Upgrades				
8	Site Preparation and Finishing				
9	Power Distribution	1	$ 2,110	25.00%	
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12					
13					
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15					
16					
17					
18					
19					
20					
21					
22					
	Engineering & Services				

	Facilities & Infrastructure <One page per site location> <DEERFIELD location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
23	Project Management				
24	System Engineering				
25	Documentation				
26	Other Services (list all)				
27					
28					
29					
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45					

	Facilities & Infrastructure <One page per site location> <MARKHAM location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Tower (New) 200' Self Supporting				
	Tower (New) 300' Self Supporting				
	Tower (New) 400' Self Supporting				
2	Tower Analysis				
3	Tower upgrade				
4	Shelter	1	$ 269,287	25.00%	
5	Generator and Automatic Transfer Switch (ATS)				$36,501.00
6	DC Power System	1	$93,829	25.00%	$69,865.30
7	Grounding Upgrades				
8	Site Preparation and Finishing				
9	Power Distribution	1	$ 2,110	25.00%	
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12					
13					
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18					
19					
20					
21					
22					
	Engineering & Services				

	Facilities & Infrastructure <One page per site location> <MARKHAM location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
23	Project Management				
24	System Engineering				
25	Documentation				
26	Other Services (list all)				
27					
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	Facilities & Infrastructure <One page per site location> <MIRAMAR location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Tower (New) 200' Self Supporting				
	Tower (New) 300' Self Supporting				
	Tower (New) 400' Self Supporting				
2	Tower Analysis				
3	Tower upgrade				
4	Shelter	1	$ 174,530	25.00%	
5	Generator and Automatic Transfer Switch (ATS)				$36,501.00
6	DC Power System	1	$93,829	25.00%	$69,865.30
7	Grounding Upgrades				
8	Site Preparation and Finishing				
9	Power Distribution	1	$ 2,110	25.00%	
10					
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12					
13					
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17					
18					
19					
20					
21					
22					
	Engineering & Services				

	Facilities & Infrastructure <One page per site location> <MIRAMAR location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
23	Project Management				
24	System Engineering				
25	Documentation				
26	Other Services (list all)				
27					
28					
29					
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31					
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45					

	Facilities & Infrastructure <One page per site location> <PARKLAND location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Tower (New) 200' Self Supporting			
	Tower (New) 300' Self Supporting	1	$ 152,664	25.00%
	Tower (New) 400' Self Supporting			
2	Tower Analysis			
3	Tower upgrade			
4	Shelter	1	$ 269,287	25.00%
5	Generator and Automatic Transfer Switch (ATS)			
6	DC Power System	1	$ 93,829	25.00%
7	Grounding Upgrades			
8	Site Preparation and Finishing			
9	Power Distribution	1	$ 2,110	25.00%
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11				
12				
13				
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17				
18				
19				
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21				
22				
	Engineering & Services			

	Facilities & Infrastructure <One page per site location> <PARKLAND location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
23	Project Management			
24	System Engineering			
25	Documentation			
26	Other Services (list all)			
27				
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	Facilities & Infrastructure <One page per site location> <PLAYA location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Tower (New) 200' Self Supporting				
	Tower (New) 300' Self Supporting				
	Tower (New) 400' Self Supporting				
2	Tower Analysis				
3	Tower upgrade				
4	Shelter				
5	Generator and Automatic Transfer Switch (ATS)				
6	DC Power System	1	$93,829	25.00%	$69,865.30
7	Grounding Upgrades				
8	Site Preparation and Finishing				
9	Power Distribution	1	$ 2,110	25.00%	
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
	Engineering & Services				

	Facilities & Infrastructure <One page per site location> <PLAYA location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
23	Project Management				
24	System Engineering				
25	Documentation				
26	Other Services (list all)				
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
39					
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41					
42					
43					
44					
45					

	Facilities & Infrastructure <One page per site location> <POINT of AMERICA location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Tower (New) 200' Self Supporting				
	Tower (New) 300' Self Supporting				
	Tower (New) 400' Self Supporting				
2	Tower Analysis				
3	Tower upgrade				
4	Shelter				
5	Generator and Automatic Transfer Switch (ATS)				
6	DC Power System	1	$93,829	25.00%	$69,865.30
7	Grounding Upgrades				
8	Site Preparation and Finishing				
9	Power Distribution	1	$ 2,110	25.00%	
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
	Engineering & Services				

	Facilities & Infrastructure <One page per site location> <POINT of AMERICA location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
23	Project Management				
24	System Engineering				
25	Documentation				
26	Other Services (list all)				
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
39					
40					
41					
42					
43					
44					
45					

	Facilities & Infrastructure <One page per site location> <POMPANO BEACH CLUB location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Tower (New) 200' Self Supporting			
	Tower (New) 300' Self Supporting			
	Tower (New) 400' Self Supporting			
2	Tower Analysis			
3	Tower upgrade			
4	Shelter			
5	Generator and Automatic Transfer Switch (ATS)			
6	DC Power System	1	$93,829	25.00%
7	Grounding Upgrades			
8	Site Preparation and Finishing			
9	Surge Protection / Power Distribution	1	$ 8,815.0	25.00%
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
	Engineering & Services			

	Facilities & Infrastructure <One page per site location> <POMPANO BEACH CLUB location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
23	Project Management			
24	System Engineering			
25	Documentation			
26	Other Services (list all)			
27				
28				
29				
30				
31				
32				
33				
34				
35				
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43				
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	Facilities & Infrastructure <One page per site location> <TAMARAC location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Tower (New) 200' Self Supporting				$76,821.75
	Tower (New) 300' Self Supporting	1	$ 133,284		
	Tower (New) 400' Self Supporting				
2	Tower Analysis				
3	Tower upgrade				
4	Shelter	1	$ 269,287	25.00%	$165,368.40
5	Generator and Automatic Transfer Switch (ATS)				
6	DC Power System	1	$ 93,829	25.00%	$69,865.30
7	Grounding Upgrades				
8	Site Preparation and Finishing				
9	Power Distribution	1	$ 2,110	25.00%	
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
	Engineering & Services				

	Facilities & Infrastructure <One page per site location> <TAMARAC location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
23	Project Management				
24	System Engineering				
25	Documentation				
26	Other Services (list all)				
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
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40					
41					
42					
43					
44					
45					

	Facilities & Infrastructure <One page per site location> <WEST LAKE location>	Name: (MOTOROLA SOLUTIONS)			
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**	**RFP Pricing**
1	Tower (New) 200' Self Supporting	1			$66,216.00
	Tower (New) 300' Self Supporting	1	$ 133,284	25.00%	
	Tower (New) 400' Self Supporting				
2	Tower Analysis				
3	Tower upgrade				
4	Shelter	1	$269,287	25.00%	$165,368.40
5	Generator and Automatic Transfer Switch (ATS)				
6	DC Power System	1	$93,829	25.00%	$69,865.30
7	Grounding Upgrades				
8	Site Preparation and Finishing				
9	Power Distribution	1	$ 2,110	25.00%	
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
	Engineering & Services				

	Facilities & Infrastructure <One page per site location> <WEST LAKE location>	Name: (MOTOROLA SOLUTIONS)			
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent	RFP Pricing
23	Project Management				
24	System Engineering				
25	Documentation				
26	Other Services (list all)				
27					
28					
29					
30					
31					
32					
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42					
43					
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45					

	Facilities & Infrastructure <One page per site location> <EOC location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Tower (New) 200' Self Supporting			
	Tower (New) 300' Self Supporting			
	Tower (New) 400' Self Supporting			
2	Tower Analysis			
3	Tower upgrade			
4	Shelter			
5	Generator and Automatic Transfer Switch (ATS)			
6	DC Power System	1	$93,829	25.00%
7	Grounding Upgrades			
8	Site Preparation and Finishing			
9	Power Distribution	1	$ 3,518	25.00%
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
	Engineering & Services			

	Facilities & Infrastructure <One page per site location> <EOC location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
23	Project Management			
24	System Engineering			
25	Documentation			
26	Other Services (list all)			
27				
28				
29				
30				
31				
32				
33				
34				
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36				
37				
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40				
41				
42				
43				
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45				

	Facilities & Infrastructure <One page per site location> <EMS location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Tower (New) 200' Self Supporting			
	Tower (New) 300' Self Supporting			
	Tower (New) 400' Self Supporting			
2	Tower Analysis			
3	Tower upgrade			
4	Shelter			
5	Generator and Automatic Transfer Switch (ATS)			
6	DC Power System	1	$93,829	25.00%
7	Grounding Upgrades			
8	Site Preparation and Finishing			
9	Power Distribution	1	$ 2,110.0	25.00%
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
	Engineering & Services			

	Facilities & Infrastructure <One page per site location> <EMS location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
23	Project Management			
24	System Engineering			
25	Documentation			
26	Other Services (list all)			
27				
28				
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30				
31				
32				
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	Facilities & Infrastructure <One page per site location> <WEST HOLLYWOOD location>	Name: (MOTOROLA SOLUTIONS)		
Item	**Description**	**Estimated Qty / Hours**	**Unit Price / Hourly Rate**	**Discount Percent**
1	Tower (New) 200' Self Supporting			
	Tower (New) 300' Self Supporting	1	$ 133,920	25.00%
	Tower (New) 400' Self Supporting			
2	Tower Analysis			
3	Tower upgrade			
4	Shelter	1	$ 269,287	25.00%
5	Generator and Automatic Transfer Switch (ATS)			
6	DC Power System	1	$93,829	25.00%
7	Grounding Upgrades			
8	Site Preparation and Finishing			
9	Power Distribution	1	$ 2,110	25.00%
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
	Engineering & Services			

	Facilities & Infrastructure <One page per site location> <WEST HOLLYWOOD location>	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
23	Project Management			
24	System Engineering			
25	Documentation			
26	Other Services (list all)			
27				
28				
29				
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31				
32				
33				
34				
35				
36				
37				
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41				
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	Recommended Spares and Test Equipment	Name: (MOTOROLA SOLUTIONS)		
Item	Description	Estimated Qty / Hours	Unit Price / Hourly Rate	Discount Percent
1	Recommended Spare Parts for 8TAC Conventional System	lot	$ 5,588	25.00%
2	Recommended Spare Parts for Console System	lot	$ 55,868	25.00%
3	Recommended Spare Parts for Main P25 System Core	lot	$ 71,126	25.00%
4	Recommended Spare Parts for Main P25 System Simulcast System	lot	$ 72,384	25.00%
13	Spare Antenna System - Parkland	lot	$ 9,575	25.00%
15	Spare Antenna System - PompBchClub	lot	$ 6,268	25.00%
18	Spare Antenna System - West Hollywood	lot	$ 9,500	25.00%
20				
	Engineering & Services			
21	Programming & Delivery			
22	Installation			
23				
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Exhibit C - Support and Maintenance Services

1. Overview

Motorola Solutions warranty, service, and maintenance plan will provide Broward County with comprehensive services designed to maintain and support the County's P25 LMR System, as well as Aviat Microwave, and any other products provided to the County under this Agreement. Motorola Solutions will combine the resources and support services provided by our Solutions Support Center (SSC), our Field Service Organization (FSO) in Broward County and our Florida based Motorola Solutions System Technologists to deliver ongoing warranty and maintenance throughout the life of the system.

For so long and to the extent that County elects to receive Support and Maintenance Services from Provider, Provider shall furnish Support and Maintenance Service in accordance with this Exhibit C. Motorola's Support and Maintenance Services will provide timely response and resolution of any errors, defects, malfunctions or other issues affecting the use or performance of the System (collectively, "Events") in keeping with the standards and requirements of this Exhibit C, including the Required Response Times stated herein.

Unless modified in writing by County in accordance with this Exhibit C, the supported System under this Agreement shall include all Software identified on Schedule 1, all Equipment identified on Schedule 2, all Interfaces identified on Schedule 5, the DC power system, and any other Systems, Equipment, and Software, as are elected by County to be included in Support and Maintenance. Any requested support may be provided by Provider's subcontractors to the extent approved in advance by County. County may modify the scope of Schedules 1, 2 or 5, or any supported Systems, Equipment, or Software, to add, remove, or otherwise modify the support requested on at least thirty (30) days prior notice (except in the event of an emergency or urgent need, in which event such notice as may reasonably be provided under the circumstances or otherwise agreed by representatives of the Parties). In no event shall any termination or reinstatement fee be charged by Provider for terminating, suspending, reinstating, or adding new supported Equipment, Software, or systems to Support and Maintenance Services. Any changes in the supported Equipment, Software or systems shall be invoice pro-rata as appropriate.

All Support and Maintenance Services provided by Motorola under the Agreement shall comply with the following general standards:

A. <u>Maintenance Standards</u>

i. Replacement parts used in repairs shall be equal or better in quality and ratings to the original parts.

ii. Equipment shall be maintained in a clean condition. Oil, dust and other foreign substances shall be removed on a routine basis.

iii. Equipment and system performance shall be maintained at the level initially described in these equipment and systems specifications. The service organization shall maintain records to confirm this has been done at the intervals defined herein.

iv. Provider shall provide only factory-trained and -authorized maintenance personnel.

v. If fixed equipment or a fixed equipment module fails more than twice during the acceptance test or twice during the first year, the Provider shall meet with the County to discuss and explain such failures. If, in the opinion of the County, these failures indicate that the equipment is potentially prone to continuing failures, the Respondent shall replace it at no cost to the County.

vi. Provider shall provide designated contacts for telephone and email support that will be available during regular County business hours and after hours for specific technical problems and questions.

vii. Support and Maintenance Services shall be provided via telephone, electronic communication, on-site, or as otherwise appropriate to address the issue. Any update, upgrades, releases, or other modifications to the Software shall be provided via electronic communication and for download via the Internet, if practicable. To the extent necessary to resolve an Event or other support request, Provider shall provide support on-site at any office or location of a Broward County agency.

B. <u>Customer Support Manager and Customer Support Plan</u>

For all contracted Support and Maintenance Services, Motorola Solutions will provide a Customer Support Manager (CSM) who will assist in providing the coordination of support resources over the lifecycle of the system. The CSM will manage all warranty and post-warranty support services and serve the role of the County's advocate. The CSM will also be the defined point of contact for issue resolution and escalation, monitoring of our contractual performance.

The CSM develops a documented Customer Support Plan (CSP) that will define the commitments and manage expectations for both Broward County and Motorola Solutions. The CSP will be developed in conjunction with the appropriate County personnel.

Upon system acceptance, Broward County will be provided with a Project Transition Certificate, which officially transitions the project from implementation to warranty. At the same time, Motorola Solutions will provide a CSP that has been discussed and agreed upon regarding County's specific requests and responsibilities throughout the subsequent warranty and maintenance periods. All of the service products described herein will be outlined and the CSP will be County's "directory" of services during warranty and maintenance. Also included will be specifics on escalations in the event of special problems and any pertinent information required specifically to Broward County. Some of these details would include items such as access to

sites, response time requirements, severity level definitions, and parts department access information.

The CSP will include the following elements:

- Contract Numbers.
- Customer Contact Information.
- Motorola Solutions Contacts.
- Service Provider Contacts.
- Third Party Vendors and Contract Numbers.
- Site Names and Site IDs.
- Equipment Inventory.
- Service Level Agreements (SLAs).
- Escalation List.
- Preventive Maintenance Schedules.
- Special Contacts.

C. Motorola On-Line Support.

Broward County will have Web-based, direct access to the call-tracking database. As a registered user of Motorola On-Line, the County will be able to open work tickets, track repair status, order parts, and view repair history. This affords the Broward County with another level of control and awareness of the response and repair process.

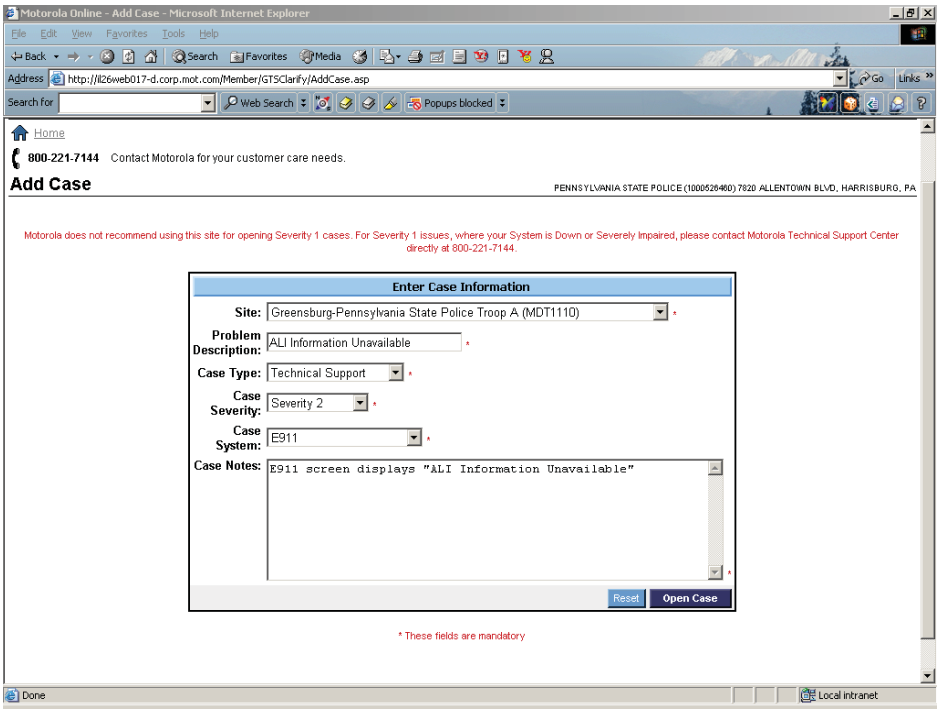


Figure 0-1: Motorola On-Line Support (MOL)

D. Disaster Recovery Plan.

In the event of a natural disaster, there is a possibility that some of the Broward County radio system will be inoperable. Because this is a public safety system, the County is required to maintain the system for the users and provide for disaster recovery should an incident damage one or more towers in the system. Provider shall provide the following disaster support and have the following responsibilities:

1. Provide a minimum of three (3) system technicians and one (1) project manager throughout the restoration phase.
2. Respond to site(s) to evaluate damage and begin restoration operations within four (4) hours of access being established, or within four (4) hours after County declares an all-clear notification, whichever comes first.
3. Provide materials, tools, documentation, physical planning manuals, and diagnostic and test equipment necessary to provide restoration.
4. Provide technical services to troubleshoot and repair the County's system, and to work with County personnel and Provider during the restoration phase.
5. Monitor the system remotely and provide the on-call Provider technicians with system updates.
6. Supply tower climbers when required to investigate any questionable problems or repair the antenna systems.
7. Supply spare antenna components for the radio transmit sites.

For radio rentals, programming (or re-programming), or other equipment or rentals, Provider shall charge the County the agreed-upon prices as set forth in Exhibit B for daily and hourly rates unless otherwise agreed by the Parties. Any additional rates or services other than those set forth herein deemed necessary by County shall be provided by Provider at the rates set forth in Exhibit B, and documented by the Parties in writing as promptly as possible under the circumstances identifying the applicable equipment, services, and resources.

The County will have the following responsibilities:

a. Supply onsite presence at the tower sites.
b. Have available the spare parts that were purchased with the original system, unless previously used by the Contractor.

Motorola Solutions will leverage its extensive first response experience in events such as natural disasters, aviation tragedies, regional power disruptions, terrorist attacks, and political conventions to work with Broward County in the development of a Disaster Recovery Plan. Our planning and response will be specifically designed to meet the needs of Broward County during unforeseen events by using our interoperability capabilities with state and countywide Motorola Solutions P25 systems.

In the event of a disaster within Broward County, Motorola Solutions is committed to work with the County to assist with the Disaster Recovery. In such emergency situations, Motorola Solutions will bypass traditional financial processes in order to deploy resources as quickly and efficiently as possible. Once the danger has passed and the situation has been stabilized, Motorola Solutions will work with any impacted agencies to explore various financing options such as lease or rental agreements as well as FEMA-aided funding. Having emergency financial arrangements in place prior to a disaster will expedite the refunds to Motorola Solutions as well as many other contractors and vendors that assist the Florida region.

E. System and Software Upgrades

Modern LMR systems are specialized Information Technology (IT) networks that are a hybrid composition of commercial off-the-shelf IT components, specialized Radio Frequency (RF) components and software designed to comply with standards-based specifications. To ensure the highest level of operation, allow for system expansion, provide maximum lifespan and protect the initial investment, regular update and replacement of individual software and hardware components is required.

Motorola provides a comprehensive approach to technology refreshment of the ASTRO 25 system aligned with the Motorola Solutions lifecycle roadmap. As major system releases become available, Motorola will provide unlimited system upgrades as approved by County. This includes the complete package of hardware, software and implementation services required to update the ASTRO 25 system to an eligible system release with an equivalent level of functionality. System and Software Upgrades as provided herein are referred to in Motorola Documentation as “System Upgrade Agreement” or “SUA II.”

Updates to OEM components ensure availability of repair services support and may also provide increased capacity and processing speed. Regular updates enable system expansion (i.e. expansion of RF site, dispatch positions, data sub-systems, network management positions, etc.) Professional implementation services guarantee live system upgrades are performed with minimal interruption to system operation with minimal reliance on owner resources. Motorola will ensures that the ASTRO 25 system functions at the highest level of operation, allows for expansion and feature enhancement and maximizes the lifespan of the investment.

Included in the software and system upgrades provided by Motorola are following for the Broward County lifecycle:

i. Software Products

- **Anti-Virus Definition Updates** – Available on a weekly basis via extranet web site or optional automated push, includes commercial anti-virus definitions for third party operating system software. High-priority updates may be released for anti-virus definitions classified as Category 4 (Severe, difficult to contain) and Category 5 (Very Severe, very difficult to contain).

- **Minor Release (patch release)** – Available on a monthly/quarterly basis via extranet web site or optional automated push, includes security patch updates to third-party operating system (OS) and application software as well as host-based intrusion detection sensor (IDS) signature file updates for Motorola Solutions supplied equipment. Updates occur monthly for Microsoft Windows and quarterly for Oracle, Sun Microsystems and Red Hat Unix/Linux OS and IDS signature files.
- **Major Release (system release)** – Available up to 1 every two-year contract term, and may include third-party software and Motorola Solutions system software updates which provide enhancements to existing features and the addition of significant new features which are available for purchase. Additionally, included are updates to Motorola Solutions subscriber programming software.

ii. Hardware and Implementation Products

- **Hardware Refresh** – Version updates and/or replacements for Motorola Solutions field replaceable unit (FRU) hardware and third-party networking and computing hardware.
- **Implementation Services** – Technical support and operational resources such as field engineering, system technologist, project management and local service shop resources to provide end-to-end design, on-site implementation and project management services.

F. <u>Security Update Service.</u>

Commercial security software updates are often designed without RF systems in mind and could cause inadvertent harm to County's radio network, disrupting mission-critical communications and putting County's first responders and citizens at risk. The Motorola Solutions Security Update Service assures that commercial anti-virus definitions, operating system software patches, and Intrusion Detection Sensor signature files are compatible with the County's ASTRO 25 network and do not interfere with network functionality. Our expert network security technologists analyze, perform testing, and validate the latest security software updates in a dedicated test lab and provide continuous monitoring of updates to provide you regular electronic updates upon completion of successful testing.

SUS includes:

- Anti-virus definitions and intrusion detection sensor updates for all Motorola Solutions supplied equipment under this contract from applicable original equipment manufacturer. This includes, but is not limited to servers, desktop computers, dispatch positions, network management terminals, routers, switches, and any other device susceptible to a virus or malware.
- Minor releases may include commercial OS and application security updates, patches and service pack updates for Microsoft Windows and Server OS, Red Hat

Linux, Sun Solaris and any Motorola Solutions software service packs that may be available.

- Anti-virus definitions and minor releases will be applied to all applicable equipment within 30 days following the release of the definitions or minor releases.
- A monthly report of all security patches applied within the previous month

G. Parts Availability & Spare Equipment

The product development process for the ASTRO 25 platform is designed to coordinate with standards bodies, regulatory agencies, customer needs and technology advancements. As a result, the ASTRO 25 platform is in compliance with P25 standards to ensure fully interoperable digital communications, and will remain in compliance as the standards evolve.

Motorola also works with its technology partners to incorporate new product versions into the ASTRO 25 platform through a system certification process, thus ensuring compatibility of new third-party products. As products are discontinued due to technology obsolescence, Motorola will incorporate replacement versions, thereby avoiding the need to replace the entire platform. The certification process also enables Motorola to continue support for discontinued third-party products.

Even after components have ceased manufacturing, replacement parts will be made available. Motorola will use commercially reasonable efforts to provide replacement parts for Motorola manufactured fixed infrastructure equipment for at least seven years from the date of last manufacture.

Motorola shall comply with the following standards:

i. From the date of final production to the seventh anniversary of the date of final production, Provider shall maintain replacement parts for all delivered equipment.

ii. In the event that the Provider plans to discontinue stocking any part required for maintenance after the seventh anniversary of final production, the Provider shall send written notice to the County 24 months prior to the date of discontinuance, to allow for last-time buys and replenishment.

iii. All parts ordered on a priority basis shall be delivered within 24 hours after placing an order. Provider shall provide year round, 24-hour ordering facilities via Internet, email and fax service, and via telephone during regular business hours.

Motorola has identified the spare parts listed on Schedule 4 as appropriate for a comprehensive supply of spare parts for the System. This list of spare parts includes, but is not limited to:

1. Any vendor-identified field-replaceable units (FRUs).

2. Any infrastructure component that does not have FRUs that can cause a critical system failure if it were to fail. Examples could include base station antennas and other non-modular components.

3. Power supplies.

4. Test measurement, calibration and repair kits.

5. Diagnostic equipment to support County maintenance activities.

6. Spares for less-critical items.

Provider will maintain adequate stock and will provide for appropriate storage (as approved by the Contract Administrator) of the spares in the quantities identified in Schedule 4. Provider's Support and Maintenance Services may utilize these spares as necessary, provided that Provider shall maintain this level of spares at all times. Spares shall be included in any System update to keep them current.

H. Records and Reports

Provider will maintain records of its Support and Maintenance Services, which shall include at least the following:

a) Date, time, and name of contact for each Event;
b) Date and time of response by Provider;
c) Description of Event and analysis of error, defect, or other issue causing Event;
d) All steps and actions taken to resolve the Event;
e) Date and time of resolution and County representative notified of resolution; and
f) All equipment costs charged to County (if any) and labor hours associated with resolution.
g) Documentation indicating the cause of the service outage, the resolution and all post-repair testing procedures to ensure proper operation. In the event County-owned spares are used to complete the repair, the model and serial number of both the defective unit and the spare shall be noted in the documentation.
h) Provider's monthly compliance with the Required Response Times

Provider shall provide reports of the foregoing records for each month within fifteen (15) calendar days of the end of that month, unless otherwise requested by Contract Administrator. County shall not be obligated to pay Support and Maintenance Services fees for the applicable month unless and until Provider provides the required reports for that month.

I. Personnel

Provider agrees that its personnel shall be suitably trained in the operation, support and maintenance of the Software, Equipment and System. If in the reasonable opinion of County, the personnel provided are not acceptable, Provider agrees to provide suitable replacements.

Provider shall have the ability and shall maintain the ability throughout the life of the system to make available two (2) technicians for assignment to locations designated by the County in advance of hurricane events. The County shall provide not less than 48 hours advance notice in any and all such instances, and shall be responsible for providing reasonable food, sheltering, and other customary accommodations as necessary and appropriate throughout the duration of the assignment. Such assignment shall be made and personnel provided without the need for a Work Authorization; all personnel shall be charged to County at the daily rates set forth in Exhibit B, and invoiced monthly in arrears.

2. System Support and Maintenance Services

Provider shall provide County with Support and Maintenance Services so as to ensure and maintain optimal performance of the System consistent with the Statement of Work and the Documentation. The approach to maintenance of this System shall be one of preventive maintenance.

These Support and Maintenance Services support the entire P25 System, inclusive of all equipment, hardware, software, and services provided by Provider (including both Provider-manufactured as well as third-party-manufactured) under this Agreement, as well as the entirety of the Radio System and Microwave System; to the extent elected by County, Support and Maintenance Services includes support for each of the tower sites and shelters.

Support and Maintenance Services for the System shall include the following:

- Timely response and resolution of any errors, defects, malfunctions or other issues affecting the use or performance of the System (collectively, "Events") in keeping with the Required Response Times stated below;
- Providing and facilitating the installation of updates, upgrades and releases as they are made available to Provider's other clients; Any update, upgrades, releases, or other modifications to the Software shall be provided via electronic communication and for download via the Internet, if practicable.
- Notification of patches and updates affecting security, and applying, testing, and validating the appropriate patches and updates and/or workarounds on a test version of the application before distribution. Provider shall ensure that all system components are maintained with up-to-date anti-virus software and security patches.
- On-call availability via telephone 24 x 7 x 365 and via e-mail during normal business hours to receive and respond to inquiries or questions from County regarding use, operation, or functionality of the System; Support and Maintenance Services shall be provided via

telephone, electronic communication, on-site, or as otherwise appropriate to address the issue; To the extent necessary to resolve an Event or other support request, Provider shall provide support on-site at any office or location of a Broward County agency.

- Emergency availability via telephone and e-mail after hours to receive and respond to specific technical problems and questions relating to the operation or functionality of the System;
- Use of ongoing best efforts to maintain the optimal functioning of the Software, to correct programming and coding errors, and to provide solutions to known errors affecting the operation of the System;
- Routine notification to County as it becomes available of new or updated information pertaining to the System and the Documentation.
- Provide a toll-free telephone number answered by Motorola 24 hours a day, 7 days a week, 365 days a year (24 x 7 x 365), for service requests and warranty claims.
- Provide full disclosure regarding all activities performed within the maintenance period.
- For all equipment needing factory or depot repairs, a comprehensive tracking system shall be put in place by the Provider to track units to and from the factory/depot.
- Remote technical support available directly to County and the field service personnel provided by Provider or its subcontractor. Provider shall track and monitor all service requests from creation to close through an electronic case-tracking process, through which each request is assigned a case number.
- Continual monitoring of the County's System via a remote access system, including remote system monitoring to identify system alarms, remotely resolve issues, and dispatch the appropriate personnel to respond onsite.
- Continuously receive and respond to technical service requests from the County or Provider's maintenance personnel.
- Open a case for each Event and gather information from the County and the System to perform the following:
    i. Characterize the issue
    ii. Determine a plan of action
    iii. Assign and track the case to resolution
- To the extent not located on-site, provide component repair at Provider's facility for failed components. Replacement parts shall be shipped immediately upon confirmation of need or that the County's equipment has been shipped to the Provider.
- Retune of all RF components every 12 months, including base stations, and microwave radios. The 12-month retune shall restore components to the manufacturer's specifications.

A. System Monitoring.

System Monitoring is the heart of Motorola Solutions' central support operations. System Monitoring requires Remote Technical Support.

System Monitoring is a service designed to electronically monitor elements of a communication system for events, including but not limited to the Events set forth in the Monitored Elements Table below. When the SSC detects an Event, (based on the severity of the event) trained technologists acknowledge and remotely diagnose the event, and initiate an appropriate response in accordance with the customer handling procedure. Appropriate responses could include, but are not limited to, continuing to monitor the event for further development, attempting remote remediation via engagement of Technical Support resources, or initiating dispatch1 of a Field Servicer for onsite remediation.

Monitored Elements Table

Master Site Infrastructure	RF Site Equipment	Dispatch Site Equipment
Servers & Back up Servers	Channels	Consoles
MOSCAD (digital inputs & RS232 serial alarms)	MOSCAD (digital inputs & RS232 serial alarms)	AIS Servers
TRAK	RF Site Communication Path	Operator Position (OP)
Core LAN Switch	Switch	Motorola Gold Elite Gateway (MGEG)
Packet Data Gateway (PDG)	Site Controller	Call Processor
Radio Network Gateway (RNG)	Router	Logging Replay Station (only within the RNI)
Zone Database Server (ZDS)	Site	Ambassador (AMB)
Gateway Router	Gateway Router	Client Station
Controller – Zone & Domain	Network Time Protocol (NTP)	Voice Processing Module (VPM)
Firewall Manager Servers	Firewall	MCC 7500 IP Logging Recorders
Air Traffic Router (ATR)	SmartX Site Converter (only the converter, not the legacy sites)	MCC 7100 (only within the RNI)
Unified Event Manager (UEM)		
Zone Statistical Server (ZSS)		
Install Server		

The toll free call center, located at the SSC, will handle County's incoming service request and manage each case from inception to closure, keeping you informed every step of the way. Our Dispatch and Case Management team works hand-in-hand with our Technical Support Teams to continuously monitor case activity and ensure rapid resolution of system issues. Our diagnostic tools allow us to detect whether the alarm condition is a result of a P25 equipment malfunction or a status change within one of the system sites. This level of integration allows us to pinpoint the problem and quickly restore the system to normal operation.

The Dispatch operations Call Management Process tracks an event or service call through each milestone, verifying that service obligations are met and provides a database of maintenance, failure and restoration history that is reviewed to identify trends or repeated events.

Network Monitoring Service will ensure Broward County's network remains at optimum availability so it is ready to serve mission critical communications needs. By watching over the County's network continuously, Network Monitoring Service takes action whenever needed, and resolves network problems. We often intervene and correct the problem before you even know a problem exists. Network Monitoring Service provides improved productivity and enhanced network performance, which in turn helps to increase County's technology Return-On-Investment.

Using a combination of network monitoring software, automated alerts, and remote diagnostics inquiries, our System Support technologists will actively monitor the County's network to maximize network uptime and overall preparedness. Upon receiving an alert, our team will immediately perform a series of diagnostics to assess the problem. Often the situation can be resolved remotely, but when additional attention is required, local field technicians are dispatched immediately to County's site to achieve restoration.

Motorola Solutions' Network Monitoring service is a vital component of an intelligent communication support plan that keeps County's business operating smoothly, County's costs down, and assures maximum preparedness at all times.

Specifically, System Monitoring Service provides:

- Improved network availability.
- Remote and timely resolution to minimize downtime.
- Cost efficiencies.
- Optimize time at site due to assessment and knowledge transfer before dispatch.
- Minimize unnecessary trips to site.
- Mitigate need for 24x7 operations monitoring center.

Provider shall provide the following additional support services for the System, which includes all monitors and alarms in the Radio System, Microwave System, or anywhere in the P25 System.

a) At the request of the County, Provider shall provide root cause of an event, or specific sequence of events.

b) Provider shall provide, on a monthly basis, report of all NOC alarms, with associated NOC response time, an aggregate average response time of all events, an identification of all alarms where response time exceeds 15 minutes, a percent of total events where response time exceeded 15 minutes.

c) Provider shall provide, on a monthly basis, report of all SOC events, time of event, response time to event, event details, event resolution, and root cause of event.

d) Provider shall provide, on a monthly basis, report of all service incidents requiring onsite service, by severity, including time to complete dispatch (time from ticket creation to acceptance of dispatch by on site technician), time from ticket creation to site arrival, time from ticket creation to resolution, an aggregate average, by severity, of time from ticket creation to site arrival, number of events where site arrival exceeded defined SLA, percent of total events where time to site arrival exceeded SLA.

e) Provider shall provide, on a monthly basis, report of all board repair events, cycle time of each board repair event, aggregate average of cycle time for all board repair events, number of board repair events that exceed SLA, percent of total board repair events that exceed SLA.

B. Remote Technical Support.

All Support and Maintenance Services include full access to Motorola Solutions' System Support Center Technical Support Operation, which provides our technicians with centralized telephone support for issues that require a high level of communications system expertise. The Technical Support Operation is staffed with technical consultants who specialize in the diagnosis and resolution of system performance issues. Technical Support Operation has access to a fully equipped laboratory containing current Motorola Solutions system equipment, including the equipment being provided to the County. The laboratory is used to test with current hardware and software versions to simulate field issues and aid in their resolution. Technical Support Operation will coordinate and consult with our field technicians, vendors of ancillary equipment, and other support resources. In addition, Technical Support Operation escalates support issues to other Motorola Solutions engineering and manufacturing groups. Technical Support Operation provides a focal point for any systemic issue and project manages those issues to resolution.

Technical Support Operations
▪ Provides a single toll-free telephone number that answers 24 hours a day, seven days a week, 365 days a year, for service requests and warranty claims. ▪ Respond to requests for Technical Support for the restoration of failed Systems and diagnosis of operation problems. ▪ Advise caller of procedure for determining any additional requirements for issue characterization, restoration, including providing a known fix for issue resolution when available. ▪ Coordinate technical resolutions with agreed upon third party vendors as needed. ▪ Escalate and manage support issues, including Systemic issues, to Motorola Solutions engineering and product groups, as applicable. ▪ Provide configuration change support and work flow changes to Systems that have dial in or remote access capability. ▪ Determine when an Event requires more than the Technical Support services described here and notify County of an alternative course of action. ▪ Escalate issue to 3rd Party Technical Support Operations. ▪ Provide a monthly report to the County of all cases within the previous month, including the resolution and identification of systemic issues

Motorola Technical Support service provides an additional layer of support through centralized, telephone consultation for issues that require a high level of communications network expertise and troubleshooting capabilities. Technical Support is delivered by the SSC. The SSC is staffed with trained, skilled technologists specializing in the diagnosis and swift resolution of network performance issues. These technologists have access to a solutions database as well as in house test labs and development engineers. Technical Support cases are continuously monitored against stringent inbound call management and case management standards to ensure rapid and consistent issue resolution. Technical Support service translates into measurable, customer-specific metrics for assured network performance and system availability.

C. System Dispatch Service.

Motorola's Dispatch Service ensures that trained and qualified technicians are dispatched to diagnose and restore County's communications network. Upon notification of an Event, the Motorola Field Support Organization (FSO), located at Motorola's Southeast Headquarters of Product Innovation, at 8000 West Sunrise Boulevard in the city of Plantation, is contacted and a qualified technician is sent to County's site. An automated escalation and case management process is followed to ensure that technician site arrival and system restoration comply with contracted response and restore times. Once the issue has been resolved, the System Support Center (SSC) verifies resolution and with County's approval, closes the case. Activity records are also available to provide a comprehensive history of site performance, issues, and resolution.

Motorola Solutions will be the single point of contact for all service and support calls relating to the network. Motorola Solutions' Dispatch Operations is staffed with trained customer support

representatives that provide a central point of contact for all County's service requests. Motorola Solutions will provide a toll-free, 7-day-per-week, 24-hour-per-day (7 x 24) coordination point for all service requests. All requests are tracked and monitored from beginning to end through a call center operations case number. Automatic, time driven escalation to management of all open issues is an integral part of this process. Customer notification and escalation can also be accommodated. Dispatch Operations will receive all calls and dispatch or coordinate appropriate technical support. If on-site service is required, we will dispatch local service provider to the site and track the call to closure. Motorola Solutions will verify and advise the caller when that restoration is complete and verify that the System is functional. Response times are defined as having an on-site technician, a remote systems technologist, or a remote network specialist having taken assignment of the issue and actively pursuing resolution working on the system. If the response time is delinquent, the customer support representative will initiate escalation procedures to achieve timely resolution.

Dispatch and Case Management
▪ Coordination and tracking of case activity. ▪ Dispatch of field technical personnel. ▪ Notification and escalation of customer and management personnel. ▪ Final resolution and case closure. ▪ Monthly reporting of all cases opened with the previous month.

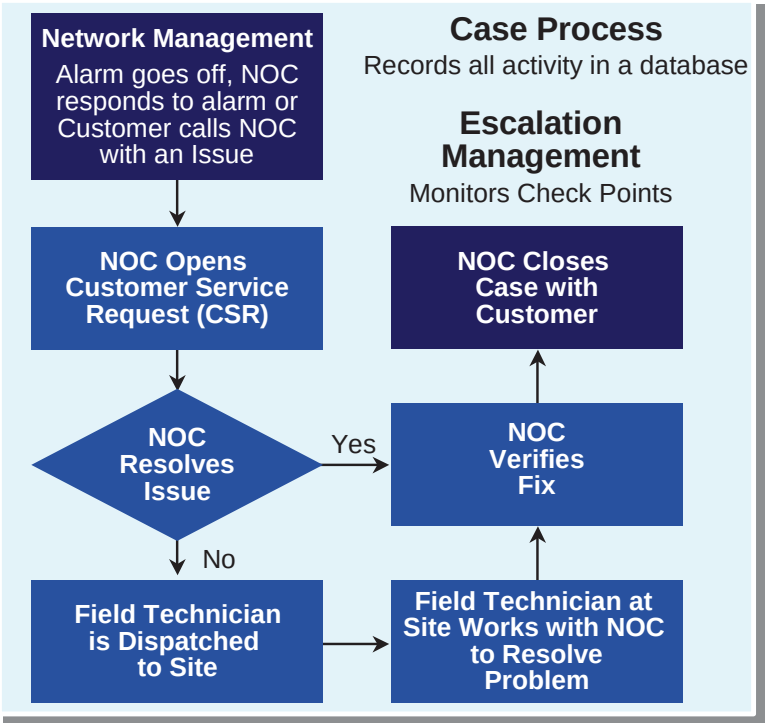


Figure 0-2: Case Tracking Process

3. Equipment Support and Maintenance Services

Provider shall provide both repair service and preventative maintenance to the extent necessary in order to ensure continuous optimal functioning of the Equipment for the duration of the time for which County elects to maintain Support and Maintenance Services for any period. Provider's support and maintenance obligations include on-site maintenance at any office or location of a Broward County agency, although to the extent reasonable and customary under the circumstances, Provider may provide services electronically.

For any level of Equipment support, if the Equipment cannot be repaired on-site, a replacement component shall be provided and installed by Provider, which replacement component must be of equal or better performance and compatible with County's existing systems. Provider will ensure that it maintains adequate stock levels to assure timely delivery of any components that may require maintenance or repair.

County may elect from one or more of the following levels of Equipment Support and Maintenance Services:

A. <u>Equipment Annual Preventive Maintenance.</u>

Routine maintenance provided by Provider shall include the periodic cleaning, adjusting, calibrating, system diagnostics, and fine tuning of the Equipment; replacement or repair of worn parts; prompt installation of any updates, upgrades, or releases of embedded software or firmware; and component replacement with equal or better equipment with the approval of the Contract Administrator when the component is approaching the end of its useful life. Provider shall perform routine maintenance on at least a monthly basis (or more frequently if appropriate as a result of equipment usage or standards set by the Equipment manufacturer). Provider shall contact the end user agency at least three (3) business days prior to arrival for the performance of routine maintenance.

Preventive maintenance is an important part of any maintenance program because it helps to detect potential problems before they develop. This proactive step reduces the possibility of failures, while helping to prolong the life and maximize the performance of the communications system. Preventive maintenance provides a scheduled operational test and alignment of the communications system equipment. The purpose of preventative maintenance testing is to ensure that all equipment meets original manufacturer specifications and to confirm that all critical subsystems in the network are fully operational. Preventative maintenance testing can help identify faulty base station and antenna equipment, prevent major site outages caused by intermittent or malfunctioning backhaul equipment and identify faulty components in the site power system. Network preventative maintenance testing will be performed annually on the LMR systems.

Preventative Maintenance Checks
▪ The approach to maintenance of this system shall be one of preventative maintenance. ▪ Physical inspection of sites and equipment ▪ Performance checks on LMR Master Sites, with restoration to original manufacturers specifications. ▪ Performance checks on all LMR Remote and Prime Sites, with restoration to original manufacturers specifications. ▪ Performance checks on Consoles, with restoration to original manufacturers specifications. ▪ Performance checks on the Network Management equipment, with restoration to original manufacturers specifications.

Motorola shall provide the services identified in the charts below for RF Sites and Dispatch Sites, as well as within the Preventive Maintenance Checklist (see chart below), at a minimum.

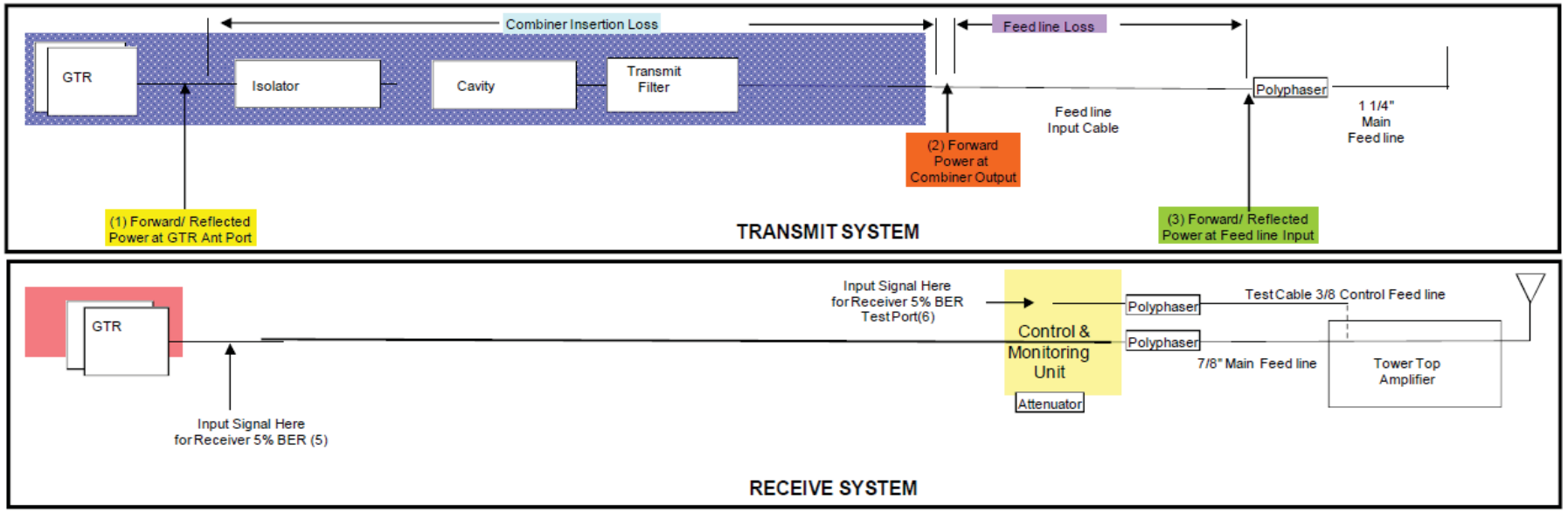
	Preventive Maintenance
RF Site	
Visual Inspection (Cabling, Equipment, Fans, Indicators)- Inspect stations/components for normal operation	x
Clean fans and equipment - Use antistatic vacuum to clean cooling pathways	x
Site frequency standard check- Check lights and indicators for A/B receivers if used.	x
Regulatory Compliance (License, ERP, Frequency, Deviation) - Check station for regulatory compliance. Update station logs	x
Effective Receiver Sensitivity (ERS) - Check effective receiver sensitivity and operation for each channel.	x
Line level validation (analog only) - Check inbound and outbound audio levels	x
Voice Call Check - Voice test each channel radio to radio and radio to console. If site uses Dynamic Dual Mode (DDM), then test both TDMA and FDMA operation."	x
Site control channel redundancy (Trunking) - Roll control channel, test, and roll back.	x
Full repeater optimization (tune repeater to manufacturer) -	x
Dispatch Site	
Visual Inspection (Cabling, Equipment, Fans, Indicators) Inspect and report discrepancies with pictures	x
Voice Call Check - Voice test each channel console to radio and radio to console. Voice test all dispatch resources	x
Check and Clean CPU, Displays, Fans, and Keyboards. Dust and vacuum workstation hardware & cabling	x
IP Network Settings - Verify IP address & settings against as built documents and report discrepancies	x
Test Motorola supplied Peripherals - Foot Switches, Headsets, Headset Jacks, Mics, and Speakers. Inspect and report discrepancies with pictures	x
Defragment Hard Drive, reboot CPU. Use standard Microsoft utilities & reboot CPU. Report any errors.	x
Perform Hard Drive back up.	x
Test Audio Input & Output Levels (Consolette & Centracom) ** Measure, verify from baseline, and document TX & RX line levels.	x

Master Site	
Visual Inspection (Cabling, Equipment, Fans, Indicators) - Verify Red LED's and/or other alarm indications	x
Server diagnostics - Perform recommended diagnostics based on server type.	x
Network Management Operational check - Review UEM events and transport medium types (microwave/leased Telco, etc.)	x
Verify Motorola and 3rd party Security Patches. Monthly/Quarterly dependant on 3rd party vendor. May be covered through a SOC/NOC/NMO service contract.	x
Roll to Redundant switches (pre-approved by customer) Test redundancy in CWR devices.	x
Roll to Redundant Zone Controller (pre-approved by customer) Test ZC1 to ZC2, back to ZC1	x
Complete backup of databases; SZ database (BAR), Centracom CDM database (legacy), etc.	x

	Standard Preventive Maintenance
Batteries (non-UPS)	
Visual Inspection (condition of cells/cabling) - Verify no corrosion, physical connections, dirt/dust etc.	x
UPS	
Visual inspection (condition, cabling)' Verify corrosion, physical connections, dirt/dust.	x
Generator	
Visual Inspection; Verify, check panel housing, cracks, rust and weathering. Physical connections, corrosion, dirt/dust, etc.	x
Verify operation (no switchover); Check, verify running of Generator, ease of start or difficult. Is generator "throttling" or running smooth. Any loud unusual noise? Etc.	x
Other maintenance (oil change, fuel filter); Check/adjust voltages, current and meter readings. Verify software version. Check and change all fluids, filters, belts, etc. Perform full operational checks and confirm proper operation of motor and sensors..	x

	Standard Preventive Maintenance
Facilities	
Visual Inspection - Confirm location coordinates and document any physical structure changes from previous as build documentation. Take digital pictures of site, date and archive.	x
Visual Security Verification (fences, site locks, access), Confirm and document security or access features (basic integrity and any changes).	x
Pest Control. Document and report any signs of pest intrusion.	x
Backhaul (Microwave, T1/E1, DSL, etc.)	
Visual Inspection (transmit/receive equipment, cabling). Ground level inspection only. Take Digital pictures of inspection and highlight problems or defects.	x
Check Receive Signal Levels. Check and compare to as built levels. Report any out of tolerance readings.	x
Tx Power output and Rx Sensitivity checks. Check and document. Perform alignment if required and report any adjustments made.	x
Tower	
Tower visual inspection (verify registration posted). Ground level inspection only. Check tower lighting controller. Check that antennas are plumb.	x
Grounding/Earthing	
Visual Inspection. Visually inspect and confirm tower, building, and equipment grounding and document any changes from as built. Document with digital pictures.	x
HVAC	
Visual and operational inspection. Visually inspect and confirm HVAC operation and controls are operational. Measure equipment area temperature. Document any problems with pictures.	x

Project: Sample Project
Site: Sample Site
Date: 1-Jan-16
Tester Name: Tech 1



Transmit System Measurements

Channel Number	Transmitter Frequency (MHz)	Transmit Power (Watts)	Combiner / Port Number	Transmit Frequency Error (1)	Mod Fidelity	Transmit BER (%) (1)	Forward Power Out in CSS (Watts) (1)	Reflected Power at CSS (Watts) (1)	Forward Power at GTR Combiner Connector (Watts) (1)	(2) Forward Power at Combiner Output (Watts)	Combiner Insertion Loss	(3) Forward Power at Feedline Input (Watts)	(3) Reflected Power at Feedline Input (Watts)	Feedline Input Loss	IP Subnet	IP Host
1	868.98750	100	1/1	-3	1.39	0.0	99.0	1.0	100.0	57.0	2.4	55.0	0.0	0.2	10.151.80	1
2	868.86250	100	2/1	-6	1.33	0.0	99.0	1.0	99.0	51.0	2.9	51.0	0.0	0.0	10.151.80	2
3	866.41250	100	3/1	-4	1.31	0.0	100.0	0.0	100.0	48.0	3.2	45.0	0.0	0.3	10.151.80	3
4	868.50000	100	1/2	-2	1.41	0.0	98.0	1.0	97.0	55.0	2.5	54.0	0.0	0.1	10.151.80	4
5	868.18750	100	2/2	-6	1.28	0.0	99.0	2.0	100.0	54.0	2.7	54.0	0.0	0.0	10.151.80	5
6	867.98750	100	3/2	-3	1.39	0.0	99.0	1.0	100.0	55.0	2.6	52.0	0.0	0.2	10.151.80	6
7	867.91250	100	1/3	-4	1.71	0.0	99.0	2.0	99.0	51.0	2.9	50.0	0.0	0.1	10.151.80	7
8	867.58750	100	2/3	-5	1.29	0.0	98.0	2.0	98.0	51.0	2.8	50.0	0.0	0.1	10.151.80	8
9	867.42500	100	1/4	-3	1.31	0.0	98.0	0.0	98.0	47.0	3.2	46.0	0.0	0.1	10.151.80	9
10	867.25000	100	2/4	-3	1.58	0.0	98.0	0.0	97.0	48.0	3.1	47.0	0.0	0.1	10.151.80	10
11	867.15000	100	3/4	-3	1.36	0.0	99.0	1.0	99.0	48.0	3.1	47.0	0.0	0.1	10.151.80	11
12	866.95000	100	1/5	-3	1.24	0.0	97.0	1.0	96.0	50.0	2.8	50.0	0.0	0.0	10.151.80	12
13	866.71250	100	2/5	-5	1.41	0.0	100.0	0.0	98.0	46.0	3.3	44.0	0.0	0.2	10.151.80	13
14	866.67500	100	1/6	-3	1.45	0.0	99.0	0.0	98.0	48.0	3.1	47.0	0.0	0.1	10.151.80	14
15	866.55000	100	2/6	-5	1.29	0.0	97.0	0.0	96.0	38.0	4.0	38.0	0.0	0.0	10.151.80	15
16	866.62500	100	3/5	-4	1.38	0.0	99.0	0.0	100.0	47.0	3.3	44.0	0.0	0.3	10.151.80	16
Example	*774.00000*	*100*	*1*	*17*	*3.25*	*0.0*	*97.0*	*1.0*	*81.0*	*28.0*	*4.6*	*23.0*	*0.0*	*5.5*		

Receive System Measurements						*Information Only*
Channel Number	Receiver Frequency (MHz)	Level of Injected Signal (5) for Rx Sensitivity of 5% BER (dBm)	CSS RX Level (dBm)	Level of Injected Signal for Rx Sensitivity of 5% BER Thru TTA (dBm) (6)	CSS RX Level (dBm)	Baseline Reading - CSS Rx Level w/No Signal Input (dBm)
Specification →		≤ -117.3dBm				
1	823.9875	-118.8	-118.84	-74.8	-112.22	
2	823.8625	-118.2	-118.71	-74.7	-111.81	
3	821.4125	-119.4	-119.08	-74.7	-112.51	
4	823.5000	-118.8	-118.75	-74.8	-111.97	
5	823.1875	-118.9	-119.00	-74.6	-110.82	
6	822.9875	-118.7	-118.67	-74.8	-111.2	
7	822.9125	-119.0	-118.60	-75.9	-109.41	
8	822.5875	-118.7	-118.54	-74.8	-109.45	
9	822.4250	-119.1	-118.7	-74.7	-111.92	
10	822.2500	-118.5	-118.92	-74.1	-112.25	
11	822.1500	-118.3	-118.96	-74.8	-112.6	
12	821.9500	-118.78	-118.41	-74.8	-111.8	
13	821.7125	-118.3	-118.43	-75	-109	
14	821.6750	-119.3	-118.3	-74.9	-110.76	
15	821.5500	-118.4	-118.29	-74.8	-112.21	
16	821.6250	-118.5	-118.62	-75	-111.8	
Example	*804.0000*	-119.4	-118	-68	-110	

Figure 0-3: Sample Preventive Maintenance Checklist for RF Site

Preventative Maintenance proactively detects issues that may result in system malfunctions and operational interruptions. Provider will provide network preventative maintenance including an operational test and alignment on County's infrastructure or fixed network equipment to ensure that it meets original manufacturer's specifications. Trained technicians perform the following services on the following schedule:

Service	Frequency
Physically inspect equipment	Monthly
Remove dust and foreign substances	Annually
Clean filters	Annually
Measure, record, align and adjust equipment to meet original manufacturer's specifications	Annually

B. Field Technical Support (On-Site Premier)

Motorola Solutions will provide technician availability provided by Motorola Solution' FSO, located in Broward County, 24 hours per day, and 7 days per week. The FSO system technicians are certified, trained and tested in the identical P25 Technology that is being provided to Broward County. County's call to Motorola Solutions sets in motion a problem-solving process

which ensures ownership is taken and the problem is resolved. That process includes getting expert local technicians on-site through our dispatch system, verifying that the situation is properly assessed, and working to get the system restored in the most efficient manner. Motorola Solutions provides you with local on-site system technicians who are trained, and who are ready and available to restore the network to optimal operating condition. Motorola Solutions ensures that the FSO team is properly supported through the availability of additional Motorola Solutions support and field system technologist resources.

When Motorola Solutions provides on-site infrastructure support, you gain access to an entire network of expertise, day or night, dedicated to the optimal operation of the system. Response may be either in person at the incident site or by remote access. Response to infrastructure equipment failure that affects end-users shall be within one hour from receipt of request for Technical Support and on-site the specified periods depending on the severity level of the event. We will provide continuous effort to achieve restoration for infrastructure equipment within the time periods identified within this contract. When on-site service is required, system technicians are dispatched to perform first echelon service, remove failed components for repair, and reinstall new or reconditioned components.

Repair service includes prompt response and resolution of any repair request within the applicable Response Time, which includes identifying the cause of malfunction or problem; provision of any applicable temporary solutions or workarounds until repair can be completed; permanent repair of the problem; correction, to the extent necessary, of any repercussions of the problem; and thorough inspection of the Equipment post-repair to ensure optimal functioning of the Equipment.

Motorola's Field Support Organization (FSO) is staffed with trained and qualified technicians to provide rapid response, repair, restoration, installations, removals, programming, and scheduled preventive maintenance tasks for site standards compliance and RF operability.

The Field Technicians' primary responsibility is to maintain the network's health and operations through database administration, running routine and emergency diagnostics, performing preventive maintenance, and maintaining network optimization.

The FSO organization will perform the following functions:

- Support Services for both Warranty and Post Warranty.
- Available 24x7 On-Call Support.
- On-Site Troubleshooting.
- Response and restoration times in accordance with this Agreement
- Preventative Maintenance.

Provider shall comply with the following fixed equipment mail-in board repair minimum response periods:

a. Normal response – seven days
b. Emergency response – next day

C. Equipment Parts Replacement (Advanced Replacement) and Infrastructure Repair.

This provides replacement stock availability via emergency request with expedited delivery within twenty-four (24) hours of an equipment failure. All repair management is handled through a central depot eliminating the need to send equipment to multiple locations. State-of-the-art repair tools enable Motorola Solutions technicians to troubleshoot, analyze, test, and repair equipment quickly and effectively. Infrastructure Board Repair with Advanced Replacement Service allows for unlimited repairs on all infrastructure equipment.

Advanced Replacement service supplements the spares inventory with Motorola Solutions' centralized inventory of critical equipment. Upon receipt of the malfunctioning unit, Motorola Solutions repairs the unit and replaces it in the centralized inventory. With this service, the new board becomes the property of County and the original malfunctioning board is not returned to County. The board will be repaired and tested thoroughly before being returned to the centralized inventory. In the event a County spare is utilized to replace a failed component, Motorola shall repair the faulty component and replace it within the spare inventory.

Hardware Maintenance Plan
▪ Provide for repair of faulty components at no additional charge. ▪ Advance board replacement within 24 Hours. ▪ Replacement parts shall be equal or better in quality and ratings to the original parts. ▪ Remove failed device and replace with spare unit. ▪ Ship Infrastructure Equipment to/from repair facility. ▪ Perform operational check on infrastructure equipment. ▪ Repair or replace infrastructure equipment. ▪ Verify Infrastructure equipment is operating to manufacturer specifications. ▪ Perform system test on all select manufacturer equipment. ▪ Package and ship repaired infrastructure to Customer location. ▪ Provide monthly report of all hardware serviced under this service.

Motorola has the following responsibilities:

- Enable customer access to the Motorola call center which is operational 24 hours a day, 7 days per week, to create requests for advanced replacement service.
- Use commercially reasonable efforts to maintain FRU inventory on supported platforms.
- Provide new or reconditioned FRU's to the customer, upon request and subject to availability. The FRU will be of similar equipment and version, and will contain equivalent boards and chips, as the customer's malfunctioning FRU.
- Load firmware/software for equipment that requires programming. The software version information must be provided for the replacement FRU to be programmed accordingly. If the customer software version/configuration is not provided, shipping times will be delayed.
- Package and ship Advance Exchange FRU from the FRU inventory to customer specified address.

    - During normal operating hours of Monday through Friday 7:00am to 7:00pm CST, excluding holidays, FRU will be shipped from Motorola as soon as possible dependent upon stock availability and configuration requested. Motorola will pay for the shipping to the customer, unless customer requests shipments outside of standard business hours and/or carrier programs, such as weekend or next flight out (NFO) shipment. In such cases, customer will be responsible for shipping and handling charges.
    - When sending the advanced replacement FRU to customer, provide a return air bill in order for customer to return the customer's malfunctioning FRU. The customer's malfunctioning FRU will become property of the Motorola repair depot or select third party and the customer will own the advanced replacement FRU.
    - When sending a loaner FRU to customer, Motorola will pay the inbound freight charges if the Customer uses the Motorola designated delivery service (Federal Express). Motorola will pay the outbound freight charges (return to Customer).
- Provide repair return authorization number upon customer request for Infrastructure that is not classified as an advanced replacement or loaner FRU.
- Provide a repair Return Authorization (RA) number so that the returned FRU can be repaired and returned to FRU stock.
- Receive malfunctioning FRU from Customer, carry out repairs and testing and return it to the FRU stock
- Receive malfunctioning infrastructure from customer and document its arrival, repair and return.
- Perform the following service on Motorola infrastructure:
    - Perform an operational check on the infrastructure to determine the nature of the problem.
    - Replace malfunctioning Field Replacement Units (FRU) or components.
    - Verify that Motorola infrastructure is returned to Motorola manufactured specifications, as applicable
    - Perform a box unit test on all serviced infrastructure.
    - Perform a system test on select infrastructure.
- Provide the following service on select third party infrastructure:
    - Perform pre-diagnostic and repair services to confirm infrastructure malfunction and eliminate sending infrastructure with no trouble found (NTF) to third party vendor for repair, when applicable.
    - Ship malfunctioning infrastructure components to the original equipment manufacturer or third party vendor for repair service, when applicable.
    - Track infrastructure sent to the original equipment manufacturer or third party vendor for service.
    - Perform a post-test after repair by Motorola, to confirm malfunctioning infrastructure has been repaired and functions properly in a Motorola system configuration, when applicable.

- For loaner equipment, Motorola will ship repaired infrastructure to the customer specified address during regular business hours. FRU will be sent two-day air unless otherwise requested. Motorola will pay for such shipping, unless customer requests shipments outside of the regular business hours and/or carrier programs, such as NFO (next flight out). In such cases, customer will be responsible for payment of shipping and handling charges unless otherwise agreed by the parties' representatives.

4. Microwave System Support and Maintenance Services.

Motorola shall provide Support and Maintenance for the Microwave System, including warranty and maintenance services, in accordance with the same scope and standard as the Radio System.

The maintenance services will include but shall not be limited to the following services (applied to the Microwave System, but as otherwise defined in the preceding sections of this Exhibit C):

1. System Monitoring
2. System Dispatch Service
3. Field Technical Support
4. Remote Technical Support
5. Equipment Annual Preventative Maintenance
6. Equipment Parts Replacement (Advanced Replacement) and Infrastructure Repair
7. System and Software Upgrades (inclusive of Security Update Service)

5. Logging Recorder Maintenance Services.

At no additional cost to County, Provider shall provide all support and maintenance for the Motorola-side of any and all interfaces to the logging recorder.

6. DC Power System Support and Maintenance Services.

Support and Maintenance Services for the DC power systems located at each site will include regularly scheduled inspections by a qualified service provider. Support and Maintenance Services will include:

1. Review Customer battery maintenance logs and make entries into customer logs.
2. Perform Quarterly Safety Checks to include checking for proper:

- Warning/hazard labels.
- Operational information
- Placards and labels for operation as necessary.

3. Provide inspection report with recommendations to Customer for any additional maintenance.

4. Quarterly Service Visits will provide for the following:

- Measure and record every cell terminal voltage and resistance.
- Measure and record overall system voltage.
- Measure and record ambient room temperature.
- Measure and record cell temperatures.
- Measure and record overall AC ripple voltage.
- Measure and record AC ripple current.
- Measure and record impedance or resistance of each cell.
- Check jar/case and/or cover for signs of leakage.
- Check for corrosion on terminal post or connector.
- Check for general appearance and cleanliness of battery room.
- Measure and record impedance or resistance of each inter-cell connection.
- Re-torque all battery terminal and jumper connections, as needed, if accessible.
- Clean and neutralize jar/case and/ or cover of each cell/unit as needed
- Replacement of batteries at no additional cost to the County in accordance with manufacturer recommended guidelines or sooner, if needed. Motorola will be responsible for recovering any funds from the battery manufacturer for batteries that fail within the warranty period.

7. PremierOne Automatic Responder location (ARL) Integration Maintenance

The first year following Final Acceptance is covered under warranty. Thereafter, Support and Maintenance for Year 2 starts the maintenance which includes:

- Software updates and bug fixes for the covered software
- Radio Integration Interface Maintenance
- 24 X 7 Support in accordance with the County's existing maintenance & support agreement

8. Warranty Services

A. System and Subsystem Warranty

From Cutover through the end of the applicable System warranty period, Motorola Solutions will provide County with Support and Maintenance Services as described above at no additional cost. In addition, Motorola will provide a warranty for the System, as well as a suite of system support services designed to maximize the network's uptime.

The System Warranty start date will be upon System Final Acceptance. The warranty for each subsystem (Radio System, Microwave System, Civil and Infrastructure System) shall commence upon Cutover or Go-Live, whichever is earlier, and continue until conclusion of the System Warranty. During the warranty period, Motorola Solutions will repair *without charge* to the County, any new unit or component of the System that becomes defective through normal use or that fails because of defective materials or workmanship.

Motorola Solutions Warranty and Support and Maintenance Services Responsibilities include:

- Warranty includes all components of the System.
- Responsibility to ensure performance and compliance for all subcontractor warranties sold with equipment.
- Provide repair or replacement of any failed equipment/components.
- Provide a Customer Support Manager (CSM).
- Provide Software enhancement, updates, and releases.
- Provide access to Motorola Solutions On-Line for repairs and notifications.
- Provide for all shipping costs associated with repairs.
- Provide replacement spares (when not available on-site per the spare inventory) with expedited delivery (next business day).
- Provide On-Site fixed network equipment support within two hours of notification.
- Utilize local and regionally located Motorola Solutions factory-authorized service facilities and resources to support the countywide P25 system.
- Provide technical support on a 24/7/365 basis.
- Provide Motorola Solutions SSC Help Desk and Dispatch services and act as the primary contact for maintenance and technical issues.

Table 0-1: Warranty and Maintenance Description of Services

Description	Warranty Package	Support and Maintenance Services
Motorola Systems Support Center (24x7x365)	√	√
Dispatch Service and Case Management (24x7x365)	√	√
Servicer Two Hour On-Site Response (24x7x365) Critical	√	√
Servicer Four Hour Restoral Response (24x7x365) Critical	√	√

Description	Warranty Package	Support and Maintenance Services
Infrastructure Board Repair with Advanced Replacement	√	√
Preventive Maintenance (Bi-Annual, Annual, or Biennial, to the extent set forth herein; if not otherwise stated, Annual)	√	√
Network Monitoring	√	√
Security Update Service (SUS)	√	√
Technical Support (24x7x365)	√	√
Customer Support Manager	√	√
Customer Support Plan	√	√
Motorola On-Line	√	√
Disaster Recovery Plan	√	√
System Lifecycle Support	√	√

B. <u>Civil and Infrastructure Warranty Services.</u>

During the period for the applicable equipment is under warranty with Motorola (including as set forth in Section 6.2 of the Agreement), Motorola shall be responsible for maintaining all of the County's civil and infrastructure components, including but not limited to radio towers, equipment shelters, generators, compounds, and fencing. The warranty services will include, without limitation, the following services:

1. Replacement of tower lighting as required
2. Servicing generators a minimum of once a year
3. Servicing HVAC systems a minimum of once a year
4. Testing site grounding systems once a year and providing remediation as needed
5. Inspecting radio towers for corrosion or loose bolts once a year
6. Managing regular testing of site generators, transfer switches, and DC power systems and providing service where necessary
7. Physically inspecting radio shelters for signs of damage or leaks and providing the appropriate remediation as-needed
8. Repair or replacement of any parts or equipment under warranty

9. Required Response Times.

Upon notice by County of an Event, Provider shall provide a response and resolve the Event consistent with the following priority, response and resolution levels. For purposes of the Required Response Times, "response" means the arrival of an appropriate service technician or other Provider representative on-site at the applicable County location (unless the Provider reasonably determines that the Event can be fully resolved remotely, in which case "response" can be met by an appropriate service technician connected remotely via telephone or computer to the County). For purposes of the Required Response Times, "resolution" means the Event is fully resolved including determination and remediation of root cause. Time calculation for both Response Time and Resolution Time commences upon occurrence for any monitored component of the System or upon notification of the Event by the County, whichever occurs first.

Priority Description	Definition	Response Time	Resolution Time
Severity 1 - Critical	Event that renders the System and/or interfaces inoperable or allows unauthorized access. Examples include but are not limited to: • Major system failure • One or more RF sites offline • 25% or more of the system talk paths offline • Failure of any console operator position • Loss of ISSI or any interoperability interface	1 hour	Work until corrected (including during non-business hours); resolution must be achieved within 4 hours
Severity 2 - Severe	Event that results in a significant impairment of performance of the System or impairs essential operations or allows unauthorized access. Examples include but are not limited to: • Significant system impairment • 10 % or more of the system talk paths offline • The loss of a logging recorder interface	2 hours during normal business hours; or within 1 hour of beginning of next business day if outside of normal business hours	Work until corrected during normal business hours; resolution must be achieved within 8 business hours
Severity 3 - Minor	Event that has minor impact to County's business and that does not impact normal operation of the System. Examples include but are not limited to:	2 hours during normal business hours; or next	Within 30 days unless otherwise approved by

	• Parts questions • Upgrades • Intermittent problems • Operational and informational questions • Configuration change support and workflow procedure questions	business day if outside of normal business hours	Contract Administrator

Notwithstanding the above-stated schedule, Provider shall use its continuing best efforts to correct the Event as expeditiously as it can. The Priority Description for each error or issue shall be reasonably determined by the Contract Administrator.

C. Failure to Meet Required Response Times.

If Provider fails to meet the Required Response Times, County may offset against any sums due Provider $237 for each hour that Provider's response time exceeds the Required Response Time, which the parties agree is a fair and reasonable approximation of County's negative financial impact caused by the delay in Provider's response. Any credits due to County under this provision shall not exceed $2,000 per event due to a delay in response times.

D. DownTime Maintenance Credit.

If a Severity 1 - Critical or Severity 2 – Severe is not resolved or reduced to a Severity 3 - Minor priority level within the required resolution times stated above, Provider will refund to County three percent (3%) of the total monthly fee (or monthly pro rata equivalent, if the fee is other than monthly) for the then-current contracted Support and Maintenance Services. Such refunds will be credited against future sums due to Provider in the next invoice unless otherwise elected by County. This refund shall be in addition to any other remedy that is available in the event of a breach of the Agreement. Any credits due to County under this provision for any given month shall not exceed 15% of the otherwise due total monthly fee. To the extent an Event is not resolved or reduced in accordance with this provision due to third party causes outside the reasonable control of Provider or other good cause, the County Contract Administrator may waive the credits otherwise due under this provision.

Exhibit D
Insurance Requirement

The following coverage is deemed the minimum insurance required for this project. The selected firm must be prepared to provide proof of insurance commensurate with or in excess of this requirement. Any deviation is subject to the approval of Risk Management.

TYPE OF INSURANCE	MINIMUM LIABILITY LIMITS		
		Each Occurrence	Aggregate
COMMERCIAL GENERAL LIABILITY **Broad form or equivalent** *With no exclusions or limitations for:* [x] Premises–Operations [ ] Explosion, Collapse, Underground Hazards [x] Products/Completed Operations Hazard [x] Contractual Insurance [x] Independent Contractors [x] Personal Injury [ ] Other:	Bodily Injury		
	Property Damage		
	Combined single limit Bodily Injury & Property Damage	**$ 3 mil**	**$ 10 mil**
	Personal Injury		
BUSINESS AUTO LIABILITY **COMPREHENSIVE FORM** [x] Owned [x] Hired [x] Non-owned [x] Scheduled [x] Any Auto	Bodily Injury (each person)		
	Bodily Injury (each accident)		
	Property Damage		
	Combined single limit Bodily Injury & Property Damage	**$ 1 mil**	
EXCESS/UMBRELLA LIABILITY *May be used to supplement minimum liability coverage requirements.*	Follow form basis or Add'l insd endorsement is required		
[x] **WORKERS' COMPENSATION**	Chapter 440 FS	**STATUTORY**	U.S. Longshoremen & Harbor Workers' Act & Jones Act is required for any activities on or about navigable water
[x] **EMPLOYERS' LIABILITY**	(each accident)	**$ 1 mil**	
[X] **PROFESSIONAL LIABILITY ~ E&O*** ***Also applies to engineering subcontractors**	(each accident)	**$ 5 mil**	**$ 10 mil**
	Extended reporting period	**4 years**	
[X] **CYBER LIABILITY**	(each claim)	**$ 1 mil**	**$ 5 mil**
	Notified individuals aggregate	**$ 2 mil**	
[ ] Installation floater Coverage must be "All Risk", completed value. Coverage must remain in force until written final acceptance by County.	Maximum Deductible: CONTRACTOR IS RESPONSIBLE FOR DEDUCTIBLE	$10 k	**Completed Value form**

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES

BROWARD COUNTY AND BROWARD SHERIFF'S OFFICE ARE LISTED AS ADDITIONAL INSUREDS ON THE GENERAL LIABILITY POLICY AND AUTOMOBILE LIABILITY POLICY

REFERENCE: P25

CERTIFICATE HOLDER:

Broward County
Attn: Jose De Zayas- OCT
115 S Andrews Av, #325
Ft Lauderdale, FL 33301

JACQUELINE BINNS
dc=cty, dc=broward, dc=bc, ou=Organization, ou=BCC, ou=RM, ou=Users, cn=JACQUELINE BINNS
2016.01.20 15:37:41 -05'00'

Risk Management Division

Revised 2015

Exhibit E – Work Authorization Form

Contract: _____

Work Authorization No. _____ _____

Award Authority for Optional Services

This Work Authorization is between Broward County and _____ as required pursuant to the Agreement, executed on _____. In the event of any inconsistency between this Work Authorization and the Agreement, the provisions of the Agreement shall govern and control.

Services to be provided: [DESCRIBE IN DETAIL]

Contract at issue is __ Lump Sum/ __Not-to-Exceed for amount: $_____

The time period for this Work Authorization will consist of ____ (___) calendar days unless otherwise set forth in an attached quotation.

Fee Determination: Payment for services under this Work Authorization is as follows:

Professional Services	$_____
General Services	$_____
Equipment/Hardware	$_____
Travel/Reimbursables (not to exceed)	$_____
Total Maximum Cost of this Work Authorization	$_____

County

Project Manager	Date	Contract Administrator	Date
		Board and/or Designee	Date

VENDOR

Attest:

_____

Signed: _____

Typed Name: _____

Title: _____

Exhibit F – Additional Terms and Conditions for Project

Provider and its Subcontractor shall comply the following additional terms and conditions for all Services relating to the Project. All references to the DB-Firm herein shall be deemed to apply to both the Provider and the DB-Firm, although Provider may meet the requirements through the Services provided by the DB-Firm.

1. Superintendence and Supervision; Personnel; Labor and Materials. The orders of County are to be given through Contract Administrator, which instructions are to be strictly and promptly followed in every case. Provider shall keep on the Project during its progress, a full-time competent English speaking superintendent and any necessary assistants, all satisfactory to Contract Administrator. The superintendent shall not be changed except with the written consent of Contract Administrator, unless the superintendent proves to be unsatisfactory to Provider and ceases to be in its employ. The superintendent shall represent Provider and all directions given to the superintendent shall be as binding as if given to DB-Firm and will be confirmed in writing by Contract Administrator upon the written request of DB-Firm. DB-Firm shall give efficient supervision to the Work, using its best skill and attention.

Daily, DB-Firm's superintendent shall record, at a minimum, the following information in a bound log: the day; date; weather conditions and how any weather condition affected progress of the Work; time of commencement of Work for the day; the work being performed; materials, labor, personnel, equipment and subcontractors at the Project site; visitors to the Project site, including representatives of County, and regulatory representatives; any event that caused or contributed a delay to the critical path of the Project, any special or unusual conditions or occurrences encountered; and the time of termination of Work for the day. All information shall be recorded in the daily log in ink. The daily log shall be kept on the Project site and shall be available at all times for inspection and copying by County.

The Contract Administrator and DB-Firm shall meet at least every two (2) weeks or as determined by the Contract Administrator, during the course of the Work to review and agree upon the Work performed to date and to establish the controlling items of Work for the next two (2) weeks. The Contract Administrator shall publish, keep, and distribute minutes and any comments thereto of each such meeting.

If DB-Firm, in the course of prosecuting the Work, finds any discrepancy between the Contract Documents and the physical conditions of the locality, or any errors, omissions, or discrepancies in the Contract Documents, it shall be DB-Firm's duty to immediately inform Contract Administrator, in writing, and Contract Administrator will promptly review the same. Any Work done after such discovery, until authorized, will be done at DB-Firm's sole risk.

DB-Firm shall supervise and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. DB-Firm shall be responsible for the design and the means, methods, techniques, sequences, and procedures of construction.

DB-Firm will provide the key staff identified in their proposal for Project as long as said key staff are in DB-Firm's employment. DB-Firm will obtain prior written approval of the Contract Administrator to change key staff. DB-Firm shall provide Contract Administrator with such information as necessary to determine the suitability of proposed new key staff. Contract Administrator will be reasonable in evaluating key staff qualifications. If Contract Administrator desires to request removal of any of DB-Firm's staff, Contract Administrator shall first meet with DB-Firm and provide reasonable justification for said removal.

Unless otherwise provided herein, DB-Firm shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation and other facilities and services necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

DB-Firm shall at all times enforce strict discipline and good order among its employees and subcontractors at the Project site and shall not employ on the Project any unfit person or anyone not skilled in the Work to which they are assigned.

2. Weather. Extensions to the Design Build Time for delays caused by the effects of inclement weather shall be submitted as a request for a change in the Design Build Time pursuant to the Agreement. These time extensions are justified only when rains or other inclement weather conditions or related adverse soil conditions result in DB-Firm being unable to work at least fifty percent (50%) of the normal workday on controlling items of work identified on the accepted schedule or updates due to adverse weather conditions.

3. Hurricane Precautions. During such periods of time as are designated by the National Weather Service as being a hurricane watch or warning, DB-Firm, at no cost to the County, shall take all precautions necessary to secure the Project site(s) in response to all threatened storm events, regardless of whether the County has given notice of same.

Compliance with any specific hurricane watch or warning precautions will not constitute additional work.

Suspension of the Work caused by a threatened or actual storm event, regardless of whether the County has directed such suspension, will entitle DB-Firm to additional Design Build Time as noncompensable, excusable delay, and shall not give rise to a claim for compensable delay.

4. Rights of Various Interests. Whenever work being done by County's forces or by other contractors is contiguous to or within the limits of Work covered by this Contract, the respective rights of the various interests involved shall be established by the Contract Administrator to secure the completion of the various portions of the Work in general harmony.

5. Explosives. When the use of explosives is necessary in the prosecution of the Work, DB-Firm shall exercise the utmost care in handling and usage of such explosives to the protection of

life and property. All explosives shall be stored in a safe manner and storage places shall be clearly marked "Dangerous-Explosives" and placed in the care of competent watchmen. When such use of explosives becomes necessary, DB-Firm shall furnish to County proof of coverage, adequately providing public liability and property damage insurance as a rider attached to its regular policies, unless otherwise included.

6. DB-Firm's Responsibility for Damages and Accidents. DB-Firm shall accept full responsibility for the Work against all loss or damage of whatsoever nature sustained until final acceptance by County, and shall promptly repair any damage done from any cause whatsoever.

DB-Firm shall be responsible for all materials, equipment and supplies pertaining to the Project. In the event any such materials, equipment and supplies are lost, stolen, damaged or destroyed prior to final acceptance by County, DB-Firm shall replace same without cost to County.

7. Location and Damage to Existing Facilities, Equipment, or Utilities. It shall be the DB-Firm's responsibility to identify and locate all underground and overhead utility lines or equipment affecting or affected by the Project. No additional payment will be made to the DB-Firm because of discrepancies in actual and plan location of utilities, and additional costs suffered as a result thereof.

DB-Firm shall notify each utility company involved at least sixty (60) days prior to the start of construction to arrange for positive underground location, relocation or support of its utility where that utility may be in conflict with or endangered by the proposed construction. Relocation of water mains or other utilities for the convenience of DB-Firm shall be paid by DB-Firm. All charges by utility companies for temporary support of its utilities shall be paid for by DB-Firm. All costs of permanent utility relocation to avoid conflict shall be the responsibility of the utility company involved. No additional payment will be made to DB-Firm for utility relocations, whether or not said relocation is necessary to avoid conflict with other lines.

DB-Firm shall schedule the Work in such a manner that the Work is not delayed by the utility providers relocating or supporting their utilities. DB-Firm shall coordinate its activities with any and all public and private utility providers occupying the right-of-way. No compensation will be paid to DB-Firm for any loss of time or delay.

All overhead, surface or underground structures and utilities encountered are to be carefully protected from injury or displacement. All damage to such structures is to be completely repaired within a reasonable time; needless delay will not be tolerated. The County reserves the right to remedy such damage by ordering outside parties to make such repairs at the expense of DB-Firm. All such repairs made by DB-Firm are to be made to the satisfaction of the utility owner. All damaged utilities must be replaced or fully repaired. All repairs are to be inspected by the utility owner prior to backfilling.

8. No Interest. Any monies not paid by County when claimed to be due to DB-Firm under this Contract, including, but not limited to, any and all claims for contract damages of any type,

shall not be subject to interest, including but not limited to prejudgment interest. However, the provisions of County's prompt payment ordinance, as such relates to timeliness of payment, and the provisions of Section 218.74(4), Florida Statutes, as such relates to the payment of interest, shall apply to valid and proper invoices.

9. Field Layout Of The Work And Record Drawings. The entire responsibility for establishing and maintaining line and grade in the field lies with DB-Firm. DB-Firm shall maintain an accurate and precise record of the location and elevation of all pipe lines, conduits, structures, maintenance access structures, handholes, fittings and the like and shall prepare record or "as-built" drawings of the same which are sealed by a Professional Surveyor. DB-Firm shall deliver these records in good order to Contract Administrator as the Work is completed. The cost of all such field layout and recording work is included in the Design Build Price. All record drawings shall be prepared in accordance with Exhibit A and shall be delivered to Contract Administrator prior to, and as a condition of, final inspection and payment.

DB-Firm shall maintain in a safe place at the Project site one record copy of all Drawings, Plans, Specifications, Addenda, written amendments, Change Orders, Field Orders and written interpretations and clarifications in good order and annotated to show all changes made during construction. These record documents together with all approved samples and a counterpart of all approved Shop Drawings shall be available at all times to the Contract Administrator for reference. Upon Final Completion of the Project and prior to Final Payment, these record documents, samples and Shop Drawings shall be delivered to the Contract Administrator.

Prior to and as a condition precedent to Final Payment, DB-Firm shall submit to County DB-Firm's record drawings or as-built drawings acceptable to Contract Administrator.

10. Safety and Protection. DB-Firm shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Project. DB-Firm shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

- All employees on the work site and other persons who may be affected thereby;

- All the Work and all materials or equipment to be incorporated therein, whether in storage on or off the Project site(s); and

- Other property at the Project site(s) or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

DB-Firm shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. DB-Firm shall notify owners of adjacent property and utilities when prosecution of

the Work may affect them. All damage, injury or loss to any property referred to in Sections 20.30.1.2 and 20.30.1.3 above, caused directly or indirectly, in whole or in part, by DB-Firm, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, shall be remedied by DB-Firm. DB-Firm's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed and Contract Administrator has issued a notice to DB-Firm that the Work is acceptable.

DB-Firm shall designate a responsible member of its organization at the Work site whose duty shall be the prevention of accidents. This person shall be DB-Firm's superintendent unless otherwise designated in writing by DB-Firm to County.

11. Cleaning Up; County's Right to Clean Up. DB-Firm shall at all times keep the premises free from accumulation of waste materials or rubbish caused by its operations. At the completion of the Project, DB-Firm shall remove all its waste materials and rubbish from and about the Project site(s) as well as its tools, construction equipment, machinery and surplus materials. If DB-Firm fails to clean up during the prosecution of the Work or at the completion of the Work, County may do so and the cost thereof shall be charged to DB-Firm. If a dispute arises between DB-Firm and separate contractors as to their responsibility for cleaning up, County may clean up and charge the cost thereof to the contractors responsible therefore as Contract Administrator shall determine to be just.

12. Taxes. Provider shall pay all applicable sales, consumer, use, and other taxes required by law. Provider is responsible for reviewing the pertinent state statutes involving state taxes and complying with all requirements. All such taxes that are required as of the time of this Agreement's execution shall be included in the Design Build Price.

13. Prevailing Wage Rate Ordinance - This Project is not federally funded. If the Contract is in excess of Two Hundred Fifty Thousand Dollars ($250,000.00), the following sections shall apply.

13.1. The rate of wages and fringe benefit payments for all laborers, mechanics, and apprentices shall not be less than those payments for similar skills in classifications of work in a like construction industry as determined by the Secretary of Labor and as published in the Federal Register (latest revision is attached hereto).

13.2. All mechanics, laborers, and apprentices, employed or working directly upon the site of the Work shall be paid in accordance with the above referenced wage rates. DB-Firm shall post notice of these provisions at the site of the Work in a prominent place where it can be easily seen by the workers.

13.3. If the parties cannot agree on the proper classification of a particular class of laborers or mechanics or apprentices to be used, the Contract Administrator shall submit the question, together with its recommendation, to the County Administrator for final determination.

13.4. In the event it is found by the Contract Administrator that any laborer or mechanic or apprentice employed by DB-Firm, or any subcontractor directly on the site of the Work has been or is being paid at a rate of wages less than the rate of wages required by the ordinance, the Contract Administrator may (1) by written notice to DB-Firm terminate its right to proceed with the Work or such part of Work for which there has been a failure to pay said required wages; and (2) prosecute the Work or portion thereof to completion by contract or otherwise. Whereupon, DB-Firm and its sureties shall be liable to County for any excess costs occasioned to County thereby.

13.5. Sections 13.1 through 13.4 above shall apply to this Contract to the extent that it is (1) a prime contract subject to the ordinance; or (2) a Subcontract also subject to the ordinance under such prime Contract.

13.6. DB-Firm shall maintain payrolls and basic records relating thereto during the course of the Work and shall preserve such for a period of three (3) years thereafter for all laborers, mechanics, and apprentices working at the site of the Work. Such records shall contain the name and address of each such employee; its current classification; rate of pay (including rates of contributions for, or costs assumed to provide, fringe benefits); daily and weekly number of hours worked; deductions made; and actual wages paid.

13.7. DB-Firm shall submit, with each requisition for payment, a signed and sworn "Statement of Compliance" (007500-8) attesting to compliance with the Prevailing Wage Ordinance, Section 26-5 of the Broward County of Ordinances, as amended.

13.8. The Contract Administrator may withhold or cause to be withheld from DB-Firm so much of the payments requisitioned as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and guards employed by DB-Firm or any Subcontractor on the work, the full amount of wages required by the Contract.

13.9. If DB-Firm or any Subcontractor fails to pay any laborer, mechanic, or apprentice employed or working on the site of the Work all or part of the wages required by the Contract, the Contract Administrator may, after written notice to DB-Firm, take such action as may be necessary to cause suspension of any further payments or advances until such violations have ceased.

14. Inspection of Work and Testing. Contract Administrator and County Consultant shall at all times have access to the Work and Services, and Provider shall provide proper facilities for such access and for inspecting, measuring, and testing. All testing on this Project shall be in conformance with all applicable Florida and federal regulations and specifications, including as stated in the RFP. The cost of all quality control sampling and testing shall be borne by Provider. All verification sampling and testing costs shall be borne by County and verification testing shall

be performed by a testing firm chosen by County. The cost of any required resolution testing which Provider fails shall be paid for by Provider.

Reexamination of any of the Work may be ordered by the Contract Administrator, and if so ordered, the Work must be uncovered by Provider or DB-Firm. If such Work is found to be in accordance with the Design Build Contract Documents, County shall pay the cost of reexamination and replacement by means of a Change Order. If such Work is not in accordance with the Design Build Contract Documents, Provider shall pay such cost.

Inspectors shall have no authority to permit deviations from, nor to relax any of the provisions of, the Design Build Contract Documents, or to delay the Project by failure to inspect the materials and work with reasonable promptness, without the written permission or instruction of the Contract Administrator. The payment of any compensation, whatever may be its character or form, or the giving of any gratuity or the granting of any favor by Provider or DB-Firm to any inspector, directly or indirectly, is strictly prohibited, and any such act on the part of Provider or DB-Firm will constitute a breach of this Agreement.

15. Audit Rights and Retention of Records. Provider and DB-Firm shall preserve all Contract Records (as defined below) for a minimum period of three (3) years after expiration or termination of this Agreement or until resolution of any audit findings, whichever is longer. Contract Records shall, upon reasonable notice, be open to County inspection and subject to audit and reproduction during normal business hours. County audits and inspections pursuant to this Section may be performed by any County representative (including any outside representative engaged by County). County may conduct audits or inspections at any time during the term of this Agreement and for a period of three years after the expiration or termination of the Agreement (or longer if required by law). County may, without limitation, verify information, payroll distribution, and amounts through interviews, written affirmations, and on-site inspection with Provider or DB-Firm's employees, Subcontractors, vendors, or other labor, including DB-Firm's Consultant.

Contract Records include any and all information, materials and data of every kind and character, including without limitation, records, books, papers, documents, subscriptions, recordings, agreements, purchase orders, leases, contracts, commitments, arrangements, notes, daily diaries, drawings, receipts, vouchers and memoranda, and any and all other documents that pertain to rights, duties, obligations or performance under this Agreement. Contract Records include hard copy and electronic records, written policies and procedures, time sheets, payroll records and registers, cancelled payroll checks, estimating work sheets, correspondence, invoices and related payment documentation, general ledgers, insurance rebates and dividends, and any other records pertaining to rights, duties, obligations or performance under this Agreement, whether by Provider, DB-Firm, Subcontractor, or DB-Firm's Consultant.

County shall have the right to audit, review, examine, inspect, analyze, and make copies of all Contract Records at a location within Broward County. County reserves the right to conduct such audit or review at Provider or DB-Firm's place of business, if deemed appropriate by County, with

seventy-two (72) hours' advance notice. Provider and DB-Firm agree to provide adequate and appropriate work space. Provider and DB-Firm shall provide County with reasonable access to the Provider's and DB-Firm's facilities, and County shall be allowed to interview all current or former employees to discuss matters pertinent to the performance of this Agreement.

Provider shall, by written contract, require its Subcontractors to agree to the requirements and obligations of this Section.

Any incomplete or incorrect entry in such books, records, and accounts shall be a basis for County's disallowance and recovery of any payment reliant upon such entry. If an audit or inspection in accordance with this Section discloses overpricing or overcharges to County of any nature by the Provider, DB-Firm, or Subcontractors in excess of five percent (5%) of the total contract billings reviewed by County, the reasonable actual cost of the County's audit shall be reimbursed to the County by the Provider in addition to making adjustments for the overcharges. Any adjustments or payments due as a result of such audit or inspection shall be made within thirty (30) days from presentation of County's findings to Provider.

16. Workforce Investment Program. The Facilities and Infrastructure portion of this Agreement (SOW A-2) constitutes a "Covered Contract" under the Broward Workforce Investment Program, Broward County Administrative Code Section 19.211 ("Workforce Investment Program"). Provider affirms it is aware of the requirements of the Workforce Investment Program and agrees to use good faith efforts to meet the First Source Referral Goal and the Qualifying New Hires Goal as set forth therein, including by (a) publicly advertising any vacancies that are the direct result of this portion of the Agreement (whether those vacancies are with Provider or its Subcontractor) exclusively with CareerSource Broward for at least five (5) business days and using good faith efforts to interview any qualified candidates referred under the Workforce Investment Program, and (b) using good faith efforts to hire Qualifying New Hires, as defined by the Workforce Investment Program, for at least fifty percent (50%) of the vacancies that are the direct result of this portion of the Agreement. Until at least one year after the conclusion of this Agreement, DB-Firm shall maintain and make available to County upon request all records documenting Provider and DB-Firm's compliance with the requirements of the Workforce Investment Program, and shall submit the required Workforce Investment Reports to the Contract Administrator annually by January 31 and within thirty (30) days after the conclusion of this Agreement. Failure to demonstrate good faith efforts to meet the First Source Referral Goal and the Qualifying New Hires Goal shall constitute a material breach of this Agreement.

EXHIBIT G
Schedule of Subcontractor Participation and CBE Letters of Intent

The Subcontractors listed below are approved by County as of the Effective Date for the scope of work as stated. Any modifications to the Subcontractors must be approved in advance in writing by Contract Administrator and, if CBE Subcontractor, OESBD.

Provider represents that the CBE participants referenced in the attached Letters of Intent have agreed by written subcontract to perform the percentage of work amounts set forth and that the following information regarding participating Subcontractors is true and correct to the best of his/her knowledge.

CBE Business Name	Address	Scope of Work to be performed
ARM Electrical Services, Inc.	10138 NW 32nd St., Sunrise, FL 33351	Provide and install DC Power Systems.
Weezer Electric	271 NW 16th St., Pompano Beach, FL 33060	Provide electrical work such as: permits, installation, modifications for new and existing sites and UPS work.
Lambert Brothers, Inc.	5501 NW 9th Ave., Fort Lauderdale, FL 33309	Provided site construction services such as: permits, concrete, shelters and fencing installations.
Mejia Telecommunications	5752 NW 119th Dr., Coral Springs, FL 33076	Provide installation of monopole towers and antenna and line systems.

MOTOROLA SOLUTIONS

Motorola Solutions, Inc.
8000 W Sunrise Blvd.
Plantation, FL 33322
USA

Telephone: +1 954-789-8817
Fax: +1 847-761-1919

A. This is a letter of intent between the Motorola Solutions on this project and ARM Electrical Services, LLC., a CBE firm to perform subcontracting work on this project.
B. By signing below, Motorola Solutions is committing to utilize the above-named CBE to perform the work described below.
C. By signing below, the above-named CBE is committing to perform the work described below.
D. By signing below, Motorola Solutions and ARM Solutions, LLC. affirm that if the CBE subcontracts any of the work described below, it may only subcontract that work to another CBE.

Work to be performed by CBE Firm			
Description	**NAICS ***	**CBE Contract Amount†**	**CBE Percentage of Total Project Value**
Supply DC Power Systems to 12 Sites	238210	$712,626.00	3.67%
Provide Services to Install DC Power Systems to 12 Sites	238210	$71,500.00	.37%

AFFIRMATION: I hereby affirm that the information above is true and correct.

CBE Subcontractor/Supplier Authorized Representative

(Signature)	(Title)	(Date)
Andrea Motorud	President	7/28/16

Bidder/Offeror Authorized Representative

(Signature)	(Title)	(Date)
Robert Mantilla	VICE PRESIDENT	8/1/16

* Visit http://www.census.gov/eos/www/naics/ to search. Match type of work with NAICS code as closely as possible.
† To be provided only when the solicitation requires that bidder/offer include a dollar amount in its bid-offer.

In the event the bidder/offeror does not receive award of the prime contract, any and all representations in this Letter of Intent and Affirmation shall be null and void.

MOTOROLA SOLUTIONS

Motorola Solutions, Inc.
8000 W Sunrise Blvd.
Plantation, FL 33322
USA

Telephone: +1 954-789-8817
Fax: +1 847-761-1919

A. This is a letter of intent between the Motorola Solutions on this project and Weezer Electric, Inc., a CBE firm to perform subcontracting work on this project.
B. By signing below, Motorola Solutions is committing to utilize the above-named CBE to perform the work described below.
C. By signing below, the above-named CBE is committing to perform the work described below.
D. By signing below, Motorola Solutions and Weezer Electric, Inc. affirm that if the CBE subcontracts any of the work described below, it may only subcontract that work to another CBE.

Work to be performed by CBE Firm			
Description	**NAICS ***	**CBE Contract Amount†**	**CBE Percentage of Total Project Value**
Supply Electric and Grounding Services for 17 Sites	238210	$236,328	**1.22%**

AFFIRMATION: I hereby affirm that the information above is true and correct.

CBE Subcontractor/Supplier Authorized Representative

(Signature)	(Title)	(Date)
Jeff	President	7/28/16

Bidder/Offeror Authorized Representative

(Signature)	(Title)	(Date)
Robert Markley	VICE PRESIDENT	8/1/16

* Visit http://www.census.gov/eos/www/naics/ to search. Match type of work with NAICS code as closely as possible.
† To be provided only when the solicitation requires that bidder/offer include a dollar amount in its bid-offer.

In the event the bidder/offeror does not receive award of the prime contract, any and all representations in this Letter of Intent and Affirmation shall be null and void.

Motorola Solutions, Inc.
8000 W Sunrise Blvd.
Plantation, FL 33322
USA

Telephone: +1 954-789-8817
Fax: +1 847-761-1919

A. This is a letter of intent between the Motorola Solutions on this project and Lambert Brothers, Inc. a CBE firm to perform subcontracting work on this project.
B. By signing below, Motorola Solutions is committing to utilize the above-named CBE to perform the work described below.
C. By signing below, the above-named CBE is committing to perform the work described below.
D. By signing below, Motorola Solutions and Lambert Brothers, Inc. affirm that if the CBE subcontracts any of the work described below, it may only subcontract that work to another CBE.

Work to be performed by CBE Firm			
Description	**NAICS ***	**CBE Contract Amount†**	**CBE Percentage of Total Project Value**
Communications Site Preparation for 2 Sites	238910	$36,152.00	.19%
Installation of Shelters for 2 sites	238110	$90,230.00	.46%

AFFIRMATION: I hereby affirm that the information above is true and correct.

CBE Subcontractor/Supplier Authorized Representative

(Signature)	President (Title)	7/29/2016 (Date)

Bidder/Offeror Authorized Representative

(Signature)	VICE PRESIDENT (Title)	8/1/16 (Date)

* Visit http://www.census.gov/eos/www/naics/ to search. Match type of work with NAICS code as closely as possible.
† To be provided only when the solicitation requires that bidder/offer include a dollar amount in its bid-offer.

In the event the bidder/offeror does not receive award of the prime contract, any and all representations in this Letter of Intent and Affirmation shall be null and void.

MOTOROLA SOLUTIONS

Motorola Solutions, Inc.
8000 W Sunrise Blvd.
Plantation, FL 33322
USA

Telephone: +1 954-789-8817
Fax: +1 847-761-1919

A. This is a letter of intent between the Motorola Solutions on this project and Mejia Telecommunications Company, a CBE firm to perform subcontracting work on this project.
B. By signing below, Motorola Solutions is committing to utilize the above-named CBE to perform the work described below.
C. By signing below, the above-named CBE is committing to perform the work described below.
D. By signing below, Motorola Solutions and Mejia Telecommunications Company affirm that if the CBE subcontracts any of the work described below, it may only subcontract that work to another CBE.

Work to be performed by CBE Firm			
Description	**NAICS ***	**CBE Contract Amount†**	**CBE Percentage of Total Project Value**
Install 2 Radio Tower Monopoles	237130	$46,396.	.24%
Install Transmission Line & Antennas	237130	$10,450	.05%

AFFIRMATION: I hereby affirm that the information above is true and correct.

CBE Subcontractor/Supplier Authorized Representative

(Signature)	Vice President (Title)	07/29/2016 (Date)

Bidder/Offeror Authorized Representative

(Signature)	VICE PRESIDENT (Title)	8/1/16 (Date)

* Visit http://www.census.gov/eos/www/naics/ to search. Match type of work with NAICS code as closely as possible.
† To be provided only when the solicitation requires that bidder/offer include a dollar amount in its bid-offer.

In the event the bidder/offeror does not receive award of the prime contract, any and all representations in this Letter of Intent and Affirmation shall be null and void.

2

Schedule 1
Software Schedule

Software Suite, Version, & Module	Quantity & Type of License	Purpose, Functionality & Expected Operation of Software
The applicable version for all Software provided to County under this Agreement as part of the System shall be the most recently released version of all Software as of the date of Final Acceptance, unless otherwise approved by the Contract Administrator. At any time prior to Final Acceptance, the parties can agree to exchange or replace any item listed in this Schedule 1 with software of equal or greater quality and functionality. Such replacement software shall be deemed automatically included herein upon written approval of County Contract Administrator.		
ASTRO 25 FDMA SITE LICENSE	19 System License	Master Site License/ Enterprise
RADIO USER LICENSES	250,000 User Licenses	Subscriber Licenses/User
CADI SOFTWARE OPTION	1 System License	Master Site License/ Enterprise
ASTRO 7.17 CLIENT APPLICATION SOFTWARE	1 System License	Master Site License/ Enterprise
ISSI 8000 / CSSI 8000 UPGRAGE Software Licenses	1 System License	Support system to system connectivity/ Enterprise
AES ENCRYPTION SOFTWARE	2 System License	Master Site License/ Enterprise
ADD: MCC 7500 ARCHIVING INTERFACE SERVER SOFTWARE LICENSE	1 System License	Master Site License/ Enterprise
ISSI 8000 / CSSI 8000 UPGRAGE Software Licenses	1 System License	Support system to system connectivity/ Enterprise
ISSI 8000 / CSSI 8000 Redundancy Software License	1 System License	Support system to system connectivity/ Enterprise
ASTRO 7.17 CLIENT APPLICATION SOFTWARE (DSR)	1 System License	Master Site License/ Enterprise
P25 DYNAMIC CHANNEL SOFTWARE	5 System License	Master Site License/ Enterprise
ASTRO 25 SITE REPEATER SITE CONTROLLER SOFTWARE IV&D	2 System License	Master Site License/ Enterprise

Software Suite, Version, & Module	Quantity & Type of License	Purpose, Functionality & Expected Operation of Software
SIMULCAST REMOTE SITE LICENSE IV&D	14 System License	Master Site License/ Enterprise
MCC 7500 ASTRO 25 SOFTWARE	1 System License	Master Site License/ Enterprise
MCC 7500 BASIC CONSOLE FUNCTIONALITY SOFTWARE LICENSE	24 System License	Master Site License/ Enterprise
P25 TDMA COMPARATOR SOFTWARE	1 System License	Master Site License/ Enterprise
P25 DYNAMIC CHANNEL SOFTWARE	3 System License	Master Site License/ Enterprise
IP BASED MULTISITE BASE RADIO SOFTWARE	4 System License	Master Site License/ Enterprise
CONVENTIONAL SOFTWARE	2 System License	Master Site License/ Enterprise
REFERENCE DISTRIBUTION SOFTWARE	2 System License	Master Site License/ Enterprise
IP BASED MULTISITE BASE RADIO SOFTWARE	3 System License	Master Site License/ Enterprise
ANALOG CONVENTIONAL SIMULCAST SOFTWARE	3 System License	Master Site License/ Enterprise
In addition to the list set forth above, this Schedule 1 is deemed to include all third party software (including any and all embedded software in the foregoing list of proprietary software) necessary for the operation or functionality of the System (including all subsubsystems) and Software for the duration of this Agreement as part of the licenses granted hereunder.		

Schedule 2 - Equipment List

This Schedule 2 is intended to include all Equipment required to complete the System Final Design. To the extent any required equipment is omitted from this Schedule 2 that is required for completion of the System Design or Final Acceptance of the System, that equipment is deemed included. To the extent approved by the Contract Administrator, any equipment listed on this Schedule 2 may be exchanged for comparable equipment of equal or greater functionality and capacity. At any time prior to Final Acceptance, the parties can agree to exchange or replace any item listed in this Schedule 2 with equipment of equal or greater quality, capacity and functionality. Such replacement equipment shall be deemed automatically included herein upon written approval of County Contract Administrator and Provider representative.

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	SQM01SUM0273	MASTER SITE CONFIGURATION	NMS/ZC	CORE Master	$ -	$0.00	25.00%	$ -
1	CA02832AB	ADD: M3 REDUNDANT ZONE (1-150 SITES)-1ST ZONE	NMS/ZC	CORE Master	$ 272,000	$272,000.00	25.00%	$ 204,000
1	CA02113AA	ADD: ASTRO 25 FDMA TRKG OPERATION	NMS/ZC	CORE Master	$ 35,000	$35,000.00	25.00%	$ 26,250
1	UA00158AA	ADD: PHASE 2 TDMA TRKG OP ZONE LIC	NMS/ZC	CORE Master	$ 25,000	$25,000.00	25.00%	$ 18,750
1	CA01723AF	ADD: BASELINE BACK UP 7.17	NMS/ZC	CORE Master	$ 500	$500.00	25.00%	$ 375
1	CA02835AB	ADD:WINDOW SUPPLEMENTAL TRANS CONFIG 7.17	NMS/ZC	CORE Master	$ -	$0.00	25.00%	$ -
1	CA01499AA	ADD: DSR SYSTEM NOTIFICATION	NMS/ZC	CORE Master	$ 10,000	$10,000.00	25.00%	$ 7,500
19	UA00407AA	ADD: CLASSIC DATA-P25 TRNK SITE	NMS/ZC	CORE Master	$ 9,840	$186,960.00	25.00%	$ 140,220
19	UA00153AA	ADD: ASTRO 25 FDMA SITE LICENSE	NMS/ZC	CORE Master	$ 17,000	$323,000.00	25.00%	$ 242,250
18	UA00156AA	ADD: MCC7500 CONSOLE LICENSES (QTY 5)	NMS/ZC	CORE Master	$ 5,000	$90,000.00	25.00%	$ 67,500
19	UA00159AA	ADD: P25 PHASE 2 TDMA TRKNG OP SITE LIC	NMS/ZC	CORE Master	$ 12,000	$228,000.00	25.00%	$ 171,000
1	CA01207AA	ADD: ASTRO 25 CONVENTIONAL	NMS/ZC	CORE Master	$ 15,000	$15,000.00	25.00%	$ 11,250
1	UA00155AA	ADD: CONVENTIONAL PORT LICENSES (QTY 25)	NMS/ZC	CORE Master	$ 1,000	$1,000.00	25.00%	$ 750
15	UA00160AA	ADD: PHASE 2 DYNAMIC TG ASGNMT SITE LIC	NMS/ZC	CORE Master	$ 18,000	$270,000.00	25.00%	$ 202,500
281	UA00161AA	ADD: P25 PHASE 2 TDMA SW BASE RADIO LIC	NMS/ZC	CORE Master	$ 3,000	$843,000.00	25.00%	$ 632,250
281	UA00162AA	ADD: PHASE 2 DYNAMIC CH BASE RADIO LIC	NMS/ZC	CORE Master	$ 2,000	$562,000.00	25.00%	$ 421,500
300	UA00152AA	ADD:500 RADIO USER LICENSES	NMS/ZC	CORE Master	$ 5,000	$1,500,000.00	25.00%	$ 1,125,000
2	UA00136AA	ADD: UNIFIED NETWORK CONFIGURATOR (UNC)	NMS/ZC	CORE Master	$ 20,000	$40,000.00	25.00%	$ 30,000
9	CA01316AA	ADD: UNC ADDTL DEVICE LIC (QTY 10)	NMS/ZC	CORE Master	$ 500	$4,500.00	25.00%	$ 3,375
3	UA00147AA	ADD: PROVISIONING MANAGER	NMS/ZC	CORE Master	$ 5,000	$15,000.00	25.00%	$ 11,250
1	CA02950AA	ADD: INTEROPERABILITY ENABLEMENT 7.16	NMS/ZC	CORE Master	$ 40,000	$40,000.00	25.00%	$ 30,000
3	UA00146AA	ADD: UNIFIED EVENT MANAGER (UEM)	NMS/ZC	CORE Master	$ 20,000	$60,000.00	25.00%	$ 45,000
1	UA00225AA	ADD: UEM ENHANCED NAVIGATION	NMS/ZC	CORE Master	$ 45,000	$45,000.00	25.00%	$ 33,750
1	UA00137AA	ADD: EMAIL ALARM NOTIFICATIONS	NMS/ZC	CORE Master	$ 5,000	$5,000.00	25.00%	$ 3,750
1	UA00143AA	ADD: SECURITY PARTITIONING	NMS/ZC	CORE Master	$ 20,000	$20,000.00	25.00%	$ 15,000
1	UA00135AA	ADD: PROVISIONING MANAGER INTERFACE	NMS/ZC	CORE Master	$ 25,000	$25,000.00	25.00%	$ 18,750
1	ZA01164AA	ENH: PMI TECHNICAL ASSISTANCE, 20 HOURS	NMS/ZC	CORE Master	$ 5,000	$5,000.00	25.00%	$ 3,750
1	UA00142AA	ADD: CADI SOFTWARE OPTION	NMS/ZC	CORE Master	$ 45,000	$45,000.00	25.00%	$ 33,750
1	ZA00104AA	ENH: TECHNICAL ASSISTANCE, FORTY HRS	NMS/ZC	CORE Master	$ 12,000	$12,000.00	25.00%	$ 9,000
3	UA00141AA	ADD: ZONEWATCH GRID & CTRL	NMS/ZC	CORE Master	$ 20,000	$60,000.00	25.00%	$ 45,000
3	UA00144AA	ADD: ZONE HISTORICAL RPTS	NMS/ZC	CORE Master	$ 5,000	$15,000.00	25.00%	$ 11,250

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
3	UA00151AA	ADD: AFFLIATION USER RPTS	NMS/ZC	CORE Master	$ 7,000	$21,000.00	25.00%	$ 15,750
3	UA00149AA	ADD: RADIO CONTROL MANAGER	NMS/ZC	CORE Master	$ 15,000	$45,000.00	25.00%	$ 33,750
3	UA00150AA	ADD: DYNAMIC REPORTS	NMS/ZC	CORE Master	$ 8,000	$24,000.00	25.00%	$ 18,000
21	CA02193AA	ADD: ANTI-MALWARE DEF UPDATE LIC	NMS/ZC	CORE Master	$ 165	$3,465.00	25.00%	$ 2,599
1	UA00138AA	ADD: FLEXIBLE ATIA	NMS/ZC	CORE Master	$ 17,000	$17,000.00	25.00%	$ 12,750
1	ZA00103AA	ENH: TECHNICAL ASSISTANCE, TEN HOURS	NMS/ZC	CORE Master	$ 3,000	$3,000.00	25.00%	$ 2,250
1	DSSTCU8000100	SEAGATE : 8TB BUSINESS STORAGE 4-BAY NAS	NMS/ZC	CORE Master	$ 1,490	$1,490.00	25.00%	$ 1,118
3	TT2296	HYPERACCESS VERSION 9.0	NMS/ZC	CORE Master	$ 408	$1,224.00	25.00%	$ 918
3	DDN9048	SERIAL/ IP 1 PORT SEAT LICENSE	NMS/ZC	CORE Master	$ 176	$528.00	25.00%	$ 396
1	DLN6692	HP LASERJET PRINTER CP3525DN 110V	NM_CLIENT1	CORE Master	$ 4,500	$4,500.00	25.00%	$ 3,375
1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	NM_CLIENT1	CORE Master	$ 3,500	$3,500.00	25.00%	$ 2,625
1	T8363	ASTRO 7.17 CLIENT APPLICATION SOFTWARE	NM_CLIENT1	CORE Master	$ 850	$850.00	25.00%	$ 638
1	DSKL9116MUKIT	ATEN 16-PORT 2 USER IP LCD KVM	KVM	CORE Master	$ 4,542	$4,542.00	25.00%	$ 3,407
5	DS2L5202U	ATEN 6FT USB KVM CABLE	KVM	CORE Master	$ 36	$180.00	25.00%	$ 135
1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	NM_CLIENT2	CORE Master	$ 3,500	$3,500.00	25.00%	$ 2,625
1	T8363	ASTRO 7.17 CLIENT APPLICATION SOFTWARE	NM_CLIENT2	CORE Master	$ 850	$850.00	25.00%	$ 638
1	DSEV191	TECH GLOBAL EVOLUTION SERIES 19INCH WITH TOUCH	NM_CLIENT2	CORE Master	$ 1,598	$1,598.00	25.00%	$ 1,199
1	DLN6692	HP LASERJET PRINTER CP3525DN 110V	NM_CLIENT2	CORE Master	$ 4,500	$4,500.00	25.00%	$ 3,375
74	T7885	MCAFEE WINDOWS AV CLIENT	ANTI_VIRUS	CORE Master	$ 165	$12,210.00	25.00%	$ 9,158
1	DDN1933	PURCHASED SOFTWARE,FORTITOKEN PACK	AUTHEN	CORE Master	$ 560	$560.00	25.00%	$ 420
1	DSTEL6209548200010	ANALOG MODEM V3600 110 120VAC SA UI	AUTHEN	CORE Master	$ 1,390	$1,390.00	25.00%	$ 1,043
95	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG	OSH	CORE Master	$ 50	$4,750.00	25.00%	$ 3,563
1	CLN1856	2620-24 ETHERNET SWITCH	CNI	CORE Master	$ 2,250	$2,250.00	25.00%	$ 1,688
1	T7776	ISSI 8000 / CSSI 8000 UPGRAGE Software Licenses	ISSICSSI	CORE Master	$ -	$0.00	25.00%	$ -
1	UA00005AA	ADD: ISSI Automatic Roaming License (for first system)	ISSICSSI	CORE Master	$ 200,000	$200,000.00	25.00%	$ 150,000
3	UA00184AA	ADD:ISSI AUTOMATIC ROAMING LICENSE (FOR SYSTEMS 2-5)	ISSICSSI	CORE Master	$ 100,000	$300,000.00	25.00%	$ 225,000
1	UA00006AA	ADD: ISSI plus 10 additional simultaneaus talk groups	ISSICSSI	CORE Master	$ 50,000	$50,000.00	25.00%	$ 37,500
1	CLN1856	2620-24 ETHERNET SWITCH	WAVE	CORE Master	$ 2,250	$2,250.00	25.00%	$ 1,688
1	SQM01SUM0238	SRC7500 SWITCHING ROUTING CENTER (7.13 AND BEYOND)	SRC	CORE Master	$ 1,200	$1,200.00	25.00%	$ 900
1	CA02870AA	ADD: SRC 7500 FOR 7.16	SRC	CORE Master	$ -	$0.00	25.00%	$ -

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	CA02873AA	ADD: MOUNT SRC IN 7.5FT OPEN RACK	SRC	CORE Master	$ 495	$495.00	25.00%	$ 371
1	CA02194AA	HIGH TIER CORE LAN SWITCHES (HP3800 - 96 PORTS)	SRC	CORE Master	$ 24,100	$24,100.00	25.00%	$ 18,075
1	CA01345AA	ADD: DUAL GATEWAY ROUTERS STANDARD	SRC	CORE Master	$ 31,400	$31,400.00	25.00%	$ 23,550
1	CA01350AA	ADD: QTY 1 PAIR CORE ROUTERS ETH	SRC	CORE Master	$ 41,400	$41,400.00	25.00%	$ 31,050
1	CA01359AA	ADD: INTERZONE CAPABILITY ETHERNET	SRC	CORE Master	$ 41,400	$41,400.00	25.00%	$ 31,050
1	CA01360AA	ADD: CORE BACKHAUL SWITCHES	SRC	CORE Master	$ 4,500	$4,500.00	25.00%	$ 3,375
1	DSTRAK91008E	PRIME/MASTER SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM AC	GPS	CORE Master	$ 34,712	$34,712.00	25.00%	$ 26,034
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	CORE Master	$ 2	$112.50	25.00%	$ 84
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	CORE Master	$ 27	$109.00	25.00%	$ 82
2	T7537	KVL 4000 KEYLOADER	KVL4000	CORE Master	$ 1,250	$2,500.00	25.00%	$ 1,875
2	U239AD	ADD: ASTRO 25 MODE	KVL4000	CORE Master	$ 250	$500.00	25.00%	$ 375
2	CA01598AA	ADD: AC LINE CORD US	KVL4000	CORE Master	$ 11	$22.00	25.00%	$ 17
2	CA00182AP	ADD: AES ENCRYPTION SOFTWARE	KVL4000	CORE Master	$ 750	$1,500.00	25.00%	$ 1,125
2	C543	ADD: CABLE FOR RNC, DIU, MGEG	KVL4000	CORE Master	$ 84	$168.00	25.00%	$ 126
2	C724	CABLE, KEYLOAD	KVL4000	CORE Master	$ 75	$150.00	25.00%	$ 113
2	CA01603AA	ADD: USB COMM/CHARGE CABLE W/ CUP	KVL4000	CORE Master	$ 115	$230.00	25.00%	$ 173
2	C725AA	ADD: KEYLOAD CABLE FOR APX PORTABLE	KVL4000	CORE Master	$ 75	$150.00	25.00%	$ 113
2	CA02186	ADD: KEYLOAD CABLE FOR CRYPTR MICRO	KVL4000	CORE Master	$ 190	$380.00	25.00%	$ 285
2	CA02187	ADD: KEYLOADING CABLE ADAPTER (GCAI)	KVL4000	CORE Master	$ 42	$83.00	25.00%	$ 62
2	TKN8209	CABLE KEYLOAD MX	KVL4000	CORE Master	$ 75	$150.00	25.00%	$ 113
2	HKN6182	KEYLOADING CABLE ADAPTER (GCAI)	KVL4000	CORE Master	$ 42	$83.00	25.00%	$ 62
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	CORE Master	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	CORE Master	$ 1,850	$1,850.00	25.00%	$ 1,388
1	V266	ADD: 90VAC TO 260VAC PS TO SM	NFM_RTU	CORE Master	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	CORE Master	$ 90	$90.00	25.00%	$ 68
1	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	CORE Master	$ 495	$495.00	25.00%	$ 371
1	DVN4046B	MASTER SYSTEM KEY STARTER KIT	SOFTWARE	CORE Master	$ 500	$500.00	25.00%	$ 375
1	B1905	MCC 7500 ASTRO 25 SOFTWARE	AIS1	SunriseDisp	$ 250	$250.00	25.00%	$ 188
1	B1933	MOTOROLA VOICE PROCESSOR MODULE	AIS1	SunriseDisp	$ 11,920	$11,920.00	25.00%	$ 8,940
1	CA00288AB	ADD: MCC 7500 ARCHIVING INTERFACE SERVER SOFTWARE LICENSE	AIS1	SunriseDisp	$ 15,060	$15,060.00	25.00%	$ 11,295
1	CA00147AF	ADD: MCC 7500 SECURE OPERATION	AIS1	SunriseDisp	$ 3,250	$3,250.00	25.00%	$ 2,438
1	CA00182AB	ADD: AES ALGORITHM	AIS1	SunriseDisp	$ 750	$750.00	25.00%	$ 563
1	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN	AIS1	SunriseDisp	$ -	$0.00	25.00%	$ -
1	T7885	MCAFEE WINDOWS AV CLIENT	AIS1	SunriseDisp	$ 165	$165.00	25.00%	$ 124

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	AIS1	SunriseDisp	$ 3,500	$3,500.00	25.00%	$ 2,625
1	DDN9748	19 INCH BLACK SHELF	AIS SHELF	SunriseDisp	$ 249	$249.00	25.00%	$ 187
1	B1905	MCC 7500 ASTRO 25 SOFTWARE	AIS2	SunriseDisp	$ 250	$250.00	25.00%	$ 188
1	B1933	MOTOROLA VOICE PROCESSOR MODULE	AIS2	SunriseDisp	$ 11,920	$11,920.00	25.00%	$ 8,940
1	CA00288AB	ADD: MCC 7500 ARCHIVING INTERFACE SERVER SOFTWARE LICENSE	AIS2	SunriseDisp	$ 15,060	$15,060.00	25.00%	$ 11,295
1	CA00147AF	ADD: MCC 7500 SECURE OPERATION	AIS2	SunriseDisp	$ 3,250	$3,250.00	25.00%	$ 2,438
1	CA00182AB	ADD: AES ALGORITHM	AIS2	SunriseDisp	$ 750	$750.00	25.00%	$ 563
1	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN	AIS2	SunriseDisp	$ -	$0.00	25.00%	$ -
1	T7885	MCAFEE WINDOWS AV CLIENT	AIS2	SunriseDisp	$ 165	$165.00	25.00%	$ 124
1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	AIS2	SunriseDisp	$ 3,500	$3,500.00	25.00%	$ 2,625
1	DDN9748	19 INCH BLACK SHELF	AIS SHELF	SunriseDisp	$ 249	$249.00	25.00%	$ 187
1	DLN6975	FRE: DL380 G9 HC 900 GB DISK	SPARES	CORE Master	$ 26,166	$26,166.00	25.00%	$ 19,625
1	DLN6977	FRE: DL380 G9 LC 600 GB DISK	SPARES	CORE Master	$ 14,586	$14,586.00	25.00%	$ 10,940
1	DLN6972	FRU: DL380 G9 POWER SUPPLY	SPARES	CORE Master	$ 598	$598.00	25.00%	$ 449
1	DLN6970	FRU: DL380 G9 HARD DRIVE	SPARES	CORE Master	$ 1,212	$1,212.00	25.00%	$ 909
1	DLN6973	FRU: DL380 G9 FAN	SPARES	CORE Master	$ 81	$81.00	25.00%	$ 61
1	DLN6971	FRU: DL380 G9 DVD DRIVE	SPARES	CORE Master	$ 228	$228.00	25.00%	$ 171
1	DLN6880	DAS - CHASSIS ONLY	SPARES	CORE Master	$ 2,708	$2,708.00	25.00%	$ 2,031
1	DLN6878	DAS - 600 GB SAS HARD DRIVE	SPARES	CORE Master	$ 941	$941.00	25.00%	$ 706
1	DLN6978	FRU: DOTHILL 4524 RAID I/O CONTROLLER MODULE	SPARES	CORE Master	$ 8,459	$8,459.00	25.00%	$ 6,344
1	DLN6867	DAS POWER SUPPLY	SPARES	CORE Master	$ 665	$665.00	25.00%	$ 499
1	CKN6967	CABLE, DATA,MINI-SAS TO MINI-SAS HD, LENGTH 1M	SPARES	CORE Master	$ 130	$130.00	25.00%	$ 98
1	SQM01SUM0205	GGM 8000 GATEWAY	SPARES	CORE Master	$ 4,200	$4,200.00	25.00%	$ 3,150
1	CA01616AA	ADD: AC POWER	SPARES	CORE Master	$ -	$0.00	25.00%	$ -
1	CLN1856	2620-24 ETHERNET SWITCH	SPARES	CORE Master	$ 2,250	$2,250.00	25.00%	$ 1,688
1	CLN1858	3800-48 ETHERNET SWITCH	SPARES	CORE Master	$ 9,600	$9,600.00	25.00%	$ 7,200
1	CLN1856	2620-24 ETHERNET SWITCH	SPARES	CORE Master	$ 2,250	$2,250.00	25.00%	$ 1,688
1	T8126	FORTINET FIREWALL APPLIANCE	SPARES	CORE Master	$ 3,200	$3,200.00	25.00%	$ 2,400
1	DLN6940	460W POWER SUPPLY FOR DL380P	SPARES	CORE Master	$ 460	$460.00	25.00%	$ 345
1	DLN6967	FRU: 500 GB SATA DRIVE	SPARES	CORE Master	$ 700	$700.00	25.00%	$ 525
1	CLN8489	48 PORT TERMINAL SERVER	SPARES	CORE Master	$ 8,000	$8,000.00	25.00%	$ 6,000
1	CLN1857	HP X311 REDUNDANT POWER SUPPLY	SPARES	CORE Master	$ 1,000	$1,000.00	25.00%	$ 750
1	SQM01SUM0205	GGM 8000 GATEWAY	SPARES	CORE Master	$ 4,200	$4,200.00	25.00%	$ 3,150
1	CA01616AA	ADD: AC POWER	SPARES	CORE Master	$ -	$0.00	25.00%	$ -
1	T8126	FORTINET FIREWALL APPLIANCE	SPARES	CORE Master	$ 3,200	$3,200.00	25.00%	$ 2,400

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	SQM01SUM0231	DYNAMIC SYSTEM RESILIENCE	DSR	EOC DSR Master	$ 20,000	$20,000.00	25.00%	$ 15,000
1	CA01511AA	ADD: DSR VOICE	DSR	EOC DSR Master	$ -	$0.00	25.00%	$ -
1	CA01512AA	ADD: DSR DATA	DSR	EOC DSR Master	$ -	$0.00	25.00%	$ -
1	CA02846AB	ADD: M3 1ST ZONE DSR 7.17	DSR	EOC DSR Master	$ 140,000	$140,000.00	25.00%	$ 105,000
1	CA03142AA	ADD: M3 1ST ZONE DSR 7.17 Hardware	DSR	EOC DSR Master	$ 66,280	$66,280.00	25.00%	$ 49,710
1	CA02077AE	ADD: DSR CAPABILITY TRKD INT DATA	DSR	EOC DSR Master	$ 59,000	$59,000.00	25.00%	$ 44,250
1	CA02835AB	ADD:WINDOW SUPPLEMENTAL TRANS CONFIG 7.17	DSR	EOC DSR Master	$ -	$0.00	25.00%	$ -
1	T7776	ISSI 8000 / CSSI 8000 UPGRAGE Software Licenses	DSR	EOC DSR Master	$ -	$0.00	25.00%	$ -
1	UA00042AA	ADD: ISSI 8000 / CSSI 8000 Redundancy Software License	DSR	EOC DSR Master	$ -	$0.00	25.00%	$ -
2	T8126	FORTINET FIREWALL APPLIANCE	DSR	EOC DSR Master	$ 3,200	$6,400.00	25.00%	$ 4,800
1	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	EOC DSR Master	$ 4,200	$4,200.00	25.00%	$ 3,150
1	CA01616AA	ADD: AC POWER	GGM8000	EOC DSR Master	$ -	$0.00	25.00%	$ -
1	DLN6692	HP LASERJET PRINTER CP3525DN 110V	NM_CLIENT3	EOC DSR Master	$ 4,500	$4,500.00	25.00%	$ 3,375
1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	NM_CLIENT3	EOC DSR Master	$ 3,500	$3,500.00	25.00%	$ 2,625
1	T8363	ASTRO 7.17 CLIENT APPLICATION SOFTWARE	NM_CLIENT3	EOC DSR Master	$ 850	$850.00	25.00%	$ 638
1	DSEV191	TECH GLOBAL EVOLUTION SERIES 19INCH WITH TOUCH	NM_CLIENT3	EOC DSR Master	$ 1,598	$1,598.00	25.00%	$ 1,199
1	DDN1933	PURCHASED SOFTWARE,FORTITOKEN PACK	AUTHEN	EOC DSR Master	$ 560	$560.00	25.00%	$ 420
92	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG	OSH	EOC DSR Master	$ 50	$4,600.00	25.00%	$ 3,450
1	CLN1856	2620-24 ETHERNET SWITCH	CNI	EOC DSR Master	$ 2,250	$2,250.00	25.00%	$ 1,688
1	SQM01SUM0238	SRC7500 SWITCHING ROUTING CENTER (7.13 AND BEYOND)	SRC	EOC DSR Master	$ 1,200	$1,200.00	25.00%	$ 900
1	CA02870AA	ADD: SRC 7500 FOR 7.16	SRC	EOC DSR Master	$ -	$0.00	25.00%	$ -
1	CA02873AA	ADD: MOUNT SRC IN 7.5FT OPEN RACK	SRC	EOC DSR Master	$ 495	$495.00	25.00%	$ 371
1	CA02194AA	HIGH TIER CORE LAN SWITCHES (HP3800 - 96 PORTS)	SRC	EOC DSR Master	$ 24,100	$24,100.00	25.00%	$ 18,075
1	CA01345AA	ADD: DUAL GATEWAY ROUTERS STANDARD	SRC	EOC DSR Master	$ 31,400	$31,400.00	25.00%	$ 23,550
1	CA01350AA	ADD: QTY 1 PAIR CORE ROUTERS ETH	SRC	EOC DSR Master	$ 41,400	$41,400.00	25.00%	$ 31,050
1	CA01359AA	ADD: INTERZONE CAPABILITY ETHERNET	SRC	EOC DSR Master	$ 41,400	$41,400.00	25.00%	$ 31,050
1	CA01360AA	ADD: CORE BACKHAUL SWITCHES	SRC	EOC DSR Master	$ 4,500	$4,500.00	25.00%	$ 3,375
1	DSTRAK91008E	PRIME/MASTER SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM AC	GPS	EOC DSR Master	$ 34,712	$34,712.00	25.00%	$ 26,034
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	EOC DSR Master	$ 2	$112.50	25.00%	$ 84
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	EOC DSR Master	$ 27	$109.00	25.00%	$ 82
1	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	EOC DSR Master	$ 495	$495.00	25.00%	$ 371
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	EOC DSR Master	$ 3,000	$3,000.00	25.00%	$ 2,250

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	EOC DSR Master	$ 1,850	$1,850.00	25.00%	$ 1,388
1	V266	ADD: 90VAC TO 260VAC PS TO SM	NFM_RTU	EOC DSR Master	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	EOC DSR Master	$ 90	$90.00	25.00%	$ 68
1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	GTR8000	BC Station 106	$ 6,000	$6,000.00	25.00%	$ 4,500
1	CA00855AA	ADD: 700/800 MHZ	GTR8000	BC Station 106	$ 6,300	$6,300.00	25.00%	$ 4,725
5	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	BC Station 106	$ 13,000	$65,000.00	25.00%	$ 48,750
5	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	BC Station 106	$ 10,000	$50,000.00	25.00%	$ 37,500
1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	GTR8000	BC Station 106	$ 35,400	$35,400.00	25.00%	$ 26,550
6	X591AE	ENH: ASTRO 25 SITE REPEATER SW	GTR8000	BC Station 106	$ 18,760	$112,560.00	25.00%	$ 84,420
5	CA01943AA	ADD:2ND BRANCH DIVERSITY	GTR8000	BC Station 106	$ 700	$3,500.00	25.00%	$ 2,625
2	CA01706AA	ADD: ADD: GGM 8000 GATEWAY	GTR8000	BC Station 106	$ 4,200	$8,400.00	25.00%	$ 6,300
1	CA00861AA	ADD: CABINET RMC W/ CAPABILITY OF 6 BRS	GTR8000	BC Station 106	$ 700	$700.00	25.00%	$ 525
1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER	GTR8000	BC Station 106	$ 8,400	$8,400.00	25.00%	$ 6,300
1	CA00882AA	ADD: 700 MHZ TX FILTER W/PMU	GTR8000	BC Station 106	$ 1,000	$1,000.00	25.00%	$ 750
2	CA00303AA	ADD: QTY (1) SITE CONTROLLER	GTR8000	BC Station 106	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA02219AA	ADD: ASTRO 25 SITE REPEATER SITE CONTROLLER SOFTWARE IV&D	GTR8000	BC Station 106	$ 12,900	$25,800.00	25.00%	$ 19,350
1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	GTR8000	BC Station 106	$ 495	$495.00	25.00%	$ 371
1	CA02686AA	ADD: AC DC POWER DISTRIBUTION	GTR8000	BC Station 106	$ -	$0.00	25.00%	$ -
1	DS43283I14294C48	CONTROL MONITORING UNIT, 796-824MHZ,DUAL DIVERSITY,ETHERNET, REDUNDANT PS 48VDC	RFDS	BC Station 106	$ 4,860	$4,860.00	25.00%	$ 3,645
1	DS43283I01T	TTA, 796-824MHZ, DUAL DIVERSITY, REDUNDANT LNA	RFDS	BC Station 106	$ 9,315	$9,315.00	25.00%	$ 6,986
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	BC Station 106	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	BC Station 106	$ 1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	BC Station 106	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	BC Station 106	$ 90	$90.00	25.00%	$ 68
1	SQM01SUM0205	GGM 8000 GATEWAY	SPARES	BC Station 106	$ 4,200	$4,200.00	25.00%	$ 3,150
1	CA01619AA	ADD: DC POWER	SPARES	BC Station 106	$ -	$0.00	25.00%	$ -
1	DLN6885	FRU: XCVR 7/800 MHZ V2	SPARES	BC Station 106	$ 1,200	$1,200.00	25.00%	$ 900
1	DLN6966	FRU: GCP 8000/GCM 8000/GPB 8000	SPARES	BC Station 106	$ 2,500	$2,500.00	25.00%	$ 1,875
1	DLN6781	FRU: POWER SUPPLY	SPARES	BC Station 106	$ 2,200	$2,200.00	25.00%	$ 1,650
1	DLN6455	CONFIGURATION/SERVICE SOFTWARE	SPARES	BC Station 106	$ 25	$25.00	25.00%	$ 19
1	DLN6898	FRU: FAN MODULE	SPARES	BC Station 106	$ 206	$206.00	25.00%	$ 155
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	BC Station 106	$ 3,873	$3,873.00	25.00%	$ 2,905
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	BC Station 106	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	BC Station 106	$ 18	$17.75	25.00%	$ 13

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	BC Station 106	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	BC Station 106	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	BC Station 106	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	BC Station 106	$ 18	$35.50	25.00%	$ 27
330	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	BC Station 106	$ 8	$2,772.00	25.00%	$ 2,079
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	BC Station 106	$ 40	$79.50	25.00%	$ 60
7	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	BC Station 106	$ 23	$157.50	25.00%	$ 118
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	BC Station 106	$ 29	$57.00	25.00%	$ 43
330	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	BC Station 106	$ 4	$1,155.00	25.00%	$ 866
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	BC Station 106	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	BC Station 106	$ 29	$28.50	25.00%	$ 21
7	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	BC Station 106	$ 17	$117.25	25.00%	$ 88
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	BC Station 106	$ 22	$43.00	25.00%	$ 32
11	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	BC Station 106	$ 21	$231.00	25.00%	$ 173
11	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	BC Station 106	$ 33	$357.50	25.00%	$ 268
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	BC Station 106	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	BC Station 106	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	BC Station 106	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	BC Station 106	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	BC Station 106	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	BC Station 106	$ 32	$64.00	25.00%	$ 48
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	BC Station 106	$ 3,873	$3,873.00	25.00%	$ 2,905
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	BC Station 106	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	BC Station 106	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	BC Station 106	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	BC Station 106	$ 22	$110.00	25.00%	$ 83

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	BC Station 106	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	BC Station 106	$ 18	$35.50	25.00%	$ 27
330	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	BC Station 106	$ 8	$2,772.00	25.00%	$ 2,079
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	BC Station 106	$ 40	$79.50	25.00%	$ 60
7	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	BC Station 106	$ 23	$157.50	25.00%	$ 118
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	BC Station 106	$ 29	$57.00	25.00%	$ 43
330	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	BC Station 106	$ 4	$1,155.00	25.00%	$ 866
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	BC Station 106	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	BC Station 106	$ 29	$28.50	25.00%	$ 21
7	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	BC Station 106	$ 17	$117.25	25.00%	$ 88
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	BC Station 106	$ 22	$43.00	25.00%	$ 32
11	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	BC Station 106	$ 21	$231.00	25.00%	$ 173
11	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	BC Station 106	$ 33	$357.50	25.00%	$ 268
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	BC Station 106	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	BC Station 106	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	BC Station 106	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	BC Station 106	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	BC Station 106	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	BC Station 106	$ 32	$64.00	25.00%	$ 48
1	DSSC412HF2LDFD01	COLLINEAR OMNI, 11.5DBD, HD, LOW PIM, 746-869 MHZ, 1 DEGREE DT	ANTENNA	BC Station 106	$ 6,763	$6,763.00	25.00%	$ 5,072
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	BC Station 106	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	BC Station 106	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	BC Station 106	$ 22	$44.00	25.00%	$ 33
330	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	BC Station 106	$ 16	$5,362.50	25.00%	$ 4,022
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	BC Station 106	$ 112	$224.00	25.00%	$ 168

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
7	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	BC Station 106	$ 23	$162.75	25.00%	$ 122
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	BC Station 106	$ 32	$64.00	25.00%	$ 48
11	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	BC Station 106	$ 29	$313.50	25.00%	$ 235
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	BC Station 106	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	BC Station 106	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	BC Station 106	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	BC Station 106	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	BC Station 106	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	BC Station 106	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	BC Station 106	$ 29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	BC Station 106	$ 4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	BC Station 106	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	BC Station 106	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	BC Station 106	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	BC Station 106	$ 27	$54.50	25.00%	$ 41
1	T7321	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	CORE Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
1	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	CORE Prime	$ 16,000	$16,000.00	25.00%	$ 12,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	CORE Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	CORE Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	CORE Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	CORE Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	CORE Prime	$ 16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	CORE Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	CORE Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	CORE Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 3,000	$3,000.00	25.00%	$ 2,250

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	CORE Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	CORE Prime	$ 16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	CORE Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	CORE Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	CORE Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	CORE Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	CORE Prime	$ 16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	CORE Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	CORE Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	CORE Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	CORE Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	CORE Prime	$ 16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	CORE Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	CORE Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	CORE Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	CORE Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	CORE Prime	$ 16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	CORE Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	CORE Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	CORE Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	CORE Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	CORE Prime	$ 16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	CORE Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	CORE Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	CORE Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	CORE Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	CORE Prime	$ 16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	CORE Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	CORE Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	CORE Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	CORE Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	CORE Prime	$ 16,000	$32,000.00	25.00%	$ 24,000

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	CORE Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	CORE Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	CORE Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	CORE Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	CORE Prime	$ 16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	CORE Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	CORE Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	CORE Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
1	CA01183AA	GCM 8000 COMPARATOR	GCM8000	CORE Prime	$ 2,500	$2,500.00	25.00%	$ 1,875
1	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	CORE Prime	$ 11,500	$11,500.00	25.00%	$ 8,625
1	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	CORE Prime	$ 16,000	$16,000.00	25.00%	$ 12,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	CORE Prime	$ 50	$50.00	25.00%	$ 38
1	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	CORE Prime	$ 1,500	$1,500.00	25.00%	$ 1,125
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	CORE Prime	$ -	$0.00	25.00%	$ -
1	T7038	GCP 8000 SITE CONTROLLER	GCP8000	CORE Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
1	CA00303AA	ADD: QTY (1) SITE CONTROLLER	GCP8000	CORE Prime	$ 2,500	$2,500.00	25.00%	$ 1,875
14	CA02206AA	ADD: SIMULCAST REMOTE SITE LICENSE ‼ IV&D	GCP8000	CORE Prime	$ 4,920	$68,880.00	25.00%	$ 51,660
1	CA01194AA	IP BASED MULTISITE SITE CONTROLLER SOFTWARE	GCP8000	CORE Prime	$ 62,500	$62,500.00	25.00%	$ 46,875
1	X153AW	ADD: RACK MOUNT HARDWARE	GCP8000	CORE Prime	$ 50	$50.00	25.00%	$ 38
1	CA01400AA	ADD: POWER CABLE, DC	GCP8000	CORE Prime	$ -	$0.00	25.00%	$ -
1	T7038	GCP 8000 SITE CONTROLLER	GCP8000	CORE Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
1	CA00303AA	ADD: QTY (1) SITE CONTROLLER	GCP8000	CORE Prime	$ 2,500	$2,500.00	25.00%	$ 1,875
14	CA02206AA	ADD: SIMULCAST REMOTE SITE LICENSE ‼ IV&D	GCP8000	CORE Prime	$ 4,920	$68,880.00	25.00%	$ 51,660
1	CA01194AA	IP BASED MULTISITE SITE CONTROLLER SOFTWARE	GCP8000	CORE Prime	$ 62,500	$62,500.00	25.00%	$ 46,875
1	X153AW	ADD: RACK MOUNT HARDWARE	GCP8000	CORE Prime	$ 50	$50.00	25.00%	$ 38
1	CA01400AA	ADD: POWER CABLE, DC	GCP8000	CORE Prime	$ -	$0.00	25.00%	$ -
1	CLN1859	2620-48 ETHERNET SWITCH	NETWORK	CORE Prime	$ 3,600	$3,600.00	25.00%	$ 2,700
1	CLN1856	2620-24 ETHERNET SWITCH	NETWORK	CORE Prime	$ 2,250	$2,250.00	25.00%	$ 1,688
1	SQM01SUM0205	GGM 8000 GATEWAY	NETWORK	CORE Prime	$ 4,200	$4,200.00	25.00%	$ 3,150
1	CA01619AA	ADD: DC POWER	NETWORK	CORE Prime	$ -	$0.00	25.00%	$ -
1	SQM01SUM0205	GGM 8000 GATEWAY	NETWORK	CORE Prime	$ 4,200	$4,200.00	25.00%	$ 3,150
1	CA01619AA	ADD: DC POWER	NETWORK	CORE Prime	$ -	$0.00	25.00%	$ -
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	CORE Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	CORE Prime	$ 1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	CORE Prime	$ 120	$120.00	25.00%	$ 90

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	CORE Prime	$ 90	$90.00	25.00%	$ 68
2	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	CORE Prime	$ 495	$990.00	25.00%	$ 743
1	DSTRAK91008EDC	PRIME/MASTER SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM DC	SPARES	CORE Prime	$ 34,712	$34,712.00	25.00%	$ 26,034
1	SQM01SUM0205	GGM 8000 GATEWAY	SPARES	CORE Prime	$ 4,200	$4,200.00	25.00%	$ 3,150
1	CA01616AA	ADD: DC POWER	SPARES	CORE Prime	$ -	$0.00	25.00%	$ -
1	CLN1859	2620-48 ETHERNET SWITCH	SPARES	CORE Prime	$ 3,600	$3,600.00	25.00%	$ 2,700
1	DLN6966	FRU: GCP 8000/GCM 8000/GPB 8000	SPARES	CORE Prime	$ 2,500	$2,500.00	25.00%	$ 1,875
1	DLN6781	FRU: POWER SUPPLY	SPARES	CORE Prime	$ 2,200	$2,200.00	25.00%	$ 1,650
1	DLN6898	FRU: FAN MODULE	SPARES	CORE Prime	$ 206	$206.00	25.00%	$ 155
1	T7321	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	West Hollywood Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
1	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	West Hollywood Prime	$ 16,000	$16,000.00	25.00%	$ 12,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	West Hollywood Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	West Hollywood Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	West Hollywood Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	West Hollywood Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	West Hollywood Prime	$ 16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	West Hollywood Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	West Hollywood Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	West Hollywood Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	West Hollywood Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	West Hollywood Prime	$ 16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	West Hollywood Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	West Hollywood Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	West Hollywood Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	West Hollywood Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	West Hollywood Prime	$ 16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	West Hollywood Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	West Hollywood Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	West Hollywood Prime	$ -	$0.00	25.00%	$ -

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	T7321	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	West Hollywood Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	West Hollywood Prime	$ 16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	West Hollywood Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	West Hollywood Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	West Hollywood Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	West Hollywood Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	West Hollywood Prime	$ 16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	West Hollywood Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	West Hollywood Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	West Hollywood Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	West Hollywood Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	West Hollywood Prime	$ 16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	West Hollywood Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	West Hollywood Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	West Hollywood Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	West Hollywood Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	West Hollywood Prime	$ 16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	West Hollywood Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	West Hollywood Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	West Hollywood Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	West Hollywood Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	West Hollywood Prime	$ 16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	West Hollywood Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	West Hollywood Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	West Hollywood Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	West Hollywood Prime	$ 11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	West Hollywood Prime	$ 16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	West Hollywood Prime	$ 50	$50.00	25.00%	$ 38
2	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	West Hollywood Prime	$ 1,500	$3,000.00	25.00%	$ 2,250
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	West Hollywood Prime	$ -	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
1	CA01183AA	GCM 8000 COMPARATOR	GCM8000	West Hollywood Prime	$ 2,500	$2,500.00	25.00%	$ 1,875
1	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	West Hollywood Prime	$ 11,500	$11,500.00	25.00%	$ 8,625

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	West Hollywood Prime	$ 16,000	$16,000.00	25.00%	$ 12,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	West Hollywood Prime	$ 50	$50.00	25.00%	$ 38
1	CA01974AA	TRUNKING REDUNDANT COMPRTR SW	GCM8000	West Hollywood Prime	$ 1,500	$1,500.00	25.00%	$ 1,125
1	CA01400AA	ADD: POWER CABLE, DC	GCM8000	West Hollywood Prime	$ -	$0.00	25.00%	$ -
1	T7038	GCP 8000 SITE CONTROLLER	GCP8000	West Hollywood Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
1	CA00303AA	ADD: QTY (1) SITE CONTROLLER	GCP8000	West Hollywood Prime	$ 2,500	$2,500.00	25.00%	$ 1,875
1	CA00303AA	ADD: QTY (1) SITE CONTROLLER	GCP8000	West Hollywood Prime	$ 2,500	$2,500.00	25.00%	$ 1,875
14	CA02206AA	ADD: SIMULCAST REMOTE SITE LICENSE IV&D	GCP8000	West Hollywood Prime	$ 4,920	$68,880.00	25.00%	$ 51,660
1	CA02474AA	ADD:GEO-REDUN BACK-UP SC LIC	GCP8000	West Hollywood Prime	$ -	$0.00	25.00%	$ -
1	CA01194AA	IP BASED MULTISITE SITE CONTROLLER SOFTWARE	GCP8000	West Hollywood Prime	$ 62,500	$62,500.00	25.00%	$ 46,875
1	X153AW	ADD: RACK MOUNT HARDWARE	GCP8000	West Hollywood Prime	$ 50	$50.00	25.00%	$ 38
1	CA01400AA	ADD: POWER CABLE, DC	GCP8000	West Hollywood Prime	$ -	$0.00	25.00%	$ -
1	DSTRAK91008EDC	PRIME/MASTER SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM DC	GPS	West Hollywood Prime	$ 34,712	$34,712.00	25.00%	$ 26,034
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	West Hollywood Prime	$ 2	$112.50	25.00%	$ 84
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	West Hollywood Prime	$ 27	$109.00	25.00%	$ 82
1	SQM01SUM0205	GGM 8000 GATEWAY	NETWORK	West Hollywood Prime	$ 4,200	$4,200.00	25.00%	$ 3,150
1	CA01616AA	ADD: AC POWER	NETWORK	West Hollywood Prime	$ -	$0.00	25.00%	$ -
1	CLN1856	2620-24 ETHERNET SWITCH	NETWORK	West Hollywood Prime	$ 2,250	$2,250.00	25.00%	$ 1,688
1	CLN1859	2620-48 ETHERNET SWITCH	NETWORK	West Hollywood Prime	$ 3,600	$3,600.00	25.00%	$ 2,700
1	SQM01SUM0205	GGM 8000 GATEWAY	NETWORK	West Hollywood Prime	$ 4,200	$4,200.00	25.00%	$ 3,150
1	CA01616AA	ADD: AC POWER	NETWORK	West Hollywood Prime	$ -	$0.00	25.00%	$ -
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	West Hollywood Prime	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	West Hollywood Prime	$ 1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	West Hollywood Prime	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	West Hollywood Prime	$ 90	$90.00	25.00%	$ 68
2	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	West Hollywood Prime	$ 495	$990.00	25.00%	$ 743
0	DSOP820B	PDU, 120V HARDWIRE (8) 20A OUTLET PDU WITH TYPE 3 SAD PROTECTION	AC Outlets	West Hollywood Prime	$ 938	$0.00	25.00%	$ -
2	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	CORE	$ 4,200	$8,400.00	25.00%	$ 6,300
2	CA01619AA	ADD: DC POWER	GGM8000	CORE	$ -	$0.00	25.00%	$ -
2	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	CORE	$ 2,250	$4,500.00	25.00%	$ 3,375
19	T7039	GTR 8000 Base Radio	GTR8000	CORE	$ -	$0.00	25.00%	$ -
19	CA00855AA	ADD: 700/800 MHZ	GTR8000	CORE	$ 6,300	$119,700.00	25.00%	$ 89,775
19	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	CORE	$ 25,500	$484,500.00	25.00%	$ 363,375
19	CA01400AA	ADD: POWER CABLE, DC	GTR8000	CORE	$ -	$0.00	25.00%	$ -
18	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	CORE	$ 13,000	$234,000.00	25.00%	$ 175,500

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
18	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	CORE	$ 10,000	$180,000.00	25.00%	$ 135,000
19	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	CORE	$ 50	$950.00	25.00%	$ 713
3	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	CORE	$ 495	$1,485.00	25.00%	$ 1,114
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 1	CORE	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 1	CORE	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 2	CORE	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 2	CORE	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSTRAK91009EDC	REMOTE SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM DC	GPS	CORE	$ 30,066	$30,066.00	25.00%	$ 22,550
9	DSTRAK91061	FOUR PORT DDM	GPS	CORE	$ 720	$6,480.00	25.00%	$ 4,860
1	DSTRAK93007DC	DISTRIBUTION SHELF FOR 9100 DC	GPS	CORE	$ 12,296	$12,296.00	25.00%	$ 9,222
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	CORE	$ 2	$112.50	25.00%	$ 84
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	CORE	$ 27	$109.00	25.00%	$ 82
2	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	CORE	$ 7,070	$14,140.00	25.00%	$ 10,605
2	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	CORE	$ 5,846	$11,692.00	25.00%	$ 8,769
0	DS7583K01	EXPANSION KIT 16-32 PORT 792-902 MHZ TTA01	RFDS	CORE	$ 2,238	$0.00	25.00%	$ -
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	CORE	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	CORE	$ 1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	CORE	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	CORE	$ 90	$90.00	25.00%	$ 68
1	DSTRAK91061	FOUR PORT DDM	SPARES	CORE	$ 720	$720.00	25.00%	$ 540
1	SQM01SUM0205	GGM 8000 GATEWAY	SPARES	CORE	$ 4,200	$4,200.00	25.00%	$ 3,150
1	CA01619AA	ADD: DC POWER	SPARES	CORE	$ -	$0.00	25.00%	$ -
4	DLN6885	FRU: XCVR 7/800 MHZ V2	SPARES	CORE	$ 1,200	$4,800.00	25.00%	$ 3,600
4	DLN6895	FRU: PA 7/800 MHz	SPARES	CORE	$ 1,200	$4,800.00	25.00%	$ 3,600
4	DLN6966	FRU: GCP 8000/GCM 8000/GPB 8000	SPARES	CORE	$ 2,500	$10,000.00	25.00%	$ 7,500
4	DLN6781	FRU: POWER SUPPLY	SPARES	CORE	$ 2,200	$8,800.00	25.00%	$ 6,600
1	DLN6455	CONFIGURATION/SERVICE SOFTWARE	SPARES	CORE	$ 25	$25.00	25.00%	$ 19
4	DLN6898	FRU: FAN MODULE	SPARES	CORE	$ 206	$824.00	25.00%	$ 618
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	SPARES	CORE	$ 4,594	$4,594.00	25.00%	$ 3,446

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	CORE	$ 3,873	$3,873.00	25.00%	$ 2,905
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	CORE	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	CORE	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	CORE	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	CORE	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	CORE	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	CORE	$ 18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	CORE	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	CORE	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	CORE	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	CORE	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	CORE	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	CORE	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	CORE	$ 29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	CORE	$ 17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	CORE	$ 22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW- HANGER KIT STAINLESS-10PK	ANTACC	CORE	$ 21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	CORE	$ 33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	CORE	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	CORE	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	CORE	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	CORE	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	CORE	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	CORE	$ 32	$64.00	25.00%	$ 48
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	CORE	$ 3,873	$3,873.00	25.00%	$ 2,905
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	CORE	$ 4	$52.50	25.00%	$ 39

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	CORE	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	CORE	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	CORE	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	CORE	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	CORE	$ 18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	CORE	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	CORE	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	CORE	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	CORE	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	CORE	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	CORE	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	CORE	$ 29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	CORE	$ 17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	CORE	$ 22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	CORE	$ 21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	CORE	$ 33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	CORE	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	CORE	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	CORE	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	CORE	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	CORE	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	CORE	$ 32	$64.00	25.00%	$ 48
1	DSSC412HF2LDFD2NU	COLLINEAR OMNI 11.5DBD GAIN 746-869MHZ 2DT NULL FILL DIN FEMALE CONN	ANTENNA	CORE	$ 6,967	$6,967.00	25.00%	$ 5,225
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	CORE	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	CORE	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	CORE	$ 22	$44.00	25.00%	$ 33

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	CORE	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	CORE	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	CORE	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	CORE	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	CORE	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	CORE	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	CORE	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	CORE	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	CORE	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	CORE	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	CORE	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	CORE	$ 29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	CORE	$ 4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	CORE	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	CORE	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	CORE	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	CORE	$ 27	$54.50	25.00%	$ 41
1	DSSC412HF2LDFD2NU	COLLINEAR OMNI 11.5DBD GAIN 746-869MHZ 2DT NULL FILL DIN FEMALE CONN	ANTENNA	CORE	$ 6,967	$6,967.00	25.00%	$ 5,225
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	CORE	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	CORE	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	CORE	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	CORE	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	CORE	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	CORE	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	CORE	$ 32	$64.00	25.00%	$ 48

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	CORE	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	CORE	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	CORE	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	CORE	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	CORE	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	CORE	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	CORE	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	CORE	$ 29	$57.00	25.00%	$ 43
1	DSSP74964440DFF1 RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	APM	CORE	$ 553	$553.00	25.00%	$ 415
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	CORE	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	CORE	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	CORE	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	CORE	$ 27	$54.50	25.00%	$ 41
2	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	Coconut Creek	$ 4,200	$8,400.00	25.00%	$ 6,300
2	CA01619AA	ADD: DC POWER	GGM8000	Coconut Creek	$ -	$0.00	25.00%	$ -
2	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	Coconut Creek	$ 2,250	$4,500.00	25.00%	$ 3,375
19	T7039	GTR 8000 Base Radio	GTR8000	Coconut Creek	$ -	$0.00	25.00%	$ -
19	CA00855AA	ADD: 700/800 MHZ	GTR8000	Coconut Creek	$ 6,300	$119,700.00	25.00%	$ 89,775
19	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	Coconut Creek	$ 25,500	$484,500.00	25.00%	$ 363,375
19	CA01400AA	ADD: POWER CABLE, DC	GTR8000	Coconut Creek	$ -	$0.00	25.00%	$ -
18	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	Coconut Creek	$ 13,000	$234,000.00	25.00%	$ 175,500
18	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	Coconut Creek	$ 10,000	$180,000.00	25.00%	$ 135,000
19	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	Coconut Creek	$ 50	$950.00	25.00%	$ 713
3	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	Coconut Creek	$ 495	$1,485.00	25.00%	$ 1,114
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 1	Coconut Creek	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 1	Coconut Creek	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 2	Coconut Creek	$ 12,267	$12,267.00	25.00%	$ 9,200

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 2	Coconut Creek	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSTRAK91009EDC	REMOTE SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM DC	GPS	Coconut Creek	$ 30,066	$30,066.00	25.00%	$ 22,550
9	DSTRAK91061	FOUR PORT DDM	GPS	Coconut Creek	$ 720	$6,480.00	25.00%	$ 4,860
1	DSTRAK93007DC	DISTRIBUTION SHELF FOR 9100 DC	GPS	Coconut Creek	$ 12,296	$12,296.00	25.00%	$ 9,222
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	Coconut Creek	$ 2	$112.50	25.00%	$ 84
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	Coconut Creek	$ 27	$109.00	25.00%	$ 82
2	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	Coconut Creek	$ 7,070	$14,140.00	25.00%	$ 10,605
2	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	Coconut Creek	$ 5,846	$11,692.00	25.00%	$ 8,769
0	DS7583K01	EXPANSION KIT 16-32 PORT 792-902 MHZ TTA01	RFDS	Coconut Creek	$ 2,238	$0.00	25.00%	$ -
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	Coconut Creek	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	Coconut Creek	$ 1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	Coconut Creek	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	Coconut Creek	$ 90	$90.00	25.00%	$ 68
1	DSBLR12SAB1	PENETRATOR ANTENNA, 794-824 MHZ, 16.4 DBI, 220 DEG	ANTENNA	Coconut Creek	$ 8,343	$8,343.00	25.00%	$ 6,257
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Coconut Creek	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Coconut Creek	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Coconut Creek	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Coconut Creek	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Coconut Creek	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Coconut Creek	$ 18	$35.50	25.00%	$ 27
430	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Coconut Creek	$ 8	$3,612.00	25.00%	$ 2,709
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Coconut Creek	$ 40	$79.50	25.00%	$ 60
8	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Coconut Creek	$ 23	$180.00	25.00%	$ 135
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Coconut Creek	$ 29	$57.00	25.00%	$ 43
430	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Coconut Creek	$ 4	$1,505.00	25.00%	$ 1,129
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Coconut Creek	$ 18	$17.75	25.00%	$ 13

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Coconut Creek	$ 29	$28.50	25.00%	$ 21
8	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Coconut Creek	$ 17	$134.00	25.00%	$ 101
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Coconut Creek	$ 22	$43.00	25.00%	$ 32
14	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Coconut Creek	$ 21	$294.00	25.00%	$ 221
14	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Coconut Creek	$ 33	$455.00	25.00%	$ 341
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Coconut Creek	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Coconut Creek	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Coconut Creek	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Coconut Creek	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Coconut Creek	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Coconut Creek	$ 32	$64.00	25.00%	$ 48
1	DSBLR12SAB1	PENETRATOR ANTENNA, 794-824 MHZ, 16.4 DBI, 220 DEG	ANTENNA	Coconut Creek	$ 8,343	$8,343.00	25.00%	$ 6,257
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Coconut Creek	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Coconut Creek	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Coconut Creek	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Coconut Creek	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Coconut Creek	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Coconut Creek	$ 18	$35.50	25.00%	$ 27
430	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Coconut Creek	$ 8	$3,612.00	25.00%	$ 2,709
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Coconut Creek	$ 40	$79.50	25.00%	$ 60
8	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Coconut Creek	$ 23	$180.00	25.00%	$ 135
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Coconut Creek	$ 29	$57.00	25.00%	$ 43
430	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Coconut Creek	$ 4	$1,505.00	25.00%	$ 1,129
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Coconut Creek	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Coconut Creek	$ 29	$28.50	25.00%	$ 21
8	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Coconut Creek	$ 17	$134.00	25.00%	$ 101

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Coconut Creek	$ 22	$43.00	25.00%	$ 32
14	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Coconut Creek	$ 21	$294.00	25.00%	$ 221
14	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Coconut Creek	$ 33	$455.00	25.00%	$ 341
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Coconut Creek	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Coconut Creek	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Coconut Creek	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Coconut Creek	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Coconut Creek	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Coconut Creek	$ 32	$64.00	25.00%	$ 48
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Coconut Creek	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Coconut Creek	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Coconut Creek	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Coconut Creek	$ 22	$44.00	25.00%	$ 33
405	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Coconut Creek	$ 16	$6,581.25	25.00%	$ 4,936
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Coconut Creek	$ 112	$224.00	25.00%	$ 168
7	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Coconut Creek	$ 23	$162.75	25.00%	$ 122
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Coconut Creek	$ 32	$64.00	25.00%	$ 48
13	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Coconut Creek	$ 29	$370.50	25.00%	$ 278
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Coconut Creek	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Coconut Creek	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Coconut Creek	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Coconut Creek	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Coconut Creek	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Coconut Creek	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Coconut Creek	$ 29	$57.00	25.00%	$ 43

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	Coconut Creek	$ 4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Coconut Creek	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Coconut Creek	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Coconut Creek	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Coconut Creek	$ 27	$54.50	25.00%	$ 41
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Coconut Creek	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Coconut Creek	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Coconut Creek	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Coconut Creek	$ 22	$44.00	25.00%	$ 33
405	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Coconut Creek	$ 16	$6,581.25	25.00%	$ 4,936
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Coconut Creek	$ 112	$224.00	25.00%	$ 168
7	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Coconut Creek	$ 23	$162.75	25.00%	$ 122
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Coconut Creek	$ 32	$64.00	25.00%	$ 48
13	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Coconut Creek	$ 29	$370.50	25.00%	$ 278
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Coconut Creek	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Coconut Creek	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Coconut Creek	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Coconut Creek	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Coconut Creek	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Coconut Creek	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Coconut Creek	$ 29	$57.00	25.00%	$ 43
1	DSSP74964440DFF1RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	APM	Coconut Creek	$ 553	$553.00	25.00%	$ 415
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Coconut Creek	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Coconut Creek	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Coconut Creek	$ 2	$22.50	25.00%	$ 17

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Coconut Creek	$ 27	$54.50	25.00%	$ 41
2	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	Markham Park	$ 4,200	$8,400.00	25.00%	$ 6,300
2	CA01619AA	ADD: DC POWER	GGM8000	Markham Park	$ -	$0.00	25.00%	$ -
2	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	Markham Park	$ 2,250	$4,500.00	25.00%	$ 3,375
19	T7039	GTR 8000 Base Radio	GTR8000	Markham Park	$ -	$0.00	25.00%	$ -
19	CA00855AA	ADD: 700/800 MHZ	GTR8000	Markham Park	$ 6,300	$119,700.00	25.00%	$ 89,775
19	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	Markham Park	$ 25,500	$484,500.00	25.00%	$ 363,375
19	CA01400AA	ADD: POWER CABLE, DC	GTR8000	Markham Park	$ -	$0.00	25.00%	$ -
18	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	Markham Park	$ 13,000	$234,000.00	25.00%	$ 175,500
18	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	Markham Park	$ 10,000	$180,000.00	25.00%	$ 135,000
19	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	Markham Park	$ 50	$950.00	25.00%	$ 713
3	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	Markham Park	$ 495	$1,485.00	25.00%	$ 1,114
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 1	Markham Park	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 1	Markham Park	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 2	Markham Park	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 2	Markham Park	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSTRAK91009EDC	REMOTE SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM DC	GPS	Markham Park	$ 30,066	$30,066.00	25.00%	$ 22,550
6	DSTRAK91061	FOUR PORT DDM	GPS	Markham Park	$ 720	$4,320.00	25.00%	$ 3,240
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	Markham Park	$ 2	$112.50	25.00%	$ 84
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	Markham Park	$ 27	$109.00	25.00%	$ 82
2	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	Markham Park	$ 5,846	$11,692.00	25.00%	$ 8,769
0	DS7583K01	EXPANSION KIT 16-32 PORT 792-902 MHZ TTA01	RFDS	Markham Park	$ 2,238	$0.00	25.00%	$ -
2	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	Markham Park	$ 7,070	$14,140.00	25.00%	$ 10,605
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	Markham Park	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	Markham Park	$ 1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	Markham Park	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	Markham Park	$ 90	$90.00	25.00%	$ 68
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	Markham Park	$ 3,873	$3,873.00	25.00%	$ 2,905

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Markham Park	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Markham Park	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Markham Park	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Markham Park	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Markham Park	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Markham Park	$ 18	$35.50	25.00%	$ 27
425	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Markham Park	$ 8	$3,570.00	25.00%	$ 2,678
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Markham Park	$ 40	$79.50	25.00%	$ 60
8	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Markham Park	$ 23	$180.00	25.00%	$ 135
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Markham Park	$ 29	$57.00	25.00%	$ 43
425	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Markham Park	$ 4	$1,487.50	25.00%	$ 1,116
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Markham Park	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Markham Park	$ 29	$28.50	25.00%	$ 21
8	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Markham Park	$ 17	$134.00	25.00%	$ 101
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Markham Park	$ 22	$43.00	25.00%	$ 32
14	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW- HANGER KIT STAINLESS-10PK	ANTACC	Markham Park	$ 21	$294.00	25.00%	$ 221
14	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Markham Park	$ 33	$455.00	25.00%	$ 341
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Markham Park	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Markham Park	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Markham Park	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Markham Park	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Markham Park	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Markham Park	$ 32	$64.00	25.00%	$ 48
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	Markham Park	$ 3,873	$3,873.00	25.00%	$ 2,905
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Markham Park	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Markham Park	$ 18	$17.75	25.00%	$ 13

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Markham Park	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Markham Park	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Markham Park	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Markham Park	$ 18	$35.50	25.00%	$ 27
425	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Markham Park	$ 8	$3,570.00	25.00%	$ 2,678
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Markham Park	$ 40	$79.50	25.00%	$ 60
8	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Markham Park	$ 23	$180.00	25.00%	$ 135
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Markham Park	$ 29	$57.00	25.00%	$ 43
425	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Markham Park	$ 4	$1,487.50	25.00%	$ 1,116
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Markham Park	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Markham Park	$ 29	$28.50	25.00%	$ 21
8	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Markham Park	$ 17	$134.00	25.00%	$ 101
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Markham Park	$ 22	$43.00	25.00%	$ 32
14	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Markham Park	$ 21	$294.00	25.00%	$ 221
14	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Markham Park	$ 33	$455.00	25.00%	$ 341
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Markham Park	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Markham Park	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Markham Park	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Markham Park	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Markham Park	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Markham Park	$ 32	$64.00	25.00%	$ 48
1	DSSC412HF2LDFD2NU	COLLINEAR OMNI 11.5DBD GAIN 746-869MHZ 2DT NULL FILL DIN FEMALE CONN	ANTENNA	Markham Park	$ 6,967	$6,967.00	25.00%	$ 5,225
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Markham Park	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Markham Park	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Markham Park	$ 22	$44.00	25.00%	$ 33

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
400	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Markham Park	$ 16	$6,500.00	25.00%	$ 4,875
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Markham Park	$ 112	$224.00	25.00%	$ 168
7	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Markham Park	$ 23	$162.75	25.00%	$ 122
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Markham Park	$ 32	$64.00	25.00%	$ 48
13	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Markham Park	$ 29	$370.50	25.00%	$ 278
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Markham Park	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Markham Park	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Markham Park	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Markham Park	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Markham Park	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Markham Park	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Markham Park	$ 29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	Markham Park	$ 4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Markham Park	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Markham Park	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Markham Park	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Markham Park	$ 27	$54.50	25.00%	$ 41
1	DSSC412HF2LDFD2NU	COLLINEAR OMNI 11.5DBD GAIN 746-869MHZ 2DT NULL FILL DIN FEMALE CONN	ANTENNA	Markham Park	$ 6,967	$6,967.00	25.00%	$ 5,225
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Markham Park	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Markham Park	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Markham Park	$ 22	$44.00	25.00%	$ 33
400	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Markham Park	$ 16	$6,500.00	25.00%	$ 4,875
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Markham Park	$ 112	$224.00	25.00%	$ 168
7	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Markham Park	$ 23	$162.75	25.00%	$ 122
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Markham Park	$ 32	$64.00	25.00%	$ 48

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
13	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Markham Park	$ 29	$370.50	25.00%	$ 278
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Markham Park	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Markham Park	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Markham Park	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Markham Park	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Markham Park	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Markham Park	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Markham Park	$ 29	$57.00	25.00%	$ 43
1	DSSP74964440DFF1 RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	APM	Markham Park	$ 553	$553.00	25.00%	$ 415
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Markham Park	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Markham Park	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Markham Park	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Markham Park	$ 27	$54.50	25.00%	$ 41
2	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	Playa	$ 4,200	$8,400.00	25.00%	$ 6,300
2	CA01619AA	ADD: DC POWER	GGM8000	Playa	$ -	$0.00	25.00%	$ -
2	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	Playa	$ 2,250	$4,500.00	25.00%	$ 3,375
19	T7039	GTR 8000 Base Radio	GTR8000	Playa	$ -	$0.00	25.00%	$ -
19	CA00855AA	ADD: 700/800 MHZ	GTR8000	Playa	$ 6,300	$119,700.00	25.00%	$ 89,775
19	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	Playa	$ 25,500	$484,500.00	25.00%	$ 363,375
19	CA01400AA	ADD: POWER CABLE, DC	GTR8000	Playa	$ -	$0.00	25.00%	$ -
18	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	Playa	$ 13,000	$234,000.00	25.00%	$ 175,500
18	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	Playa	$ 10,000	$180,000.00	25.00%	$ 135,000
19	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	Playa	$ 50	$950.00	25.00%	$ 713
3	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	Playa	$ 495	$1,485.00	25.00%	$ 1,114
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 1	Playa	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 1	Playa	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 2	Playa	$ 12,267	$12,267.00	25.00%	$ 9,200

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 2	Playa	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSTRAK91009EDC	REMOTE SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM DC	GPS	Playa	$ 30,066	$30,066.00	25.00%	$ 22,550
6	DSTRAK91061	FOUR PORT DDM	GPS	Playa	$ 720	$4,320.00	25.00%	$ 3,240
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	Playa	$ 2	$112.50	25.00%	$ 84
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	Playa	$ 27	$109.00	25.00%	$ 82
2	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	Playa	$ 5,846	$11,692.00	25.00%	$ 8,769
0	DS7583K01	EXPANSION KIT 16-32 PORT 792-902 MHZ TTA01	RFDS	Playa	$ 2,238	$0.00	25.00%	$ -
2	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	Playa	$ 7,070	$14,140.00	25.00%	$ 10,605
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	Playa	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	Playa	$ 1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	Playa	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	Playa	$ 90	$90.00	25.00%	$ 68
1	DSBLR12SAB1	PENETRATOR ANTENNA, 794-824 MHZ, 16.4 DBI, 220 DEG	ANTENNA	Playa	$ 8,343	$8,343.00	25.00%	$ 6,257
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Playa	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Playa	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Playa	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Playa	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Playa	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Playa	$ 18	$35.50	25.00%	$ 27
100	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Playa	$ 8	$840.00	25.00%	$ 630
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Playa	$ 40	$79.50	25.00%	$ 60
3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Playa	$ 23	$67.50	25.00%	$ 51
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Playa	$ 29	$57.00	25.00%	$ 43
100	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Playa	$ 4	$350.00	25.00%	$ 263
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Playa	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Playa	$ 29	$28.50	25.00%	$ 21

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
3	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Playa	$ 17	$50.25	25.00%	$ 38
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Playa	$ 22	$43.00	25.00%	$ 32
3	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Playa	$ 21	$63.00	25.00%	$ 47
3	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Playa	$ 33	$97.50	25.00%	$ 73
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Playa	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Playa	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Playa	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Playa	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Playa	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Playa	$ 32	$64.00	25.00%	$ 48
1	DSBLR12SAB1	PENETRATOR ANTENNA, 794-824 MHZ, 16.4 DBI, 220 DEG	ANTENNA	Playa	$ 8,343	$8,343.00	25.00%	$ 6,257
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Playa	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Playa	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Playa	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Playa	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Playa	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Playa	$ 18	$35.50	25.00%	$ 27
100	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Playa	$ 8	$840.00	25.00%	$ 630
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Playa	$ 40	$79.50	25.00%	$ 60
3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Playa	$ 23	$67.50	25.00%	$ 51
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Playa	$ 29	$57.00	25.00%	$ 43
100	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Playa	$ 4	$350.00	25.00%	$ 263
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Playa	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Playa	$ 29	$28.50	25.00%	$ 21
3	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Playa	$ 17	$50.25	25.00%	$ 38
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Playa	$ 22	$43.00	25.00%	$ 32

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
3	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Playa	$ 21	$63.00	25.00%	$ 47
3	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Playa	$ 33	$97.50	25.00%	$ 73
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Playa	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Playa	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Playa	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Playa	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Playa	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Playa	$ 32	$64.00	25.00%	$ 48
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Playa	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Playa	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Playa	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Playa	$ 22	$44.00	25.00%	$ 33
100	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Playa	$ 8	$840.00	25.00%	$ 630
2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)	MAINLINE	Playa	$ 40	$79.50	25.00%	$ 60
3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Playa	$ 23	$67.50	25.00%	$ 51
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Playa	$ 32	$64.00	25.00%	$ 48
3	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Playa	$ 33	$97.50	25.00%	$ 73
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Playa	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Playa	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Playa	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Playa	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Playa	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Playa	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Playa	$ 29	$57.00	25.00%	$ 43

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	Playa	$ 4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Playa	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Playa	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Playa	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Playa	$ 27	$54.50	25.00%	$ 41
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Playa	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Playa	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Playa	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Playa	$ 22	$44.00	25.00%	$ 33
100	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Playa	$ 8	$840.00	25.00%	$ 630
2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)	MAINLINE	Playa	$ 40	$79.50	25.00%	$ 60
3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Playa	$ 23	$67.50	25.00%	$ 51
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Playa	$ 32	$64.00	25.00%	$ 48
3	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Playa	$ 33	$97.50	25.00%	$ 73
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Playa	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Playa	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Playa	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Playa	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Playa	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Playa	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Playa	$ 29	$57.00	25.00%	$ 43
1	DSSP74964440DFF1RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	APM	Playa	$ 553	$553.00	25.00%	$ 415
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Playa	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Playa	$ 27	$54.50	25.00%	$ 41

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Playa	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Playa	$ 27	$54.50	25.00%	$ 41
2	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	Davie	$ 4,200	$8,400.00	25.00%	$ 6,300
2	CA01619AA	ADD: DC POWER	GGM8000	Davie	$ -	$0.00	25.00%	$ -
2	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	Davie	$ 2,250	$4,500.00	25.00%	$ 3,375
19	T7039	GTR 8000 Base Radio	GTR8000	Davie	$ -	$0.00	25.00%	$ -
19	CA00855AA	ADD: 700/800 MHZ	GTR8000	Davie	$ 6,300	$119,700.00	25.00%	$ 89,775
19	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	Davie	$ 25,500	$484,500.00	25.00%	$ 363,375
19	CA01400AA	ADD: POWER CABLE, DC	GTR8000	Davie	$ -	$0.00	25.00%	$ -
18	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	Davie	$ 13,000	$234,000.00	25.00%	$ 175,500
18	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	Davie	$ 10,000	$180,000.00	25.00%	$ 135,000
19	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	Davie	$ 50	$950.00	25.00%	$ 713
3	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	Davie	$ 495	$1,485.00	25.00%	$ 1,114
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 1	Davie	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 1	Davie	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 2	Davie	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 2	Davie	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSTRAK91009EDC	REMOTE SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM DC	GPS	Davie	$ 30,066	$30,066.00	25.00%	$ 22,550
9	DSTRAK91061	FOUR PORT DDM	GPS	Davie	$ 720	$6,480.00	25.00%	$ 4,860
1	DSTRAK93007DC	DISTRIBUTION SHELF FOR 9100 DC	GPS	Davie	$ 12,296	$12,296.00	25.00%	$ 9,222
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	Davie	$ 2	$112.50	25.00%	$ 84
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	Davie	$ 27	$109.00	25.00%	$ 82
2	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	Davie	$ 5,846	$11,692.00	25.00%	$ 8,769
0	DS7583K01	EXPANSION KIT 16-32 PORT 792-902 MHZ TTA01	RFDS	Davie	$ 2,238	$0.00	25.00%	$ -
2	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	Davie	$ 7,070	$14,140.00	25.00%	$ 10,605
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	Davie	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	Davie	$ 1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	Davie	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	Davie	$ 90	$90.00	25.00%	$ 68

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	Davie	$ 3,873	$3,873.00	25.00%	$ 2,905
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Davie	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Davie	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Davie	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Davie	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Davie	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Davie	$ 18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Davie	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Davie	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Davie	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Davie	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Davie	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Davie	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Davie	$ 29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Davie	$ 17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Davie	$ 22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Davie	$ 21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Davie	$ 33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Davie	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Davie	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Davie	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Davie	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Davie	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Davie	$ 32	$64.00	25.00%	$ 48
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	Davie	$ 3,873	$3,873.00	25.00%	$ 2,905
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Davie	$ 4	$52.50	25.00%	$ 39

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Davie	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Davie	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Davie	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Davie	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Davie	$ 18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Davie	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Davie	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Davie	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Davie	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Davie	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Davie	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Davie	$ 29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Davie	$ 17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Davie	$ 22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Davie	$ 21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Davie	$ 33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Davie	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Davie	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Davie	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Davie	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Davie	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Davie	$ 32	$64.00	25.00%	$ 48
1	DSSC412HF2LDFD2NU	COLLINEAR OMNI 11.5DBD GAIN 746-869MHZ 2DT NULL FILL DIN FEMALE CONN	ANTENNA	Davie	$ 6,967	$6,967.00	25.00%	$ 5,225
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Davie	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Davie	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Davie	$ 22	$44.00	25.00%	$ 33

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Davie	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Davie	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Davie	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Davie	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Davie	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Davie	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Davie	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Davie	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Davie	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Davie	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Davie	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Davie	$ 29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	Davie	$ 4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Davie	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Davie	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Davie	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Davie	$ 27	$54.50	25.00%	$ 41
1	DSSC412HF2LDFD2NU	COLLINEAR OMNI 11.5DBD GAIN 746-869MHZ 2DT NULL FILL DIN FEMALE CONN	ANTENNA	Davie	$ 6,967	$6,967.00	25.00%	$ 5,225
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Davie	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Davie	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Davie	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Davie	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Davie	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Davie	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Davie	$ 32	$64.00	25.00%	$ 48

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Davie	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Davie	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Davie	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Davie	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Davie	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Davie	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Davie	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Davie	$ 29	$57.00	25.00%	$ 43
1	DSSP74964440DFF1 RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	APM	Davie	$ 553	$553.00	25.00%	$ 415
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Davie	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Davie	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Davie	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Davie	$ 27	$54.50	25.00%	$ 41
2	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	Pt of America	$ 4,200	$8,400.00	25.00%	$ 6,300
2	CA01619AA	ADD: DC POWER	GGM8000	Pt of America	$ -	$0.00	25.00%	$ -
2	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	Pt of America	$ 2,250	$4,500.00	25.00%	$ 3,375
19	T7039	GTR 8000 Base Radio	GTR8000	Pt of America	$ -	$0.00	25.00%	$ -
19	CA00855AA	ADD: 700/800 MHZ	GTR8000	Pt of America	$ 6,300	$119,700.00	25.00%	$ 89,775
19	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	Pt of America	$ 25,500	$484,500.00	25.00%	$ 363,375
19	CA01400AA	ADD: POWER CABLE, DC	GTR8000	Pt of America	$ -	$0.00	25.00%	$ -
18	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	Pt of America	$ 13,000	$234,000.00	25.00%	$ 175,500
18	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	Pt of America	$ 10,000	$180,000.00	25.00%	$ 135,000
19	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	Pt of America	$ 50	$950.00	25.00%	$ 713
3	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	Pt of America	$ 495	$1,485.00	25.00%	$ 1,114
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 1	Pt of America	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 1	Pt of America	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 2	Pt of America	$ 12,267	$12,267.00	25.00%	$ 9,200

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 2	Pt of America	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSTRAK91009EDC	REMOTE SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM DC	GPS	Pt of America	$ 30,066	$30,066.00	25.00%	$ 22,550
6	DSTRAK91061	FOUR PORT DDM	GPS	Pt of America	$ 720	$4,320.00	25.00%	$ 3,240
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	Pt of America	$ 2	$112.50	25.00%	$ 84
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	Pt of America	$ 27	$109.00	25.00%	$ 82
2	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	Pt of America	$ 5,846	$11,692.00	25.00%	$ 8,769
0	DS7583K01	EXPANSION KIT 16-32 PORT 792-902 MHZ TTA01	RFDS	Pt of America	$ 2,238	$0.00	25.00%	$ -
2	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	Pt of America	$ 7,070	$14,140.00	25.00%	$ 10,605
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	Pt of America	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	Pt of America	$ 1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	Pt of America	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	Pt of America	$ 90	$90.00	25.00%	$ 68
1	DSBLR12SAB1	PENETRATOR ANTENNA, 794-824 MHZ, 16.4 DBI, 220 DEG	ANTENNA	Pt of America	$ 8,343	$8,343.00	25.00%	$ 6,257
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Pt of America	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Pt of America	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Pt of America	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Pt of America	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Pt of America	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Pt of America	$ 18	$35.50	25.00%	$ 27
100	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Pt of America	$ 8	$840.00	25.00%	$ 630
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Pt of America	$ 40	$79.50	25.00%	$ 60
3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Pt of America	$ 23	$67.50	25.00%	$ 51
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Pt of America	$ 29	$57.00	25.00%	$ 43
100	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Pt of America	$ 4	$350.00	25.00%	$ 263
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Pt of America	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Pt of America	$ 29	$28.50	25.00%	$ 21

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
3	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Pt of America	$ 17	$50.25	25.00%	$ 38
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Pt of America	$ 22	$43.00	25.00%	$ 32
3	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Pt of America	$ 21	$63.00	25.00%	$ 47
3	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Pt of America	$ 33	$97.50	25.00%	$ 73
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Pt of America	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Pt of America	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Pt of America	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Pt of America	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Pt of America	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Pt of America	$ 32	$64.00	25.00%	$ 48
1	DSBLR12SAB1	PENETRATOR ANTENNA, 794-824 MHZ, 16.4 DBI, 220 DEG	ANTENNA	Pt of America	$ 8,343	$8,343.00	25.00%	$ 6,257
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Pt of America	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Pt of America	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Pt of America	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Pt of America	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Pt of America	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Pt of America	$ 18	$35.50	25.00%	$ 27
100	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Pt of America	$ 8	$840.00	25.00%	$ 630
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Pt of America	$ 40	$79.50	25.00%	$ 60
3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Pt of America	$ 23	$67.50	25.00%	$ 51
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Pt of America	$ 29	$57.00	25.00%	$ 43
100	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Pt of America	$ 4	$350.00	25.00%	$ 263
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Pt of America	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Pt of America	$ 29	$28.50	25.00%	$ 21
3	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Pt of America	$ 17	$50.25	25.00%	$ 38
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Pt of America	$ 22	$43.00	25.00%	$ 32

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
3	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Pt of America	$ 21	$63.00	25.00%	$ 47
3	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Pt of America	$ 33	$97.50	25.00%	$ 73
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Pt of America	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Pt of America	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Pt of America	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Pt of America	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Pt of America	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Pt of America	$ 32	$64.00	25.00%	$ 48
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Pt of America	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Pt of America	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Pt of America	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Pt of America	$ 22	$44.00	25.00%	$ 33
100	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Pt of America	$ 8	$840.00	25.00%	$ 630
2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)	MAINLINE	Pt of America	$ 40	$79.50	25.00%	$ 60
3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Pt of America	$ 23	$67.50	25.00%	$ 51
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Pt of America	$ 32	$64.00	25.00%	$ 48
3	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Pt of America	$ 33	$97.50	25.00%	$ 73
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Pt of America	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Pt of America	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Pt of America	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Pt of America	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Pt of America	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Pt of America	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Pt of America	$ 29	$57.00	25.00%	$ 43

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	Pt of America	$ 4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Pt of America	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Pt of America	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Pt of America	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Pt of America	$ 27	$54.50	25.00%	$ 41
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Pt of America	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Pt of America	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Pt of America	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Pt of America	$ 22	$44.00	25.00%	$ 33
100	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Pt of America	$ 16	$1,625.00	25.00%	$ 1,219
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Pt of America	$ 112	$224.00	25.00%	$ 168
3	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Pt of America	$ 23	$69.75	25.00%	$ 52
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Pt of America	$ 32	$64.00	25.00%	$ 48
3	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Pt of America	$ 29	$85.50	25.00%	$ 64
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Pt of America	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Pt of America	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Pt of America	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Pt of America	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Pt of America	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Pt of America	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Pt of America	$ 29	$57.00	25.00%	$ 43
1	DSSP74964440DFF1RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	APM	Pt of America	$ 553	$553.00	25.00%	$ 415
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Pt of America	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Pt of America	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Pt of America	$ 2	$22.50	25.00%	$ 17

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Pt of America	$ 27	$54.50	25.00%	$ 41
2	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	Miramar	$ 4,200	$8,400.00	25.00%	$ 6,300
2	CA01619AA	ADD: DC POWER	GGM8000	Miramar	$ -	$0.00	25.00%	$ -
2	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	Miramar	$ 2,250	$4,500.00	25.00%	$ 3,375
19	T7039	GTR 8000 Base Radio	GTR8000	Miramar	$ -	$0.00	25.00%	$ -
19	CA00855AA	ADD: 700/800 MHZ	GTR8000	Miramar	$ 6,300	$119,700.00	25.00%	$ 89,775
19	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	Miramar	$ 25,500	$484,500.00	25.00%	$ 363,375
19	CA01400AA	ADD: POWER CABLE, DC	GTR8000	Miramar	$ -	$0.00	25.00%	$ -
18	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	Miramar	$ 13,000	$234,000.00	25.00%	$ 175,500
18	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	Miramar	$ 10,000	$180,000.00	25.00%	$ 135,000
19	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	Miramar	$ 50	$950.00	25.00%	$ 713
3	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	Miramar	$ 495	$1,485.00	25.00%	$ 1,114
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 1	Miramar	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 1	Miramar	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 2	Miramar	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 2	Miramar	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSTRAK91009EDC	REMOTE SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM DC	GPS	Miramar	$ 30,066	$30,066.00	25.00%	$ 22,550
6	DSTRAK91061	FOUR PORT DDM	GPS	Miramar	$ 720	$4,320.00	25.00%	$ 3,240
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	Miramar	$ 2	$112.50	25.00%	$ 84
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	Miramar	$ 27	$109.00	25.00%	$ 82
2	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	Miramar	$ 5,846	$11,692.00	25.00%	$ 8,769
0	DS7583K01	EXPANSION KIT 16-32 PORT 792-902 MHZ TTA01	RFDS	Miramar	$ 2,238	$0.00	25.00%	$ -
2	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	Miramar	$ 7,070	$14,140.00	25.00%	$ 10,605
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	Miramar	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	Miramar	$ 1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	Miramar	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	Miramar	$ 90	$90.00	25.00%	$ 68
1	DSBLR12SAB1	PENETRATOR ANTENNA, 794-824 MHZ, 16.4 DBI, 220 DEG	ANTENNA	Miramar	$ 8,343	$8,343.00	25.00%	$ 6,257

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Miramar	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Miramar	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Miramar	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Miramar	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Miramar	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Miramar	$ 18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Miramar	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Miramar	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Miramar	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Miramar	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Miramar	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Miramar	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Miramar	$ 29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Miramar	$ 17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Miramar	$ 22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Miramar	$ 21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Miramar	$ 33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Miramar	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Miramar	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Miramar	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Miramar	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Miramar	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Miramar	$ 32	$64.00	25.00%	$ 48
1	DSBLR12SAB1	PENETRATOR ANTENNA, 794-824 MHZ, 16.4 DBI, 220 DEG	ANTENNA	Miramar	$ 8,343	$8,343.00	25.00%	$ 6,257
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Miramar	$ 4	$52.50	25.00%	$ 39

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Miramar	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Miramar	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Miramar	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Miramar	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Miramar	$ 18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Miramar	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Miramar	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Miramar	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Miramar	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Miramar	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Miramar	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Miramar	$ 29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Miramar	$ 17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Miramar	$ 22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Miramar	$ 21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Miramar	$ 33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Miramar	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Miramar	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Miramar	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Miramar	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Miramar	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Miramar	$ 32	$64.00	25.00%	$ 48
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Miramar	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Miramar	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Miramar	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Miramar	$ 22	$44.00	25.00%	$ 33

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Miramar	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Miramar	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Miramar	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Miramar	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Miramar	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Miramar	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Miramar	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Miramar	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Miramar	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Miramar	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Miramar	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Miramar	$ 29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	Miramar	$ 4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Miramar	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Miramar	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Miramar	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Miramar	$ 27	$54.50	25.00%	$ 41
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Miramar	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Miramar	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Miramar	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Miramar	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Miramar	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Miramar	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Miramar	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Miramar	$ 32	$64.00	25.00%	$ 48

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Miramar	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Miramar	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Miramar	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Miramar	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Miramar	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Miramar	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Miramar	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Miramar	$ 29	$57.00	25.00%	$ 43
1	DSSP74964440DFF1 RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	APM	Miramar	$ 553	$553.00	25.00%	$ 415
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Miramar	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Miramar	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Miramar	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Miramar	$ 27	$54.50	25.00%	$ 41
2	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	Channel 2	$ 4,200	$8,400.00	25.00%	$ 6,300
2	CA01619AA	ADD: DC POWER	GGM8000	Channel 2	$ -	$0.00	25.00%	$ -
2	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	Channel 2	$ 2,250	$4,500.00	25.00%	$ 3,375
19	T7039	GTR 8000 Base Radio	GTR8000	Channel 2	$ -	$0.00	25.00%	$ -
19	CA00855AA	ADD: 700/800 MHZ	GTR8000	Channel 2	$ 6,300	$119,700.00	25.00%	$ 89,775
19	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	Channel 2	$ 25,500	$484,500.00	25.00%	$ 363,375
19	CA01400AA	ADD: POWER CABLE, DC	GTR8000	Channel 2	$ -	$0.00	25.00%	$ -
18	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	Channel 2	$ 13,000	$234,000.00	25.00%	$ 175,500
18	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	Channel 2	$ 10,000	$180,000.00	25.00%	$ 135,000
19	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	Channel 2	$ 50	$950.00	25.00%	$ 713
3	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	Channel 2	$ 495	$1,485.00	25.00%	$ 1,114
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 1	Channel 2	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 1	Channel 2	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 2	Channel 2	$ 12,267	$12,267.00	25.00%	$ 9,200

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 2	Channel 2	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSTRAK91009EDC	REMOTE SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM DC	GPS	Channel 2	$ 30,066	$30,066.00	25.00%	$ 22,550
9	DSTRAK91061	FOUR PORT DDM	GPS	Channel 2	$ 720	$6,480.00	25.00%	$ 4,860
1	DSTRAK93007DC	DISTRIBUTION SHELF FOR 9100 DC	GPS	Channel 2	$ 12,296	$12,296.00	25.00%	$ 9,222
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	Channel 2	$ 2	$112.50	25.00%	$ 84
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	Channel 2	$ 27	$109.00	25.00%	$ 82
2	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	Channel 2	$ 5,846	$11,692.00	25.00%	$ 8,769
0	DS7583K01	EXPANSION KIT 16-32 PORT 792-902 MHZ TTA01	RFDS	Channel 2	$ 2,238	$0.00	25.00%	$ -
2	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	Channel 2	$ 7,070	$14,140.00	25.00%	$ 10,605
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	Channel 2	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	Channel 2	$ 1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	Channel 2	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	Channel 2	$ 90	$90.00	25.00%	$ 68
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	Channel 2	$ 3,873	$3,873.00	25.00%	$ 2,905
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Channel 2	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Channel 2	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Channel 2	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Channel 2	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Channel 2	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Channel 2	$ 18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Channel 2	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Channel 2	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Channel 2	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Channel 2	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Channel 2	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Channel 2	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Channel 2	$ 29	$28.50	25.00%	$ 21

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Channel 2	$ 17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Channel 2	$ 22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Channel 2	$ 21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Channel 2	$ 33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Channel 2	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Channel 2	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Channel 2	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Channel 2	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Channel 2	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Channel 2	$ 32	$64.00	25.00%	$ 48
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	Channel 2	$ 3,873	$3,873.00	25.00%	$ 2,905
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Channel 2	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Channel 2	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Channel 2	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Channel 2	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Channel 2	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Channel 2	$ 18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Channel 2	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Channel 2	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Channel 2	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Channel 2	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Channel 2	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Channel 2	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Channel 2	$ 29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Channel 2	$ 17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Channel 2	$ 22	$43.00	25.00%	$ 32

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Channel 2	$ 21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Channel 2	$ 33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Channel 2	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Channel 2	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Channel 2	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Channel 2	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Channel 2	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Channel 2	$ 32	$64.00	25.00%	$ 48
1	DSCC807011T1	OMNI, CORP COLLINEAR, 10.5DBD, 746-870MHZ, 1DEG DT, PIM, 25KW PIP RATED	ANTENNA	Channel 2	$ 6,632	$6,632.00	25.00%	$ 4,974
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Channel 2	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Channel 2	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Channel 2	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Channel 2	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Channel 2	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Channel 2	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Channel 2	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Channel 2	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Channel 2	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Channel 2	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Channel 2	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Channel 2	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Channel 2	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Channel 2	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Channel 2	$ 29	$57.00	25.00%	$ 43

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	Channel 2	$ 4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Channel 2	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Channel 2	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Channel 2	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Channel 2	$ 27	$54.50	25.00%	$ 41
1	DSCC807011T1	OMNI, CORP COLLINEAR, 10.5DBD, 746-870MHZ, 1DEG DT, PIM, 25KW PIP RATED	ANTENNA	Channel 2	$ 6,632	$6,632.00	25.00%	$ 4,974
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Channel 2	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Channel 2	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Channel 2	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Channel 2	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Channel 2	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Channel 2	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Channel 2	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Channel 2	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Channel 2	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Channel 2	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Channel 2	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Channel 2	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Channel 2	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Channel 2	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Channel 2	$ 29	$57.00	25.00%	$ 43
1	DSSP74964440DFF1RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	APM	Channel 2	$ 553	$553.00	25.00%	$ 415
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Channel 2	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Channel 2	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Channel 2	$ 2	$22.50	25.00%	$ 17

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Channel 2	$ 27	$54.50	25.00%	$ 41
2	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	Deerfield	$ 4,200	$8,400.00	25.00%	$ 6,300
2	CA01619AA	ADD: DC POWER	GGM8000	Deerfield	$ -	$0.00	25.00%	$ -
2	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	Deerfield	$ 2,250	$4,500.00	25.00%	$ 3,375
19	T7039	GTR 8000 Base Radio	GTR8000	Deerfield	$ -	$0.00	25.00%	$ -
19	CA00855AA	ADD: 700/800 MHZ	GTR8000	Deerfield	$ 6,300	$119,700.00	25.00%	$ 89,775
19	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	Deerfield	$ 25,500	$484,500.00	25.00%	$ 363,375
19	CA01400AA	ADD: POWER CABLE, DC	GTR8000	Deerfield	$ -	$0.00	25.00%	$ -
18	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	Deerfield	$ 13,000	$234,000.00	25.00%	$ 175,500
18	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	Deerfield	$ 10,000	$180,000.00	25.00%	$ 135,000
19	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	Deerfield	$ 50	$950.00	25.00%	$ 713
3	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	Deerfield	$ 495	$1,485.00	25.00%	$ 1,114
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 1	Deerfield	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 1	Deerfield	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 2	Deerfield	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 2	Deerfield	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSTRAK91009EDC	REMOTE SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM DC	GPS	Deerfield	$ 30,066	$30,066.00	25.00%	$ 22,550
6	DSTRAK91061	FOUR PORT DDM	GPS	Deerfield	$ 720	$4,320.00	25.00%	$ 3,240
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	Deerfield	$ 2	$112.50	25.00%	$ 84
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	Deerfield	$ 27	$109.00	25.00%	$ 82
2	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	Deerfield	$ 5,846	$11,692.00	25.00%	$ 8,769
0	DS7583K01	EXPANSION KIT 16-32 PORT 792-902 MHZ TTA01	RFDS	Deerfield	$ 2,238	$0.00	25.00%	$ -
2	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	Deerfield	$ 7,070	$14,140.00	25.00%	$ 10,605
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	Deerfield	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	Deerfield	$ 1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	Deerfield	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	Deerfield	$ 90	$90.00	25.00%	$ 68
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	Deerfield	$ 3,873	$3,873.00	25.00%	$ 2,905

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Deerfield	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Deerfield	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Deerfield	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Deerfield	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Deerfield	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Deerfield	$ 18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Deerfield	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Deerfield	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Deerfield	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Deerfield	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Deerfield	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Deerfield	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Deerfield	$ 29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Deerfield	$ 17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Deerfield	$ 22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Deerfield	$ 21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Deerfield	$ 33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Deerfield	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Deerfield	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Deerfield	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Deerfield	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Deerfield	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Deerfield	$ 32	$64.00	25.00%	$ 48
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	Deerfield	$ 3,873	$3,873.00	25.00%	$ 2,905
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Deerfield	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Deerfield	$ 18	$17.75	25.00%	$ 13

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Deerfield	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Deerfield	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Deerfield	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Deerfield	$ 18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Deerfield	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Deerfield	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Deerfield	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Deerfield	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Deerfield	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Deerfield	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Deerfield	$ 29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Deerfield	$ 17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Deerfield	$ 22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Deerfield	$ 21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Deerfield	$ 33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Deerfield	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Deerfield	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Deerfield	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Deerfield	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Deerfield	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Deerfield	$ 32	$64.00	25.00%	$ 48
1	DSCC807011T1	OMNI, CORP COLLINEAR, 10.5DBD, 746-870MHZ, 1DEG DT, PIM, 25KW PIP RATED	ANTENNA	Deerfield	$ 6,632	$6,632.00	25.00%	$ 4,974
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Deerfield	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Deerfield	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Deerfield	$ 22	$44.00	25.00%	$ 33

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Deerfield	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Deerfield	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Deerfield	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Deerfield	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Deerfield	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Deerfield	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Deerfield	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Deerfield	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Deerfield	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Deerfield	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Deerfield	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Deerfield	$ 29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	Deerfield	$ 4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Deerfield	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Deerfield	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Deerfield	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Deerfield	$ 27	$54.50	25.00%	$ 41
1	DSCC807011T1	OMNI, CORP COLLINEAR, 10.5DBD, 746-870MHZ, 1DEG DT, PIM, 25KW PIP RATED	ANTENNA	Deerfield	$ 6,632	$6,632.00	25.00%	$ 4,974
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Deerfield	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Deerfield	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Deerfield	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Deerfield	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Deerfield	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Deerfield	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Deerfield	$ 32	$64.00	25.00%	$ 48

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Deerfield	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Deerfield	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Deerfield	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Deerfield	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Deerfield	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Deerfield	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Deerfield	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Deerfield	$ 29	$57.00	25.00%	$ 43
1	DSSP74964440DFF1 RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	APM	Deerfield	$ 553	$553.00	25.00%	$ 415
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Deerfield	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Deerfield	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Deerfield	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Deerfield	$ 27	$54.50	25.00%	$ 41
2	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	Tamarac	$ 4,200	$8,400.00	25.00%	$ 6,300
2	CA01619AA	ADD: DC POWER	GGM8000	Tamarac	$ -	$0.00	25.00%	$ -
2	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	Tamarac	$ 2,250	$4,500.00	25.00%	$ 3,375
19	T7039	GTR 8000 Base Radio	GTR8000	Tamarac	$ -	$0.00	25.00%	$ -
19	CA00855AA	ADD: 700/800 MHZ	GTR8000	Tamarac	$ 6,300	$119,700.00	25.00%	$ 89,775
19	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	Tamarac	$ 25,500	$484,500.00	25.00%	$ 363,375
19	CA01400AA	ADD: POWER CABLE, DC	GTR8000	Tamarac	$ -	$0.00	25.00%	$ -
18	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	Tamarac	$ 13,000	$234,000.00	25.00%	$ 175,500
18	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	Tamarac	$ 10,000	$180,000.00	25.00%	$ 135,000
19	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	Tamarac	$ 50	$950.00	25.00%	$ 713
3	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	Tamarac	$ 495	$1,485.00	25.00%	$ 1,114
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 1	Tamarac	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 1	Tamarac	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 2	Tamarac	$ 12,267	$12,267.00	25.00%	$ 9,200

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 2	Tamarac	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSTRAK91009EDC	REMOTE SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM DC	GPS	Tamarac	$ 30,066	$30,066.00	25.00%	$ 22,550
6	DSTRAK91061	FOUR PORT DDM	GPS	Tamarac	$ 720	$4,320.00	25.00%	$ 3,240
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	Tamarac	$ 2	$112.50	25.00%	$ 84
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	Tamarac	$ 27	$109.00	25.00%	$ 82
2	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	Tamarac	$ 5,846	$11,692.00	25.00%	$ 8,769
0	DS7583K01	EXPANSION KIT 16-32 PORT 792-902 MHZ TTA01	RFDS	Tamarac	$ 2,238	$0.00	25.00%	$ -
2	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	Tamarac	$ 7,070	$14,140.00	25.00%	$ 10,605
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	Tamarac	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	Tamarac	$ 1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	Tamarac	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	Tamarac	$ 90	$90.00	25.00%	$ 68
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	Tamarac	$ 3,873	$3,873.00	25.00%	$ 2,905
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Tamarac	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Tamarac	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Tamarac	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Tamarac	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Tamarac	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Tamarac	$ 18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Tamarac	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Tamarac	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Tamarac	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Tamarac	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Tamarac	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Tamarac	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Tamarac	$ 29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Tamarac	$ 17	$100.50	25.00%	$ 75

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Tamarac	$ 22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Tamarac	$ 21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Tamarac	$ 33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Tamarac	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Tamarac	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Tamarac	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Tamarac	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Tamarac	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Tamarac	$ 32	$64.00	25.00%	$ 48
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	Tamarac	$ 3,873	$3,873.00	25.00%	$ 2,905
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Tamarac	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Tamarac	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Tamarac	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Tamarac	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Tamarac	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Tamarac	$ 18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Tamarac	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Tamarac	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Tamarac	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Tamarac	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Tamarac	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Tamarac	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Tamarac	$ 29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Tamarac	$ 17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Tamarac	$ 22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Tamarac	$ 21	$210.00	25.00%	$ 158

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Tamarac	$ 33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Tamarac	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Tamarac	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Tamarac	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Tamarac	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Tamarac	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Tamarac	$ 32	$64.00	25.00%	$ 48
1	DSSC412HF2LDFD2NU	COLLINEAR OMNI 11.5DBD GAIN 746-869MHZ 2DT NULL FILL DIN FEMALE CONN	ANTENNA	Tamarac	$ 6,967	$6,967.00	25.00%	$ 5,225
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Tamarac	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Tamarac	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Tamarac	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Tamarac	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Tamarac	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Tamarac	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Tamarac	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Tamarac	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Tamarac	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Tamarac	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Tamarac	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Tamarac	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Tamarac	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Tamarac	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Tamarac	$ 29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	Tamarac	$ 4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Tamarac	$ 2	$22.50	25.00%	$ 17

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Tamarac	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Tamarac	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Tamarac	$ 27	$54.50	25.00%	$ 41
1	DSSC412HF2LDFD2NU	COLLINEAR OMNI 11.5DBD GAIN 746-869MHZ 2DT NULL FILL DIN FEMALE CONN	ANTENNA	Tamarac	$ 6,967	$6,967.00	25.00%	$ 5,225
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Tamarac	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Tamarac	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Tamarac	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Tamarac	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Tamarac	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Tamarac	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Tamarac	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Tamarac	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Tamarac	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Tamarac	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Tamarac	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Tamarac	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Tamarac	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Tamarac	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Tamarac	$ 29	$57.00	25.00%	$ 43
1	DSSP74964440DFF1RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	APM	Tamarac	$ 553	$553.00	25.00%	$ 415
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Tamarac	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Tamarac	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Tamarac	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Tamarac	$ 27	$54.50	25.00%	$ 41
2	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	West Lake	$ 4,200	$8,400.00	25.00%	$ 6,300

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	CA01619AA	ADD: DC POWER	GGM8000	West Lake	$ -	$0.00	25.00%	$ -
2	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	West Lake	$ 2,250	$4,500.00	25.00%	$ 3,375
19	T7039	GTR 8000 Base Radio	GTR8000	West Lake	$ -	$0.00	25.00%	$ -
19	CA00855AA	ADD: 700/800 MHZ	GTR8000	West Lake	$ 6,300	$119,700.00	25.00%	$ 89,775
19	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	West Lake	$ 25,500	$484,500.00	25.00%	$ 363,375
19	CA01400AA	ADD: POWER CABLE, DC	GTR8000	West Lake	$ -	$0.00	25.00%	$ -
18	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	West Lake	$ 13,000	$234,000.00	25.00%	$ 175,500
18	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	West Lake	$ 10,000	$180,000.00	25.00%	$ 135,000
19	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	West Lake	$ 50	$950.00	25.00%	$ 713
3	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	West Lake	$ 495	$1,485.00	25.00%	$ 1,114
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 1	West Lake	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 1	West Lake	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 2	West Lake	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 2	West Lake	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSTRAK91009EDC	REMOTE SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM DC	GPS	West Lake	$ 30,066	$30,066.00	25.00%	$ 22,550
6	DSTRAK91061	FOUR PORT DDM	GPS	West Lake	$ 720	$4,320.00	25.00%	$ 3,240
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	West Lake	$ 2	$112.50	25.00%	$ 84
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	West Lake	$ 27	$109.00	25.00%	$ 82
2	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	West Lake	$ 5,846	$11,692.00	25.00%	$ 8,769
0	DS7583K01	EXPANSION KIT 16-32 PORT 792-902 MHZ TTA01	RFDS	West Lake	$ 2,238	$0.00	25.00%	$ -
2	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	West Lake	$ 7,070	$14,140.00	25.00%	$ 10,605
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	West Lake	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	West Lake	$ 1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	West Lake	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	West Lake	$ 90	$90.00	25.00%	$ 68
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	West Lake	$ 3,873	$3,873.00	25.00%	$ 2,905
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	West Lake	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	West Lake	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	West Lake	$ 29	$28.50	25.00%	$ 21

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	West Lake	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	West Lake	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	West Lake	$ 18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	West Lake	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	West Lake	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	West Lake	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	West Lake	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	West Lake	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	West Lake	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	West Lake	$ 29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	West Lake	$ 17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	West Lake	$ 22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	West Lake	$ 21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	West Lake	$ 33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	West Lake	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	West Lake	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	West Lake	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	West Lake	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	West Lake	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	West Lake	$ 32	$64.00	25.00%	$ 48
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	West Lake	$ 3,873	$3,873.00	25.00%	$ 2,905
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	West Lake	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	West Lake	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	West Lake	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	West Lake	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	West Lake	$ 4	$17.50	25.00%	$ 13

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	West Lake	$ 18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	West Lake	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	West Lake	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	West Lake	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	West Lake	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	West Lake	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	West Lake	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	West Lake	$ 29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	West Lake	$ 17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	West Lake	$ 22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW- HANGER KIT STAINLESS-10PK	ANTACC	West Lake	$ 21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	West Lake	$ 33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	West Lake	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	West Lake	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	West Lake	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	West Lake	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	West Lake	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	West Lake	$ 32	$64.00	25.00%	$ 48
1	DSCC807011T1	OMNI, CORP COLLINEAR, 10.5DBD, 746-870MHZ, 1DEG DT, PIM, 25KW PIP RATED	ANTENNA	West Lake	$ 6,632	$6,632.00	25.00%	$ 4,974
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	West Lake	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	West Lake	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	West Lake	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	West Lake	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	West Lake	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	West Lake	$ 23	$139.50	25.00%	$ 105

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	West Lake	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	West Lake	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	West Lake	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	West Lake	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	West Lake	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	West Lake	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	West Lake	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	West Lake	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	West Lake	$ 29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	West Lake	$ 4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	West Lake	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	West Lake	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	West Lake	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	West Lake	$ 27	$54.50	25.00%	$ 41
1	DSCC807011T1	OMNI, CORP COLLINEAR, 10.5DBD, 746-870MHZ, 1DEG DT, PIM, 25KW PIP RATED	ANTENNA	West Lake	$ 6,632	$6,632.00	25.00%	$ 4,974
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	West Lake	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	West Lake	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	West Lake	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	West Lake	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	West Lake	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	West Lake	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	West Lake	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	West Lake	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	West Lake	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	West Lake	$ 36	$36.00	25.00%	$ 27

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	West Lake	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	West Lake	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	West Lake	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	West Lake	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	West Lake	$ 29	$57.00	25.00%	$ 43
1	DSSP74964440DFF1RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	APM	West Lake	$ 553	$553.00	25.00%	$ 415
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	West Lake	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	West Lake	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	West Lake	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	West Lake	$ 27	$54.50	25.00%	$ 41
2	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	PompBchClub	$ 4,200	$8,400.00	25.00%	$ 6,300
2	CA01619AA	ADD: DC POWER	GGM8000	PompBchClub	$ -	$0.00	25.00%	$ -
2	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	PompBchClub	$ 2,250	$4,500.00	25.00%	$ 3,375
19	T7039	GTR 8000 Base Radio	GTR8000	PompBchClub	$ -	$0.00	25.00%	$ -
19	CA00855AA	ADD: 700/800 MHZ	GTR8000	PompBchClub	$ 6,300	$119,700.00	25.00%	$ 89,775
19	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	PompBchClub	$ 25,500	$484,500.00	25.00%	$ 363,375
19	CA01400AA	ADD: POWER CABLE, DC	GTR8000	PompBchClub	$ -	$0.00	25.00%	$ -
18	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	PompBchClub	$ 13,000	$234,000.00	25.00%	$ 175,500
18	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	PompBchClub	$ 10,000	$180,000.00	25.00%	$ 135,000
19	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	PompBchClub	$ 50	$950.00	25.00%	$ 713
3	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	PompBchClub	$ 495	$1,485.00	25.00%	$ 1,114
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 1	PompBchClub	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 1	PompBchClub	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 2	PompBchClub	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 2	PompBchClub	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSTRAK91009EDC	REMOTE SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM DC	GPS	PompBchClub	$ 30,066	$30,066.00	25.00%	$ 22,550
6	DSTRAK91061	FOUR PORT DDM	GPS	PompBchClub	$ 720	$4,320.00	25.00%	$ 3,240

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	PompBchClub	$ 2	$112.50	25.00%	$ 84
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	PompBchClub	$ 27	$109.00	25.00%	$ 82
2	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	PompBchClub	$ 5,846	$11,692.00	25.00%	$ 8,769
0	DS7583K01	EXPANSION KIT 16-32 PORT 792-902 MHZ TTA01	RFDS	PompBchClub	$ 2,238	$0.00	25.00%	$ -
2	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	PompBchClub	$ 7,070	$14,140.00	25.00%	$ 10,605
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	PompBchClub	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	PompBchClub	$ 1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	PompBchClub	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	PompBchClub	$ 90	$90.00	25.00%	$ 68
1	DSBLR12SAB1	PENETRATOR ANTENNA, 794-824 MHZ, 16.4 DBI, 220 DEG	ANTENNA	PompBchClub	$ 8,343	$8,343.00	25.00%	$ 6,257
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	PompBchClub	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	PompBchClub	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	PompBchClub	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	PompBchClub	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	PompBchClub	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	PompBchClub	$ 18	$35.50	25.00%	$ 27
100	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	PompBchClub	$ 8	$840.00	25.00%	$ 630
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	PompBchClub	$ 40	$79.50	25.00%	$ 60
3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	PompBchClub	$ 23	$67.50	25.00%	$ 51
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	PompBchClub	$ 29	$57.00	25.00%	$ 43
100	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	PompBchClub	$ 4	$350.00	25.00%	$ 263
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	PompBchClub	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	PompBchClub	$ 29	$28.50	25.00%	$ 21
3	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	PompBchClub	$ 17	$50.25	25.00%	$ 38
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	PompBchClub	$ 22	$43.00	25.00%	$ 32
3	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	PompBchClub	$ 21	$63.00	25.00%	$ 47
3	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	PompBchClub	$ 33	$97.50	25.00%	$ 73

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	PompBchClub	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	PompBchClub	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	PompBchClub	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	PompBchClub	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	PompBchClub	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	PompBchClub	$ 32	$64.00	25.00%	$ 48
1	DSBLR12SAB1	PENETRATOR ANTENNA, 794-824 MHZ, 16.4 DBI, 220 DEG	ANTENNA	PompBchClub	$ 8,343	$8,343.00	25.00%	$ 6,257
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	PompBchClub	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	PompBchClub	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	PompBchClub	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	PompBchClub	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	PompBchClub	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	PompBchClub	$ 18	$35.50	25.00%	$ 27
100	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	PompBchClub	$ 8	$840.00	25.00%	$ 630
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	PompBchClub	$ 40	$79.50	25.00%	$ 60
3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	PompBchClub	$ 23	$67.50	25.00%	$ 51
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	PompBchClub	$ 29	$57.00	25.00%	$ 43
100	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	PompBchClub	$ 4	$350.00	25.00%	$ 263
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	PompBchClub	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	PompBchClub	$ 29	$28.50	25.00%	$ 21
3	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	PompBchClub	$ 17	$50.25	25.00%	$ 38
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	PompBchClub	$ 22	$43.00	25.00%	$ 32
3	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	PompBchClub	$ 21	$63.00	25.00%	$ 47
3	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	PompBchClub	$ 33	$97.50	25.00%	$ 73
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	PompBchClub	$ 168	$168.00	25.00%	$ 126

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	PompBchClub	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	PompBchClub	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	PompBchClub	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	PompBchClub	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	PompBchClub	$ 32	$64.00	25.00%	$ 48
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	PompBchClub	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	PompBchClub	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	PompBchClub	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	PompBchClub	$ 22	$44.00	25.00%	$ 33
100	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	PompBchClub	$ 8	$840.00	25.00%	$ 630
2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)	MAINLINE	PompBchClub	$ 40	$79.50	25.00%	$ 60
3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	PompBchClub	$ 23	$67.50	25.00%	$ 51
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	PompBchClub	$ 32	$64.00	25.00%	$ 48
3	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	PompBchClub	$ 33	$97.50	25.00%	$ 73
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	PompBchClub	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	PompBchClub	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	PompBchClub	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	PompBchClub	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	PompBchClub	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	PompBchClub	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	PompBchClub	$ 29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	PompBchClub	$ 4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	PompBchClub	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	PompBchClub	$ 27	$54.50	25.00%	$ 41

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	PompBchClub	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	PompBchClub	$ 27	$54.50	25.00%	$ 41
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	PompBchClub	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	PompBchClub	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	PompBchClub	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	PompBchClub	$ 22	$44.00	25.00%	$ 33
100	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	PompBchClub	$ 16	$1,625.00	25.00%	$ 1,219
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	PompBchClub	$ 112	$224.00	25.00%	$ 168
3	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	PompBchClub	$ 23	$69.75	25.00%	$ 52
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	PompBchClub	$ 32	$64.00	25.00%	$ 48
3	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	PompBchClub	$ 29	$85.50	25.00%	$ 64
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	PompBchClub	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	PompBchClub	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	PompBchClub	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	PompBchClub	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	PompBchClub	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	PompBchClub	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	PompBchClub	$ 29	$57.00	25.00%	$ 43
1	DSSP74964440DFF1RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	APM	PompBchClub	$ 553	$553.00	25.00%	$ 415
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	PompBchClub	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	PompBchClub	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	PompBchClub	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	PompBchClub	$ 27	$54.50	25.00%	$ 41
2	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	West Hollywood	$ 4,200	$8,400.00	25.00%	$ 6,300
2	CA01619AA	ADD: DC POWER	GGM8000	West Hollywood	$ -	$0.00	25.00%	$ -
2	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	West Hollywood	$ 2,250	$4,500.00	25.00%	$ 3,375

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
19	T7039	GTR 8000 Base Radio	GTR8000	West Hollywood	$ -	$0.00	25.00%	$ -
19	CA00855AA	ADD: 700/800 MHZ	GTR8000	West Hollywood	$ 6,300	$119,700.00	25.00%	$ 89,775
19	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	West Hollywood	$ 25,500	$484,500.00	25.00%	$ 363,375
19	CA01400AA	ADD: POWER CABLE, DC	GTR8000	West Hollywood	$ -	$0.00	25.00%	$ -
18	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	West Hollywood	$ 13,000	$234,000.00	25.00%	$ 175,500
18	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	West Hollywood	$ 10,000	$180,000.00	25.00%	$ 135,000
19	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	West Hollywood	$ 50	$950.00	25.00%	$ 713
3	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	West Hollywood	$ 495	$1,485.00	25.00%	$ 1,114
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 1	West Hollywood	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 1	West Hollywood	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 2	West Hollywood	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 2	West Hollywood	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSTRAK91009EDC	REMOTE SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM DC	GPS	West Hollywood	$ 30,066	$30,066.00	25.00%	$ 22,550
9	DSTRAK91061	FOUR PORT DDM	GPS	West Hollywood	$ 720	$6,480.00	25.00%	$ 4,860
1	DSTRAK93007DC	DISTRIBUTION SHELF FOR 9100 DC	GPS	West Hollywood	$ 12,296	$12,296.00	25.00%	$ 9,222
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	West Hollywood	$ 2	$112.50	25.00%	$ 84
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	West Hollywood	$ 27	$109.00	25.00%	$ 82
2	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	West Hollywood	$ 5,846	$11,692.00	25.00%	$ 8,769
0	DS7583K01	EXPANSION KIT 16-32 PORT 792-902 MHZ TTA01	RFDS	West Hollywood	$ 2,238	$0.00	25.00%	$ -
2	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	West Hollywood	$ 7,070	$14,140.00	25.00%	$ 10,605
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	West Hollywood	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	West Hollywood	$ 1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	West Hollywood	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	West Hollywood	$ 90	$90.00	25.00%	$ 68
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	West Hollywood	$ 3,873	$3,873.00	25.00%	$ 2,905
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	West Hollywood	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	West Hollywood	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	West Hollywood	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	West Hollywood	$ 22	$110.00	25.00%	$ 83

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	West Hollywood	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	West Hollywood	$ 18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	West Hollywood	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	West Hollywood	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	West Hollywood	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	West Hollywood	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	West Hollywood	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	West Hollywood	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	West Hollywood	$ 29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	West Hollywood	$ 17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	West Hollywood	$ 22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	West Hollywood	$ 21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	West Hollywood	$ 33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	West Hollywood	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	West Hollywood	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	West Hollywood	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	West Hollywood	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	West Hollywood	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	West Hollywood	$ 32	$64.00	25.00%	$ 48
1	DSDS7E12F36UN	DS7E12F36U-N 794-824 MHZ, 12 DBD, OMNI, N(F)	ANTENNA	West Hollywood	$ 3,873	$3,873.00	25.00%	$ 2,905
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	West Hollywood	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	West Hollywood	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	West Hollywood	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	West Hollywood	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	West Hollywood	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	West Hollywood	$ 18	$35.50	25.00%	$ 27

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	West Hollywood	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	West Hollywood	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	West Hollywood	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	West Hollywood	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	West Hollywood	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	West Hollywood	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	West Hollywood	$ 29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	West Hollywood	$ 17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	West Hollywood	$ 22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	West Hollywood	$ 21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	West Hollywood	$ 33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	West Hollywood	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	West Hollywood	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	West Hollywood	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	West Hollywood	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	West Hollywood	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	West Hollywood	$ 32	$64.00	25.00%	$ 48
1	DSCC807011T1	OMNI, CORP COLLINEAR, 10.5DBD, 746-870MHZ, 1DEG DT, PIM, 25KW PIP RATED	ANTENNA	West Hollywood	$ 6,632	$6,632.00	25.00%	$ 4,974
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	West Hollywood	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	West Hollywood	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	West Hollywood	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	West Hollywood	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	West Hollywood	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	West Hollywood	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	West Hollywood	$ 32	$64.00	25.00%	$ 48

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	West Hollywood	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	West Hollywood	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	West Hollywood	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	West Hollywood	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	West Hollywood	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	West Hollywood	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	West Hollywood	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	West Hollywood	$ 29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	West Hollywood	$ 4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	West Hollywood	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	West Hollywood	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	West Hollywood	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	West Hollywood	$ 27	$54.50	25.00%	$ 41
1	DSCC807011T1	OMNI, CORP COLLINEAR, 10.5DBD, 746-870MHZ, 1DEG DT, PIM, 25KW PIP RATED	ANTENNA	West Hollywood	$ 6,632	$6,632.00	25.00%	$ 4,974
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	West Hollywood	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	West Hollywood	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	West Hollywood	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	West Hollywood	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	West Hollywood	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	West Hollywood	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	West Hollywood	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	West Hollywood	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	West Hollywood	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	West Hollywood	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	West Hollywood	$ 4	$87.50	25.00%	$ 66

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	West Hollywood	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	West Hollywood	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	West Hollywood	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	West Hollywood	$ 29	$57.00	25.00%	$ 43
1	DSSP74964440DFF1 RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	APM	West Hollywood	$ 553	$553.00	25.00%	$ 415
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	West Hollywood	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	West Hollywood	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	West Hollywood	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	West Hollywood	$ 27	$54.50	25.00%	$ 41
2	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	Parkland	$ 4,200	$8,400.00	25.00%	$ 6,300
2	CA01619AA	ADD: DC POWER	GGM8000	Parkland	$ -	$0.00	25.00%	$ -
2	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	Parkland	$ 2,250	$4,500.00	25.00%	$ 3,375
19	T7039	GTR 8000 Base Radio	GTR8000	Parkland	$ -	$0.00	25.00%	$ -
19	CA00855AA	ADD: 700/800 MHZ	GTR8000	Parkland	$ 6,300	$119,700.00	25.00%	$ 89,775
19	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	Parkland	$ 25,500	$484,500.00	25.00%	$ 363,375
19	CA01400AA	ADD: POWER CABLE, DC	GTR8000	Parkland	$ -	$0.00	25.00%	$ -
18	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	Parkland	$ 13,000	$234,000.00	25.00%	$ 175,500
18	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	Parkland	$ 10,000	$180,000.00	25.00%	$ 135,000
19	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	Parkland	$ 50	$950.00	25.00%	$ 713
3	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	Parkland	$ 495	$1,485.00	25.00%	$ 1,114
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 1	Parkland	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 1	Parkland	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSPCD012V12	12 CHANNEL COMBINER KIT, STANDARD ISOLATION, 762-776 MHZ	TxComb 2	Parkland	$ 12,267	$12,267.00	25.00%	$ 9,200
1	DSMWF7AMD	700MHZ HIGH POWER TRANSMIT MILLED FILTER,762-776MHZ, 14 MHZ BANDWIDTH	TxFilter 2	Parkland	$ 2,408	$2,408.00	25.00%	$ 1,806
1	DSTRAK91009EDC	REMOTE SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM DC	GPS	Parkland	$ 30,066	$30,066.00	25.00%	$ 22,550
6	DSTRAK91061	FOUR PORT DDM	GPS	Parkland	$ 720	$4,320.00	25.00%	$ 3,240
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	Parkland	$ 2	$112.50	25.00%	$ 84

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	Parkland	$ 27	$109.00	25.00%	$ 82
2	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	Parkland	$ 5,846	$11,692.00	25.00%	$ 8,769
0	DS7583K01	EXPANSION KIT 16-32 PORT 792-902 MHZ TTA01	RFDS	Parkland	$ 2,238	$0.00	25.00%	$ -
2	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	Parkland	$ 7,070	$14,140.00	25.00%	$ 10,605
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	Parkland	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	Parkland	$ 1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	Parkland	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	Parkland	$ 90	$90.00	25.00%	$ 68
1	DSBLR12SAB1	PENETRATOR ANTENNA, 794-824 MHZ, 16.4 DBI, 220 DEG	ANTENNA	Parkland	$ 8,343	$8,343.00	25.00%	$ 6,257
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Parkland	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Parkland	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Parkland	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Parkland	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Parkland	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Parkland	$ 18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Parkland	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Parkland	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Parkland	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Parkland	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Parkland	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Parkland	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Parkland	$ 29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Parkland	$ 17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Parkland	$ 22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Parkland	$ 21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Parkland	$ 33	$325.00	25.00%	$ 244

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Parkland	$ 168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Parkland	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Parkland	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Parkland	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Parkland	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Parkland	$ 32	$64.00	25.00%	$ 48
1	DSBLR12SAB1	PENETRATOR ANTENNA, 794-824 MHZ, 16.4 DBI, 220 DEG	ANTENNA	Parkland	$ 8,343	$8,343.00	25.00%	$ 6,257
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Parkland	$ 4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Parkland	$ 18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Parkland	$ 29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Parkland	$ 22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Parkland	$ 4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Parkland	$ 18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Parkland	$ 8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Parkland	$ 40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Parkland	$ 23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Parkland	$ 29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Parkland	$ 4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Parkland	$ 18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Parkland	$ 29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Parkland	$ 17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Parkland	$ 22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Parkland	$ 21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Parkland	$ 33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Parkland	$ 168	$168.00	25.00%	$ 126

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Parkland	$ 168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Parkland	$ 2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Parkland	$ 27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Parkland	$ 5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Parkland	$ 32	$64.00	25.00%	$ 48
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Parkland	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Parkland	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Parkland	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Parkland	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Parkland	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Parkland	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Parkland	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Parkland	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Parkland	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Parkland	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Parkland	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Parkland	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Parkland	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Parkland	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Parkland	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Parkland	$ 29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	Parkland	$ 4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Parkland	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Parkland	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Parkland	$ 2	$22.50	25.00%	$ 17

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Parkland	$ 27	$54.50	25.00%	$ 41
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Parkland	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Parkland	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Parkland	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Parkland	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Parkland	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Parkland	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Parkland	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Parkland	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Parkland	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Parkland	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Parkland	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Parkland	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Parkland	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Parkland	$ 41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Parkland	$ 4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Parkland	$ 29	$57.00	25.00%	$ 43
1	DSSP74964440DFF1RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	APM	Parkland	$ 553	$553.00	25.00%	$ 415
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Parkland	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Parkland	$ 27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Parkland	$ 2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Parkland	$ 27	$54.50	25.00%	$ 41
1	DSSC412HF2LDFD01	COLLINEAR OMNI, 11.5DBD, HD, LOW PIM, 746-869 MHZ, 1 DEGREE DT	ANTENNA	BC Station 106	$ 6,763	$6,763.00	25.00%	$ 5,072
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	BC Station 106	$ 4	$52.50	25.00%	$ 39

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	BC Station 106	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	BC Station 106	$ 22	$44.00	25.00%	$ 33
330	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	BC Station 106	$ 16	$5,362.50	25.00%	$ 4,022
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	BC Station 106	$ 112	$224.00	25.00%	$ 168
7	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	BC Station 106	$ 23	$162.75	25.00%	$ 122
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	BC Station 106	$ 32	$64.00	25.00%	$ 48
11	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	BC Station 106	$ 29	$313.50	25.00%	$ 235
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	BC Station 106	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	BC Station 106	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	BC Station 106	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	BC Station 106	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	BC Station 106	$ 41	$40.75	25.00%	$ 31
1	DSSC412HF2LDFD2NU	COLLINEAR OMNI 11.5DBD GAIN 746-869MHZ 2DT NULL FILL DIN FEMALE CONN	ANTENNA	CORE	$ 6,967	$6,967.00	25.00%	$ 5,225
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	CORE	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	CORE	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	CORE	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	CORE	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	CORE	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	CORE	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	CORE	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	CORE	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	CORE	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	CORE	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	CORE	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	CORE	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	CORE	$ 41	$40.75	25.00%	$ 31

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Coconut Creek	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Coconut Creek	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Coconut Creek	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Coconut Creek	$ 22	$44.00	25.00%	$ 33
405	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Coconut Creek	$ 16	$6,581.25	25.00%	$ 4,936
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Coconut Creek	$ 112	$224.00	25.00%	$ 168
7	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Coconut Creek	$ 23	$162.75	25.00%	$ 122
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Coconut Creek	$ 32	$64.00	25.00%	$ 48
13	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Coconut Creek	$ 29	$370.50	25.00%	$ 278
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Coconut Creek	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Coconut Creek	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Coconut Creek	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Coconut Creek	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Coconut Creek	$ 41	$40.75	25.00%	$ 31
1	DSSC412HF2LDFD2NU	COLLINEAR OMNI 11.5DBD GAIN 746-869MHZ 2DT NULL FILL DIN FEMALE CONN	ANTENNA	Markham Park	$ 6,967	$6,967.00	25.00%	$ 5,225
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Markham Park	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Markham Park	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Markham Park	$ 22	$44.00	25.00%	$ 33
400	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Markham Park	$ 16	$6,500.00	25.00%	$ 4,875
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Markham Park	$ 112	$224.00	25.00%	$ 168
7	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Markham Park	$ 23	$162.75	25.00%	$ 122
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Markham Park	$ 32	$64.00	25.00%	$ 48
13	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Markham Park	$ 29	$370.50	25.00%	$ 278
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Markham Park	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Markham Park	$ 36	$36.00	25.00%	$ 27

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Markham Park	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Markham Park	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Markham Park	$ 41	$40.75	25.00%	$ 31
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Playa	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Playa	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Playa	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Playa	$ 22	$44.00	25.00%	$ 33
100	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Playa	$ 8	$840.00	25.00%	$ 630
2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)	MAINLINE	Playa	$ 40	$79.50	25.00%	$ 60
3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Playa	$ 23	$67.50	25.00%	$ 51
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Playa	$ 32	$64.00	25.00%	$ 48
3	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Playa	$ 33	$97.50	25.00%	$ 73
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Playa	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Playa	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Playa	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Playa	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Playa	$ 41	$40.75	25.00%	$ 31
1	DSSC412HF2LDFD2NU	COLLINEAR OMNI 11.5DBD GAIN 746-869MHZ 2DT NULL FILL DIN FEMALE CONN	ANTENNA	Davie	$ 6,967	$6,967.00	25.00%	$ 5,225
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Davie	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Davie	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Davie	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Davie	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Davie	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Davie	$ 23	$139.50	25.00%	$ 105

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Davie	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Davie	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Davie	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Davie	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Davie	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Davie	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Davie	$ 41	$40.75	25.00%	$ 31
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Pt of America	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Pt of America	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Pt of America	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Pt of America	$ 22	$44.00	25.00%	$ 33
100	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Pt of America	$ 8	$840.00	25.00%	$ 630
2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)	MAINLINE	Pt of America	$ 40	$79.50	25.00%	$ 60
3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Pt of America	$ 23	$67.50	25.00%	$ 51
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Pt of America	$ 32	$64.00	25.00%	$ 48
3	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Pt of America	$ 33	$97.50	25.00%	$ 73
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Pt of America	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Pt of America	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Pt of America	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Pt of America	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Pt of America	$ 41	$40.75	25.00%	$ 31
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Miramar	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Miramar	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Miramar	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Miramar	$ 22	$44.00	25.00%	$ 33

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Miramar	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Miramar	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Miramar	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Miramar	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Miramar	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Miramar	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Miramar	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Miramar	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Miramar	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Miramar	$ 41	$40.75	25.00%	$ 31
1	DSCC807011T1	OMNI, CORP COLLINEAR, 10.5DBD, 746-870MHZ, 1DEG DT, PIM, 25KW PIP RATED	ANTENNA	Channel 2	$ 6,632	$6,632.00	25.00%	$ 4,974
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Channel 2	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Channel 2	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Channel 2	$ 22	$44.00	25.00%	$ 33
385	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Channel 2	$ 16	$6,256.25	25.00%	$ 4,692
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Channel 2	$ 112	$224.00	25.00%	$ 168
7	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Channel 2	$ 23	$162.75	25.00%	$ 122
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Channel 2	$ 32	$64.00	25.00%	$ 48
12	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Channel 2	$ 29	$342.00	25.00%	$ 257
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Channel 2	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Channel 2	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Channel 2	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Channel 2	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Channel 2	$ 41	$40.75	25.00%	$ 31
1	DSCC807011T1	OMNI, CORP COLLINEAR, 10.5DBD, 746-870MHZ, 1DEG DT, PIM, 25KW PIP RATED	ANTENNA	Deerfield	$ 6,632	$6,632.00	25.00%	$ 4,974

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Deerfield	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Deerfield	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Deerfield	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Deerfield	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Deerfield	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Deerfield	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Deerfield	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Deerfield	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Deerfield	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Deerfield	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Deerfield	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Deerfield	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Deerfield	$ 41	$40.75	25.00%	$ 31
1	DSSC412HF2LDFD2NU	COLLINEAR OMNI 11.5DBD GAIN 746-869MHZ 2DT NULL FILL DIN FEMALE CONN	ANTENNA	Tamarac	$ 6,967	$6,967.00	25.00%	$ 5,225
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Tamarac	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Tamarac	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Tamarac	$ 22	$44.00	25.00%	$ 33
175	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Tamarac	$ 16	$2,843.75	25.00%	$ 2,133
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Tamarac	$ 112	$224.00	25.00%	$ 168
5	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Tamarac	$ 23	$116.25	25.00%	$ 87
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Tamarac	$ 32	$64.00	25.00%	$ 48
6	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Tamarac	$ 29	$171.00	25.00%	$ 128
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Tamarac	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Tamarac	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Tamarac	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Tamarac	$ 29	$28.50	25.00%	$ 21

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Tamarac	$ 41	$40.75	25.00%	$ 31
1	DSCC807011T1	OMNI, CORP COLLINEAR, 10.5DBD, 746-870MHZ, 1DEG DT, PIM, 25KW PIP RATED	ANTENNA	West Lake	$ 6,632	$6,632.00	25.00%	$ 4,974
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	West Lake	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	West Lake	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	West Lake	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	West Lake	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	West Lake	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	West Lake	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	West Lake	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	West Lake	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	West Lake	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	West Lake	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	West Lake	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	West Lake	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	West Lake	$ 41	$40.75	25.00%	$ 31
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	PompBchClub	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	PompBchClub	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	PompBchClub	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	PompBchClub	$ 22	$44.00	25.00%	$ 33
100	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	PompBchClub	$ 8	$840.00	25.00%	$ 630
2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)	MAINLINE	PompBchClub	$ 40	$79.50	25.00%	$ 60
3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	PompBchClub	$ 23	$67.50	25.00%	$ 51
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	PompBchClub	$ 32	$64.00	25.00%	$ 48
3	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	PompBchClub	$ 33	$97.50	25.00%	$ 73

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	PompBchClub	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	PompBchClub	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	PompBchClub	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	PompBchClub	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	PompBchClub	$ 41	$40.75	25.00%	$ 31
1	DSCC807011T1	OMNI, CORP COLLINEAR, 10.5DBD, 746-870MHZ, 1DEG DT, PIM, 25KW PIP RATED	ANTENNA	West Hollywood	$ 6,632	$6,632.00	25.00%	$ 4,974
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	West Hollywood	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	West Hollywood	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	West Hollywood	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	West Hollywood	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	West Hollywood	$ 112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	West Hollywood	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	West Hollywood	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	West Hollywood	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	West Hollywood	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	West Hollywood	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	West Hollywood	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	West Hollywood	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	West Hollywood	$ 41	$40.75	25.00%	$ 31
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Parkland	$ 6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Parkland	$ 4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Parkland	$ 29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Parkland	$ 22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Parkland	$ 16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Parkland	$ 112	$224.00	25.00%	$ 168

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Parkland	$ 23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Parkland	$ 32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Parkland	$ 29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Parkland	$ 130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Parkland	$ 36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Parkland	$ 4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Parkland	$ 29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Parkland	$ 41	$40.75	25.00%	$ 31
1	B1905	MCC 7500 ASTRO 25 SOFTWARE	OP_POSIT	SunriseDisp	$ 250	$250.00	25.00%	$ 188
24	B1933	MOTOROLA VOICE PROCESSOR MODULE	OP_POS	SunriseDisp	$ 11,920	$286,080.00	25.00%	$ 214,560
24	CA01642AA	ADD: MCC 7500 BASIC CONSOLE FUNCTIONALITY SOFTWARE LICENSE	OP_POS_LIC	SunriseDisp	$ 12,000	$288,000.00	25.00%	$ 216,000
24	CA01643AA	ADD: MCC 7500 / MCC 7100 TRUNKING OPERATION	OP_POSIT	SunriseDisp	$ 5,000	$120,000.00	25.00%	$ 90,000
24	CA00147AF	ADD: MCC 7500 SECURE OPERATION	OP_POSIT	SunriseDisp	$ 3,250	$78,000.00	25.00%	$ 58,500
24	CA00182AB	ADD: AES ALGORITHM	OP_POSIT	SunriseDisp	$ 750	$18,000.00	25.00%	$ 13,500
24	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN	OP_POSIT	SunriseDisp	$ -	$0.00	25.00%	$ -
24	DSEV221	TECH GLOBAL EVOLUTION SERIES 22INCH WITH TOUCH	OP_POSIT	SunriseDisp	$ 3,378	$81,072.00	25.00%	$ 60,804
24	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	OP_POSIT	SunriseDisp	$ 3,500	$84,000.00	25.00%	$ 63,000
24	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG	OP_POSIT	SunriseDisp	$ 50	$1,200.00	25.00%	$ 900
48	B1912	MCC SERIES DESKTOP SPEAKER	OP_POSIT	SunriseDisp	$ 450	$21,600.00	25.00%	$ 16,200
24	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE	OP_POSIT	SunriseDisp	$ 250	$6,000.00	25.00%	$ 4,500
48	B1913	MCC SERIES HEADSET JACK	OP_POSIT	SunriseDisp	$ 200	$9,600.00	25.00%	$ 7,200
24	DSTWIN6328A	PROVIDES ONE DUAL PEDAL FOOTSWITCH FOR USE WITH MOTOROLA MCC 7500 DISP	OP_POSIT	SunriseDisp	$ 290	$6,960.00	25.00%	$ 5,220
24	T7885	MCAFEE WINDOWS AV CLIENT	OP_POSIT	SunriseDisp	$ 165	$3,960.00	25.00%	$ 2,970
24	DDN2089	DUAL IRR SW USB HASP WITH LICENSE (V47)	OP_POSIT	SunriseDisp	$ 2,648	$63,552.00	25.00%	$ 47,664
24	DDN2134	SOUND BLASTER AUDIGY FX PCIE SOUND CARD	OP_POSIT	SunriseDisp	$ 75	$1,800.00	25.00%	$ 1,350
24	CDN6673	CREATIVE LABS INSPIRE A60	OP_POSIT	SunriseDisp	$ 46	$1,104.00	25.00%	$ 828
2	CLN1859	2620-48 ETHERNET SWITCH	SWITCH	SunriseDisp	$ 3,600	$7,200.00	25.00%	$ 5,400
2	SQM01SUM0205	GGM 8000 GATEWAY	ROUTER	SunriseDisp	$ 4,200	$8,400.00	25.00%	$ 6,300
2	CA01616AA	ADD: AC POWER	ROUTER	SunriseDisp	$ -	$0.00	25.00%	$ -
1	F4543	SITE MANAGER BASIC	AUX_IO	SunriseDisp	$ 1,855	$1,855.00	25.00%	$ 1,391

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	VA00874	ADD: AUX I-O SERV FW CURR ASTRO REL	AUX_IO	SunriseDisp	$ 175	$175.00	25.00%	$ 131
1	V266	ADD: 90VAC TO 260VAC PS TO SM	AUX_IO	SunriseDisp	$ 120	$120.00	25.00%	$ 90
3	V592	AAD TERM BLCK & CONN WI	AUX_IO	SunriseDisp	$ 90	$270.00	25.00%	$ 203
1	T7038	GCP 8000 SITE CONTROLLER	GCP8000	SunriseDisp	$ 3,000	$3,000.00	25.00%	$ 2,250
1	CA00303AA	ADD: QTY (1) SITE CONTROLLER	GCP8000	SunriseDisp	$ 2,500	$2,500.00	25.00%	$ 1,875
1	X153AW	ADD: RACK MOUNT HARDWARE	GCP8000	SunriseDisp	$ 50	$50.00	25.00%	$ 38
1	CA01136AA	MCC 7500 CONVEN SITE OPER	GCP8000	SunriseDisp	$ 6,500	$6,500.00	25.00%	$ 4,875
3	SQM01SUM0205	GGM 8000 GATEWAY	CCGW	SunriseDisp	$ 4,200	$12,600.00	25.00%	$ 9,450
3	CA01616AA	ADD: AC POWER	CCGW	SunriseDisp	$ -	$0.00	25.00%	$ -
3	CA02086AA	ADD: HIGH DENSITY ENH CONV GATEWAY	CCGW	SunriseDisp	$ 6,000	$18,000.00	25.00%	$ 13,500
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	SunriseDisp	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	SunriseDisp	$ 1,850	$1,850.00	25.00%	$ 1,388
1	V266	ADD: 90VAC TO 260VAC PS TO SM	NFM_RTU	SunriseDisp	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	SunriseDisp	$ 90	$90.00	25.00%	$ 68
1	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	SunriseDisp	$ 495	$495.00	25.00%	$ 371
2	DSTSJ100BT	SPD, RJ-48 8 PIN, 10/100 BASE T TSJ PROTECTS/PASSES ON ALL 8 PIN	RACK	SunriseDisp	$ 118	$236.00	25.00%	$ 177
1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	RACK	SunriseDisp	$ 85	$85.00	25.00%	$ 64
1	B1912	MCC SERIES DESKTOP SPEAKER	SPARES	SunriseDisp	$ 450	$450.00	25.00%	$ 338
1	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE	SPARES	SunriseDisp	$ 250	$250.00	25.00%	$ 188
1	B1913	MCC SERIES HEADSET JACK	SPARES	SunriseDisp	$ 200	$200.00	25.00%	$ 150
1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	SPARES	SunriseDisp	$ 3,500	$3,500.00	25.00%	$ 2,625
1	B1934	MCC 7500 VOICE PROCESSOR MODULE FRU	SPARES	SunriseDisp	$ 11,830	$11,830.00	25.00%	$ 8,873
1	CA00147AF	ADD: MCC 7500 SECURE OPERATION	SPARES	SunriseDisp	$ 3,250	$3,250.00	25.00%	$ 2,438
1	CA00182AB	ADD: AES ALGORITHM	SPARES	SunriseDisp	$ 750	$750.00	25.00%	$ 563
1	CLN1859	2620-48 ETHERNET SWITCH	SPARES	SunriseDisp	$ 3,600	$3,600.00	25.00%	$ 2,700
1	SQM01SUM0205	GGM 8000 GATEWAY	SPARES	SunriseDisp	$ 4,200	$4,200.00	25.00%	$ 3,150
1	CA01616AA	ADD: AC POWER	SPARES	SunriseDisp	$ -	$0.00	25.00%	$ -
1	CA02086AA	ADD: HIGH DENSITY ENH CONV GATEWAY	SPARES	SunriseDisp	$ 6,000	$6,000.00	25.00%	$ 4,500
1	B1905	MCC 7500 ASTRO 25 SOFTWARE	OP_POSIT	P_PinesDisp	$ 250	$250.00	25.00%	$ 188
23	B1933	MOTOROLA VOICE PROCESSOR MODULE	OP_POS	P_PinesDisp	$ 11,920	$274,160.00	25.00%	$ 205,620
23	CA01642AA	ADD: MCC 7500 BASIC CONSOLE FUNCTIONALITY SOFTWARE LICENSE	OP_POS_LIC	P_PinesDisp	$ 12,000	$276,000.00	25.00%	$ 207,000
23	CA01643AA	ADD: MCC 7500 / MCC 7100 TRUNKING OPERATION	OP_POSIT	P_PinesDisp	$ 5,000	$115,000.00	25.00%	$ 86,250
23	CA00147AF	ADD: MCC 7500 SECURE OPERATION	OP_POSIT	P_PinesDisp	$ 3,250	$74,750.00	25.00%	$ 56,063
23	CA00182AB	ADD: AES ALGORITHM	OP_POSIT	P_PinesDisp	$ 750	$17,250.00	25.00%	$ 12,938

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
23	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN	OP_POSIT	P_PinesDisp	$ -	$0.00	25.00%	$ -
23	DSEV221	TECH GLOBAL EVOLUTION SERIES 22INCH WITH TOUCH	OP_POSIT	P_PinesDisp	$ 3,378	$77,694.00	25.00%	$ 58,271
23	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	OP_POSIT	P_PinesDisp	$ 3,500	$80,500.00	25.00%	$ 60,375
23	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG	OP_POSIT	P_PinesDisp	$ 50	$1,150.00	25.00%	$ 863
46	B1912	MCC SERIES DESKTOP SPEAKER	OP_POSIT	P_PinesDisp	$ 450	$20,700.00	25.00%	$ 15,525
23	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE	OP_POSIT	P_PinesDisp	$ 250	$5,750.00	25.00%	$ 4,313
46	B1913	MCC SERIES HEADSET JACK	OP_POSIT	P_PinesDisp	$ 200	$9,200.00	25.00%	$ 6,900
23	DSTWIN6328A	PROVIDES ONE DUAL PEDAL FOOTSWITCH FOR USE WITH MOTOROLA MCC 7500 DISP	OP_POSIT	P_PinesDisp	$ 290	$6,670.00	25.00%	$ 5,003
23	T7885	MCAFEE WINDOWS AV CLIENT	OP_POSIT	P_PinesDisp	$ 165	$3,795.00	25.00%	$ 2,846
23	DDN2089	DUAL IRR SW USB HASP WITH LICENSE (V47)	OP_POSIT	P_PinesDisp	$ 2,648	$60,904.00	25.00%	$ 45,678
23	DDN2134	SOUND BLASTER AUDIGY FX PCIE SOUND CARD	OP_POSIT	P_PinesDisp	$ 75	$1,725.00	25.00%	$ 1,294
23	CDN6673	CREATIVE LABS INSPIRE A60	OP_POSIT	P_PinesDisp	$ 46	$1,058.00	25.00%	$ 794
2	CLN1859	2620-48 ETHERNET SWITCH	SWITCH	P_PinesDisp	$ 3,600	$7,200.00	25.00%	$ 5,400
2	SQM01SUM0205	GGM 8000 GATEWAY	ROUTER	P_PinesDisp	$ 4,200	$8,400.00	25.00%	$ 6,300
2	CA01616AA	ADD: AC POWER	ROUTER	P_PinesDisp	$ -	$0.00	25.00%	$ -
1	B1905	MCC 7500 ASTRO 25 SOFTWARE	AIS	P_PinesDisp	$ 250	$250.00	25.00%	$ 188
1	B1933	MOTOROLA VOICE PROCESSOR MODULE	AIS	P_PinesDisp	$ 11,920	$11,920.00	25.00%	$ 8,940
1	CA00288AB	ADD: MCC 7500 ARCHIVING INTERFACE SERVER SOFTWARE LICENSE	AIS	P_PinesDisp	$ 15,060	$15,060.00	25.00%	$ 11,295
1	CA00147AF	ADD: MCC 7500 SECURE OPERATION	AIS	P_PinesDisp	$ 3,250	$3,250.00	25.00%	$ 2,438
1	CA00182AB	ADD: AES ALGORITHM	AIS	P_PinesDisp	$ 750	$750.00	25.00%	$ 563
1	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN	AIS	P_PinesDisp	$ -	$0.00	25.00%	$ -
1	T7885	MCAFEE WINDOWS AV CLIENT	AIS	P_PinesDisp	$ 165	$165.00	25.00%	$ 124
1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	AIS	P_PinesDisp	$ 3,500	$3,500.00	25.00%	$ 2,625
1	DDN9748	19 INCH BLACK SHELF	AIS SHELF	P_PinesDisp	$ 249	$249.00	25.00%	$ 187
1	F4543	SITE MANAGER BASIC	AUX_IO	P_PinesDisp	$ 1,855	$1,855.00	25.00%	$ 1,391
1	VA00874	ADD: AUX I-O SERV FW CURR ASTRO REL	AUX_IO	P_PinesDisp	$ 175	$175.00	25.00%	$ 131
1	V266	ADD: 90VAC TO 260VAC PS TO SM	AUX_IO	P_PinesDisp	$ 120	$120.00	25.00%	$ 90
3	V592	AAD TERM BLCK & CONN WI	AUX_IO	P_PinesDisp	$ 90	$270.00	25.00%	$ 203
1	T7038	GCP 8000 SITE CONTROLLER	GCP8000	P_PinesDisp	$ 3,000	$3,000.00	25.00%	$ 2,250
1	CA00303AA	ADD: QTY (1) SITE CONTROLLER	GCP8000	P_PinesDisp	$ 2,500	$2,500.00	25.00%	$ 1,875
1	X153AW	ADD: RACK MOUNT HARDWARE	GCP8000	P_PinesDisp	$ 50	$50.00	25.00%	$ 38
1	CA01136AA	MCC 7500 CONVEN SITE OPER	GCP8000	P_PinesDisp	$ 6,500	$6,500.00	25.00%	$ 4,875
3	SQM01SUM0205	GGM 8000 GATEWAY	CCGW	P_PinesDisp	$ 4,200	$12,600.00	25.00%	$ 9,450

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
3	CA01616AA	ADD: AC POWER	CCGW	P_PinesDisp	$ -	$0.00	25.00%	$ -
3	CA02086AA	ADD: HIGH DENSITY ENH CONV GATEWAY	CCGW	P_PinesDisp	$ 6,000	$18,000.00	25.00%	$ 13,500
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	P_PinesDisp	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	P_PinesDisp	$ 1,850	$1,850.00	25.00%	$ 1,388
1	V266	ADD: 90VAC TO 260VAC PS TO SM	NFM_RTU	P_PinesDisp	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	P_PinesDisp	$ 90	$90.00	25.00%	$ 68
1	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	P_PinesDisp	$ 495	$495.00	25.00%	$ 371
2	DSTSJ100BT	SPD, RJ-48 8 PIN, 10/100 BASE T TSJ PROTECTS/PASSES ON ALL 8 PIN	RACK	P_PinesDisp	$ 118	$236.00	25.00%	$ 177
1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	RACK	P_PinesDisp	$ 85	$85.00	25.00%	$ 64
1	B1912	MCC SERIES DESKTOP SPEAKER	SPARES	P_PinesDisp	$ 450	$450.00	25.00%	$ 338
1	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE	SPARES	P_PinesDisp	$ 250	$250.00	25.00%	$ 188
1	B1913	MCC SERIES HEADSET JACK	SPARES	P_PinesDisp	$ 200	$200.00	25.00%	$ 150
1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	SPARES	P_PinesDisp	$ 3,500	$3,500.00	25.00%	$ 2,625
1	B1934	MCC 7500 VOICE PROCESSOR MODULE FRU	SPARES	P_PinesDisp	$ 11,830	$11,830.00	25.00%	$ 8,873
1	CA00147AF	ADD: MCC 7500 SECURE OPERATION	SPARES	P_PinesDisp	$ 3,250	$3,250.00	25.00%	$ 2,438
1	CA00182AB	ADD: AES ALGORITHM	SPARES	P_PinesDisp	$ 750	$750.00	25.00%	$ 563
1	B1905	MCC 7500 ASTRO 25 SOFTWARE	OP_POSIT	C_Creek Disp	$ 250	$250.00	25.00%	$ 188
21	B1933	MOTOROLA VOICE PROCESSOR MODULE	OP_POS	C_Creek Disp	$ 11,920	$250,320.00	25.00%	$ 187,740
21	CA01642AA	ADD: MCC 7500 BASIC CONSOLE FUNCTIONALITY SOFTWARE LICENSE	OP_POS_LIC	C_Creek Disp	$ 12,000	$252,000.00	25.00%	$ 189,000
21	CA01643AA	ADD: MCC 7500 / MCC 7100 TRUNKING OPERATION	OP_POSIT	C_Creek Disp	$ 5,000	$105,000.00	25.00%	$ 78,750
21	CA00147AF	ADD: MCC 7500 SECURE OPERATION	OP_POSIT	C_Creek Disp	$ 3,250	$68,250.00	25.00%	$ 51,188
21	CA00182AB	ADD: AES ALGORITHM	OP_POSIT	C_Creek Disp	$ 750	$15,750.00	25.00%	$ 11,813
21	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN	OP_POSIT	C_Creek Disp	$ -	$0.00	25.00%	$ -
21	DSEV221	TECH GLOBAL EVOLUTION SERIES 22INCH WITH TOUCH	OP_POSIT	C_Creek Disp	$ 3,378	$70,938.00	25.00%	$ 53,204
21	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	OP_POSIT	C_Creek Disp	$ 3,500	$73,500.00	25.00%	$ 55,125
21	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG	OP_POSIT	C_Creek Disp	$ 50	$1,050.00	25.00%	$ 788
42	B1912	MCC SERIES DESKTOP SPEAKER	OP_POSIT	C_Creek Disp	$ 450	$18,900.00	25.00%	$ 14,175
21	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE	OP_POSIT	C_Creek Disp	$ 250	$5,250.00	25.00%	$ 3,938
42	B1913	MCC SERIES HEADSET JACK	OP_POSIT	C_Creek Disp	$ 200	$8,400.00	25.00%	$ 6,300
21	DSTWIN6328A	PROVIDES ONE DUAL PEDAL FOOTSWITCH FOR USE WITH MOTOROLA MCC 7500 DISP	OP_POSIT	C_Creek Disp	$ 290	$6,090.00	25.00%	$ 4,568
21	T7885	MCAFEE WINDOWS AV CLIENT	OP_POSIT	C_Creek Disp	$ 165	$3,465.00	25.00%	$ 2,599

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
21	DDN2089	DUAL IRR SW USB HASP WITH LICENSE (V47)	OP_POSIT	C_Creek Disp	$ 2,648	$55,608.00	25.00%	$ 41,706
21	DDN2134	SOUND BLASTER AUDIGY FX PCIE SOUND CARD	OP_POSIT	C_Creek Disp	$ 75	$1,575.00	25.00%	$ 1,181
21	CDN6673	CREATIVE LABS INSPIRE A60	OP_POSIT	C_Creek Disp	$ 46	$966.00	25.00%	$ 725
2	CLN1859	2620-48 ETHERNET SWITCH	SWITCH	C_Creek Disp	$ 3,600	$7,200.00	25.00%	$ 5,400
2	SQM01SUM0205	GGM 8000 GATEWAY	ROUTER	C_Creek Disp	$ 4,200	$8,400.00	25.00%	$ 6,300
2	CA01616AA	ADD: AC POWER	ROUTER	C_Creek Disp	$ -	$0.00	25.00%	$ -
1	B1905	MCC 7500 ASTRO 25 SOFTWARE	AIS1	C_Creek Disp	$ 250	$250.00	25.00%	$ 188
1	B1933	MOTOROLA VOICE PROCESSOR MODULE	AIS1	C_Creek Disp	$ 11,920	$11,920.00	25.00%	$ 8,940
1	CA00288AB	ADD: MCC 7500 ARCHIVING INTERFACE SERVER SOFTWARE LICENSE	AIS1	C_Creek Disp	$ 15,060	$15,060.00	25.00%	$ 11,295
1	CA00147AF	ADD: MCC 7500 SECURE OPERATION	AIS1	C_Creek Disp	$ 3,250	$3,250.00	25.00%	$ 2,438
1	CA00182AB	ADD: AES ALGORITHM	AIS1	C_Creek Disp	$ 750	$750.00	25.00%	$ 563
1	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN	AIS1	C_Creek Disp	$ -	$0.00	25.00%	$ -
1	T7885	MCAFEE WINDOWS AV CLIENT	AIS1	C_Creek Disp	$ 165	$165.00	25.00%	$ 124
1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	AIS1	C_Creek Disp	$ 3,500	$3,500.00	25.00%	$ 2,625
1	B1905	MCC 7500 ASTRO 25 SOFTWARE	AIS2	C_Creek Disp	$ 250	$250.00	25.00%	$ 188
1	B1933	MOTOROLA VOICE PROCESSOR MODULE	AIS2	C_Creek Disp	$ 11,920	$11,920.00	25.00%	$ 8,940
1	CA00288AB	ADD: MCC 7500 ARCHIVING INTERFACE SERVER SOFTWARE LICENSE	AIS2	C_Creek Disp	$ 15,060	$15,060.00	25.00%	$ 11,295
1	CA00147AF	ADD: MCC 7500 SECURE OPERATION	AIS2	C_Creek Disp	$ 3,250	$3,250.00	25.00%	$ 2,438
1	CA00182AB	ADD: AES ALGORITHM	AIS2	C_Creek Disp	$ 750	$750.00	25.00%	$ 563
1	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN	AIS2	C_Creek Disp	$ -	$0.00	25.00%	$ -
1	T7885	MCAFEE WINDOWS AV CLIENT	AIS2	C_Creek Disp	$ 165	$165.00	25.00%	$ 124
1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	AIS2	C_Creek Disp	$ 3,500	$3,500.00	25.00%	$ 2,625
1	DDN9748	19 INCH BLACK SHELF	AIS SHELF	C_Creek Disp	$ 249	$249.00	25.00%	$ 187
1	F4543	SITE MANAGER BASIC	AUX_IO	C_Creek Disp	$ 1,855	$1,855.00	25.00%	$ 1,391
1	VA00874	ADD: AUX I-O SERV FW CURR ASTRO REL	AUX_IO	C_Creek Disp	$ 175	$175.00	25.00%	$ 131
1	V266	ADD: 90VAC TO 260VAC PS TO SM	AUX_IO	C_Creek Disp	$ 120	$120.00	25.00%	$ 90
3	V592	AAD TERM BLCK & CONN WI	AUX_IO	C_Creek Disp	$ 90	$270.00	25.00%	$ 203
1	T7038	GCP 8000 SITE CONTROLLER	GCP8000	C_Creek Disp	$ 3,000	$3,000.00	25.00%	$ 2,250
1	CA00303AA	ADD: QTY (1) SITE CONTROLLER	GCP8000	C_Creek Disp	$ 2,500	$2,500.00	25.00%	$ 1,875
1	X153AW	ADD: RACK MOUNT HARDWARE	GCP8000	C_Creek Disp	$ 50	$50.00	25.00%	$ 38
1	CA01136AA	MCC 7500 CONVEN SITE OPER	GCP8000	C_Creek Disp	$ 6,500	$6,500.00	25.00%	$ 4,875
3	SQM01SUM0205	GGM 8000 GATEWAY	CCGW	C_Creek Disp	$ 4,200	$12,600.00	25.00%	$ 9,450
3	CA01616AA	ADD: AC POWER	CCGW	C_Creek Disp	$ -	$0.00	25.00%	$ -
3	CA02086AA	ADD: HIGH DENSITY ENH CONV GATEWAY	CCGW	C_Creek Disp	$ 6,000	$18,000.00	25.00%	$ 13,500

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	F4544	SITE MANAGER ADVANCED	NFM_RTU	C_Creek Disp	$ 3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	C_Creek Disp	$ 1,850	$1,850.00	25.00%	$ 1,388
1	V266	ADD: 90VAC TO 260VAC PS TO SM	NFM_RTU	C_Creek Disp	$ 120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	NFM_RTU	C_Creek Disp	$ 90	$90.00	25.00%	$ 68
1	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	C_Creek Disp	$ 495	$495.00	25.00%	$ 371
2	DSTSJ100BT	SPD, RJ-48 8 PIN, 10/100 BASE T TSJ PROTECTS/PASSES ON ALL 8 PIN	RACK	C_Creek Disp	$ 118	$236.00	25.00%	$ 177
1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	RACK	C_Creek Disp	$ 85	$85.00	25.00%	$ 64
1	B1912	MCC SERIES DESKTOP SPEAKER	SPARES	C_Creek Disp	$ 450	$450.00	25.00%	$ 338
1	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE	SPARES	C_Creek Disp	$ 250	$250.00	25.00%	$ 188
1	B1913	MCC SERIES HEADSET JACK	SPARES	C_Creek Disp	$ 200	$200.00	25.00%	$ 150
1	TT3106	Z440 WORKSTATION WINDOWS 10 IOT ENT (NON RETURNABLE)	SPARES	C_Creek Disp	$ 3,500	$3,500.00	25.00%	$ 2,625
1	B1934	MCC 7500 VOICE PROCESSOR MODULE FRU	SPARES	C_Creek Disp	$ 11,830	$11,830.00	25.00%	$ 8,873
1	CA00147AF	ADD: MCC 7500 SECURE OPERATION	SPARES	C_Creek Disp	$ 3,250	$3,250.00	25.00%	$ 2,438
1	CA00182AB	ADD: AES ALGORITHM	SPARES	C_Creek Disp	$ 750	$750.00	25.00%	$ 563
1	DQ_Broward_VPI_1	VPI Logging Recorders for P25 (redundant)	Replay_VPI	Sunrise Disp	$ 162,018	$162,018.00	25.00%	$ 121,514
1	DQ_Broward_VPI_2	VPI Logging Recorders for P25 (non-redundant)	Replay_VPI	PembrokePinesDisp	$ 110,030	$110,030.00	25.00%	$ 82,523
1	DQ_Broward_VPI_3	VPI Logging Recorders for P25 (redundant)	Replay_VPI	CoconutCreek Disp	$ 162,018	$162,018.00	25.00%	$ 121,514
1	T7321	GCM 8000 COMPARATOR	GCM8000	EMS	$3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	EMS	$2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	EMS	$11,500	$23,000.00	25.00%	$ 17,250
1	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	EMS	$16,000	$16,000.00	25.00%	$ 12,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	EMS	$50	$50.00	25.00%	$ 38
1	CA01400AA	ADD: DC POWER CABLE	GCM8000	EMS	$0	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	EMS	$3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	EMS	$2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	EMS	$11,500	$23,000.00	25.00%	$ 17,250
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	EMS	$16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	EMS	$50	$50.00	25.00%	$ 38
1	CA01400AA	ADD: DC POWER CABLE	GCM8000	EMS	$0	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	EMS	$3,000	$3,000.00	25.00%	$ 2,250
2	CA01183AA	GCM 8000 COMPARATOR	GCM8000	EMS	$2,500	$5,000.00	25.00%	$ 3,750
2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	EMS	$11,500	$23,000.00	25.00%	$ 17,250

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	EMS	$16,000	$32,000.00	25.00%	$ 24,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	EMS	$50	$50.00	25.00%	$ 38
1	CA01400AA	ADD: DC POWER CABLE	GCM8000	EMS	$0	$0.00	25.00%	$ -
1	T7321	GCM 8000 COMPARATOR	GCM8000	EMS	$3,000	$3,000.00	25.00%	$ 2,250
1	CA01183AA	GCM 8000 COMPARATOR	GCM8000	EMS	$2,500	$2,500.00	25.00%	$ 1,875
1	CA01185AA	ADD: IP BASED MULTISITE OPERATION	GCM8000	EMS	$11,500	$11,500.00	25.00%	$ 8,625
1	CA01901AA	ADD: P25 TDMA COMPARATOR SOFTWARE	GCM8000	EMS	$16,000	$16,000.00	25.00%	$ 12,000
1	X153AW	ADD: RACK MOUNT HARDWARE	GCM8000	EMS	$50	$50.00	25.00%	$ 38
1	CA01400AA	ADD: DC POWER CABLE	GCM8000	EMS	$0	$0.00	25.00%	$ -
1	T7038	GCP 8000 SITE CONTROLLER	GCP8000	EMS	$3,000	$3,000.00	25.00%	$ 2,250
1	CA00303AA	ADD: QTY (1) SITE CONTROLLER	GCP8000	EMS	$2,500	$2,500.00	25.00%	$ 1,875
4	CA02206AA	ADD: SIMULCAST REMOTE SITE LICENSE IV&D	GCP8000	EMS	$4,920	$19,680.00	25.00%	$ 14,760
1	CA01194AA	IP BASED MULTISITE SITE CONTROLLER SOFTWARE	GCP8000	EMS	$62,500	$62,500.00	25.00%	$ 46,875
1	X153AW	ADD: RACK MOUNT HARDWARE	GCP8000	EMS	$50	$50.00	25.00%	$ 38
1	CA01400AA	ADD: DC POWER CABLE	GCP8000	EMS	$0	$0.00	25.00%	$ -
1	T7038	GCP 8000 SITE CONTROLLER	GCP8000	EMS	$3,000	$3,000.00	25.00%	$ 2,250
1	CA00303AA	ADD: QTY (1) SITE CONTROLLER	GCP8000	EMS	$2,500	$2,500.00	25.00%	$ 1,875
4	CA02206AA	ADD: SIMULCAST REMOTE SITE LICENSE IV&D	GCP8000	EMS	$4,920	$19,680.00	25.00%	$ 14,760
1	CA01194AA	IP BASED MULTISITE SITE CONTROLLER SOFTWARE	GCP8000	EMS	$62,500	$62,500.00	25.00%	$ 46,875
1	X153AW	ADD: RACK MOUNT HARDWARE	GCP8000	EMS	$50	$50.00	25.00%	$ 38
1	CA01400AA	ADD: DC POWER CABLE	GCP8000	EMS	$0	$0.00	25.00%	$ -
1	DSTRAK91008EDC	PRIME/MASTER SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM DC	GPS	EMS	$34,712	$34,712.00	25.00%	$ 26,034
50	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	GPS	EMS	$2	$112.50	25.00%	$ 84
4	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	GPS	EMS	$27	$109.00	25.00%	$ 82
1	SQM01SUM0205	GGM 8000 GATEWAY	NETWORK	EMS	$4,200	$4,200.00	25.00%	$ 3,150
1	CA01616AA	ADD: AC POWER	NETWORK	EMS	$0	$0.00	25.00%	$ -
1	SQM01SUM0205	GGM 8000 GATEWAY	NETWORK	EMS	$4,200	$4,200.00	25.00%	$ 3,150
1	CA01616AA	ADD: AC POWER	NETWORK	EMS	$0	$0.00	25.00%	$ -
2	CLN1859	2620-48 ETHERNET SWITCH	NETWORK	EMS	$3,600	$7,200.00	25.00%	$ 5,400
1	SQM01SUM0205	GGM 8000 GATEWAY	NETWORK	EMS	$4,200	$4,200.00	25.00%	$ 3,150
1	CA01616AA	ADD: AC POWER	NETWORK	EMS	$0	$0.00	25.00%	$ -
1	SQM01SUM0205	GGM 8000 GATEWAY	NETWORK	EMS	$4,200	$4,200.00	25.00%	$ 3,150
1	CA01616AA	ADD: AC POWER	NETWORK	EMS	$0	$0.00	25.00%	$ -
2	CLN1859	2620-48 ETHERNET SWITCH	NETWORK	EMS	$3,600	$7,200.00	25.00%	$ 5,400
1	F4544	SITE MANAGER ADVANCED	SDM3000	EMS	$3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	SDM3000	EMS	$1,850	$1,850.00	25.00%	$ 1,388

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	VA00905	ADD:24/48 VDC PS TO SM	SDM3000	EMS	$120	$120.00	25.00%	$ 90
1	V592	AAD TERM BLCK & CONN WI	SDM3000	EMS	$90	$90.00	25.00%	$ 68
1	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	EMS	$495	$495.00	25.00%	$ 371
0	DS11011188	PDU, 120/240 SPLIT PH OR N+1 REDUNDANT, 60A MAX PER PHASE, SIX DEDICAT	PDU	EMS	$2,790	$0.00	25.00%	$ -
0	DS37502851	BREAKER KIT AIRPAX 15AMP SNAPAC, FOR AC EDGE QTY 1	PDU	EMS	$35	$0.00	25.00%	$ -
0	DSRMP615A	SPD, TYPE 3, 120V RACK MOUNT, 15A PLUG-IN W/ (6) 15A NEMA 5-15 OUTLETS	PDU	EMS	$258	$0.00	25.00%	$ -
1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	GTR8000	EMS	$6,000	$6,000.00	25.00%	$ 4,500
1	CA00855AA	ADD: 700/800 MHZ	GTR8000	EMS	$6,300	$6,300.00	25.00%	$ 4,725
3	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	EMS	$13,000	$39,000.00	25.00%	$ 29,250
3	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	EMS	$10,000	$30,000.00	25.00%	$ 22,500
1	X304AE	ADD: QTY (4) GTR 8000 BASE RADIOS	GTR8000	EMS	$23,600	$23,600.00	25.00%	$ 17,700
4	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	EMS	$25,500	$102,000.00	25.00%	$ 76,500
1	X302AE	ADD: QTY (2) GTR 8000 BASE RADIOS	GTR8000	EMS	$11,800	$11,800.00	25.00%	$ 8,850
2	CA01948AA	ADD: CONVENTIONAL SOFTWARE	GTR8000	EMS	$12,500	$25,000.00	25.00%	$ 18,750
2	CA01706AA	ADD: ADD: GGM 8000 GATEWAY	GTR8000	EMS	$4,200	$8,400.00	25.00%	$ 6,300
1	CA01706AA	ADD: ADD: GGM 8000 GATEWAY	GTR8000	EMS	$4,200	$4,200.00	25.00%	$ 3,150
1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILITY OF 7-24 BRS	GTR8000	EMS	$2,100	$2,100.00	25.00%	$ 1,575
1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER	GTR8000	EMS	$8,400	$8,400.00	25.00%	$ 6,300
1	CA00882AA	ADD: 700 MHZ TX FILTER W/PMU	GTR8000	EMS	$1,000	$1,000.00	25.00%	$ 750
2	CA01536AA	GPB 8000 REFERENCE DISTRIBUTION MODULE	GTR8000	EMS	$5,000	$10,000.00	25.00%	$ 7,500
2	CA01537AA	ADD: REFERENCE DISTRIBUTION SOFTWARE	GTR8000	EMS	$6,500	$13,000.00	25.00%	$ 9,750
1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	GTR8000	EMS	$495	$495.00	25.00%	$ 371
1	CA02686AA	ADD: AC DC POWER DISTRIBUTION	GTR8000	EMS	$0	$0.00	25.00%	$ -
2	DS0900382702	GPS TIMING ANTENNA/RECEIVER W/ ADDTL FILTERING	GTR8000	EMS	$1,190	$2,380.00	25.00%	$ 1,785
2	DS58534AAUB	MOUNTING KIT FOR 110033-03, GPS TIMING ANTENNA	GTR8000	EMS	$90	$180.00	25.00%	$ 135
2	DSIX2L1M1DC48IG	SPD, HPD GPS DATA LINE, 48VDC, HARD WIRE WITH ISOLATED GROUNDING	GTR8000	EMS	$247	$494.00	25.00%	$ 371
2	DS30C87465CO1	125FT OUTDOOR UV PROTECTED CABLE 6 PR, 22AWG DB15 CABLE	GTR8000	EMS	$634	$1,268.00	25.00%	$ 951
1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	GTR8000	EMS	$6,000	$6,000.00	25.00%	$ 4,500
1	CA00855AA	ADD: 700/800 MHZ	GTR8000	EMS	$6,300	$6,300.00	25.00%	$ 4,725
3	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	EMS	$13,000	$39,000.00	25.00%	$ 29,250

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
3	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	EMS	$10,000	$30,000.00	25.00%	$ 22,500
1	X303AE	ADD: QTY (3) GTR 8000 BASE RADIOS	GTR8000	EMS	$17,700	$17,700.00	25.00%	$ 13,275
3	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	EMS	$25,500	$76,500.00	25.00%	$ 57,375
1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK	GTR8000	EMS	$600	$600.00	25.00%	$ 450
1	CA00880AA	ADD: EXPANSION 6 PORT CAVITY COMBINER	GTR8000	EMS	$8,400	$8,400.00	25.00%	$ 6,300
1	CA01058AA	ADD: 700/800 PHASING HARNESS	GTR8000	EMS	$1,000	$1,000.00	25.00%	$ 750
2	CA00885AA	ADD: HIGH AVAILABILITY XHUB	GTR8000	EMS	$3,500	$7,000.00	25.00%	$ 5,250
1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	GTR8000	EMS	$495	$495.00	25.00%	$ 371
1	CA02686AA	ADD: AC DC POWER DISTRIBUTION	GTR8000	EMS	$0	$0.00	25.00%	$ -
1	F4544	SITE MANAGER ADVANCED	SDM3000	EMS	$3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	SDM3000	EMS	$1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	SDM3000	EMS	$120	$120.00	25.00%	$ 90
1	DSSC412HF2LDF	COLLINEAR OMNI ANTENNA, 11.5 DBD GAIN, 746-869 MHZ, PIM	ANTENNA	EMS	$6,440	$6,440.00	25.00%	$ 4,830
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	EMS	$4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	EMS	$29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	EMS	$22	$44.00	25.00%	$ 33
320	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	EMS	$16	$5,200.00	25.00%	$ 3,900
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	EMS	$112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	EMS	$23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	EMS	$32	$64.00	25.00%	$ 48
10	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	EMS	$29	$285.00	25.00%	$ 214
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	EMS	$130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	EMS	$36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	EMS	$4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	EMS	$29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	EMS	$41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	RFMIXING	EMS	$4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	RFMIXING	EMS	$29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	RFMIXING	EMS	$4,594	$4,594.00	25.00%	$ 3,446

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	RFMIXING	EMS	$2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	RFMIXING	EMS	$27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	RFMIXING	EMS	$2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	RFMIXING	EMS	$27	$54.50	25.00%	$ 41
1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	GTR8000	COCONUT CREEK	$6,000	$6,000.00	25.00%	$ 4,500
1	CA00855AA	ADD: 700/800 MHZ	GTR8000	COCONUT CREEK	$6,300	$6,300.00	25.00%	$ 4,725
3	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	COCONUT CREEK	$13,000	$39,000.00	25.00%	$ 29,250
3	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	COCONUT CREEK	$10,000	$30,000.00	25.00%	$ 22,500
1	X304AE	ADD: QTY (4) GTR 8000 BASE RADIOS	GTR8000	COCONUT CREEK	$23,600	$23,600.00	25.00%	$ 17,700
4	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	COCONUT CREEK	$25,500	$102,000.00	25.00%	$ 76,500
1	X302AE	ADD: QTY (2) GTR 8000 BASE RADIOS	GTR8000	COCONUT CREEK	$11,800	$11,800.00	25.00%	$ 8,850
2	CA01948AA	ADD: CONVENTIONAL SOFTWARE	GTR8000	COCONUT CREEK	$12,500	$25,000.00	25.00%	$ 18,750
2	CA01706AA	ADD: ADD: GGM 8000 GATEWAY	GTR8000	COCONUT CREEK	$4,200	$8,400.00	25.00%	$ 6,300
1	CA01706AA	ADD: ADD: GGM 8000 GATEWAY	GTR8000	COCONUT CREEK	$4,200	$4,200.00	25.00%	$ 3,150
1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILITY OF 7-24 BRS	GTR8000	COCONUT CREEK	$2,100	$2,100.00	25.00%	$ 1,575
1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER	GTR8000	COCONUT CREEK	$8,400	$8,400.00	25.00%	$ 6,300
1	CA00882AA	ADD: 700 MHZ TX FILTER W/PMU	GTR8000	COCONUT CREEK	$1,000	$1,000.00	25.00%	$ 750
2	CA01536AA	GPB 8000 REFERENCE DISTRIBUTION MODULE	GTR8000	COCONUT CREEK	$5,000	$10,000.00	25.00%	$ 7,500
2	CA01537AA	ADD: REFERENCE DISTRIBUTION SOFTWARE	GTR8000	COCONUT CREEK	$6,500	$13,000.00	25.00%	$ 9,750
1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	GTR8000	COCONUT CREEK	$495	$495.00	25.00%	$ 371
1	CA02686AA	ADD: AC DC POWER DISTRIBUTION	GTR8000	COCONUT CREEK	$0	$0.00	25.00%	$ -
2	DS0900382702	GPS TIMING ANTENNA/RECEIVER W/ ADDTL FILTERING	GTR8000	COCONUT CREEK	$1,190	$2,380.00	25.00%	$ 1,785
2	DS58534AAUB	MOUNTING KIT FOR 110033-03, GPS TIMING ANTENNA	GTR8000	COCONUT CREEK	$90	$180.00	25.00%	$ 135
2	DSIX2L1M1DC48IG	SPD, HPD GPS DATA LINE, 48VDC, HARD WIRE WITH ISOLATED GROUNDING	GTR8000	COCONUT CREEK	$247	$494.00	25.00%	$ 371
2	DS30C87465CO1	125FT OUTDOOR UV PROTECTED CABLE 6 PR, 22AWG DB15 CABLE	GTR8000	COCONUT CREEK	$634	$1,268.00	25.00%	$ 951
1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	GTR8000	COCONUT CREEK	$6,000	$6,000.00	25.00%	$ 4,500
1	CA00855AA	ADD: 700/800 MHZ	GTR8000	COCONUT CREEK	$6,300	$6,300.00	25.00%	$ 4,725
3	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	COCONUT CREEK	$13,000	$39,000.00	25.00%	$ 29,250
3	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	COCONUT CREEK	$10,000	$30,000.00	25.00%	$ 22,500
1	X303AE	ADD: QTY (3) GTR 8000 BASE RADIOS	GTR8000	COCONUT CREEK	$17,700	$17,700.00	25.00%	$ 13,275
3	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	COCONUT CREEK	$25,500	$76,500.00	25.00%	$ 57,375

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK	GTR8000	COCONUT CREEK	$600	$600.00	25.00%	$ 450
1	CA00880AA	ADD: EXPANSION 6 PORT CAVITY COMBINER	GTR8000	COCONUT CREEK	$8,400	$8,400.00	25.00%	$ 6,300
1	CA01058AA	ADD: 700/800 PHASING HARNESS	GTR8000	COCONUT CREEK	$1,000	$1,000.00	25.00%	$ 750
2	CA00885AA	ADD: HIGH AVAILABILITY XHUB	GTR8000	COCONUT CREEK	$3,500	$7,000.00	25.00%	$ 5,250
1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	GTR8000	COCONUT CREEK	$495	$495.00	25.00%	$ 371
1	CA02686AA	ADD: AC DC POWER DISTRIBUTION	GTR8000	COCONUT CREEK	$0	$0.00	25.00%	$ -
1	F4544	SITE MANAGER ADVANCED	SDM3000	COCONUT CREEK	$3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	SDM3000	COCONUT CREEK	$1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	SDM3000	COCONUT CREEK	$120	$120.00	25.00%	$ 90
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 10 DBD, LOW PIM, 746-960 MHZ	ANTENNA	COCONUT CREEK	$6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	COCONUT CREEK	$4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	COCONUT CREEK	$29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	COCONUT CREEK	$22	$44.00	25.00%	$ 33
425	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	COCONUT CREEK	$16	$6,906.25	25.00%	$ 5,180
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	COCONUT CREEK	$112	$224.00	25.00%	$ 168
8	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	COCONUT CREEK	$23	$186.00	25.00%	$ 140
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	COCONUT CREEK	$32	$64.00	25.00%	$ 48
14	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	COCONUT CREEK	$29	$399.00	25.00%	$ 299
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	COCONUT CREEK	$130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	COCONUT CREEK	$36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	COCONUT CREEK	$4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	COCONUT CREEK	$29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	COCONUT CREEK	$41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	RFMIXING	COCONUT CREEK	$4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	RFMIXING	COCONUT CREEK	$29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	RFMIXING	COCONUT CREEK	$4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	RFMIXING	COCONUT CREEK	$2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	RFMIXING	COCONUT CREEK	$27	$54.50	25.00%	$ 41

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	RFMIXING	COCONUT CREEK	$2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	RFMIXING	COCONUT CREEK	$27	$54.50	25.00%	$ 41
1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	GTR8000	DAVIE	$6,000	$6,000.00	25.00%	$ 4,500
1	CA00855AA	ADD: 700/800 MHZ	GTR8000	DAVIE	$6,300	$6,300.00	25.00%	$ 4,725
3	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	DAVIE	$13,000	$39,000.00	25.00%	$ 29,250
3	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	DAVIE	$10,000	$30,000.00	25.00%	$ 22,500
1	X304AE	ADD: QTY (4) GTR 8000 BASE RADIOS	GTR8000	DAVIE	$23,600	$23,600.00	25.00%	$ 17,700
4	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	DAVIE	$25,500	$102,000.00	25.00%	$ 76,500
1	X302AE	ADD: QTY (2) GTR 8000 BASE RADIOS	GTR8000	DAVIE	$11,800	$11,800.00	25.00%	$ 8,850
2	CA01948AA	ADD: CONVENTIONAL SOFTWARE	GTR8000	DAVIE	$12,500	$25,000.00	25.00%	$ 18,750
2	CA01706AA	ADD: ADD: GGM 8000 GATEWAY	GTR8000	DAVIE	$4,200	$8,400.00	25.00%	$ 6,300
1	CA01706AA	ADD: ADD: GGM 8000 GATEWAY	GTR8000	DAVIE	$4,200	$4,200.00	25.00%	$ 3,150
1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILITY OF 7-24 BRS	GTR8000	DAVIE	$2,100	$2,100.00	25.00%	$ 1,575
1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER	GTR8000	DAVIE	$8,400	$8,400.00	25.00%	$ 6,300
1	CA00882AA	ADD: 700 MHZ TX FILTER W/PMU	GTR8000	DAVIE	$1,000	$1,000.00	25.00%	$ 750
2	CA01536AA	GPB 8000 REFERENCE DISTRIBUTION MODULE	GTR8000	DAVIE	$5,000	$10,000.00	25.00%	$ 7,500
2	CA01537AA	ADD: REFERENCE DISTRIBUTION SOFTWARE	GTR8000	DAVIE	$6,500	$13,000.00	25.00%	$ 9,750
1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	GTR8000	DAVIE	$495	$495.00	25.00%	$ 371
1	CA02686AA	ADD: AC DC POWER DISTRIBUTION	GTR8000	DAVIE	$0	$0.00	25.00%	$ -
2	DS0900382702	GPS TIMING ANTENNA/RECEIVER W/ ADDTL FILTERING	GTR8000	DAVIE	$1,190	$2,380.00	25.00%	$ 1,785
2	DS58534AAUB	MOUNTING KIT FOR 110033-03, GPS TIMING ANTENNA	GTR8000	DAVIE	$90	$180.00	25.00%	$ 135
2	DSIX2L1M1DC48IG	SPD, HPD GPS DATA LINE, 48VDC, HARD WIRE WITH ISOLATED GROUNDING	GTR8000	DAVIE	$247	$494.00	25.00%	$ 371
2	DS30C87465CO1	125FT OUTDOOR UV PROTECTED CABLE 6 PR, 22AWG DB15 CABLE	GTR8000	DAVIE	$634	$1,268.00	25.00%	$ 951
1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	GTR8000	DAVIE	$6,000	$6,000.00	25.00%	$ 4,500
1	CA00855AA	ADD: 700/800 MHZ	GTR8000	DAVIE	$6,300	$6,300.00	25.00%	$ 4,725
3	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	DAVIE	$13,000	$39,000.00	25.00%	$ 29,250
3	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	DAVIE	$10,000	$30,000.00	25.00%	$ 22,500
1	X303AE	ADD: QTY (3) GTR 8000 BASE RADIOS	GTR8000	DAVIE	$17,700	$17,700.00	25.00%	$ 13,275
3	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	DAVIE	$25,500	$76,500.00	25.00%	$ 57,375
1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK	GTR8000	DAVIE	$600	$600.00	25.00%	$ 450
1	CA00880AA	ADD: EXPANSION 6 PORT CAVITY COMBINER	GTR8000	DAVIE	$8,400	$8,400.00	25.00%	$ 6,300
1	CA01058AA	ADD: 700/800 PHASING HARNESS	GTR8000	DAVIE	$1,000	$1,000.00	25.00%	$ 750

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	CA00885AA	ADD: HIGH AVAILABILITY XHUB	GTR8000	DAVIE	$3,500	$7,000.00	25.00%	$ 5,250
1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	GTR8000	DAVIE	$495	$495.00	25.00%	$ 371
1	CA02686AA	ADD: AC DC POWER DISTRIBUTION	GTR8000	DAVIE	$0	$0.00	25.00%	$ -
1	F4544	SITE MANAGER ADVANCED	SDM3000	DAVIE	$3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	SDM3000	DAVIE	$1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	SDM3000	DAVIE	$120	$120.00	25.00%	$ 90
1	DSSC412HF2LDF	COLLINEAR OMNI ANTENNA, 11.5 DBD GAIN, 746-869 MHZ, PIM	ANTENNA	DAVIE	$6,440	$6,440.00	25.00%	$ 4,830
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	DAVIE	$4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	DAVIE	$29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	DAVIE	$22	$44.00	25.00%	$ 33
320	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	DAVIE	$16	$5,200.00	25.00%	$ 3,900
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	DAVIE	$112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	DAVIE	$23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	DAVIE	$32	$64.00	25.00%	$ 48
11	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	DAVIE	$29	$313.50	25.00%	$ 235
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	DAVIE	$130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	DAVIE	$36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	DAVIE	$4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	DAVIE	$29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	DAVIE	$41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	RFMIXING	DAVIE	$4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	RFMIXING	DAVIE	$29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	RFMIXING	DAVIE	$4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	RFMIXING	DAVIE	$2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	RFMIXING	DAVIE	$27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	RFMIXING	DAVIE	$2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	RFMIXING	DAVIE	$27	$54.50	25.00%	$ 41

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	GTR8000	CHANNEL 2	$6,000	$6,000.00	25.00%	$ 4,500
1	CA00855AA	ADD: 700/800 MHZ	GTR8000	CHANNEL 2	$6,300	$6,300.00	25.00%	$ 4,725
3	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	CHANNEL 2	$13,000	$39,000.00	25.00%	$ 29,250
3	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	CHANNEL 2	$10,000	$30,000.00	25.00%	$ 22,500
1	X304AE	ADD: QTY (4) GTR 8000 BASE RADIOS	GTR8000	CHANNEL 2	$23,600	$23,600.00	25.00%	$ 17,700
4	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	CHANNEL 2	$25,500	$102,000.00	25.00%	$ 76,500
1	X302AE	ADD: QTY (2) GTR 8000 BASE RADIOS	GTR8000	CHANNEL 2	$11,800	$11,800.00	25.00%	$ 8,850
2	CA01948AA	ADD: CONVENTIONAL SOFTWARE	GTR8000	CHANNEL 2	$12,500	$25,000.00	25.00%	$ 18,750
2	CA01706AA	ADD: ADD: GGM 8000 GATEWAY	GTR8000	CHANNEL 2	$4,200	$8,400.00	25.00%	$ 6,300
1	CA01706AA	ADD: ADD: GGM 8000 GATEWAY	GTR8000	CHANNEL 2	$4,200	$4,200.00	25.00%	$ 3,150
1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILITY OF 7-24 BRS	GTR8000	CHANNEL 2	$2,100	$2,100.00	25.00%	$ 1,575
1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER	GTR8000	CHANNEL 2	$8,400	$8,400.00	25.00%	$ 6,300
1	CA00882AA	ADD: 700 MHZ TX FILTER W/PMU	GTR8000	CHANNEL 2	$1,000	$1,000.00	25.00%	$ 750
2	CA01536AA	GPB 8000 REFERENCE DISTRIBUTION MODULE	GTR8000	CHANNEL 2	$5,000	$10,000.00	25.00%	$ 7,500
2	CA01537AA	ADD: REFERENCE DISTRIBUTION SOFTWARE	GTR8000	CHANNEL 2	$6,500	$13,000.00	25.00%	$ 9,750
1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	GTR8000	CHANNEL 2	$495	$495.00	25.00%	$ 371
1	CA02686AA	ADD: AC DC POWER DISTRIBUTION	GTR8000	CHANNEL 2	$0	$0.00	25.00%	$ -
2	DS0900382702	GPS TIMING ANTENNA/RECEIVER W/ ADDTL FILTERING	GTR8000	CHANNEL 2	$1,190	$2,380.00	25.00%	$ 1,785
2	DS58534AAUB	MOUNTING KIT FOR 110033-03, GPS TIMING ANTENNA	GTR8000	CHANNEL 2	$90	$180.00	25.00%	$ 135
2	DSIX2L1M1DC48IG	SPD, HPD GPS DATA LINE, 48VDC, HARD WIRE WITH ISOLATED GROUNDING	GTR8000	CHANNEL 2	$247	$494.00	25.00%	$ 371
2	DS30C87465CO1	125FT OUTDOOR UV PROTECTED CABLE 6 PR, 22AWG DB15 CABLE	GTR8000	CHANNEL 2	$634	$1,268.00	25.00%	$ 951
1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	GTR8000	CHANNEL 2	$6,000	$6,000.00	25.00%	$ 4,500
1	CA00855AA	ADD: 700/800 MHZ	GTR8000	CHANNEL 2	$6,300	$6,300.00	25.00%	$ 4,725
3	CA01842AA	ADD: P25 TDMA SOFTWARE	GTR8000	CHANNEL 2	$13,000	$39,000.00	25.00%	$ 29,250
3	CA01902AA	ADD: P25 DYNAMIC CHANNEL SOFTWARE	GTR8000	CHANNEL 2	$10,000	$30,000.00	25.00%	$ 22,500
1	X303AE	ADD: QTY (3) GTR 8000 BASE RADIOS	GTR8000	CHANNEL 2	$17,700	$17,700.00	25.00%	$ 13,275
3	CA01193AA	IP BASED MULTISITE BASE RADIO SOFTWARE	GTR8000	CHANNEL 2	$25,500	$76,500.00	25.00%	$ 57,375
1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK	GTR8000	CHANNEL 2	$600	$600.00	25.00%	$ 450
1	CA00880AA	ADD: EXPANSION 6 PORT CAVITY COMBINER	GTR8000	CHANNEL 2	$8,400	$8,400.00	25.00%	$ 6,300
1	CA01058AA	ADD: 700/800 PHASING HARNESS	GTR8000	CHANNEL 2	$1,000	$1,000.00	25.00%	$ 750
2	CA00885AA	ADD: HIGH AVAILABILITY XHUB	GTR8000	CHANNEL 2	$3,500	$7,000.00	25.00%	$ 5,250
1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	GTR8000	CHANNEL 2	$495	$495.00	25.00%	$ 371
1	CA02686AA	ADD: AC DC POWER DISTRIBUTION	GTR8000	CHANNEL 2	$0	$0.00	25.00%	$ -

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	F4544	SITE MANAGER ADVANCED	SDM3000	CHANNEL 2	$3,000	$3,000.00	25.00%	$ 2,250
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	SDM3000	CHANNEL 2	$1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	SDM3000	CHANNEL 2	$120	$120.00	25.00%	$ 90
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 10 DBD, LOW PIM, 746-960 MHZ	ANTENNA	CHANNEL 2	$6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	CHANNEL 2	$4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	CHANNEL 2	$29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	CHANNEL 2	$22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	CHANNEL 2	$16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	CHANNEL 2	$112	$224.00	25.00%	$ 168
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	CHANNEL 2	$23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	CHANNEL 2	$32	$64.00	25.00%	$ 48
10	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	CHANNEL 2	$29	$285.00	25.00%	$ 214
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	CHANNEL 2	$130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	CHANNEL 2	$36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	CHANNEL 2	$4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	CHANNEL 2	$29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	CHANNEL 2	$41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	RFMIXING	CHANNEL 2	$4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	RFMIXING	CHANNEL 2	$29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	RFMIXING	CHANNEL 2	$4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	RFMIXING	CHANNEL 2	$2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	RFMIXING	CHANNEL 2	$27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	RFMIXING	CHANNEL 2	$2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	RFMIXING	CHANNEL 2	$27	$54.50	25.00%	$ 41
1	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	EMS Prime	$4,200	$4,200.00	25.00%	$ 3,150
1	CA01619AA	ADD: DC POWER	GGM8000	EMS Prime	$0	$0.00	25.00%	$ -
1	CA01618AA	ADD: COMV CHAN GATEWAY	GGM8001	EMS Prime	$2,000	$2,000.00	25.00%	$ 1,500

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	EMS Prime	$2,250	$2,250.00	25.00%	$ 1,688
3	F2979	MLC 8000	MLC8000 VGU	EMS Prime	$1,000	$3,000.00	25.00%	$ 2,250
3	VA00012AA	ADD: 120/240VAC TO +12VDC POWER ADAPTER	MLC8000 VGU	EMS Prime	$50	$150.00	25.00%	$ 113
3	VA00011AA	19INCH RACK MOUNT HARDWARE KIT CABINET OR RACK	MLC8000 VGU	EMS Prime	$50	$150.00	25.00%	$ 113
1	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	EMS Prime	$495	$495.00	25.00%	$ 371
1	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	EMS	$4,200	$4,200.00	25.00%	$ 3,150
1	CA01619AA	ADD: DC POWER	GGM8000	EMS	$0	$0.00	25.00%	$ -
1	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	EMS	$2,250	$2,250.00	25.00%	$ 1,688
3	T7039	GTR 8000 Base Radio	GTR8000	EMS	$0	$0.00	25.00%	$ -
3	CA00855AA	ADD: 700/800 MHZ	GTR8000	EMS	$6,300	$18,900.00	25.00%	$ 14,175
3	CA01949AA	ADD: ANALOG ONLY CONV SW	GTR8000	EMS	$6,000	$18,000.00	25.00%	$ 13,500
3	CA01952AA	ADD: ANALOG CONVENTIONAL SIMULCAST SOFTWARE	GTR8000	EMS	$0	$0.00	25.00%	$ -
3	CA01400AA	ADD: POWER CABLE, DC	GTR8000	EMS	$0	$0.00	25.00%	$ -
3	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	EMS	$50	$150.00	25.00%	$ 113
3	F2979	MLC 8000	MLC8000 AGU	EMS	$1,000	$3,000.00	25.00%	$ 2,250
3	VA00783AA	ADD: ANALOG CONVENTIONAL SIMULCAST COMPARATOR/GATEWAY	MLC8000 AGU	EMS	$1,000	$3,000.00	25.00%	$ 2,250
3	VA00012AA	ADD: 120/240VAC TO +12VDC POWER ADAPTER	MLC8000 AGU	EMS	$50	$150.00	25.00%	$ 113
3	VA00011AA	19INCH RACK MOUNT HARDWARE KIT CABINET OR RACK	MLC8000 AGU	EMS	$50	$150.00	25.00%	$ 113
1	DSPCD013V4	4 CHANNEL COMBINER KIT, STANDARD ISOLATION, 851-870 MHZ	MLC8000 AGU	EMS	$7,031	$7,031.00	25.00%	$ 5,273
1	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	EMS	$495	$495.00	25.00%	$ 371
1	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	EMS	$7,070	$7,070.00	25.00%	$ 5,303
1	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	EMS	$5,846	$5,846.00	25.00%	$ 4,385
1	F4543	SITE MANAGER BASIC	NFM_RTU	EMS	$1,855	$1,855.00	25.00%	$ 1,391
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	EMS	$1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	EMS	$120	$120.00	25.00%	$ 90
1	DSSC412HF2LDFD2NU	COLLINEAR OMNI 11.5DBD GAIN 746-869MHZ 2DT NULL FILL DIN FEMALE CONN	ANTENNA	EMS	$6,967	$6,967.00	25.00%	$ 5,225
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	EMS	$4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	EMS	$18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	EMS	$29	$28.50	25.00%	$ 21

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	EMS	$22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	EMS	$4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	EMS	$18	$35.50	25.00%	$ 27
425	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	EMS	$8	$3,570.00	25.00%	$ 2,678
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	EMS	$40	$79.50	25.00%	$ 60
7	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	EMS	$23	$157.50	25.00%	$ 118
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	EMS	$29	$57.00	25.00%	$ 43
425	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	EMS	$4	$1,487.50	25.00%	$ 1,116
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	EMS	$18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	EMS	$29	$28.50	25.00%	$ 21
7	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	EMS	$17	$117.25	25.00%	$ 88
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	EMS	$22	$43.00	25.00%	$ 32
14	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	EMS	$21	$294.00	25.00%	$ 221
14	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	EMS	$33	$455.00	25.00%	$ 341
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	EMS	$168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	EMS	$168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	EMS	$2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	EMS	$27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	EMS	$5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	EMS	$32	$64.00	25.00%	$ 48
1	DSSC412HF2LDFD2NU	COLLINEAR OMNI 11.5DBD GAIN 746-869MHZ 2DT NULL FILL DIN FEMALE CONN	ANTENNA	EMS	$6,967	$6,967.00	25.00%	$ 5,225
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	EMS	$4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	EMS	$29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	EMS	$22	$44.00	25.00%	$ 33
400	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	EMS	$16	$6,500.00	25.00%	$ 4,875

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	EMS	$112	$224.00	25.00%	$ 168
7	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	EMS	$23	$162.75	25.00%	$ 122
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	EMS	$32	$64.00	25.00%	$ 48
14	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	EMS	$29	$399.00	25.00%	$ 299
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	EMS	$130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	EMS	$36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	EMS	$4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	EMS	$29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	EMS	$41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	EMS	$4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	EMS	$29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	EMS	$4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	EMS	$2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	EMS	$27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	EMS	$2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	EMS	$27	$54.50	25.00%	$ 41
1	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	Coconut Creek	$4,200	$4,200.00	25.00%	$ 3,150
1	CA01619AA	ADD: DC POWER	GGM8000	Coconut Creek	$0	$0.00	25.00%	$ -
1	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	Coconut Creek	$2,250	$2,250.00	25.00%	$ 1,688
3	T7039	GTR 8000 Base Radio	GTR8000	Coconut Creek	$0	$0.00	25.00%	$ -
3	CA00855AA	ADD: 700/800 MHZ	GTR8000	Coconut Creek	$6,300	$18,900.00	25.00%	$ 14,175
3	CA01949AA	ADD: ANALOG ONLY CONV SW	GTR8000	Coconut Creek	$6,000	$18,000.00	25.00%	$ 13,500
3	CA01952AA	ADD: ANALOG CONVENTIONAL SIMULCAST SOFTWARE	GTR8000	Coconut Creek	$0	$0.00	25.00%	$ -
3	CA01400AA	ADD: POWER CABLE, DC	GTR8000	Coconut Creek	$0	$0.00	25.00%	$ -
3	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	Coconut Creek	$50	$150.00	25.00%	$ 113
3	F2979	MLC 8000	MLC8000 AGU	Coconut Creek	$1,000	$3,000.00	25.00%	$ 2,250
3	VA00783AA	ADD: ANALOG CONVENTIONAL SIMULCAST COMPARATOR/GATEWAY	MLC8000 AGU	Coconut Creek	$1,000	$3,000.00	25.00%	$ 2,250
3	VA00012AA	ADD: 120/240VAC TO +12VDC POWER ADAPTER	MLC8000 AGU	Coconut Creek	$50	$150.00	25.00%	$ 113

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
3	VA00011AA	19INCH RACK MOUNT HARDWARE KIT CABINET OR RACK	MLC8000 AGU	Coconut Creek	$50	$150.00	25.00%	$ 113
1	DSPCD013V4	4 CHANNEL COMBINER KIT, STANDARD ISOLATION, 851-870 MHZ	MLC8000 AGU	Coconut Creek	$7,031	$7,031.00	25.00%	$ 5,273
1	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	Coconut Creek	$495	$495.00	25.00%	$ 371
1	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	Coconut Creek	$7,070	$7,070.00	25.00%	$ 5,303
1	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	Coconut Creek	$5,846	$5,846.00	25.00%	$ 4,385
1	F4543	SITE MANAGER BASIC	NFM_RTU	Coconut Creek	$1,855	$1,855.00	25.00%	$ 1,391
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	Coconut Creek	$1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	Coconut Creek	$120	$120.00	25.00%	$ 90
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Coconut Creek	$6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Coconut Creek	$4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Coconut Creek	$18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Coconut Creek	$29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Coconut Creek	$22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Coconut Creek	$4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Coconut Creek	$18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Coconut Creek	$8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Coconut Creek	$40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Coconut Creek	$23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Coconut Creek	$29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Coconut Creek	$4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Coconut Creek	$18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Coconut Creek	$29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Coconut Creek	$17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Coconut Creek	$22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Coconut Creek	$21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Coconut Creek	$33	$325.00	25.00%	$ 244

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Coconut Creek	$168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Coconut Creek	$168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Coconut Creek	$2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Coconut Creek	$27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Coconut Creek	$5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Coconut Creek	$32	$64.00	25.00%	$ 48
1	DSSE4192SWBP2LD FD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Coconut Creek	$6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Coconut Creek	$4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Coconut Creek	$29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Coconut Creek	$22	$44.00	25.00%	$ 33
405	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Coconut Creek	$16	$6,581.25	25.00%	$ 4,936
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Coconut Creek	$112	$224.00	25.00%	$ 168
7	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Coconut Creek	$23	$162.75	25.00%	$ 122
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Coconut Creek	$32	$64.00	25.00%	$ 48
13	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Coconut Creek	$29	$370.50	25.00%	$ 278
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Coconut Creek	$130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Coconut Creek	$36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Coconut Creek	$4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Coconut Creek	$29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Coconut Creek	$41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Coconut Creek	$4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Coconut Creek	$29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	Coconut Creek	$4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Coconut Creek	$2	$22.50	25.00%	$ 17

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Coconut Creek	$27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Coconut Creek	$2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Coconut Creek	$27	$54.50	25.00%	$ 41
1	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	DAVIE	$4,200	$4,200.00	25.00%	$ 3,150
1	CA01619AA	ADD: DC POWER	GGM8000	DAVIE	$0	$0.00	25.00%	$ -
1	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	DAVIE	$2,250	$2,250.00	25.00%	$ 1,688
3	T7039	GTR 8000 Base Radio	GTR8000	DAVIE	$0	$0.00	25.00%	$ -
3	CA00855AA	ADD: 700/800 MHZ	GTR8000	DAVIE	$6,300	$18,900.00	25.00%	$ 14,175
3	CA01949AA	ADD: ANALOG ONLY CONV SW	GTR8000	DAVIE	$6,000	$18,000.00	25.00%	$ 13,500
3	CA01952AA	ADD: ANALOG CONVENTIONAL SIMULCAST SOFTWARE	GTR8000	DAVIE	$0	$0.00	25.00%	$ -
3	CA01400AA	ADD: POWER CABLE, DC	GTR8000	DAVIE	$0	$0.00	25.00%	$ -
3	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	DAVIE	$50	$150.00	25.00%	$ 113
3	F2979	MLC 8000	MLC8000 AGU	DAVIE	$1,000	$3,000.00	25.00%	$ 2,250
3	VA00783AA	ADD: ANALOG CONVENTIONAL SIMULCAST COMPARATOR/GATEWAY	MLC8000 AGU	DAVIE	$1,000	$3,000.00	25.00%	$ 2,250
3	VA00012AA	ADD: 120/240VAC TO +12VDC POWER ADAPTER	MLC8000 AGU	DAVIE	$50	$150.00	25.00%	$ 113
3	VA00011AA	19INCH RACK MOUNT HARDWARE KIT CABINET OR RACK	MLC8000 AGU	DAVIE	$50	$150.00	25.00%	$ 113
1	DSPCD013V4	4 CHANNEL COMBINER KIT, STANDARD ISOLATION, 851-870 MHZ	MLC8000 AGU	DAVIE	$7,031	$7,031.00	25.00%	$ 5,273
1	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	DAVIE	$495	$495.00	25.00%	$ 371
1	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	DAVIE	$7,070	$7,070.00	25.00%	$ 5,303
1	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	DAVIE	$5,846	$5,846.00	25.00%	$ 4,385
1	F4543	SITE MANAGER BASIC	NFM_RTU	DAVIE	$1,855	$1,855.00	25.00%	$ 1,391
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	DAVIE	$1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	DAVIE	$120	$120.00	25.00%	$ 90
1	DSSC412HF2LDFD4 NUP	COLLINEAR OMNI 11.5 DBD HD NULL PIP RATED LOW PIM 746-869MHZ 4 DEG DT	ANTENNA	DAVIE	$7,210	$7,210.00	25.00%	$ 5,408
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	DAVIE	$4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	DAVIE	$18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	DAVIE	$29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	DAVIE	$22	$110.00	25.00%	$ 83

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	DAVIE	$4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	DAVIE	$18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	DAVIE	$8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	DAVIE	$40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	DAVIE	$23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	DAVIE	$29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	DAVIE	$4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	DAVIE	$18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	DAVIE	$29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	DAVIE	$17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	DAVIE	$22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	DAVIE	$21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	DAVIE	$33	$325.00	25.00%	$ 244
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	DAVIE	$168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	DAVIE	$168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	DAVIE	$2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	DAVIE	$27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	DAVIE	$5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	DAVIE	$32	$64.00	25.00%	$ 48
1	DSSC412HF2LDFD4NUP	COLLINEAR OMNI 11.5 DBD HD NULL PIP RATED LOW PIM 746-869MHZ 4 DEG DT	ANTENNA	DAVIE	$7,210	$7,210.00	25.00%	$ 5,408
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	DAVIE	$4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	DAVIE	$29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	DAVIE	$22	$44.00	25.00%	$ 33
300	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	DAVIE	$16	$4,875.00	25.00%	$ 3,656
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	DAVIE	$112	$224.00	25.00%	$ 168

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
6	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	DAVIE	$23	$139.50	25.00%	$ 105
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	DAVIE	$32	$64.00	25.00%	$ 48
9	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	DAVIE	$29	$256.50	25.00%	$ 192
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	DAVIE	$130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	DAVIE	$36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	DAVIE	$4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	DAVIE	$29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	DAVIE	$41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	DAVIE	$4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	DAVIE	$29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	DAVIE	$4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	DAVIE	$2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	DAVIE	$27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	DAVIE	$2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	DAVIE	$27	$54.50	25.00%	$ 41
1	SQM01SUM0205	GGM 8000 GATEWAY	GGM8000	Channel 2	$4,200	$4,200.00	25.00%	$ 3,150
1	CA01619AA	ADD: DC POWER	GGM8000	Channel 2	$0	$0.00	25.00%	$ -
1	CLN1856	2620-24 ETHERNET SWITCH	SWITCH	Channel 2	$2,250	$2,250.00	25.00%	$ 1,688
3	T7039	GTR 8000 Base Radio	GTR8000	Channel 2	$0	$0.00	25.00%	$ -
3	CA00855AA	ADD: 700/800 MHZ	GTR8000	Channel 2	$6,300	$18,900.00	25.00%	$ 14,175
3	CA01949AA	ADD: ANALOG ONLY CONV SW	GTR8000	Channel 2	$6,000	$18,000.00	25.00%	$ 13,500
3	CA01952AA	ADD: ANALOG CONVENTIONAL SIMULCAST SOFTWARE	GTR8000	Channel 2	$0	$0.00	25.00%	$ -
3	CA01400AA	ADD: POWER CABLE, DC	GTR8000	Channel 2	$0	$0.00	25.00%	$ -
3	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	Channel 2	$50	$150.00	25.00%	$ 113
3	F2979	MLC 8000	MLC8000 AGU	Channel 2	$1,000	$3,000.00	25.00%	$ 2,250
3	VA00783AA	ADD: ANALOG CONVENTIONAL SIMULCAST COMPARATOR/GATEWAY	MLC8000 AGU	Channel 2	$1,000	$3,000.00	25.00%	$ 2,250
3	VA00012AA	ADD: 120/240VAC TO +12VDC POWER ADAPTER	MLC8000 AGU	Channel 2	$50	$150.00	25.00%	$ 113

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
3	VA00011AA	19INCH RACK MOUNT HARDWARE KIT CABINET OR RACK	MLC8000 AGU	Channel 2	$50	$150.00	25.00%	$ 113
1	DSPCD013V4	4 CHANNEL COMBINER KIT, STANDARD ISOLATION, 851-870 MHZ	MLC8000 AGU	Channel 2	$7,031	$7,031.00	25.00%	$ 5,273
1	TRN7343	SEVEN AND A HALF FOOT RACK	RACK	Channel 2	$495	$495.00	25.00%	$ 371
1	DS428E83I01T	TTA, NON-DIVERSITY, 796-824 MHZ, REDUNDANT LNA, TEST PORT, BYPASS	RFDS	Channel 2	$7,070	$7,070.00	25.00%	$ 5,303
1	DS428E83I01M48	MULTICOUPLER UNIT, NON-DIVERSITY, 796-824 MHZ, SNMP, 48 VDC	RFDS	Channel 2	$5,846	$5,846.00	25.00%	$ 4,385
1	F4543	SITE MANAGER BASIC	NFM_RTU	Channel 2	$1,855	$1,855.00	25.00%	$ 1,391
1	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL	NFM_RTU	Channel 2	$1,850	$1,850.00	25.00%	$ 1,388
1	VA00905	ADD:24/48 VDC PS TO SM	NFM_RTU	Channel 2	$120	$120.00	25.00%	$ 90
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Channel 2	$6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Channel 2	$4	$52.50	25.00%	$ 39
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Channel 2	$18	$17.75	25.00%	$ 13
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Channel 2	$29	$28.50	25.00%	$ 21
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Channel 2	$22	$110.00	25.00%	$ 83
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TTAJUMPR	Channel 2	$4	$17.50	25.00%	$ 13
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TTAJUMPR	Channel 2	$18	$35.50	25.00%	$ 27
325	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	MAINLINE	Channel 2	$8	$2,730.00	25.00%	$ 2,048
2	DDN1079	78EZNF-M N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	MAINLINE	Channel 2	$40	$79.50	25.00%	$ 60
6	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	MAINLINE	Channel 2	$23	$135.00	25.00%	$ 101
2	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	MAINLINE	Channel 2	$29	$57.00	25.00%	$ 43
325	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	TESTLINE	Channel 2	$4	$1,137.50	25.00%	$ 853
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	TESTLINE	Channel 2	$18	$17.75	25.00%	$ 13
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	TESTLINE	Channel 2	$29	$28.50	25.00%	$ 21
6	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	TESTLINE	Channel 2	$17	$100.50	25.00%	$ 75
2	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	TESTLINE	Channel 2	$22	$43.00	25.00%	$ 32
10	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	ANTACC	Channel 2	$21	$210.00	25.00%	$ 158
10	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	ANTACC	Channel 2	$33	$325.00	25.00%	$ 244

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Channel 2	$168	$168.00	25.00%	$ 126
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	SURGE	Channel 2	$168	$168.00	25.00%	$ 126
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	TESTLINE	Channel 2	$2	$56.25	25.00%	$ 42
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	TESTLINE	Channel 2	$27	$54.50	25.00%	$ 41
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWERJUMPR	Channel 2	$5	$126.25	25.00%	$ 95
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	Channel 2	$32	$64.00	25.00%	$ 48
1	DSSE4192SWBP2LDFD0	ENCLOSED DIPOLE, BI-DIRECTIONAL, 12 DBD, LOW PIM, 746-960 MHZ	ANTENNA	Channel 2	$6,732	$6,732.00	25.00%	$ 5,049
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	UPPERJUMPR	Channel 2	$4	$52.50	25.00%	$ 39
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	UPPERJUMPR	Channel 2	$29	$57.00	25.00%	$ 43
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	UPPERJUMPR	Channel 2	$22	$44.00	25.00%	$ 33
385	L3599	AVA6-50 CABLE: 1-1/4" AVA6-50, COAX CORRUG COPPER, BLACK PE JACKET	MAINLINE	Channel 2	$16	$6,256.25	25.00%	$ 4,692
2	DS114EZDF	114EZ DIN FEMALE CONNECTOR	MAINLINE	Channel 2	$112	$224.00	25.00%	$ 168
7	DSSG11406B2A	SG114-06B2A 1-1/4" SURE GROUND GROUNDING KIT	MAINLINE	Channel 2	$23	$162.75	25.00%	$ 122
2	DSL6SGRIP	L6SGRIP 1-1/4" SUPPORT HOIST GRIP	MAINLINE	Channel 2	$32	$64.00	25.00%	$ 48
12	TDN7519	42396A-1 1-1/4" CABLE HANGER KIT STAINLESS	ANTACC	Channel 2	$29	$342.00	25.00%	$ 257
1	DSTSXDFMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	SURGE	Channel 2	$130	$130.00	25.00%	$ 98
1	DSGSAKITD	GROUND STRAP KIT - DIN	SURGE	Channel 2	$36	$36.00	25.00%	$ 27
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	LOWERJUMPR	Channel 2	$4	$87.50	25.00%	$ 66
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	LOWERJUMPR	Channel 2	$29	$28.50	25.00%	$ 21
1	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWERJUMPR	Channel 2	$41	$40.75	25.00%	$ 31
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	APM	Channel 2	$4	$35.00	25.00%	$ 26
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	APM	Channel 2	$29	$57.00	25.00%	$ 43
1	DSAPM7487K248	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)	APM	Channel 2	$4,594	$4,594.00	25.00%	$ 3,446
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Channel 2	$2	$22.50	25.00%	$ 17

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Channel 2	$27	$54.50	25.00%	$ 41
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	APM	Channel 2	$2	$22.50	25.00%	$ 17
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	APM	Channel 2	$27	$54.50	25.00%	$ 41
1	FLN0001	FRU KIT, MLC8000	SPARES	CORE	$1,000	$1,000.00	25.00%	$ 750
3	TRN7343	SEVEN AND A HALF FOOT RACK	TRAILER	TRAILER	$495	$1,485.00	25.00%	$ 1,114
6	DSRMP615A	SPD. AUTOMATIC, SPARE TIICRE LT245	PDU	TRAILER	$258	$1,548.00	25.00%	$ 1,161
3	DSOP820B	PDU, 120V HARDWIRE (8) 20A OUTLET PDU WITH TYPE 3 SAD PROTECTION	PDU	TRAILER	$938	$2,814.00	25.00%	$ 2,111
3	DS1101378	RACK MT ADAPTER PLATE, 19 IN FOR DSOP820B, DSOP820B2 & DSNSOP820B	PDU	TRAILER	$62	$186.00	25.00%	$ 140
1	FVN5473	G1-G4 CONFIGURATION TOOL	CNFG SFTW	GUI-BASED GATEWAY	$250	$250.00	25.00%	$ 188
1	FVN5896	DISPATCH APPLICATION	DISP SFTW	GUI-BASED GATEWAY	$2,200	$2,200.00	25.00%	$ 1,650
1	DQWQ57923017	HP PROBOOK 650 15.6IN CORE I5 4310M WIN7 PRO 64BIT 8 PRO LIC	PC	GUI-BASED GATEWAY	$1,702	$1,702.00	25.00%	$ 1,277
1	DDN6335	RACKMOUNT SHELF	SHELF	GUI-BASED GATEWAY	$170	$170.00	25.00%	$ 128
1	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE	ACC	GUI-BASED GATEWAY	$250	$250.00	25.00%	$ 188
1	3089004V15	WSGU_GOOSENECK CABLE	ACC	GUI-BASED GATEWAY	$100	$100.00	25.00%	$ 75
2	RMN5078B	SUPRAPLUS NC SINGLE MUFF HEADSET	ACC	GUI-BASED GATEWAY	$149	$298.00	25.00%	$ 224
2	RLN6098	HDST MODULE BASE W/PTT, 15' CBL	ACC	GUI-BASED GATEWAY	$210	$420.00	25.00%	$ 315
2	DDN6516	AUDIO ACCESSORY JACK BOX	ACC	GUI-BASED GATEWAY	$110	$220.00	25.00%	$ 165
2	30013114001	AUDIO CABLE	ACC	GUI-BASED GATEWAY	$100	$200.00	25.00%	$ 150
1	DSTWIN6328A	PROVIDES ONE DUAL PEDAL FOOTSWITCH FOR USE WITH MOTOROLA MCC 7500 DISP	ACC	GUI-BASED GATEWAY	$290	$290.00	25.00%	$ 218
2	F2840	MOTOBRIDGE 8-PORT GATEWAY UNIT	RGU	GUI-BASED GATEWAY	$15,100	$30,200.00	25.00%	$ 22,650
2	VA00122	AES SW VERSION	RGU	GUI-BASED GATEWAY	$0	$0.00	25.00%	$ -
2	FTN7687	MOTOBRIDGE GU 110/220V PS KIT	RGU	GUI-BASED GATEWAY	$155	$310.00	25.00%	$ 233
1	F2688	COMPACT WSGU	WSGU	GUI-BASED GATEWAY	$8,000	$8,000.00	25.00%	$ 6,000
1	FPN5647	COMPACT WSGU POWER SUPPLY	WSGU	GUI-BASED GATEWAY	$100	$100.00	25.00%	$ 75
3	FTN6634	MOTOBRIDGE GATEWAY RACKMOUNT HW	RGU	GUI-BASED GATEWAY	$75	$225.00	25.00%	$ 169
10	3087810V02	ASTRO XTL5000 RADIO CABLE	CABLES	GUI-BASED GATEWAY	$105	$1,050.00	25.00%	$ 788
2	3071815Y82	MOTOTURBO CABLE	CABLES	GUI-BASED GATEWAY	$100	$200.00	25.00%	$ 150
2	3087810V01	RGU OPEN END CABLE (3 METER)	CABLES	GUI-BASED GATEWAY	$105	$210.00	25.00%	$ 158
1	CLN1856	2620-24 ETHERNET SWITCH	NETWORK	GUI-BASED GATEWAY	$2,250	$2,250.00	25.00%	$ 1,688
8	DDN6335	RACKMOUNT SHELF	SHELF	CONTROL STATION RADIOS	$170	$1,360.00	25.00%	$ 1,020

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
8	M22URS9PW1 N	APX4500 7/800	APX 4500	CONTROL STATION RADIOS	$1,564	$12,512.00	25.00%	$ 9,384
8	QA02756	ADD: 3600 OR 9600 TRUNKING BAUD SINGLE SYSTEM	APX 4500	CONTROL STATION RADIOS	$1,570	$12,560.00	25.00%	$ 9,420
8	GA00580	ADD: TDMA OPERATION	APX 4500	CONTROL STATION RADIOS	$450	$3,600.00	25.00%	$ 2,700
8	GA00804	ADD: APX O2 CONTROL HEAD (Grey)	APX 4500	CONTROL STATION RADIOS	$492	$3,936.00	25.00%	$ 2,952
8	G444	ADD: APX CONTROL HEAD SOFTWARE	APX 4500	CONTROL STATION RADIOS	$0	$0.00	25.00%	$ -
8	G66	ADD: DASH MOUNT O2 WWM	APX 4500	CONTROL STATION RADIOS	$125	$1,000.00	25.00%	$ 750
8	G89	ADD: NO RF ANTENNA NEEDED	APX 4500	CONTROL STATION RADIOS	$0	$0.00	25.00%	$ -
8	W382	ADD: CONTROL STATION DESK GCAI MIC	APX 4500	CONTROL STATION RADIOS	$169	$1,352.00	25.00%	$ 1,014
8	G142	ADD: NO SPEAKER NEEDED	APX 4500	CONTROL STATION RADIOS	$0	$0.00	25.00%	$ -
8	GA00318	ADD: 5 YEAR SERVICE FROM THE START LITE	APX 4500	CONTROL STATION RADIOS	$319	$2,552.00	25.00%	$ 1,914
8	G91	ADD: CONTROL STATION POWER SUPPLY	APX 4500	CONTROL STATION RADIOS	$269	$2,152.00	25.00%	$ 1,614
8	W665	ADD: CONTROL STATION OPERATION	APX 4500	CONTROL STATION RADIOS	$70	$560.00	25.00%	$ 420
8	G996	ADD: PROGRAMMING OVER P25 (OTAP)	APX 4500	CONTROL STATION RADIOS	$100	$800.00	25.00%	$ 600
8	G843	ADD: AES ENCRYPTION APX	APX 4500	CONTROL STATION RADIOS	$475	$3,800.00	25.00%	$ 2,850
8	W969	ADD: MULTIKEY	APX 4500	CONTROL STATION RADIOS	$330	$2,640.00	25.00%	$ 1,980
1	DS4383G01A08	CONTROL STATION COMBINER, STANDARD, 746-869 MHZ, 8 CHANNEL	COMBINER	ANTENNA SYSTEMS	$13,254	$13,254.00	25.00%	$ 9,941
2	DSCC80703	OMNI, CORPORATE COLLINEAR, 3 DBD, 746-870 MHZ, PIM & 25 KW PIP RATED	ANTENNA	ANTENNA SYSTEMS	$2,562	$5,124.00	25.00%	$ 3,843
4	DSUC114	ANTENNA CLAMP 60 TO 115MM	ANTENNA	ANTENNA SYSTEMS	$99	$396.00	25.00%	$ 297
2	DSTSXDFMBF	DC BLOCK, HIGH POW, 698 TO 2700MHZ,	SURGE	ANTENNA SYSTEMS	$130	$260.00	25.00%	$ 195
100	L1702	CABLE: 1/2" SUPERFLEX POLY JKT PER	LOWERJUMPR	ANTENNA SYSTEMS	$5	$505.00	25.00%	$ 379
2	DSF4PDMV2C	1/2" 7-16 DIN MALE CONNECTOR	LOWERJUMPR	ANTENNA SYSTEMS	$32	$64.00	25.00%	$ 48

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DSF4NRHC	1/2" TYPE N MALE RIGHT ANGLE CONNE	LOWERJUMPR	ANTENNA SYSTEMS	$56	$111.50	25.00%	$ 84
120	L3579	FSJ1RK-50B CABLE: 1/4" FSJ, FLAME RETARD.JKT. 50-OHM	RADIO JUMPER	ANTENNA SYSTEMS	$3	$324.00	25.00%	$ 243
8	DSF1MU	F1MU 1/4" MINI UHF MALE S FLEX CONNECTOR	RADIO JUMPER	ANTENNA SYSTEMS	$18	$144.00	25.00%	$ 108
8	5880367B22	ADPT,MINI UHF MALE/UHF-FEMALE	RADIO JUMPER	ANTENNA SYSTEMS	$22	$176.00	25.00%	$ 132
8	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	RADIO JUMPER	ANTENNA SYSTEMS	$27	$218.00	25.00%	$ 164
3	DDN6335	RACKMOUNT SHELF	SHELF	CONTROL STATION RADIOS	$170	$510.00	25.00%	$ 383
1	M22SSS9PW1 N	APX4500 UHF R2	APX 4500	CONTROL STATION RADIOS	$1,564	$1,564.00	25.00%	$ 1,173
1	QA02829	ADD: ANALOG CONVENTIONAL	APX 4500	CONTROL STATION RADIOS	$400	$400.00	25.00%	$ 300
1	GA00804	ADD: APX O2 CONTROL HEAD (Grey)	APX 4500	CONTROL STATION RADIOS	$492	$492.00	25.00%	$ 369
1	G444	ADD: APX CONTROL HEAD SOFTWARE	APX 4500	CONTROL STATION RADIOS	$0	$0.00	25.00%	$ -
1	G66	ADD: DASH MOUNT O2 WWM	APX 4500	CONTROL STATION RADIOS	$125	$125.00	25.00%	$ 94
1	G89	ADD: NO RF ANTENNA NEEDED	APX 4500	CONTROL STATION RADIOS	$0	$0.00	25.00%	$ -
1	W382	ADD: CONTROL STATION DESK GCAI MIC	APX 4500	CONTROL STATION RADIOS	$169	$169.00	25.00%	$ 127
1	G142	ADD: NO SPEAKER NEEDED	APX 4500	CONTROL STATION RADIOS	$0	$0.00	25.00%	$ -
1	GA00318	ADD: 5 YEAR SERVICE FROM THE START LITE	APX 4500	CONTROL STATION RADIOS	$319	$319.00	25.00%	$ 239
1	G91	ADD: CONTROL STATION POWER SUPPLY	APX 4500	CONTROL STATION RADIOS	$269	$269.00	25.00%	$ 202
1	W665	ADD: CONTROL STATION OPERATION	APX 4500	CONTROL STATION RADIOS	$70	$70.00	25.00%	$ 53
2	AAM27QPH9LA1 N	XPR4550 403-470MHZ 40W MIDT W/ GPS	XPR4550	CONTROL STATION RADIOS	$960	$1,920.00	25.00%	$ 1,440
2	GA00037AA	ALT: IMPRES KEYPAD MICROPHONE	XPR4550	CONTROL STATION RADIOS	$70	$140.00	25.00%	$ 105
2	GA00249AA	ENH: SfS COMPREHENSIVE	XPR4550	CONTROL STATION RADIOS	$184	$368.00	25.00%	$ 276

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	QA00588AE	ADD:CONNECT PLUS TRUNKING OPERATION	XPR4550	CONTROL STATION RADIOS	$25	$50.00	25.00%	$ 38
2	QA01839AB	ADD: LTR/PASSPORT OPERATION	XPR4550	CONTROL STATION RADIOS	$122	$244.00	25.00%	$ 183
2	RSN4005A	DESKTOP TRAY W/SPEAKER	XPR4550	CONTROL STATION RADIOS	$84	$168.00	25.00%	$ 126
2	HPN4007D	POWER SUPPLY 14V 15A UNI 117/240 VAC	XPR4550	CONTROL STATION RADIOS	$296	$592.00	25.00%	$ 444
1	DSCS45520405SN	HYBRID CONTROL STATION COMBINER, 450-520 MHZ 4 CH.	COMBINER	ANTENNA SYSTEMS	$6,157	$6,157.00	25.00%	$ 4,618
2	DSCOL4170	OMNI, MEANDER COLLINEAR, O DBD, 450-470 MHZ, PIM RATED	ANTENNA	ANTENNA SYSTEMS	$880	$1,760.00	25.00%	$ 1,320
4	DSUC1	ANTENNA CLAMPS, KIT OF 1 FOR .75 IN TO 3.0 IN OD	ANTENNA	ANTENNA SYSTEMS	$69	$276.00	25.00%	$ 207
2	DSVHF50DMAPGR	RF SPD, 100-512MHZ, DC BLOCK HIGH POWER DIN MALE ANT, DIN FEMALE EQUIP	SURGE	ANTENNA SYSTEMS	$166	$332.00	25.00%	$ 249
100	L1702	CABLE: 1/2" SUPERFLEX POLY JKT PER	LOWERJUMPR	ANTENNA SYSTEMS	$5	$505.00	25.00%	$ 379
2	DSF4PDMV2C	1/2" 7-16 DIN MALE CONNECTOR	LOWERJUMPR	ANTENNA SYSTEMS	$32	$64.00	25.00%	$ 48
2	DSF4NRHC	1/2" TYPE N MALE RIGHT ANGLE CONNE	LOWERJUMPR	ANTENNA SYSTEMS	$56	$111.50	25.00%	$ 84
50	L3579	FSJ1RK-50B CABLE: 1/4" FSJ, FLAME RETARD.JKT. 50-OHM	RADIO JUMPER	ANTENNA SYSTEMS	$3	$135.00	25.00%	$ 101
3	DSF1MU	F1MU 1/4" MINI UHF MALE S FLEX CONNECTOR	RADIO JUMPER	ANTENNA SYSTEMS	$18	$54.00	25.00%	$ 41
3	5880367B22	ADPT,MINI UHF MALE/UHF-FEMALE	RADIO JUMPER	ANTENNA SYSTEMS	$22	$66.00	25.00%	$ 50
3	DDN9769	F1TNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	RADIO JUMPER	ANTENNA SYSTEMS	$27	$81.75	25.00%	$ 61
1	DDN6335	RACKMOUNT SHELF	SHELF	CONTROL STATION RADIOS	$170	$170.00	25.00%	$ 128
1	M22KSS9PW1 N	APX4500 VHF	APX 4500	CONTROL STATION RADIOS	$1,564	$1,564.00	25.00%	$ 1,173
1	QA02829	ADD: ANALOG CONVENTIONAL	APX 4500	CONTROL STATION RADIOS	$400	$400.00	25.00%	$ 300
1	GA00804	ADD: APX O2 CONTROL HEAD (Grey)	APX 4500	CONTROL STATION RADIOS	$492	$492.00	25.00%	$ 369
1	G444	ADD: APX CONTROL HEAD SOFTWARE	APX 4500	CONTROL STATION RADIOS	$0	$0.00	25.00%	$ -
1	G66	ADD: DASH MOUNT O2 WWM	APX 4500	CONTROL STATION RADIOS	$125	$125.00	25.00%	$ 94
1	G89	ADD: NO RF ANTENNA NEEDED	APX 4500	CONTROL STATION RADIOS	$0	$0.00	25.00%	$ -

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	W382	ADD: CONTROL STATION DESK GCAI MIC	APX 4500	CONTROL STATION RADIOS	$169	$169.00	25.00%	$ 127
1	G142	ADD: NO SPEAKER NEEDED	APX 4500	CONTROL STATION RADIOS	$0	$0.00	25.00%	$ -
1	GA00318	ADD: 5 YEAR SERVICE FROM THE START LITE	APX 4500	CONTROL STATION RADIOS	$319	$319.00	25.00%	$ 239
1	G91	ADD: CONTROL STATION POWER SUPPLY	APX 4500	CONTROL STATION RADIOS	$269	$269.00	25.00%	$ 202
1	W665	ADD: CONTROL STATION OPERATION	APX 4500	CONTROL STATION RADIOS	$70	$70.00	25.00%	$ 53
1	DSCOL51160	OMNI, RUGGED MENDER COLLINEAR, 0 DBD, 150-160 MHZ, PIM RATED	ANTENNA	ANTENNA SYSTEMS	$1,748	$1,748.00	25.00%	$ 1,311
2	DSUC114	ANTENNA CLAMP 60 TO 115MM	ANTENNA	ANTENNA SYSTEMS	$99	$198.00	25.00%	$ 149
1	DSVHF50DMAPGR	RF SPD, 100-512MHZ, DC BLOCK HIGH POWER DIN MALE ANT, DIN FEMALE EQUIP	SURGE	ANTENNA SYSTEMS	$166	$166.00	25.00%	$ 125
50	L1702	CABLE: 1/2" SUPERFLEX POLY JKT PER	LOWERJUMPR	ANTENNA SYSTEMS	$5	$252.50	25.00%	$ 189
1	DSF4PDMV2C	1/2" 7-16 DIN MALE CONNECTOR	LOWERJUMPR	ANTENNA SYSTEMS	$32	$32.00	25.00%	$ 24
3	DSF1MU	F1MU 1/4" MINI UHF MALE S FLEX CONNECTOR	LOWERJUMPR	ANTENNA SYSTEMS	$18	$54.00	25.00%	$ 41
3	5880367B22	ADPT,MINI UHF MALE/UHF-FEMALE	LOWERJUMPR	ANTENNA SYSTEMS	$22	$66.00	25.00%	$ 50
1	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	LOWERJUMPR	ANTENNA SYSTEMS	$32	$32.00	25.00%	$ 24
1	RVN5224L	CPS R06.01.00 ASTRO DIG APX POR MOB	PRG SFTWR	CONTROL STATION RADIOS	$265	$265.00	25.00%	$ 199
1	HKN6184C	CABLE CH, PROGRAMMING, USB	PRG CABLE	CONTROL STATION RADIOS	$52	$52.00	25.00%	$ 39
1	PMKN4010B	CPS CABLE	PRG CABLE	CONTROL STATION RADIOS	$45	$45.00	25.00%	$ 34
1	RVN5115AK	PURCHASED SOFTWARE,CPS R12.1 GLOBAL MOTOTRBO DVD	PRG SFTWR	CONTROL STATION RADIOS	$299	$299.00	25.00%	$ 224
2	T7039	GTR 8000 BASE RADIO	GTR8000	700 MHz CONVENTIONAL REPEATERS	$0	$0.00	25.00%	$ -
2	CA00855AA	ADD: 700/800 MHZ	GTR8000	700 MHz CONVENTIONAL REPEATERS	$6,300	$12,600.00	25.00%	$ 9,450
2	CA01948AA	ADD: CONVENTIONAL SOFTWARE	GTR8000	700 MHz CONVENTIONAL REPEATERS	$12,500	$25,000.00	25.00%	$ 18,750

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	CA01504AA	ADD: ANTENNA RELAY	GTR8000	700 MHz CONVENTIONAL REPEATERS	$350	$700.00	25.00%	$ 525
2	X182BW	ADD: DUPLEXER, 700 MHZ	GTR8000	700 MHz CONVENTIONAL REPEATERS	$1,380	$2,760.00	25.00%	$ 2,070
2	X265AJ	ADD: BASE RADIO PRESELECTOR, 700 MHZ	GTR8000	700 MHz CONVENTIONAL REPEATERS	$500	$1,000.00	25.00%	$ 750
2	X676BF	ADD: 700/800 MHZ EXTERNAL DUAL CIRCULATOR	GTR8000	700 MHz CONVENTIONAL REPEATERS	$1,000	$2,000.00	25.00%	$ 1,500
2	X153AW	ADD: RACK MOUNT HARDWARE	GTR8000	700 MHz CONVENTIONAL REPEATERS	$50	$100.00	25.00%	$ 75
2	DSCC80706	OMNI, CORPORATE COLLINEAR, 6 DBD, 746-870 MHZ, PIM & 25 KW PIP RATED	ANTENNA	ANTENNA SYSTEMS	$2,388	$4,776.00	25.00%	$ 3,582
4	DSUC114	ANTENNA CLAMP 60 TO 115MM	ANTENNA	ANTENNA SYSTEMS	$99	$396.00	25.00%	$ 297
2	DSTSXDFMBF	DC BLOCK, HIGH POW, 698 TO 2700MHZ,	SURGE	ANTENNA SYSTEMS	$130	$260.00	25.00%	$ 195
2	DSF4PDMV2C	F4PDMV2-C 1/2" 7-16 DIN MALE CONNECTOR	LOWER JUMPER	ANTENNA SYSTEMS	$32	$64.00	25.00%	$ 48
2	DSL4DRPS	L4DR-PS 1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWER JUMPER	ANTENNA SYSTEMS	$41	$81.50	25.00%	$ 61
100	L1702	CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	LOWER JUMPER	ANTENNA SYSTEMS	$5	$505.00	25.00%	$ 379
2	DSF4DRC	1/2" 7-16 DIN MALE RIGHT ANGLE CONNECTOR	LOWER JUMPER	ANTENNA SYSTEMS	$46	$91.00	25.00%	$ 68
1	DQALUMA1601844-1	RF SITE ON WHEELS - 80' UNGUYED TOWER, 8' X 8' WALK-IN SHELTER, 15KW GENERATOR	TRAILER	TRAILER	$374,279.00	$374,279.00	25.00%	$ 280,709
1	DQALUMA1601844-2	TRUCK, F350, 4X4, WHITE, 142" WHEELBASE, TOWING PACKAGE, 6 SPD., AUTOMATIC, SPARE TIRE	TRAILER	TRAILER	$90,314.00	$90,314.00	25.00%	$ 67,736
1	DQMWBRWARDCOAD	Antennas & Mounting Hardware	ANTENNA	Microwave	$713,270	$713,270	25.00%	$ 534,953
1	DQMWBRWARDCONM	Network Management Equipment	NMS	Microwave	$55,908	$55,908	25.00%	$ 41,931
1	DQMWBRWARDCORF	Radio Frequency Equipment	RF	Microwave	$164,352	$164,352	25.00%	$ 123,264
1	DQMWBRWARDCORT	Routing Equipment	RT	Microwave	$788,546	$788,546	25.00%	$ 591,410
1	DQMWBRWARDCOSP	Spare Equipment	SPARE	Microwave	$24,624	$24,624	25.00%	$ 18,468

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DQMWBROAUXCARD	AUX Alarming Cards	AUX	Microwave	$15,000.00	$15,000	25.00%	$ 11,250
1	SQM01SUM0273	MASTER SITE CONFIGURATION	SW Upgrade	Enhanced Data	$0	$0	25.00%	$ -
1	CA02389AA	ENH: TRUNKED ENHANCED DATA	Enhanced Data	Enhanced Data	$12,017	$12,017	25.00%	$ 9,013
40	CA02473AA	ENH: 500 ENHANCED TRUNKED DATA USER LICENSES	EnH Data Users	Enhanced Data	$3,000	$120,000	25.00%	$ 90,000
36	CA03004AA	ADD:SMLCST RMT ST LIC IV&D+ENH DATA	EnH Data Users	Enhanced Data	$2,170	$78,120	25.00%	$ 58,590
2	CA03001AA	ADD: ASTRO 25 SITE REPEATER SITE CONTROLLER SOFTWARE IV&D	EnH Data Users	Enhanced Data	$1,600	$3,200	25.00%	$ 2,400
1	SQM01SUM0257	UNIFIED NETWORK SERVICES	IMW 5.2	IMW PN-LOC	$0	$0	25.00%	$ -
1	CA02384AE	ADD: UNIFIED NETWORK SERVICES SOFTWARE	IMW 5.2	IMW PN-LOC	$0	$0	25.00%	$ -
1	CA02354AA	ADD: ASTRO NETWORK APPLICATION INTERFACE	IMW 5.2	IMW PN-LOC	$0	$0	25.00%	$ -
1	CA02362AE	ADD: MCAFEE STANDALONE ANTI VIRUS SOFTWAARE	IMW 5.2	IMW PN-LOC	$165	$165	25.00%	$ 124
1	CA03063AA	ADD: HIGH CAPACITY/GEO REDUNDANT	IMW Server	IMW PN-LOC	$55,490	$55,490	25.00%	$ 41,618
1	UA00061AA	ADD: 10,001-20,000 DEVICES FOR PRESENCE	PN Licenses	IMW PN-LOC	$288,000	$288,000	25.00%	$ 216,000
2	CA02668AE	ADD: SQL SVR STD2014 EMB	SQL DB Red	IMW PN-LOC	$5,000	$10,000	25.00%	$ 7,500
1	CA02053AE	ADD: SUPPLEMENTAL CD IA (IMW)	CD IA	IMW PN-LOC	$0	$0	25.00%	$ -
1	UA00018AA	ADD: 10,001-20,000 DEVICES FOR LOCATION	Loc Licenses	IMW PN-LOC	$864,000	$864,000	25.00%	$ 648,000
1	SVC850PMDC	Licenses for ARL Integration	GPS Loc Software	ARL	$2,400,000	$2,400,000	25.00%	$ 1,800,000
1	T7688	KEY MANAGEMENT FACILITY	KMF SW	OTAR	$3,000	$3,000	25.00%	$ 2,250
1	ZA01180AA	ADD: KMF SERVER AND CLIENT SOFTWARE	KMF SW	OTAR	$145,600	$145,600	25.00%	$ 109,200
1	ZA00861AA	ADD: MORE THAN 1000 RADIO USERS	KMF SW	OTAR	$75,000	$75,000	25.00%	$ 56,250
1	ZA00975AA	64 AGENCY PARTITIONING	KMF SW	OTAR	$50,000	$50,000	25.00%	$ 37,500
1	CA01229AA	ADD: KMF REDUNDANCY SOFTWARE	KMF SW	OTAR	$57,150	$57,150	25.00%	$ 42,863
2	TT2872	KMF DL380 G9 SERVER WITH WINDOWS SERVER 2012 EMBEDDED	KMF Server	OTAR	$14,500	$29,000	25.00%	$ 21,750
2	DSMT9234MUCDCXR	USB MODEM BY MULTITECH - REQUIRED FOR KVL-KMF COMMUNICATION REMOTELY	KMF Server	OTAR	$250	$500	25.00%	$ 375
2	SQM01SUM0222	KMF CRYPTR	KMF Server	OTAR	$750	$1,500	25.00%	$ 1,125
2	CA00147AG	ADD: BASIC SOFTWARE OPTION	KMF Server	OTAR	$3,500	$7,000	25.00%	$ 5,250
2	CA00182AV	ADD: AES 256 ENCRYPTION KIT	KMF Server	OTAR	$750	$1,500	25.00%	$ 1,125
2	CA02066AA	AC Line Cord, North America	KMF Server	OTAR	$0	$0	25.00%	$ -
2	TKN9285	RACK MOUNT KIT FOR CRYPTR II	KMF Server	OTAR	$135	$270	25.00%	$ 203
2	DSTG191	TECH GLOBAL EVOLUTION SERIES 19INCH NON TOUCH	KMF Server	OTAR	$1,398	$2,796	25.00%	$ 2,097
2	TT3106	COMPUTER, Z440 WORKSTATION WINDOWS 10	KMF Client	OTAR	$2,550	$5,100	25.00%	$ 3,825
2	DSTG191	TECH GLOBAL EVOLUTION SERIES 19INCH NON TOUCH	KMF Client	OTAR	$1,398	$2,796	25.00%	$ 2,097
1	T7914	RADIO MANAGEMENT ONLINE	RM On Line	Radio Mngt	$0	$0	25.00%	$ -

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
####	UA00049AA	ADD: RADIO MANAGEMENT LICENSES ONLINE	RM Licenses	Radio Mngt	$100	$1,990,000	25.00%	$ 1,492,500
1	DSSUBDESKTOP	WINDOWS DESKTOP	Win Desktop	Radio Mngt	$1,559	$1,559	25.00%	$ 1,169
1	DSSUBSERVER4	RACK MOUNT WINDOWS SERVER	Win Server	Radio Mngt	$12,860	$12,860	25.00%	$ 9,645
1	DSSUBSERVER2	RACK MOUNT WINDOWS SERVER	Job Processer	Radio Mngt	$7,973	$7,973	25.00%	$ 5,980
3	DSTG191	TECH GLOBAL EVOLUTION SERIES 19INCH NON TOUCH	Monitor	Radio Mngt	$1,398	$4,194	25.00%	$ 3,146
2	DSSUBLAPTOP	WINDOWS LAPTOP	Laptop	Radio Mngt	$1,156	$2,312	25.00%	$ 1,734
1	DS320778SYS1	DC POWER SYSTEM, FP2 23IN RACK MOUNTED 1344 AMP -48V DUAL AC INPUT	DC System	CORE Main	$20,470	$20,470.00	25.00%	$ 15,353
27	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	Rectifier	CORE Main	$860	$23,220.00	25.00%	$ 17,415
5	DS236408	BLIND PANEL FP2 HE BLACK G1	Blank Panel	CORE Main	$26	$130.00	25.00%	$ 98
2	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	CORE Main	$3,265	$6,530.00	25.00%	$ 4,898
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	CORE Main	$38	$76.00	25.00%	$ 57
3	DS506495	BATTERY, 48V 1625AH DDM125-27 BATT SET 4WX6H	Battery	CORE Main	$37,836	$113,508.00	25.00%	$ 85,131
2	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	CORE Prime	$906	$1,812.00	25.00%	$ 1,359
4	DS502666	100 AMP CIRCUIT BREAKER	CKT Breaker	CORE Prime	$38	$152.00	25.00%	$ 114
6	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	CORE Prime	$38	$228.00	25.00%	$ 171
12	DS502653	BREAKER 10A 1P AUX 5/16 BULLET	CKT Breaker	CORE Prime	$38	$456.00	25.00%	$ 342
2	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	CORE Main	$906	$1,812.00	25.00%	$ 1,359
4	DS502666	100 AMP CIRCUIT BREAKER	CKT Breaker	CORE Main	$38	$152.00	25.00%	$ 114
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	CORE Main	$38	$38.00	25.00%	$ 29
11	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	CORE Main	$38	$418.00	25.00%	$ 314
19	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	CORE Main	$38	$722.00	25.00%	$ 542
2	DS1720481315	CONVERTER, 200-WATT, SINGLE OUTPUT 48 VDC INPUT TO 13 VDC OUTPUT	Converter	CORE Main	$943	$1,886.00	25.00%	$ 1,415
2	DS1720482416	48 VDC TO 24 VDC CONVERTER, 400W, WILMORE	Converter	CORE Main	$1,535	$3,070.00	25.00%	$ 2,303
1	DS338033	MPC-2-12-00-08 with Candis Display	Inverter Shelf	CORE Master	$13,436	$13,436.00	25.00%	$ 10,077
2	DS267783	150A, 2P BREAKER KIT	CKT Breaker	CORE Master	$135	$270.00	25.00%	$ 203
8	DS275843	1.5KVA, 120VAC, 48VDC INV	Inverter	CORE Master	$1,479	$11,832.00	25.00%	$ 8,874
2	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	CORE Main	$1,040	$2,080.00	25.00%	$ 1,560
12	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	CORE Main	$10	$120.00	25.00%	$ 90
4	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	CORE Main	$38	$152.00	25.00%	$ 114
2	DS502660	BREAKER 50A 1P AUX 5/16 BULLET	CKT Breaker	CORE Main	$38	$76.00	25.00%	$ 57
1	DS256181	DC SYS FP2-48/600- 2BD & SPW/WEB	DC System	EMS Backup	$18,613	$18,613.00	25.00%	$ 13,960

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
13	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	Rectifier	EMS Backup	$860	$11,180.00	25.00%	$ 8,385
3	DS236408	BLIND PANEL FP2 HE BLACK G1	Blank Panel	EMS Backup	$26	$78.00	25.00%	$ 59
2	DS506835	BATTERY, 48V 1360AH BATT SET DDM85-33 4X6	Battery	EMS Backup	$33,651	$67,302.00	25.00%	$ 50,477
4	DS502661	BREAKER 60A 1P AUX 5/16 BULLET	CKT Breaker	EMS Backup	$38	$152.00	25.00%	$ 114
1	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	EMS Backup	$1,040	$1,040.00	25.00%	$ 780
1	DS219595	BRKR 1A 1P CR15 SNAPAK	CKT Breaker	EMS Backup	$29	$29.00	25.00%	$ 22
2	DS219598	BRKR 5A 1P CR15 SNAPAK	CKT Breaker	EMS Backup	$29	$58.00	25.00%	$ 44
9	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	EMS Backup	$10	$90.00	25.00%	$ 68
2	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	EMS 800 MA	$3,265	$6,530.00	25.00%	$ 4,898
1	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	EMS 800 MA	$38	$38.00	25.00%	$ 29
1	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	EMS 800 MA	$906	$906.00	25.00%	$ 680
1	DS502661	BREAKER 60A 1P AUX 5/16 BULLET	CKT Breaker	EMS 800 MA	$38	$38.00	25.00%	$ 29
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	EMS 800 MA	$38	$38.00	25.00%	$ 29
4	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	EMS 800 MA	$38	$152.00	25.00%	$ 114
3	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	EMS 800 MA	$38	$114.00	25.00%	$ 86
2	DS1720481315	CONVERTER, 200-WATT, SINGLE OUTPUT 48 VDC INPUT TO 13 VDC OUTPUT	Converter	EMS Main	$943	$1,886.00	25.00%	$ 1,415
2	DS1720482416	48 VDC TO 24 VDC CONVERTER, 400W, WILMORE	Converter	EMS Main	$1,535	$3,070.00	25.00%	$ 2,303
1	DS338033	MPC-2-12-00-08 with Candis Display	Inverter Shelf	EMS Main	$13,436	$13,436.00	25.00%	$ 10,077
2	DS267783	150A, 2P BREAKER KIT	CKT Breaker	EMS Main	$135	$270.00	25.00%	$ 203
8	DS275843	1.5KVA, 120VAC, 48VDC INV	Inverter	EMS Main	$1,479	$11,832.00	25.00%	$ 8,874
2	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	EMS Main	$1,040	$2,080.00	25.00%	$ 1,560
12	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	EMS Main	$10	$120.00	25.00%	$ 90
4	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	EMS Main	$38	$152.00	25.00%	$ 114
2	DS502660	BREAKER 50A 1P AUX 5/16 BULLET	CKT Breaker	EMS Main	$38	$76.00	25.00%	$ 57
1	DS256181	DC SYS FP2-48/600- 2BD & SPW/WEB	DC System	EOC	$18,613	$18,613.00	25.00%	$ 13,960
6	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	Rectifier	EOC	$860	$5,160.00	25.00%	$ 3,870
10	DS236408	BLIND PANEL FP2 HE BLACK G1	Blank Panel	EOC	$26	$260.00	25.00%	$ 195
1	DS222865	BATTERY, 48V 850AH BATT SET DDM85-21 4X6	Battery	EOC	$22,175	$22,175.00	25.00%	$ 16,631
1	DS338033	MPC-2-12-00-08 with Candis Display	Inverter Shelf	EOC	$13,436	$13,436.00	25.00%	$ 10,077
2	DS267783	150A, 2P BREAKER KIT	Breaker	EOC	$135	$270.00	25.00%	$ 203
4	DS275843	1.5KVA, 120VAC, 48VDC INV	Inverter	EOC	$1,479	$5,916.00	25.00%	$ 4,437
4	DS241560202	Inverter Blank Panel	Blank Panel	EOC	$26	$104.00	25.00%	$ 78
1	DS320778SYS1	DC POWER SYSTEM, FP2 23IN RACK MOUNTED 1344 AMP -48V DUAL AC INPUT	DC System	C Creek Main	$20,470	$20,470.00	25.00%	$ 15,353
27	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	Rectifier	C Creek Main	$860	$23,220.00	25.00%	$ 17,415

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
5	DS236408	BLIND PANEL FP2 HE BLACK G1	Blank Panel	C Creek Main	$26	$130.00	25.00%	$ 98
2	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	C Creek Main	$3,265	$6,530.00	25.00%	$ 4,898
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	C Creek Main	$38	$76.00	25.00%	$ 57
3	DS506495	BATTERY, 48V 1625AH DDM125-27 BATT SET 4WX6H	Battery	C Creek Main	$35,288	$105,864.00	25.00%	$ 79,398
2	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	C Creek Main	$906	$1,812.00	25.00%	$ 1,359
4	DS502666	100 AMP CIRCUIT BREAKER	CKT Breaker	C Creek Main	$38	$152.00	25.00%	$ 114
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	C Creek Main	$38	$38.00	25.00%	$ 29
11	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	C Creek Main	$38	$418.00	25.00%	$ 314
19	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	C Creek Main	$38	$722.00	25.00%	$ 542
4	DS502661	BREAKER 60A 1P AUX 5/16 BULLET	CKT Breaker	C Creek Backup	$38	$152.00	25.00%	$ 114
1	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	C Creek Backup	$1,040	$1,040.00	25.00%	$ 780
1	DS219595	BRKR 1A 1P CR15 SNAPAK	CKT Breaker	C Creek Backup	$29	$29.00	25.00%	$ 22
2	DS219598	BRKR 5A 1P CR15 SNAPAK	CKT Breaker	C Creek Backup	$29	$58.00	25.00%	$ 44
9	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	C Creek Backup	$10	$90.00	25.00%	$ 68
1	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	C Creek 800 MA	$3,265	$3,265.00	25.00%	$ 2,449
1	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	C Creek 800 MA	$38	$38.00	25.00%	$ 29
1	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	C Creek 800 MA	$906	$906.00	25.00%	$ 680
1	DS502661	BREAKER 60A 1P AUX 5/16 BULLET	CKT Breaker	C Creek 800 MA	$38	$38.00	25.00%	$ 29
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	C Creek 800 MA	$38	$38.00	25.00%	$ 29
5	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	C Creek 800 MA	$38	$190.00	25.00%	$ 143
3	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	C Creek 800 MA	$38	$114.00	25.00%	$ 86
2	DS1720481315	CONVERTER, 200-WATT, SINGLE OUTPUT 48 VDC INPUT TO 13 VDC OUTPUT	Converter	C Creek Main	$943	$1,886.00	25.00%	$ 1,415
2	DS1720482416	48 VDC TO 24 VDC CONVERTER, 400W, WILMORE	Converter	C Creek Main	$1,535	$3,070.00	25.00%	$ 2,303
1	DS338033	MPC-2-12-00-08 with Candis Display	Inverter Shelf	C Creek Main	$13,436	$13,436.00	25.00%	$ 10,077
2	DS267783	150A, 2P BREAKER KIT	CKT Breaker	C Creek Main	$135	$270.00	25.00%	$ 203
8	DS275843	1.5KVA, 120VAC, 48VDC INV	Inverter	C Creek Main	$1,479	$11,832.00	25.00%	$ 8,874
2	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	C Creek Main	$1,040	$2,080.00	25.00%	$ 1,560
12	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	C Creek Main	$10	$120.00	25.00%	$ 90
4	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	C Creek Main	$38	$152.00	25.00%	$ 114
2	DS502660	BREAKER 50A 1P AUX 5/16 BULLET	CKT Breaker	C Creek Main	$38	$76.00	25.00%	$ 57
1	DS320778SYS1	DC POWER SYSTEM, FP2 23IN RACK MOUNTED 1344 AMP -48V DUAL AC INPUT	DC System	Davie Main	$20,470	$20,470.00	25.00%	$ 15,353

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
19	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	Rectifier	Davie Main	$860	$16,340.00	25.00%	$ 12,255
13	DS236408	BLIND PANEL FP2 HE BLACK G1	Blank Panel	Davie Main	$26	$338.00	25.00%	$ 254
2	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	Davie Main	$3,265	$6,530.00	25.00%	$ 4,898
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Davie Main	$38	$76.00	25.00%	$ 57
2	DS506074	BATTERY, 48V 1500AH DDM125-25 BATT SET 4WX6H	Battery	Davie Main	$32,915	$65,830.00	25.00%	$ 49,373
2	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	Davie Main	$906	$1,812.00	25.00%	$ 1,359
4	DS502666	100 AMP CIRCUIT BREAKER	CKT Breaker	Davie Main	$38	$152.00	25.00%	$ 114
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	Davie Main	$38	$38.00	25.00%	$ 29
11	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	Davie Main	$38	$418.00	25.00%	$ 314
19	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	Davie Main	$38	$722.00	25.00%	$ 542
4	DS502661	BREAKER 60A 1P AUX 5/16 BULLET	CKT Breaker	Davie Backup	$38	$152.00	25.00%	$ 114
1	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	Davie Backup	$1,040	$1,040.00	25.00%	$ 780
1	DS219595	BRKR 1A 1P CR15 SNAPAK	CKT Breaker	Davie Backup	$29	$29.00	25.00%	$ 22
2	DS219598	BRKR 5A 1P CR15 SNAPAK	CKT Breaker	Davie Backup	$29	$58.00	25.00%	$ 44
9	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	Davie Backup	$10	$90.00	25.00%	$ 68
1	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	Davie 800 MA	$3,265	$3,265.00	25.00%	$ 2,449
1	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Davie 800 MA	$38	$38.00	25.00%	$ 29
1	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	Davie 800 MA	$906	$906.00	25.00%	$ 680
1	DS502661	BREAKER 60A 1P AUX 5/16 BULLET	CKT Breaker	Davie 800 MA	$38	$38.00	25.00%	$ 29
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	Davie 800 MA	$38	$38.00	25.00%	$ 29
5	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	Davie 800 MA	$38	$190.00	25.00%	$ 143
3	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	Davie 800 MA	$38	$114.00	25.00%	$ 86
2	DS1720481315	CONVERTER, 200-WATT, SINGLE OUTPUT 48 VDC INPUT TO 13 VDC OUTPUT	Converter	Davie Main	$943	$1,886.00	25.00%	$ 1,415
2	DS1720482416	48 VDC TO 24 VDC CONVERTER, 400W, WILMORE	Converter	Davie Main	$1,535	$3,070.00	25.00%	$ 2,303
1	DS338033	MPC-2-12-00-08 with Candis Display	Inverter Shelf	Davie Main	$13,436	$13,436.00	25.00%	$ 10,077
2	DS267783	150A, 2P BREAKER KIT	CKT Breaker	Davie Main	$135	$270.00	25.00%	$ 203
3	DS275843	1.5KVA, 120VAC, 48VDC INV	Inverter	Davie Main	$1,479	$4,437.00	25.00%	$ 3,328
5	DS241560202	Inverter Blank Panel	Blank Panel	Davie Main	$26	$130.00	25.00%	$ 98
2	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	Davie Main	$1,040	$2,080.00	25.00%	$ 1,560
12	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	Davie Main	$10	$120.00	25.00%	$ 90
4	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Davie Main	$38	$152.00	25.00%	$ 114
2	DS502660	BREAKER 50A 1P AUX 5/16 BULLET	CKT Breaker	Davie Main	$38	$76.00	25.00%	$ 57

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DS320778SYS1	DC POWER SYSTEM, FP2 23IN RACK MOUNTED 1344 AMP -48V DUAL AC INPUT	DC System	CH2 Main	$20,470	$20,470.00	25.00%	$ 15,353
21	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	Rectifier	CH2 Main	$860	$18,060.00	25.00%	$ 13,545
11	DS236408	BLIND PANEL FP2 HE BLACK G1	Blank Panel	CH2 Main	$26	$286.00	25.00%	$ 215
2	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	CH2 Main	$3,265	$6,530.00	25.00%	$ 4,898
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	CH2 Main	$38	$76.00	25.00%	$ 57
2	DS222707	BATTERY, 48V 2000AH BATT SET DDM125-33 4X6	Battery	CH2 Main	$42,218	$84,436.00	25.00%	$ 63,327
2	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	CH2 Main	$906	$1,812.00	25.00%	$ 1,359
4	DS502666	100 AMP CIRCUIT BREAKER	CKT Breaker	CH2 Main	$38	$152.00	25.00%	$ 114
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	CH2 Main	$38	$38.00	25.00%	$ 29
11	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	CH2 Main	$38	$418.00	25.00%	$ 314
19	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	CH2 Main	$38	$722.00	25.00%	$ 542
4	DS502661	BREAKER 60A 1P AUX 5/16 BULLET	CKT Breaker	CH2 Backup	$38	$152.00	25.00%	$ 114
1	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	CH2 Backup	$1,040	$1,040.00	25.00%	$ 780
1	DS219595	BRKR 1A 1P CR15 SNAPAK	CKT Breaker	CH2 Backup	$29	$29.00	25.00%	$ 22
2	DS219598	BRKR 5A 1P CR15 SNAPAK	CKT Breaker	CH2 Backup	$29	$58.00	25.00%	$ 44
9	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	CH2 Backup	$10	$90.00	25.00%	$ 68
1	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	CH2 800 MA	$3,265	$3,265.00	25.00%	$ 2,449
1	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	CH2 800 MA	$38	$38.00	25.00%	$ 29
1	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	CH2 800 MA	$906	$906.00	25.00%	$ 680
1	DS502661	BREAKER 60A 1P AUX 5/16 BULLET	CKT Breaker	CH2 800 MA	$38	$38.00	25.00%	$ 29
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	CH2 800 MA	$38	$38.00	25.00%	$ 29
3	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	CH2 800 MA	$38	$114.00	25.00%	$ 86
3	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	CH2 800 MA	$38	$114.00	25.00%	$ 86
2	DS1720481315	CONVERTER, 200-WATT, SINGLE OUTPUT 48 VDC INPUT TO 13 VDC OUTPUT	Converter	CH2 Main	$943	$1,886.00	25.00%	$ 1,415
2	DS1720482416	48 VDC TO 24 VDC CONVERTER, 400W, WILMORE	Converter	CH2 Main	$1,535	$3,070.00	25.00%	$ 2,303
1	DS338033	MPC-2-12-00-08 with Candis Display	Inverter Shelf	CH2 Main	$13,436	$13,436.00	25.00%	$ 10,077
2	DS267783	150A, 2P BREAKER KIT	CKT Breaker	CH2 Main	$135	$270.00	25.00%	$ 203
6	DS275843	1.5KVA, 120VAC, 48VDC INV	Inverter	CH2 Main	$1,479	$8,874.00	25.00%	$ 6,656
2	DS241560202	Inverter Blank Panel	Blank Panel	CH2 Main	$26	$52.00	25.00%	$ 39
2	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	CH2 Main	$1,040	$2,080.00	25.00%	$ 1,560
12	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	CH2 Main	$10	$120.00	25.00%	$ 90
2	DS502656	25 AMP CIRCUIT BREAKER	Blank Panel	CH2 Main	$38	$76.00	25.00%	$ 57

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QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DS502660	BREAKER 50A 1P AUX 5/16 BULLET	Blank Panel	CH2 Main	$38	$76.00	25.00%	$ 57
1	DS320778SYS1	DC POWER SYSTEM, FP2 23IN RACK MOUNTED 1344 AMP -48V DUAL AC INPUT	DC System	Markam Park	$20,470	$20,470.00	25.00%	$ 15,353
16	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	Rectifier	Markam Park	$860	$13,760.00	25.00%	$ 10,320
16	DS236408	BLIND PANEL FP2 HE BLACK G1	Blank Panel	Markam Park	$26	$416.00	25.00%	$ 312
2	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	Markam Park	$3,265	$6,530.00	25.00%	$ 4,898
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Markam Park	$38	$76.00	25.00%	$ 57
2	DS506835	BATTERY, 48V 1360AH BATT SET DDM85-33 4X6	Battery	Markam Park	$29,829	$59,658.00	25.00%	$ 44,744
2	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	Markam Park	$906	$1,812.00	25.00%	$ 1,359
4	DS502666	100 AMP CIRCUIT BREAKER	CKT Breaker	Markam Park	$38	$152.00	25.00%	$ 114
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	Markam Park	$38	$38.00	25.00%	$ 29
6	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	Markam Park	$38	$228.00	25.00%	$ 171
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Markam Park	$38	$76.00	25.00%	$ 57
19	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	Markam Park	$38	$722.00	25.00%	$ 542
2	DS1720481315	CONVERTER, 200-WATT, SINGLE OUTPUT 48 VDC INPUT TO 13 VDC OUTPUT	Converter	Markam Park	$943	$1,886.00	25.00%	$ 1,415
2	DS1720482416	48 VDC TO 24 VDC CONVERTER, 400W, WILMORE	Converter	Markam Park	$1,535	$3,070.00	25.00%	$ 2,303
1	DS338033	MPC-2-12-00-08 with Candis Display	Inverter Shelf	Markam Park	$13,436	$13,436.00	25.00%	$ 10,077
2	DS267783	150A, 2P BREAKER KIT	CKT Breaker	Markam Park	$135	$270.00	25.00%	$ 203
5	DS275843	1.5KVA, 120VAC, 48VDC INV	Inverter	Markam Park	$1,479	$7,395.00	25.00%	$ 5,546
3	DS241560202	Inverter Blank Panel	Blank Panel	Markam Park	$26	$78.00	25.00%	$ 59
2	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	Markam Park	$1,040	$2,080.00	25.00%	$ 1,560
12	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	Markam Park	$10	$120.00	25.00%	$ 90
4	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Markam Park	$38	$152.00	25.00%	$ 114
2	DS502660	BREAKER 50A 1P AUX 5/16 BULLET	CKT Breaker	Markam Park	$38	$76.00	25.00%	$ 57
1	DS256181	DC SYS FP2-48/600- 2BD & SPW/WEB	DC System	Miramar	$18,613	$18,613.00	25.00%	$ 13,960
14	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	Rectifier	Miramar	$860	$12,040.00	25.00%	$ 9,030
2	DS236408	BLIND PANEL FP2 HE BLACK G1	Blank Panel	Miramar	$26	$52.00	25.00%	$ 39
2	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	Miramar	$3,265	$6,530.00	25.00%	$ 4,898
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Miramar	$38	$76.00	25.00%	$ 57
1	DS222707	BATTERY, 48V 2000AH BATT SET DDM125-33 4X6	Battery	Miramar	$42,218	$42,218.00	25.00%	$ 31,664
2	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	Miramar	$906	$1,812.00	25.00%	$ 1,359
4	DS502666	100 AMP CIRCUIT BREAKER	CKT Breaker	Miramar	$38	$152.00	25.00%	$ 114
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	Miramar	$38	$38.00	25.00%	$ 29

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QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
6	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	Miramar	$38	$228.00	25.00%	$ 171
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Miramar	$38	$76.00	25.00%	$ 57
19	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	Miramar	$38	$722.00	25.00%	$ 542
2	DS1720481315	CONVERTER, 200-WATT, SINGLE OUTPUT 48 VDC INPUT TO 13 VDC OUTPUT	Converter	Miramar	$943	$1,886.00	25.00%	$ 1,415
2	DS1720482416	48 VDC TO 24 VDC CONVERTER, 400W, WILMORE	Converter	Miramar	$1,535	$3,070.00	25.00%	$ 2,303
1	DS338033	MPC-2-12-00-08 with Candis Display	Inverter Shelf	Miramar	$13,436	$13,436.00	25.00%	$ 10,077
2	DS267783	150A, 2P BREAKER KIT	CKT Breaker	Miramar	$135	$270.00	25.00%	$ 203
3	DS275843	1.5KVA, 120VAC, 48VDC INV	Inverter	Miramar	$1,479	$4,437.00	25.00%	$ 3,328
5	DS241560202	Inverter Blank Panel	Blank Panel	Miramar	$26	$130.00	25.00%	$ 98
2	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	Miramar	$1,040	$2,080.00	25.00%	$ 1,560
12	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	Miramar	$10	$120.00	25.00%	$ 90
4	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Miramar	$38	$152.00	25.00%	$ 114
2	DS502660	BREAKER 50A 1P AUX 5/16 BULLET	CKT Breaker	Miramar	$38	$76.00	25.00%	$ 57
1	DS256181	DC SYS FP2-48/600- 2BD & SPW/WEB	DC System	Deerfield	$18,613	$18,613.00	25.00%	$ 13,960
13	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	Rectifier	Deerfield	$860	$11,180.00	25.00%	$ 8,385
3	DS236408	BLIND PANEL FP2 HE BLACK G1	Blank Panel	Deerfield	$26	$78.00	25.00%	$ 59
2	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	Deerfield	$3,265	$6,530.00	25.00%	$ 4,898
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Deerfield	$38	$76.00	25.00%	$ 57
1	DS222707	BATTERY, 48V 2000AH BATT SET DDM125-33 4X6	Battery	Deerfield	$42,218	$42,218.00	25.00%	$ 31,664
2	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	Deerfield	$906	$1,812.00	25.00%	$ 1,359
4	DS502666	100 AMP CIRCUIT BREAKER	CKT Breaker	Deerfield	$38	$152.00	25.00%	$ 114
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	Deerfield	$38	$38.00	25.00%	$ 29
6	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	Deerfield	$38	$228.00	25.00%	$ 171
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Deerfield	$38	$76.00	25.00%	$ 57
19	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	Deerfield	$38	$722.00	25.00%	$ 542
2	DS1720481315	CONVERTER, 200-WATT, SINGLE OUTPUT 48 VDC INPUT TO 13 VDC OUTPUT	Converter	Deerfield	$943	$1,886.00	25.00%	$ 1,415
2	DS1720482416	48 VDC TO 24 VDC CONVERTER, 400W, WILMORE	Converter	Deerfield	$1,535	$3,070.00	25.00%	$ 2,303
1	DS331010	MEDIA INVERTER 21 2PH	Inverter Shelf	Deerfield	$10,141	$10,141.00	25.00%	$ 7,606
1	DS502666	100A, 1P BREAKER KIT	CKT Breaker	Deerfield	$38	$38.00	25.00%	$ 29
2	DS275843	1.5KVA, 120VAC, 48VDC INV	Inverter	Deerfield	$1,479	$2,958.00	25.00%	$ 2,219
2	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	Deerfield	$1,040	$2,080.00	25.00%	$ 1,560
12	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	Deerfield	$10	$120.00	25.00%	$ 90
4	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Deerfield	$38	$152.00	25.00%	$ 114
2	DS502660	BREAKER 50A 1P AUX 5/16 BULLET	CKT Breaker	Deerfield	$38	$76.00	25.00%	$ 57

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QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DS256181	DC SYS FP2-48/600- 2BD & SPW/WEB	DC System	Tamarac	$18,613	$18,613.00	25.00%	$ 13,960
13	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	Rectifier	Tamarac	$860	$11,180.00	25.00%	$ 8,385
3	DS236408	BLIND PANEL FP2 HE BLACK G1	Blank Panel	Tamarac	$26	$78.00	25.00%	$ 59
2	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	Tamarac	$3,265	$6,530.00	25.00%	$ 4,898
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Tamarac	$38	$76.00	25.00%	$ 57
1	DS222707	BATTERY, 48V 2000AH BATT SET DDM125-33 4X6	Battery	Tamarac	$42,218	$42,218.00	25.00%	$ 31,664
2	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	Tamarac	$906	$1,812.00	25.00%	$ 1,359
4	DS502666	100 AMP CIRCUIT BREAKER	CKT Breaker	Tamarac	$38	$152.00	25.00%	$ 114
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	Tamarac	$38	$38.00	25.00%	$ 29
6	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	Tamarac	$38	$228.00	25.00%	$ 171
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Tamarac	$38	$76.00	25.00%	$ 57
19	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	Tamarac	$38	$722.00	25.00%	$ 542
2	DS1720481315	CONVERTER, 200-WATT, SINGLE OUTPUT 48 VDC INPUT TO 13 VDC OUTPUT	Converter	Tamarac	$943	$1,886.00	25.00%	$ 1,415
2	DS1720482416	48 VDC TO 24 VDC CONVERTER, 400W, WILMORE	Converter	Tamarac	$1,535	$3,070.00	25.00%	$ 2,303
1	DS331010	MEDIA INVERTER 21 2PH	Inverter Shelf	Tamarac	$10,141	$10,141.00	25.00%	$ 7,606
1	DS502666	100A, 1P BREAKER KIT	CKT Breaker	Tamarac	$38	$38.00	25.00%	$ 29
2	DS275843	1.5KVA, 120VAC, 48VDC INV	Inverter	Tamarac	$1,479	$2,958.00	25.00%	$ 2,219
2	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	Tamarac	$1,040	$2,080.00	25.00%	$ 1,560
12	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	Tamarac	$10	$120.00	25.00%	$ 90
4	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Tamarac	$38	$152.00	25.00%	$ 114
2	DS502660	BREAKER 50A 1P AUX 5/16 BULLET	CKT Breaker	Tamarac	$38	$76.00	25.00%	$ 57
1	DS256181	DC SYS FP2-48/600- 2BD & SPW/WEB	DC System	Playa	$18,613	$18,613.00	25.00%	$ 13,960
13	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	Rectifier	Playa	$860	$11,180.00	25.00%	$ 8,385
3	DS236408	BLIND PANEL FP2 HE BLACK G1	Blank Panel	Playa	$26	$78.00	25.00%	$ 59
2	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	Playa	$3,265	$6,530.00	25.00%	$ 4,898
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Playa	$38	$76.00	25.00%	$ 57
1	DS222707	BATTERY, 48V 2000AH BATT SET DDM125-33 4X6	Battery	Playa	$42,218	$42,218.00	25.00%	$ 31,664
2	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	Playa	$906	$1,812.00	25.00%	$ 1,359
4	DS502666	100 AMP CIRCUIT BREAKER	CKT Breaker	Playa	$38	$152.00	25.00%	$ 114
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	Playa	$38	$38.00	25.00%	$ 29
6	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	Playa	$38	$228.00	25.00%	$ 171
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Playa	$38	$76.00	25.00%	$ 57
19	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	Playa	$38	$722.00	25.00%	$ 542

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DS1720481315	CONVERTER, 200-WATT, SINGLE OUTPUT 48 VDC INPUT TO 13 VDC OUTPUT	Converter	Playa	$943	$1,886.00	25.00%	$ 1,415
2	DS1720482416	48 VDC TO 24 VDC CONVERTER, 400W, WILMORE	Converter	Playa	$1,535	$3,070.00	25.00%	$ 2,303
1	DS331010	MEDIA INVERTER 21 2PH	Inverter Shelf	Playa	$10,141	$10,141.00	25.00%	$ 7,606
1	DS502666	100A, 1P BREAKER KIT	CKT Breaker	Playa	$38	$38.00	25.00%	$ 29
2	DS275843	1.5KVA, 120VAC, 48VDC INV	Inverter	Playa	$1,479	$2,958.00	25.00%	$ 2,219
2	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	Playa	$1,040	$2,080.00	25.00%	$ 1,560
12	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	Playa	$10	$120.00	25.00%	$ 90
4	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Playa	$38	$152.00	25.00%	$ 114
2	DS502660	BREAKER 50A 1P AUX 5/16 BULLET	CKT Breaker	Playa	$38	$76.00	25.00%	$ 57
1	DS256181	DC SYS FP2-48/600- 2BD & SPW/WEB	DC System	Pt of America	$18,613	$18,613.00	25.00%	$ 13,960
13	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	Rectifier	Pt of America	$860	$11,180.00	25.00%	$ 8,385
3	DS236408	BLIND PANEL FP2 HE BLACK G1	Blank Panel	Pt of America	$26	$78.00	25.00%	$ 59
2	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	Pt of America	$3,265	$6,530.00	25.00%	$ 4,898
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Pt of America	$38	$76.00	25.00%	$ 57
1	DS222707	BATTERY, 48V 2000AH BATT SET DDM125-33 4X6	Battery	Pt of America	$42,218	$42,218.00	25.00%	$ 31,664
2	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	Pt of America	$906	$1,812.00	25.00%	$ 1,359
4	DS502666	100 AMP CIRCUIT BREAKER	CKT Breaker	Pt of America	$38	$152.00	25.00%	$ 114
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	Pt of America	$38	$38.00	25.00%	$ 29
6	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	Pt of America	$38	$228.00	25.00%	$ 171
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Pt of America	$38	$76.00	25.00%	$ 57
19	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	Pt of America	$38	$722.00	25.00%	$ 542
2	DS1720481315	CONVERTER, 200-WATT, SINGLE OUTPUT 48 VDC INPUT TO 13 VDC OUTPUT	Converter	Pt of America	$943	$1,886.00	25.00%	$ 1,415
2	DS1720482416	48 VDC TO 24 VDC CONVERTER, 400W, WILMORE	Converter	Pt of America	$1,535	$3,070.00	25.00%	$ 2,303
1	DS331010	MEDIA INVERTER 21 2PH	Inverter Shelf	Pt of America	$10,141	$10,141.00	25.00%	$ 7,606
1	DS502666	100A, 1P BREAKER KIT	CKT Breaker	Pt of America	$38	$38.00	25.00%	$ 29
2	DS275843	1.5KVA, 120VAC, 48VDC INV	Inverter	Pt of America	$1,479	$2,958.00	25.00%	$ 2,219
2	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	Pt of America	$1,040	$2,080.00	25.00%	$ 1,560
12	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	Pt of America	$10	$120.00	25.00%	$ 90
4	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Pt of America	$38	$152.00	25.00%	$ 114
2	DS502660	BREAKER 50A 1P AUX 5/16 BULLET	CKT Breaker	Pt of America	$38	$76.00	25.00%	$ 57
1	DS256181	DC SYS FP2-48/600- 2BD & SPW/WEB	DC System	West Lake	$18,613	$18,613.00	25.00%	$ 13,960
13	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	Rectifier	West Lake	$860	$11,180.00	25.00%	$ 8,385
3	DS236408	BLIND PANEL FP2 HE BLACK G1	Blank Panel	West Lake	$26	$78.00	25.00%	$ 59

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	West Lake	$3,265	$6,530.00	25.00%	$ 4,898
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	West Lake	$38	$76.00	25.00%	$ 57
1	DS222707	BATTERY, 48V 2000AH BATT SET DDM125-33 4X6	Battery	West Lake	$42,218	$42,218.00	25.00%	$ 31,664
2	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	West Lake	$906	$1,812.00	25.00%	$ 1,359
4	DS502666	100 AMP CIRCUIT BREAKER	CKT Breaker	West Lake	$38	$152.00	25.00%	$ 114
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	West Lake	$38	$38.00	25.00%	$ 29
6	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	West Lake	$38	$228.00	25.00%	$ 171
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	West Lake	$38	$76.00	25.00%	$ 57
19	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	West Lake	$38	$722.00	25.00%	$ 542
2	DS1720481315	CONVERTER, 200-WATT, SINGLE OUTPUT 48 VDC INPUT TO 13 VDC OUTPUT	Converter	West Lake	$943	$1,886.00	25.00%	$ 1,415
2	DS1720482416	48 VDC TO 24 VDC CONVERTER, 400W, WILMORE	Converter	West Lake	$1,535	$3,070.00	25.00%	$ 2,303
1	DS331010	MEDIA INVERTER 21 2PH	Inverter Shelf	West Lake	$10,141	$10,141.00	25.00%	$ 7,606
1	DS502666	100A, 1P BREAKER KIT	CKT Breaker	West Lake	$38	$38.00	25.00%	$ 29
2	DS275843	1.5KVA, 120VAC, 48VDC INV	Inverter	West Lake	$1,479	$2,958.00	25.00%	$ 2,219
2	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	West Lake	$1,040	$2,080.00	25.00%	$ 1,560
12	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	West Lake	$10	$120.00	25.00%	$ 90
4	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	West Lake	$38	$152.00	25.00%	$ 114
2	DS502660	BREAKER 50A 1P AUX 5/16 BULLET	CKT Breaker	West Lake	$38	$76.00	25.00%	$ 57
1	DS256181	DC SYS FP2-48/600- 2BD & SPW/WEB	DC System	BC Station 106	$18,613	$18,613.00	25.00%	$ 13,960
8	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	Rectifier	BC Station 106	$860	$6,880.00	25.00%	$ 5,160
8	DS236408	BLIND PANEL FP2 HE BLACK G1	Blank Panel	BC Station 106	$26	$208.00	25.00%	$ 156
1	DS506835	BATTERY, 48V 1360AH BATT SET DDM85-33 4X6	Battery	BC Station 106	$29,829	$29,829.00	25.00%	$ 22,372
2	DS502661	BREAKER 60A 1P AUX 5/16 BULLET	CKT Breaker	BC Station 106	$38	$76.00	25.00%	$ 57
2	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	BC Station 106	$1,040	$2,080.00	25.00%	$ 1,560
1	DS219595	BRKR 1A 1P CR15 SNAPAK	CKT Breaker	BC Station 106	$29	$29.00	25.00%	$ 22
2	DS1720481315	CONVERTER, 200-WATT, SINGLE OUTPUT 48 VDC INPUT TO 13 VDC OUTPUT	Converter	BC Station 106	$943	$1,886.00	25.00%	$ 1,415
2	DS1720482416	48 VDC TO 24 VDC CONVERTER, 400W, WILMORE	Converter	BC Station 106	$1,535	$3,070.00	25.00%	$ 2,303
1	DS338010	MPC-2-12-00-08 with Candis Display	Inverter Shelf	BC Station 106	$9,861	$9,861.00	25.00%	$ 7,396
1	DS502666	100A, 1P BREAKER KIT	CKT Breaker	BC Station 106	$38	$38.00	25.00%	$ 29
2	DS275843	1.5KVA, 120VAC, 48VDC INV	Inverter	BC Station 106	$1,479	$2,958.00	25.00%	$ 2,219
2	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	BC Station 106	$1,040	$2,080.00	25.00%	$ 1,560
12	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	BC Station 106	$10	$120.00	25.00%	$ 90
4	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	BC Station 106	$38	$152.00	25.00%	$ 114
2	DS502660	BREAKER 50A 1P AUX 5/16 BULLET	CKT Breaker	BC Station 106	$38	$76.00	25.00%	$ 57

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DS256181	DC SYS FP2-48/600- 2BD & SPW/WEB	DC System	PompBchClubN	$18,613	$18,613.00	25.00%	$ 13,960
13	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	Rectifier	PompBchClubN	$860	$11,180.00	25.00%	$ 8,385
3	DS236408	BLIND PANEL FP2 HE BLACK G1	Blank Panel	PompBchClubN	$26	$78.00	25.00%	$ 59
2	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	PompBchClubN	$3,265	$6,530.00	25.00%	$ 4,898
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	PompBchClubN	$38	$76.00	25.00%	$ 57
1	DS222707	BATTERY, 48V 2000AH BATT SET DDM125-33 4X6	Battery	PompBchClubN	$42,218	$42,218.00	25.00%	$ 31,664
2	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	PompBchClubN	$906	$1,812.00	25.00%	$ 1,359
4	DS502666	100 AMP CIRCUIT BREAKER	CKT Breaker	PompBchClubN	$38	$152.00	25.00%	$ 114
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	PompBchClubN	$38	$38.00	25.00%	$ 29
6	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	PompBchClubN	$38	$228.00	25.00%	$ 171
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	PompBchClubN	$38	$76.00	25.00%	$ 57
19	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	PompBchClubN	$38	$722.00	25.00%	$ 542
2	DS1720481315	CONVERTER, 200-WATT, SINGLE OUTPUT 48 VDC INPUT TO 13 VDC OUTPUT	Converter	PompBchClubN	$943	$1,886.00	25.00%	$ 1,415
2	DS1720482416	48 VDC TO 24 VDC CONVERTER, 400W, WILMORE	Converter	PompBchClubN	$1,535	$3,070.00	25.00%	$ 2,303
1	DS331010	MEDIA INVERTER 21 2PH	Inverter Shelf	PompBchClubN	$10,141	$10,141.00	25.00%	$ 7,606
1	DS502666	100A, 1P BREAKER KIT	CKT Breaker	PompBchClubN	$38	$38.00	25.00%	$ 29
2	DS275843	1.5KVA, 120VAC, 48VDC INV	Inverter	PompBchClubN	$1,479	$2,958.00	25.00%	$ 2,219
2	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	PompBchClubN	$1,040	$2,080.00	25.00%	$ 1,560
12	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	PompBchClubN	$10	$120.00	25.00%	$ 90
4	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	PompBchClubN	$38	$152.00	25.00%	$ 114
2	DS502660	BREAKER 50A 1P AUX 5/16 BULLET	CKT Breaker	PompBchClubN	$38	$76.00	25.00%	$ 57
2	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	WH Prime	$906	$1,812.00	25.00%	$ 1,359
4	DS502666	100 AMP CIRCUIT BREAKER	CKT Breaker	WH Prime	$38	$152.00	25.00%	$ 114
6	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	WH Prime	$38	$228.00	25.00%	$ 171
12	DS502653	BREAKER 10A 1P AUX 5/16 BULLET	CKT Breaker	WH Prime	$38	$456.00	25.00%	$ 342
1	DS256181	DC SYS FP2-48/600- 2BD & SPW/WEB	DC System	West Hollywood	$18,613	$18,613.00	25.00%	$ 13,960
15	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	Rectifier	West Hollywood	$860	$12,900.00	25.00%	$ 9,675
1	DS236408	BLIND PANEL FP2 HE BLACK G1	Blank Panel	West Hollywood	$26	$26.00	25.00%	$ 20
2	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	West Hollywood	$3,265	$6,530.00	25.00%	$ 4,898
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	West Hollywood	$38	$76.00	25.00%	$ 57
2	DS506835	BATTERY, 48V 1360AH BATT SET DDM85-33 4X6	Battery	West Hollywood	$29,829	$59,658.00	25.00%	$ 44,744
2	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	West Hollywood	$906	$1,812.00	25.00%	$ 1,359

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
4	DS502666	100 AMP CIRCUIT BREAKER	CKT Breaker	West Hollywood	$38	$152.00	25.00%	$ 114
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	West Hollywood	$38	$38.00	25.00%	$ 29
6	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	West Hollywood	$38	$228.00	25.00%	$ 171
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	West Hollywood	$38	$76.00	25.00%	$ 57
19	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	West Hollywood	$38	$722.00	25.00%	$ 542
2	DS1720481315	CONVERTER, 200-WATT, SINGLE OUTPUT 48 VDC INPUT TO 13 VDC OUTPUT	Converter	West Hollywood	$943	$1,886.00	25.00%	$ 1,415
2	DS1720482416	48 VDC TO 24 VDC CONVERTER, 400W, WILMORE	Converter	West Hollywood	$1,535	$3,070.00	25.00%	$ 2,303
1	DS338010	MPC-2-12-00-08 with Candis Display	Inverter Shelf	West Hollywood	$9,861	$9,861.00	25.00%	$ 7,396
1	DS502666	100A, 1P BREAKER KIT	CKT Breaker	West Hollywood	$38	$38.00	25.00%	$ 29
2	DS275843	1.5KVA, 120VAC, 48VDC INV	Inverter	West Hollywood	$1,479	$2,958.00	25.00%	$ 2,219
2	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	West Hollywood	$1,040	$2,080.00	25.00%	$ 1,560
12	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	West Hollywood	$10	$120.00	25.00%	$ 90
4	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	West Hollywood	$38	$152.00	25.00%	$ 114
2	DS502660	BREAKER 50A 1P AUX 5/16 BULLET	CKT Breaker	West Hollywood	$38	$76.00	25.00%	$ 57
1	DS256181	DC SYS FP2-48/600- 2BD & SPW/WEB	DC System	Parkland	$18,613	$18,613.00	25.00%	$ 13,960
13	DS241115105	RECTIFIER, FLATPACK 2 48/2000 HE	Rectifier	Parkland	$860	$11,180.00	25.00%	$ 8,385
3	DS236408	BLIND PANEL FP2 HE BLACK G1	Blank Panel	Parkland	$26	$78.00	25.00%	$ 59
2	DS268132	INVERTER, 1 KVA, 48VDCIN/120VACOUT 2RU RM 19/23 INCH, DELTA	Inverter	Parkland	$3,265	$6,530.00	25.00%	$ 4,898
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Parkland	$38	$76.00	25.00%	$ 57
1	DS222707	BATTERY, 48V 2000AH BATT SET DDM125-33 4X6	Battery	Parkland	$42,218	$42,218.00	25.00%	$ 31,664
2	DS212200	DISTRIBUTION PANEL, 4U BRKR DIST 48V 10A10B CVR BLK	Dist Panel	Parkland	$906	$1,812.00	25.00%	$ 1,359
4	DS502666	100 AMP CIRCUIT BREAKER	CKT Breaker	Parkland	$38	$152.00	25.00%	$ 114
1	DS502650	1 AMP CIRCUIT BREAKER	CKT Breaker	Parkland	$38	$38.00	25.00%	$ 29
6	DS502652	5 AMP CIRCUIT BREAKER	CKT Breaker	Parkland	$38	$228.00	25.00%	$ 171
2	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Parkland	$38	$76.00	25.00%	$ 57
19	DS502657	BREAKER 30A 1P AUX 5/16 BULLET	CKT Breaker	Parkland	$38	$722.00	25.00%	$ 542
2	DS1720481315	CONVERTER, 200-WATT, SINGLE OUTPUT 48 VDC INPUT TO 13 VDC OUTPUT	Converter	Parkland	$943	$1,886.00	25.00%	$ 1,415
2	DS1720482416	48 VDC TO 24 VDC CONVERTER, 400W, WILMORE	Converter	Parkland	$1,535	$3,070.00	25.00%	$ 2,303
1	DS331010	MEDIA INVERTER 21 2PH	Inverter Shelf	Parkland	$10,141	$10,141.00	25.00%	$ 7,606
1	DS502666	100A, 1P BREAKER KIT	CKT Breaker	Parkland	$38	$38.00	25.00%	$ 29
2	DS275843	1.5KVA, 120VAC, 48VDC INV	Inverter	Parkland	$1,479	$2,958.00	25.00%	$ 2,219
2	DS219593	BREAKER DISTRIBUTION PANEL-/+ 24/48, 1U 6/6P	Dist Panel	Parkland	$1,040	$2,080.00	25.00%	$ 1,560
12	DS225036	BREAKER PANEL FILLER PLATE	Blank Panel	Parkland	$10	$120.00	25.00%	$ 90
4	DS502656	25 AMP CIRCUIT BREAKER	CKT Breaker	Parkland	$38	$152.00	25.00%	$ 114

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
2	DS502660	BREAKER 50A 1P AUX 5/16 BULLET	CKT Breaker	Parkland	$38	$76.00	25.00%	$ 57
1	TT05394AA	GW3_SW	GW3_SW	GEN_WATCH	$22,200	$22,200.00	25.00%	$ 16,650
1	TT05413AA	GW3_SERVER	GW3_SERVER	GEN_WATCH	$28,400	$28,400.00	25.00%	$ 21,300
1	TT05416AA	GW3_READR	GW3_READR	GEN_WATCH	$5,800	$5,800.00	25.00%	$ 4,350
1	TT05418AA	GW3_CLIENT	GW3_CLIENT	GEN_WATCH	$4,800	$4,800.00	25.00%	$ 3,600
1	DS2432-1606-344-R1	Thermobond 24' x 32' x 9' Prefab Building	Building	CORE Civil	$359,049	$359,049.40	25.00%	$ 269,287
10	DSOP820B	Transtector 8 outlet distribution panel	Power Distribution	CORE Civil	$938	$9,380.00	25.00%	$ 7,035
1	DS560SA16FNRJ1S	Liebert Indoor - 120/240 VAC 1-PHASE Type 2 surge protector	Surge Protection	Coconut Creek CIVIL	$1,740	$1,740.00	25.00%	$ 1,305
5	DSOP820B	Transtector 8 outlet distribution panel	Power Distribution	Coconut Creek CIVIL	$938	$4,690.00	25.00%	$ 3,518
1	DS2432-1606-344-R1	Thermobond 24' x 32' x 9' Prefab Building	Building	Markham Park CIVIL	$359,049	$359,049.40	25.00%	$ 269,287
3	DSOP820B	Transtector 8 outlet distribution panel	Power Distribution	Markham Park CIVIL	$938	$2,814.00	25.00%	$ 2,111
3	DSOP820B	Transtector 8 outlet distribution panel	Power Distribution	Playa CIVIL	$938	$2,814.00	25.00%	$ 2,111
1	DSSD080ODDL	Generac 80 KW/Diesel/1 Phase	Generator	Davie Civil	$43,717	$43,717.00	25.00%	$ 32,788
1	DS300GLSUBTKUPG50D	Generac 300 gallon fuel tank	Generator	Davie Civil	$2,150	$2,150.00	25.00%	$ 1,613
1	DSGTS400ID	Generac 400 Amps/1Phase	ATS	Davie Civil	$4,951	$4,951.00	25.00%	$ 3,713
1	DS560SA16FNRJ1S	Liebert Indoor - 120/240 VAC 1-PHASE Type 2 surge protector	Surge Protection	Davie Civil	$1,740	$1,740.00	25.00%	$ 1,305
3	DSOP820B	Transtector 8 outlet distribution panel	Power Distribution	Davie Civil	$938	$2,814.00	25.00%	$ 2,111
3	DSOP820B	Transtector 8 outlet distribution panel	Power Distribution	Points of America CIVIL	$938	$2,814.00	25.00%	$ 2,111
1	DS1232-1606-344-R1	Thermobond 12' x 32' x 9' Prefab Building	Building	Miramar CIVIL	$232,707	$232,707.20	25.00%	$ 174,530
3	DSOP820B	Transtector 8 outlet distribution panel	Power Distribution	Miramar CIVIL	$938	$2,814.00	25.00%	$ 2,111
1	DS2432-1606-344-R1	ThermoBond 24' x 32' x 9' Prefab Building	Building	CH 2 CIVIL	$359,049	$359,049.40	25.00%	$ 269,287
1	DS300SS-334251-02	Valmont 300-foot self-supported tower	Tower	CH 2 CIVIL	$177,712	$177,712.00	25.00%	$ 133,284
1	LK1E12L550AV	TWR Medium Intensity Strobe	Tower	CH 2 CIVIL	$23,384	$23,384.00	25.00%	$ 17,538
3	DSOP820B	Transtector 8 outlet distribution panel	Power Distribution	CH 2 CIVIL	$938	$2,814.00	25.00%	$ 2,111
1	DS2432-1606-344-R1	ThermoBond 24' x 32' x 9' Prefab Building	Building	Deerfield CIVIL	$359,049	$359,049.40	25.00%	$ 269,287
1	DS300SS-334249-02	Valmont 300-foot self-supported tower	Tower	Deerfield CIVIL	$160,560	$160,560.00	25.00%	$ 120,420
1	LK1E12L550AV	TWR Medium Intensity Strobe	Tower	Deerfield CIVIL	$23,384	$23,384.00	25.00%	$ 17,538
3	DSOP820B	Transtector 8 outlet distribution panel	Power Distribution	Deerfield CIVIL	$938	$2,814.00	25.00%	$ 2,111

Schedule 2 - Equipment List

QTY	NOMENCLATURE	DESCRIPTION	BLOCK	SUB SYS	Unit Price	Quanity x Unit Price	% Discount	Final Price
1	DS2432-1606-344-R1	ThermoBond 24' x 32' x 9' Prefab Building	Building	Tamarac CIVIL	$359,049	$359,049.40	25.00%	$ 269,287
1	DS300SS-334251-02	Valmont 300-foot self-supported tower	Tower	Tamarac CIVIL	$177,712	$177,712.00	25.00%	$ 133,284
1	LK1E12L550AV	TWR Medium Intensity Strobe	Tower	Tamarac CIVIL	$23,384	$23,384.00	25.00%	$ 17,538
3	DSOP820B	Transtector 8 outlet distribution panel	Power Distribution	Tamarac CIVIL	$938	$2,814.00	25.00%	$ 2,111
1	DS2432-1606-344-R1	ThermoBond 24' x 32' x 9' Prefab Building	Building	West Lake CIVIL	$359,049	$359,049.40	25.00%	$ 269,287
1	DS180M-2016-WLP-1	Valmont 300-foot self-supported tower	Tower	West Lake CIVIL	$177,712	$177,712.00	25.00%	$ 133,284
1	LK1E12L550AV	TWR Medium Intensity Strobe	Tower	West Lake CIVIL	$23,384	$23,384.00	25.00%	$ 17,538
3	DSOP820B	Transtector 8 outlet distribution panel	Power Distribution	West Lake CIVIL	$938	$2,814.00	25.00%	$ 2,111
1	DS2432-1606-344-R1	ThermoBond 24' x 32' x 9' Prefab Building	Building	FS106 CIVIL	$359,049	$359,049.40	25.00%	$ 269,287
1	DS180M-2016-FS106-1	Valmont 300-foot self-supported tower	Tower	FS106 CIVIL	$169,040	$169,040.00	25.00%	$ 126,780
3	DSOP820B	Transtector 8 outlet distribution panel	Power Distribution	FS106 CIVIL	$938	$2,814.00	25.00%	$ 2,111
3	DSOP820B	Transtector 8 outlet distribution panel	Power Distribution	EMS CIVIL	$938	$2,814.00	25.00%	$ 2,111
5	DSOP820B	Transtector 8 outlet distribution panel	Power Distribution	EOC CIVIL	$938	$4,690.00	25.00%	$ 3,518
1	DS2432-1606-344-R1	Thermobond 24' x 32' x 9' Prefab Building	Building	Parkland CIVIL	$359,049	$359,049.40	25.00%	$ 269,287
1	DS300SS-366799-01	Valmont 300-foot self-supported tower	Tower	Parkland CIVIL	$203,552	$203,552.00	25.00%	$ 152,664
1	LK1E12L550AV	TWR Medium Intensity Strobe	Tower	Parkland CIVIL	$23,384	$23,384.00	25.00%	$ 17,538
3	DSOP820B	Transtector 8 outlet distribution panel	Power Distribution	Parkland CIVIL	$938	$2,814.00	25.00%	$ 2,111
1	DS2432-1606-344-R1	Thermobond 24' x 32' x 9' Prefab Building	Building	West Hollywood CIVIL	$359,049	$359,049.40	25.00%	$ 269,287
1	DS300SS-366799-01	Valmont 300-foot self-supported tower	Tower	West Hollywood CIVIL	$178,560	$178,560.00	25.00%	$ 133,920
1	LK1E12L550AV	TWR Medium Intensity Strobe	Tower	West Hollywood CIVIL	$23,384	$23,384.00	25.00%	$ 17,538
3	DSOP820B	Transtector 8 outlet distribution panel	Power Distribution	West Hollywood CIVIL	$938	$2,814.00	25.00%	$ 2,111
1	EE50S3H	Square D 0.51875	Surge Protection	Pompano Bch Club CIVIL	$7,200	$7,200.00	25.00%	$ 5,400
1	DS560SA16FNRJ1S	Liebert Indoor - 120/240 VAC 1-PHASE Type 2 surge protector	Surge Protection	Pompano Bch Club CIVIL	$1,740	$1,740.00	25.00%	$ 1,305
3	DSOP820B	Transtector 8 outlet distribution panel	Power Distribution	Pompano Bch Club CIVIL	$938	$2,814.00	25.00%	$ 2,111
1	CA02802AA	ADD: PremierOne CAD Software License	ARL	CAD Integration	$1,600,000	$1,600,000	25.00%	$ 1,200,000

Schedule 3
Training Plans

The following Schedule 3 sets forth the anticipated training plan for the System and subscribers, and is included in the System Total set forth in Exhibit B.

In addition to the training in the amounts set forth herein, the Contract Administrator may request additional training (including, without limitation, additional instances of any of these training courses or any other training courses offered by Motorola) upon written request, which additional training shall be charged at the line item training rates set forth in Exhibit B (plus any escalator, to the extent applicable). The additional training, including any courses offered in Motorola Product and System Technical Training Course Catalog, can be acquired at any time during the Agreement upon written notice by the Contract Administrator (without the need for a purchase order or Work Authorization) at the price set forth in Exhibit B or at the standard County 25% discount off Motorola list price (currently available at motorolasolutions.com/nalearnschedule2017, and as may be subsequently updated), so long as the total additional training acquired is within the not-to-exceed amounts set forth in Section 5.1.

1. Training Plans

1.1. System Administrator Training Plan

Course Title	Target Audience	Sessions	Duration (days/hrs)	Location	Date	Participants
ASTRO 25 Fleetmapping Workshop (Instructor–led onsite at Broward County)	System Planners; Administrators; Technicians	1	5 days	FL	In the Planning Phase	Up to 12
Course Synopsis This workshop addresses topics necessary for the effective planning and mapping of an ASTRO 25 IV&D radio system. During this course, the participants will learn about ASTRO 25 features, capabilities, and restrictions in order to effectively plan for a new or upgraded ASTRO 25 system.						
ASTRO 25 Systems Applied Networking (Instructor–led) onsite at Broward County)	System Administrators and Technicians	1	5 days	FL	Prior to remaining courses	Up to 12
Course Synopsis This course provides the participant with the necessary networking information required for understanding the Network Transport subsystem components installed in an ASTRO 25 IV&D communications system. The course includes familiarization with basic networking concepts and the networking components deployed throughout the system.						

Course Title	Target Audience	Sessions	Duration (days/hrs)	Location	Date	Participants
ASTRO 25 IV&D Trunking M & L Core System Overview Prerequisite 1 (Online Self–paced)	System Administrators and Technicians	1	2 hours	Online/ Self–paced	Prior to Prerequisite 2	Up to 12
Course Synopsis The ASTRO® 25 IV&D with L Core System Overview is a self–paced course. It is the starting point for all ASTRO 25 IV&D with L Core systems. It provides a high–level description of the system's call flow capabilities, components, features and benefits. Participants are required to complete this course with a passing score on the corresponding test before taking other classes.						
ASTRO 25 IV&D Introduction to Radio System Management Applications Prerequisite 2 (Online Self–paced)	System Administrators and Technicians	1	2 hours	Online/ Self–paced	Prior to the Workshops	Up to 12
Course Synopsis This virtual, interactive course provides a high–level overview of the Motorola Radio System Management applications through recorded demonstrations of common system tasks.						
ASTRO 25 IV&D **Radio System Administrator Workshop** (Instructor–led) onsite at Broward County)	System Administrators	1	5 days	FL	Prior to Managing the system	6
Course Synopsis This workshop covers administrator functions for an ASTRO 25 Integrated Voice and Data (IV&D) System. Learning activities in this course focus on how to use the different ASTRO 25 IV&D System Management applications. Participants will be provided with an opportunity to discuss how to structure their organization and personnel for optimal ASTRO 25 IV&D system use.						
ASTRO 25 ISSI 8000/CSSI 8000 Feature Overview (Self–paced; On–line)	System Administrators and Technicians	NA	1 hour	Online/ Self–paced	Prior to Managing the System	Up to 12
Course Synopsis The ISSI 8000/CSSI 8000 Feature Overview self–paced course describes the optional Inter–RF Subsystem Interface available in an ASTRO 25 IV&D System. It presents a description of the feature, its benefits and components, call processing scenarios, and an overview of the installation process.						
ASTRO 25 IV&D Dynamic System Resilience Overview (Self–paced; On–line)	System Administrators and Technicians	NA	2 hours	Online/ Self–paced	Prior to Managing the System	Up to 12

Course Title	Target Audience	Sessions	Duration (days/hrs)	Location	Date	Participants
Course Synopsis The Overview for ASTRO 25 IV&D Dynamic System Resilience is a self–study training course intended to provide a technical overview of DSR. The course describes how DSR adds a geographically separate backup for the Master Site to protect against a catastrophic failure.						

1.2. Maintenance Technician Training Plan

Course Title	Target Audience	Sessions	Duration (days/hrs)	Location	Date	Participants
ASTRO 25 IV&D M & L Core Workshop (Instructor–led) onsite at Broward County)	System Technicians	1	5 days	FL	Prior to Maintaining the system	Up to 12
Course Synopsis The ASTRO 25 IV&D with L Core course teaches advanced troubleshooting skills and best practices. The course also focuses on gathering and analyzing system information to implement appropriate action(s) that will return a system to full operational status.						
ASTRO 25 IV&D IP Simulcast with GTR 8000 Repeater Site Workshop (Instructor–led) onsite at Broward County)	Site Technicians	1	5 days	FL	Prior to Maintaining the system	Up to 12
IP Simulcast Course Synopsis The ASTRO 25 IV&D IP Based Digital Simulcast workshop provides an understanding of the components that comprise the ASTRO 25 IV&D IP Simulcast subsystem, and how they operate in conjunction with each other. The workshop also explains the tools and methods available for troubleshooting components within the IP Based Simulcast subsystem. **GTR8000 Course Synopsis** This workshop describes the components in the ASTRO 25 IV&D System Repeater Site with GTR 8000 expandable site subsystem. This course also presents how the GTR 8000 expandable site subsystem operates and explains the tools and methods available for troubleshooting components within the subsystem.						
APX CPS Radio Programming and Template Building (Instructor–led) onsite at Broward County)	Radio Programmers and Technicians	1	2 days	FL	Prior to programming radios	Up to 12

Course Title	Target Audience	Sessions	Duration (days/hrs)	Location	Date	Participants
Course Synopsis The APX CPS Programming and Template Building course provides communications management personnel and technicians with the knowledge and training necessary to build templates and program APX 7000/7500 subscriber radio's in the most efficient way possible. The content, parameters and exercises demonstrated in this class apply to the APX 7000 portable and APX 7500 mobile.						
APX Technical Subscriber Academy (Instructor–led) onsite at Broward County)	Radio Technicians	1	5 days	FL	Prior to Maintaining radios	Up to 12
Course Synopsis This course focuses on the knowledge required for a 2–way Radio Technician working in a communication environment or using the family of APX radios in the field. The course is specifically designed to provide significant amounts of hands–on, scenario based labs around configuration and troubleshooting. Key Loading and Management, Encryption, Over–The Air Programming and Mobile Radio Installation are some of the topics that will be covered in detail for both mobile and portable radios.						

1.3. Console Operator and Supervisor Training

Course Title	Target Audience	Sessions	Duration (days)	Location	Date	Participants
MCC 7500 Console Operator and Admin Upgrade Differences 10 training consoles (Instructor–led) onsite at Broward County)	Console Dispatch Supervisors	4 (4–hour sessions)	2	FL	Prior to training console operators	40 (10 per session)
MCC 7500 Console Operator Upgrade Differences 10 training consoles (Instructor–led) onsite at Broward County)	Console Dispatch Operators	24 (2–hour sessions/three per day)	8	FL	Prior to cutover	460 (20 per)
Operator Course Synopsis This course provides participants with an introduction to the dispatch console, its basic operation and tailored job aids which will be available for assistance in operation. Through facilitation and hands–on activities, the user learns how to perform common tasks associated with the console operation. **Admin Course Synopsis** This course provides participants with the knowledge and skills to manage and utilize the MCC 7500 console administrator functions. Through facilitation and hands–on activities, the participant learns how to customize the console screens.						

1.4. Radio Subscriber Train–the–Trainer

Course Title	Target Audience	Sessions	Duration (days)	Location	Date	Participants
APX Mobile and Portable Train the Trainer (Instructor–led) onsite at Broward County)	Subscriber Trainers	14 (4–hour sessions)	7	FL	Prior to training end users	200 (15 per)
Course Synopsis This course provides APX radio trainers with an introduction to their radio, its basic operation and tailored job aids available for assistance in operation. The learning experience is a mix of facilitation and hands–on activities to help users perform common tasks associated with their radio operation. Segmentation between user groups (i.e. Police, Fire/EMS, and Public Service) is encouraged to help focus instruction on the specific operational issues of the individual user group. This course is geared for customers who have an experienced dedicated training staff in their organization. It provides the customer's identified training personnel with the knowledge and practice applying training techniques that will enable them to successfully train their students. Trainers will use audio visual (Interactive End User Toolkits–iEUTK), facilitation and "hands–on" activities to facilitate learning events supported by tailored or customized training materials and job aides. They will become proficient in discussing common tasks associated with the operation of the customer's radios.						
Note: Upgrading from XTL/XTS to APX and experienced with Trunking)						

1.5. Microwave System Training

Course Title	Target Audience	Sessions	Duration (days/hrs)	Location	Date	Participants
ProVision Installation, Configuration & Management (Instructor–led) onsite at Broward County)	Network Operations Center (NOC) operators and engineers involved in managing microwave networks	1	2 days	FL	TBD	10
Course Synopsis The ProVision™ Installation, Configuration and Management course provides full guidance on the installation, use and administration of ProVision EMS software. The course will cover in detail all aspects of using the EMS for fault management, configuration management, performance monitoring and reporting.						
Eclipse Installation, Operation and Maintenance Course (Instructor–led) onsite at Broward County)	Installation and service personnel responsible for installation, configuration, test and maintenance procedures System Administrators and Technicians	1	3 days	FL	TBD	10

Course Title	Target Audience	Sessions	Duration (days/hrs)	Location	Date	Participants
Course Synopsis The Eclipse Installation, Operation and Maintenance course teaches students key functions of the Eclipse platform. The course includes an overview of all available equipment, basic configuration with the Portal craft tool, system commissioning, maintenance, diagnostics and troubleshooting.						

2. Course Descriptions

2.1. ASTRO 25 Fleetmapping Workshop

Duration

5 days.

Delivery Method

ILT–Instructor–led training.

Target Audience

Pre–Sale System Owners, Planners, Administrators, and Technicians

Course Synopsis

This workshop addresses topics necessary for the effective planning and mapping of an ASTRO 25 IV&D radio system. During this course, the participants will learn about ASTRO 25 features, capabilities, and restrictions in order to effectively plan for a new or upgraded ASTRO 25 system.

Prerequisite

None.

Course Objectives

After completing the course, the participant will be able to:

- Understand the methodologies used to configure radio users and groups with the goal of optimizing system resources.
- Enable participants to knowledgably assist with fleetmapping decisions.
- Perform the basic planning requirements and complete a simple fleetmap information template.
- Create a sample fleetmap based on sample operational requirement information.

2.2. ASTRO 25 Systems Applied Networking (NWT003)

Duration

5 days.

Delivery Method

Instructor–led.

Target Audience

Technical system managers, technicians and/or engineers.

Course Synopsis

This course provides the participant with the necessary networking information required for understanding the Network Transport subsystem components installed in an ASTRO 25 IV&D communications system. The course includes familiarization with basic networking concepts and the networking components deployed throughout the system.

Prerequisites

None.

Learning Outcome

After completing this course, the participant will be able to:

- Understand basic networking concepts.
- Describe the various Transport Network Subsystem components.
- Define the LAN topologies for each system.
- Define the WAN topologies for each system.
- Identify the expanse of Network Management across each system.
- Discuss HP switch and Motorola Series router configurations.
- Describe and perform the backup/restore procedures for the HP switch and Motorola Series routers in the ASTRO 25 system.

Course Modules

Module 1: Basic Networking Concepts:

- Terminology and acronyms.
- LANS and WANS.
- Basic protocols.
- Network troubleshooting commands.

Module 2: ASTRO 25 Network Transport Subsystem:

- Call Processing:
  - Block diagram description of how a call travels through the system.
  - Identification and isolation of the network components.
- Network Components.
- HP switches–description and location in the network:
  - Menu–driven configuration.
  - Web–based configuration.
- Cooperative WAN Routing–description and location in the network.
- Motorola Series Routers–description and location in the network:
  - Command line interface configuration.

- Menu–driven configuration.
- Web–based configuration.

- Router Manager–location and application identification.

Module 3: Network Concepts

- Identify the LAN portion(s) of the network.
- Identify the LAN Protocols and describe where they are present in the network.
- Identify the WAN portion(s) of the network.
- Identify the WAN protocols and describe where they are present in the network.

Module 4: Hands–On Practice

- Backup and restore HP switch configurations.
- Backup and restore Motorola Series router configurations.
- Create router boot configuration file.
- Flash routers with new operating system.

2.3. ASTRO 25 IV&D M & L Core Systems Overview (ACS716200)

Duration

2 Hours.

Delivery Method

OLT–Online Training.

Target Audience

- System Managers.
- Technical System Managers.
- System Technicians.
- Field Service Technicians.

Course Synopsis

ASTRO 25 IV&D M/L Core Systems Overview self–paced course is the starting point of all ASTRO 25 IV&D Trunking with M/L Core Systems. In order to take other classes, students are required to complete this course and obtain a passing score on the corresponding test. The course provides an overview of the architecture, features, components, and functions of ASTRO Release 7.16 M/L Core Trunking systems.

Prerequisite

Completion of the following courses or equivalent experience:

- ASTRO 25 Systems Applied Networking (NWT003).
- Bridging the Knowledge Gap (ACT100 or ACT101).

Course Objectives

By the end of this course, you will be able to:

- Describe M/L Core architectures, features, and components.
- Describe remote sites and their components.
- Describe information types and paths used for control, voice, and data.
- Describe the servers and databases used in an ASTRO 25 M/L Core systems.

2.4. ASTRO 25 IV&D Introduction to Radio System Management Applications (ACS716201)

Duration

2 Hours.

Delivery Method

OLT–Online Training.

Target Audience

System managers, technical system managers, system technicians, and other application users.

Course Synopsis

This virtual, interactive course provides a high–level overview of the Motorola Radio System Management applications through recorded demonstrations of common system tasks.

Prerequisite

Completion of the following courses or equivalent knowledge:

- Bridging the Knowledge Gap–Technicians (ACT100).

Required

- Take one of the following depending on system supporting:
  - ASTRO 25 IV&D with M/L Core Systems Overview (ACS716200).
  - ASTRO 25 IV&D Conventional with M Core Overview (ACS716420).

Course Modules

Module 1: Licensing Applications:

- License Manager.

Module 2: Monitoring Applications:

- Affiliation Display.
- Zone Watch.
- Radio Control Manager.
- UEM.

Module 3: Network Configuration Applications:

- UNC.

Module 4: Reporting and Logging Applications:

- ATIA Log Viewer

- Reports:
  - RCM Reports.
  - System Historical Reports.
  - Zone Historical Reports.
  - Dynamic Reports.
  - UNC and License Manager Reports.

2.5. ASTRO 25 IV&D Radio System Administrator Workshop (ACS715102)

Duration

5 days.

Delivery Method

ILT = Instructor Led Training.

Target Audience

System Administrators, technical system administrators, system technicians, and other application users. The applications covered in this course only apply to customers with releases 7.15 or newer.

Course Synopsis

This workshop covers administrator functions for an ASTRO 25 Integrated Voice and Data (IV&D) System. Learning activities in this course focus on how to use the different ASTRO 25 IV&D System Management applications. Participants will be provided with an opportunity to discuss how to structure their organization and personnel for optimal ASTRO 25 IV&D system use.

Prerequisite

Completion of the following courses or equivalent knowledge:

- Bridging the Knowledge Gap–System Administrators (ACT101).
- Networking Essentials in Communication Equipment (NST762).
- Advanced Networking in Motorola Communications Equipment (NWT003).

Take one of the following depending on system supporting:

- ASTRO 25 IV&D with M core System Overview (ACS715200).
- ASTRO 25 IV&D Conventional with M core Overview (ACS715420).
- ASTRO 25 IV&D with L core System Overview (ACS715430).
- ASTRO 25 IV&D Introduction to Radio System Management Applications (ACS715201).

Course Objectives

After completing the course the participant will be able to:

- Describe the relationship between radio programming, console administration and system management, and the impact of this relationship on system planning.
- List the network management tools applicable at each phase of the system life cycle.
- Identify the advantages and disadvantages of options available for the configuration of system infrastructure and user parameters.

- Use the report and real–time data to monitor performance and make adjustments necessary to maintain acceptable system performance levels.
- Explain the key factors that affect the planning of ASTRO 25 Radio Systems and create a Fleetmap.

Course Modules

Module 1: Course Introduction

Module 2: Basic Concepts of Radio System Administration:

- Topic 2–1: Why Did They Do it That Way?
- Topic 2–2: Radio Programming vs. System Management.
- Topic 2–3: List of Management Applications.

Module 3: Configuration:

- Topic 3–1: Configuration Process and Tools.
- Topic 3–2: Adding Radios and Talkgroups to the System.
- Topic 3–3: Editing Existing Records in PM.
- Topic 3–4: Setting System–Level Parameters.
- Topic 3–5: Creating Managers and Controlling Access.
- Topic 3–6: Managing Configurations with UNCDS.
- Topic 3–7: Configuring Sites and Channels with PM.

Module 4: Operation and Optimization:

- Topic 4–1: License Sharing.
- Topic 4–2: Live Monitoring of the System.
- Topic 4–3: Report Generation.
- Topic 4–4: Network Maintenance Tools.

Module 5: Communications Planning:

- Topic 5–1: Factors That Impact Communications System Planning.
- Topic 5–2: Fleetmapping.

2.6. ASTRO 25 ISSI 8000/CSSI 8000 Feature Overview (AST2005.00E)

Duration

1 Hour.

Delivery Method

OLT–Online Training.

Target Audience

System managers, technical system managers and system technicians.

Course Synopsis

This self–paced course describes the optional Inter–RF Subsystem Interface available in the ASTRO 25 IV&D System. It presents a description of the feature, its benefits and components, call processing scenarios, and an overview of the installation process.

Prerequisites

Completion of the following courses or equivalent knowledge:

- Bridging the Knowledge Gap for Technicians (ACT100).

Required:

- Take one of the following depending on system supporting:
  - ASTRO 25 IV&D with M Core System Overview (ACS713200).
  - ASTRO 25 IV&D with L Core System Overview (ACS713430).

Learning Outcomes

After completing the course the participant will be able to:

- Describe the ISSI 8000/CSSI 8000 feature.
- Describe the components of the ISSI 8000/CSSI 8000 feature.
- Describe the communication scenarios if this feature is enabled.
- Follow the installation and configuration process if this feature is added to an ASTRO system.

Course Modules

Module 1: Introduction:

- Project 25 ISSI Trunking.
- ISSI vs. CSSI.
- Interoperability vs. Operability.
- Levels of Interoperability.
- Requirements and Capacity.
- Features and Benefits.
- Subscriber Support.
- Services Supported.

Module 2: Architecture and Components:

- ASTRO Zone Core Architecture.
- Components.
- Other ASTRO Applications.

Module 3: Call Processing Scenarios:

- Coordinated Incident Management.
- Console Subsystem Interface.
- Deploy and Assist.
- System Site Access.

Module 4: Installation and Configuration:

- Installation and Configuration Process.

Summary

Quiz

2.7. ASTRO 25 IV&D Dynamic System Resilience Overview (ACS715023)

Duration

2 Hours.

Delivery Method

OLT–Online Training.

Target Audience

System administrators, system technicians, field technicians.

Course Synopsis

The Overview for ASTRO 25 IV&D Dynamic System Resilience is a self–study training course intended to provide a technical overview of DSR. The course describes how DSR adds a geographically separate backup for the Master Site to protect against a catastrophic failure.

Prerequisite

- ACS715200–System Overview for ASTRO 25 IV&D with M Core.

Course Objectives

After completing this course, the student will be able to:

- Differentiate between a non–DSR Master Site and a DSR Master Site.
- Describe the DSR components, operation and functionality of each of the following services:
  - Voice.
  - Data.
  - Network Management.
  - Network Transport.
  - IP Services.

2.8. ASTRO 25 IV&D M Core Workshop (ACS715103)

Duration

5 Days.

Delivery Method

ILT = Instructor Led Training.

Target Audience

M Core master site technicians.

Course Synopsis

The ASTRO 25 IV&D with M Core course teaches advanced troubleshooting skills and best practices for the Trunked Large Systems. The course also focuses on gathering and analyzing system information to implement appropriate action(s) that return a system to full operational status.

Prerequisite

Completion of the following courses or equivalent knowledge:

- Bridging the Knowledge Gap (ACT100 or ACT101).
- Networking Essentials in Communication Equipment (NST762).
- Advanced Networking in Motorola Communications Equipment (NWT003).
- Introduction to Radio System Administration (ACS714201–E).
- ASTRO 25 Integrated Voice and Data System Overview (ACS714200–E).

Course Objectives

After completing this course, the participant will be able to:

- Describe the ASTRO 25 System architecture.
- Identify the functional and radio subsystems that comprise the ASTRO 25 System.
- Explain and discuss call flow and data flow through Large System Core devices and their subsystems.
- Perform recommended routine maintenance procedures for the ASTRO 25 Large System Core.
- Utilize the troubleshooting tools to diagnose a fault and restore the Large System Core to the level of the Motorola–supported service strategy.

Course Modules

Module 1: Course Introduction

Module 2: Overview of M Core Systems:

- Topic 2–1: Intro to M Core.
- Topic 2–2: What's New in This Release.
- Topic 2–3: Required Subsystems.
- Topic 2–4: Call Control and Audio Paths.
- Topic 2–5: Optional Services and Subsystem.

Module 3: System Troubleshooting Tools:

- Topic 3–1: Recommended Test Equipment.
- Topic 3–2: Detection and Monitoring Tools.
- Topic 3–3: Performance Management Tools.
- Topic 3–4: Network Management Overview.
- Topic 3–5: Network Management Servers.
- Topic 3–6: Network Management Databases.

- Topic 3–7: Network Management Clients.
- Topic 3–8: Network Management Applications.

Module 4: Network Transport Subsystem:

- Topic 4–1: Network Transport Review.
- Topic 4–2: Core LAN Switch.
- Lab Activity.
- Topic 4–3: Routers.

Module 5: Virtual Management Server (VMS) System Servers:

- Topic 5–1: Servers Overview.
- Topic 5–2: Direct Attached Storage (DAS).
- Topic 5–3: Managing Servers and VMS using Vsphere.
- Lab Activity.

Module 6: Network Management and Zone Controller Applications:

- Topic 6–1: Zone Controller.
- Topic 6–2: Zone Controller Configuration.
- Topic 6–3: UNCW and Network Infrastructure Overview.
- Lab Activity.

Module 7: Data Subsystem and Customer Enterprise Network (CEN) Interface:

- Topic 7–1: Data Service Overview.
- Topic 7–2: Data Service Components.
- Topic 7–3: Data Traffic Flow.
- Topic 7–4: Data Paths.

Module 8: Troubleshooting:

- Topic 8–1: Recommended Routine Maintenance.
- Topic 8–2: Database Backups.
- Topic 8–3: Troubleshooting.
- Topic 8–4: System Level Reliability.
- Lab Activity

Appendix A: Non–CSA Server Architecture

Appendix B: MGEG & AEB–Dispatch Subsystems:

- Topic B–1: Circuit–Based Dispatch Subsystem Overview.
- Topic B–2: Motorola Gold Elite Gateway (MGEG).
- Topic B–3: Ambassador Electronics Bank (AEB).

2.9. ASTRO 25 IV&D IP Based Digital Simulcast (ACS715217)

Duration

3 Days.

Delivery Method

ILT = Instructor Led Training.

Target Audience

Simulcast site technicians.

Course Synopsis

The ASTRO 25 IV&D IP Based Digital Simulcast workshop provides an understanding of the components that comprise the ASTRO 25 IV&D IP Simulcast subsystem, and how they operate in conjunction with each other. The workshop also explains the tools and methods available for troubleshooting components within the IP Based Simulcast subsystem.

Prerequisite

Completion of the following courses or equivalent knowledge:

- Bridging the Knowledge Gap–Technicians (ACT100).
- Networking Essentials in Communication Equipment (NST762).
- Advanced Networking in Motorola Communications Equipment (NWT003).

Take one of the following depending on system supporting:

- ASTRO 25 IV&D with M core System Overview (ACS715200).
- ASTRO 25 IV&D with L core System Overview (ACS715430).

Course Objectives

After completing this course, the participant will be able to:

- Recognize the flow of message and control data within an ASTRO 25 IV&D IP Digital Simulcast subsystem.
- Identify the major components and connections within an ASTRO 25 IV&D IP Digital Simulcast subsystem prime and remote sites.
- Recognize how calls are processed within an ASTRO 25 IV&D IP Digital Simulcast subsystem.
- Perform maintenance and troubleshooting of select components in an ASTRO 25 IV&D IP Digital Simulcast subsystem.

Course Modules

Module 1: Course Introduction

Module 2: Repeater Site:

- Topic 2–1: Simulcast Review.
- Topic 2–2: IP Simulcast with GTR 8000 Subsystem Overview.
- Topic 2–3: Site Configurations.
- Topic 2–4: IP Simulcast–Integrated Voice and Data.

Module 3: GCP 8000 Site Controller

- Topic 3–1: GCP 8000 Overview.

- Topic 3–2: GCP 8000 Physical Description.
- Topic 3–3: GCP 8000 Configuration.
- Topic 3–4: GCP 8000 Diagnostics and Troubleshooting.

Module 4: GTR 8000 Comparator:

- Topic 4–1: GCM 8000 Overview.
- Topic 4–2: GCM 8000 Physical Description.
- Topic 4–3: GCM 8000 Configuration.
- Topic 4–4: GCM Diagnostics and Troubleshooting.

Module 5: IP Simulcast Network:

- Topic 5–1: Ethernet LAN Switches:
  - 5–1.1: Ethernet Switch–Overview.
  - 5–1.2: Ethernet Switch–Physical Description.
  - 5–1.3: Ethernet Switch–Configuration.
  - 5–1.4: Ethernet Switch–Diagnostics and Troubleshooting.
- Topic 5–2: Prime Site Routers/Gateways:
  - 5–2.1: Prime Site Routers/Gateways–Overview.
  - 5–2.2: Prime Site Routers/Gateways–Physical Description.
  - 5–2.3: Prime Site Routers/Gateways–Configuration.
  - 5–2.4: Prime Site Routers/Gateways–Diagnostics and Troubleshooting.
- Topic 5–3: Remote Site Routers/Gateway:
  - 5–3.1: Remote Site Routers/Gateway–Overview.
  - 5–3.2: Remote Site Routers/Gateway–Physical Description.
  - 5–3.3: Remote Site Routers/Gateway–Configuration.
  - 5–3.4: Remote Site Routers/Gateway–Diagnostics and Troubleshooting.

Module 6: TRAK 9100 Site Reference:

- Topic 6–1: TRAK 9100 Site Reference Overview.
- Topic 6–2: TRAK 9100 Site Reference Physical Description.
- Topic 6–3: TRAK 9100 Site Reference Installation and Configuration.
- Topic 6–4: TRAK 9100 Site Reference Diagnostics and Troubleshooting.

Module 7: GTR 8000 Base Radio Subsystem:

- Topic 7–1: GTR 8000 Base Radio Subsystem Overview.
- Topic 7–2: GTR 8000 Base Radio Subsystem Physical Description.
- Topic 7–3: GTR 8000 Base Radio Subsystem Configuration.
- Topic 7–4: GTR 8000 Base Radio Subsystem Diagnostics and Troubleshooting.

Module 8: IP Simulcast Subsystem Maintenance and Troubleshooting:

- Topic 8–1: Maintenance and Troubleshooting Overview.
- Topic 8–2: Troubleshooting Tools.
- Topic 8–3: Device Fault Management.
- Topic 8–4: Troubleshooting Process.
- Topic 8–5: Troubleshooting Site Links.
- Topic 8–6: Motorola Support Centers.

2.10. ASTRO 25 IV&D GTR 8000 Repeater Site Workshop (ACS715208)

Duration

3 Days.

Delivery Method

ILT = Instructor Led Training.

Target Audience

GTR 8000 Site Technicians.

Course Synopsis

This workshop describes the components in the ASTRO 25 IV&D System Repeater Site with GTR 8000 expandable site subsystem. This course also presents how the GTR 8000 expandable site subsystem operates and explains the tools and methods available for troubleshooting components within the subsystem.

Prerequisite

Completion of the following courses or equivalent experience:

- Bridging the Knowledge Gap–Technicians (ACT100).
- Networking Essentials in Communication Equipment (NST762).
- Advanced Networking in Motorola Communications Equipment (NWT003).

Take one of the following depending on system supporting:

- ASTRO 25 IV&D with M core System Overview (ACS715200).
- ASTRO 25 IV&D with L core System Overview (ACS715430).
- ASTRO 25 IV&D Introduction to Radio System Management Applications (ACS715201).

Course Objectives

After completing this course, the participant will be able to:

- Describe the ASTRO 25 IV&D Repeater Site with GTR 8000 Expandable Site Subsystem configurations and components.
- Identify the GCP 8000 Site Controller functions and configuration requirements.
- Describe the connections and interfaces to the GCP 8000.
- Diagnose and troubleshoot the GCP 8000.
- Describe the functionality of the GTR 8000 Expandable Site Subsystem.
- Configure and troubleshoot the ASTRO 25 Repeater Site with GTR 8000 Expandable Site Subsystem.
- Configure and troubleshoot the Network Transport subsystem.

Course Modules

Module 1: Course Introduction

Module 2: GTR 8000 Repeater Site:

- Topic 2–1: GTR 8000 Repeater Site Overview.
- Topic 2–2: Operational Modes.
- Topic 2–3: Site Configurations.
- Topic 2–4: Site Components.
- Topic 2–5: Time Synchronization and Frequency Reference.
- Test Your Understanding Exercise.

Module 3: GCP 8000 Site Controller:

- Topic 3–1: GCP 8000 Overview.
- Topic 3–2: GCP 8000 Physical Description.
- Topic 3–3: GCP 8000 Configuration.
- Topic 3–4: GCP 8000 Diagnostics and Troubleshooting.
- Test Your Understanding Exercise.

Module 4: GTR 8000 Expandable Site Subsystem:

- Topic 4–1: GTR 8000 Expandable Site Subsystem Overview.
- Topic 4–2: GTR 8000 Expandable Site Subsystem Theory of Operation.
- Topic 4–3: GTR 8000 Expandable Site Subsystem Configuration.
- Topic 4–4: GTR 8000 Expandable Site Subsystem Diagnostics and Troubleshooting.
- Test Your Understanding Exercise.

Module 5: Radio Frequency Distribution System (RFDS):

- Topic 5–1: RFDS Overview.
- Topic 5–2: RFDS Physical Description.
- Topic 5–3: RFDS Configuration.
- Topic 5–4: RFDS Diagnostics and Troubleshooting.
- Test Your Understanding Exercise.

Module 6: Network Transport Subsystem:

- Topic 6–1: Network Transport Subsystem Overview.
- Topic 6–2: Ethernet Switch Diagnostics and Troubleshooting.
- Topic 6–3: Site Gateways.
- Topic 6–4: Gateway Diagnostics and Troubleshooting.
- Test Your Understanding Exercise.

Module 7: GTR 8000 Site Maintenance and Troubleshooting:

- Topic 7–1: Troubleshooting Tools.
- Topic 7–2: Troubleshooting Methodology.
- Topic 7–3: Troubleshooting Repeater Site Link.
- Topic 7–4: Motorola Support Centers.

2.11. APX CPS Programming and Template Building

Duration

2 Days in Field.

Delivery Method

Instructor–led.

Target Audience

Radio Technicians, System Managers and anyone who has the responsibility of programming APX subscriber radios.

Course Synopsis

The APX CPS Programming and Template Building course provides communications management personnel and technicians with the knowledge and training necessary to build templates and program APX 7000/7500 subscriber radio's in the most efficient way possible. The content, parameters and exercises demonstrated in this class apply to the APX7000 portable and APX 7500 mobile.

Prerequisites

Knowledge of the basic features and options of two–way radios, and the basic concepts of conventional and trunking systems.

Course Objectives

After completing this course, the student will be able to:

- Build APX 7000/7500 templates using the APX Customer Programming Software (CPS).
- Program the specific parameters related to various radio system configurations: Conventional, Single Site Trunking, Simulcast, SmartZone, ASTRO 25 and ASTRO 25 X2 .
- Demonstrate detailed knowledge of APX CPS navigation, tools, options and features that make efficient programming of the radio possible.
- Demonstrate a complete understanding of APX CPS efficiency tools, such as Cloning, Drag and Drop, Codeplug Comparison, Radio Flashing, Advance System Key Administration and others.

Course Outline

- Introduction to APX 7000 Radio.
- Introduction to APX CPS.
- APX CPS Install, Setup and Configuration.
- Navigating APX CPS.
- APX CPS Data Transfer.
- Understanding and Interpreting Radio Information.
- Detailed Review of Codeplug Contents.
- APX Conventional Codeplug Build.
- APX Type II Trunking Codeplug Build.
- APX ASTRO 25 Trunking Codeplug Build.
- Building Scan List.
- Additional/Advanced CPS Functionality.

2.12. APX Technical Subscriber Academy

Duration

5 Days.

Delivery Method

ILT–Instructor–led Training (Classroom).

Target Audience

Radio technicians.

Course Synopsis

This course focuses on the knowledge required for a 2–way Radio Technician working in a communication environment or using the family of APX radios in the field. The course is specifically designed to provide significant amounts of hands–on, scenario based labs around configuration and troubleshooting. Key Loading and Management, Encryption, Over–The Air Programming and Mobile Radio Installation are some of the topics that will be covered in detail for both mobile and portable radios.

Objectives

After completing this course, the student will be able to:

- Distinguish between the features and specifications of APX7000 and APX 7500 radios.
- Verify the correct operations of the APX 7000 and the APX 7500 radio.
- Maintain and troubleshoot an APX 7000 and APX 7500 radio.
- Disassemble and reassemble the radio using the documented procedures.
- Verify the housing integrity of an APX 7000 portable radio.
- Flash upgrade an APX 7000 and APX 7500 radio.

Prerequisites

Completion of the following courses:

- CPS Programming and Template Building Overview (ADT001–V or Test out ADT001–T).

Completion of the following courses or equivalent experience in Radio Communications:

- Communication Systems Concepts (NST021).
- Radio Systems Overview (RCS002–E or Test out RCS002–T).
- Theory of Radio Operations (RCS003–E or TEST out RCS003–T).

Course Outline

- APX Radio Introduction.
- APX Radio Performance Checks.
- APX Radio Alignment.
- APX Radio Theory Of Operation.
- Radio Disassembly/Reassembly.
- Vacuum Testing For Submergibility.
- Mobile Radio Installation and Configuration.

- Advanced Customer Programming Software.
- Radio Troubleshooting.

2.13. MCC 7500 Operator

Duration

4 Hours.

Delivery Method

Instructor–led.

Target Audience

Dispatch console operators, supervisors, system administrators, and support personnel.

Course Synopsis

This course provides participants with an introduction to the dispatch console, its basic operation and tailored job aids which will be available for assistance in operation. Through facilitation and hands–on activities, the user learns how to perform common tasks associated with the console operation.

Course Objectives

- Perform basic operational tasks of the dispatch console.
- Utilize the provided job aids to perform specific tasks associated with the console.
- Understand a high level view of the system configuration.
- High–level overview of the customer system configuration.
- General console operation.
- Proper operating procedures for specific customer features.

Recommended Prerequisites

None.

Key Topics

- Overview.
- Communicating with Radios.
- Advanced Signaling Features.
- Resource Groups.
- Working with Configurations.
- Working with Aux IOs.
- Troubleshooting.

2.14. MCC 7500 Supervisor

Duration

4 hours Operator, plus 4 hours Admin.

Delivery Method

Instructor–led.

Target Audience

Dispatch supervisors and system administrators.

Admin Course Synopsis

This course provides participants with the knowledge and skills to manage and utilize the MCC 7500 console administrator functions. Through facilitation and hands–on activities, the participant learns how to customize the console screens.

Course Objectives

- Understand the menu items and tool bar icons.
- Edit folders, multi–select/patch groups, auxiliary input output groups, windows and toolbars.
- Add/delete folders.

Recommended Prerequisites

None.

Key Topics

- Introduction.
- Configurations.
- Folders and Resource Setup.
- Customizing Folders.
- Auto Starting the MCC 7500 Dispatch Console.
- Editing Preferences.
- Configuring the Toolbar.
- Setting Up Aux IOs.
- Resource Groups.

2.15. APX Portable and APX Mobile–Train the Trainer

Duration

Up to 8 hours.

Delivery Method

Instructor–led.

Target Audience

APX trainers, supervisors and support personnel.

Course Synopsis

This course provides APX radio trainers with an introduction to their radio, its basic operation and tailored job aids available for assistance in operation. The learning experience is a mix of facilitation

and hands–on activities to help users perform common tasks associated with their radio operation. Segmentation between user groups (i.e. Police, Fire/EMS, and Public Service) is encouraged to help focus instruction on the specific operational issues of the individual user group. This course is geared for customers who have an experienced dedicated training staff in their organization. It provides the customer's identified training personnel with the knowledge and practice applying training techniques that will enable them to successfully train their students. Trainers will use audio visual (Interactive End User Toolkits–iEUTK), facilitation and "hands–on" activities to facilitate learning events supported by tailored or customized training materials and job aides. They will become proficient in discussing common tasks associated with the operation of the customer's radios.

Required Pre–Work

None.

Recommended Prerequisites

Previous two–way radio and training experience.

Course Objectives

- High–level overview of the customer system configuration.
- General radio operation.
- Proper operating procedures for specific customer features.
- Perform basic operational tasks of the radio.
- Utilize the provided job aids to perform specific tasks associated with the radio.

Course Outline

- Basics.
- Controls.
- Top and Side Buttons.
- Switches.
- 3 Position toggle.
- 2 Position Concentric.
- Home key.
- Data Key.
- Display.
- Front Display.
- Top Display.
- Display Light.
- Intelligent Lighting.
- Push to Talk or Accessory PTT Found on the Microphone.
- Hub, Hang Up Box (Mobile).
- Menu.
- Menu Screen Anatomy.
- Navigating Menu Screen.
- Recent Call List (Model 3.5).
- Unified Call List–Contacts (Model 3.5).
- Dual Sided Radio (Model 3.5).
- Dual Mics.

- Dual Speakers.
- Accessory Connector.
- Specific Features.
- Changing Talkgroups/Channels.
- Changing Zones.
- Mute tones of keypad.
- Talkgroup Call.
- Private Call.
- Accessing Private Call Feature.
- Initiating Private Call.
- Call List Programming.
- Announcement/All Call (Calls involving Multiple Talkgroups).
- Initiating Announcement/All Call.
- Direct/Talkaround.
- Failsoft.
- Radio Profiles.
- Accessing and Changing Radio Profile.
- Optional Features.
- Scan.
- Scan Program.
- Priority Scan.
- Dynamic Priority.
- Telephone Interconnect.
- Accessing Telephone Interconnect Feature.
- Initiating a Phone Call.
- Phone List Programming.
- Data Services.
- Text Messaging.
- Accessing the Text Messaging Feature.
- Creating a Free Form Text Message.
- Sending a “Canned Text Message.
- GPS.
- OTAP.
- Encryption.
- Emergency.

2.16. ProVision Installation, Configuration & Management

Duration

2 Days.

Delivery Method

Instructor–led.

Target Audience

Network Operations Center (NOC) operators and engineers involved in managing microwave networks using the ProVision EMS.

Course Synopsis

Aviat ProVision™ is a powerful, standards-based Element Management System (EMS). Designed to simplify Carrier Ethernet and TDM network designs and services, it provides superior intelligence for mobile and private network operators. ProVision delivers network management across the full Aviat product portfolio, key partner products and many third party SNMP-based platforms. It provides efficient, seamless end-to-end network management solutions for TDM, Carrier Ethernet, and hybrid microwave networks.

The ProVision™ Installation, Configuration and Management course provides full guidance on the installation, use and administration of ProVision EMS software. The course will cover in detail all aspects of using the EMS for fault management, configuration management, performance monitoring and reporting.

By leveraging the extensive hands-on labs exercises (50% of the course duration) provided, students will be able to master the ProVision EMS features and significantly reduce complex configuration time for deployment.

Courses are conducted by Aviat expert trainers in a mentoring environment backed by their deep technology expertise and experience in implementation of microwave wireless and IP networks.

Course Objectives

- Installation and configuration of ProVision software.
- Basic diagnostics, troubleshooting and preventive maintenance of microwave network elements using ProVision EMS.
- Setup users and administer features for fault management, configuration management and reporting.

Recommended Prerequisites

- Participants must complete ProVision System Overview e-learning course.
- Participants should have knowledge and experience in the areas of network operations fundamentals and telecommunications fundamentals.
- The student will need a Notebook computer with an Ethernet port and running on one of the following Operating Systems:
  - Windows XP Pro.
  - Windows Vista.
  - Windows 7.
  - Windows 2003 Server.
  - Windows 2008 Server.

2.17. Eclipse Installation, Operation and Maintenance

Duration

3 Days.

Delivery Method

Instructor–led.

Target Audience

Installation and service personnel responsible for installation, configuration, test and maintenance procedures for the Eclipse platform.

Course Synopsis

The Eclipse™ product family is a highly modular and scalable platform that delivers a unique combination of high capacity hybrid or all-packet transport, Carrier Ethernet/IP networking, and comprehensive mission critical microwave features, enabling operators to prepare for the all-IP future.

The Eclipse Installation, Operation and Maintenance course teaches students key functions of the Eclipse platform. The course includes an overview of all available equipment, basic configuration with the Portal craft tool, system commissioning, maintenance, diagnostics and troubleshooting. Extensive hands-on labs (nearly 50% of the course duration) offer students with scenarios they will face in real deployments in their networks.

Courses are conducted by Aviat expert trainers in a mentoring environment backed by their deep technology expertise and experience in implementation of microwave wireless and IP networks.

Course Objectives

- Basic installation and configuration for Eclipse equipment.
- Preventative maintenance on the relevant Eclipse equipment.
- Basic diagnostics and troubleshooting of the relevant Eclipse equipment.

Recommended Prerequisites

- Participants must complete Eclipse System Overview e-learning course.
- Participants should have a basic understanding of Electronics, Telecommunications and IP Fundamentals and have basic computer skills.
- Each student must bring an IBM compatible laptop PC and have administrator rights on the PC (to allow installation of the Portal craft tool).
- The PC must have minimum parameters of:
  - Pentium 4 or later w/ 1GB of RAM and 250 Mb of free hard drive space.
  - Microsoft Windows XP, Vista, or Windows 7.
  - USB Port.
  - Network card (LAN Port).
  - DB9 serial port connection or adapter (optional).

Schedule 4
Recommended Spares

SITE	SPARE QTY	NOMENCLATURE	PRICE PAGE CATEGORY	DESCRIPTION
Sunrise Master	1	DLN6975	Recommended Spare Parts for Main P25 System Core	FRE: DL380 G9 HC 900 GB DISK
Sunrise Master	1	DLN6977	Recommended Spare Parts for Main P25 System Core	FRE: DL380 G9 LC 600 GB DISK
Sunrise Master	1	DLN6972	Recommended Spare Parts for Main P25 System Core	FRU: DL380 G9 POWER SUPPLY
Sunrise Master	1	DLN6970	Recommended Spare Parts for Main P25 System Core	FRU: DL380 G9 HARD DRIVE
Sunrise Master	1	DLN6973	Recommended Spare Parts for Main P25 System Core	FRU: DL380 G9 FAN
Sunrise Master	1	DLN6971	Recommended Spare Parts for Main P25 System Core	FRU: DL380 G9 DVD DRIVE
Sunrise Master	1	DLN6880	Recommended Spare Parts for Main P25 System Core	DAS - CHASSIS ONLY
Sunrise Master	1	DLN6878	Recommended Spare Parts for Main P25 System Core	DAS - 600 GB SAS HARD DRIVE
Sunrise Master	1	DLN6978	Recommended Spare Parts for Main P25 System Core	FRU: DOTHILL 4524 RAID I/O CONTROLLER MODULE
Sunrise Master	1	DLN6867	Recommended Spare Parts for Main P25 System Core	DAS POWER SUPPLY
Sunrise Master	1	CKN6967	Recommended Spare Parts for Main P25 System Core	CABLE, DATA,MINI-SAS TO MINI-SAS HD, LENGTH 1M
Sunrise Master	1	SQM01SUM0205	Recommended Spare Parts for Main P25 System Core	GGM 8000 GATEWAY
Sunrise Master	1	CA01616AA	Recommended Spare Parts for Main P25 System Core	ADD: AC POWER
Sunrise Master	1	CLN1856	Recommended Spare Parts for Main P25 System Core	2620-24 ETHERNET SWITCH
Sunrise Master	1	CLN1858	Recommended Spare Parts for Main P25 System Core	3800-48 ETHERNET SWITCH

SITE	SPARE QTY	NOMENCLATURE	PRICE PAGE CATEGORY	DESCRIPTION
Sunrise Master	1	CLN1856	Recommended Spare Parts for Main P25 System Core	2620-24 ETHERNET SWITCH
Sunrise Master	1	T8126	Recommended Spare Parts for Main P25 System Core	FORTINET FIREWALL APPLIANCE
Sunrise Master	1	DLN6940	Recommended Spare Parts for Main P25 System Core	460W POWER SUPPLY FOR DL380P
Sunrise Master	1	DLN6967	Recommended Spare Parts for Main P25 System Core	FRU: 500 GB SATA DRIVE
Sunrise Master	1	CLN8489	Recommended Spare Parts for Main P25 System Core	48 PORT TERMINAL SERVER
Sunrise Master	1	CLN1857	Recommended Spare Parts for Main P25 System Core	HP X311 REDUNDANT POWER SUPPLY
Sunrise Master	1	SQM01SUM0205	Recommended Spare Parts for Main P25 System Core	GGM 8000 GATEWAY
Sunrise Master	1	CA01616AA	Recommended Spare Parts for Main P25 System Core	ADD: AC POWER
Sunrise Master	1	T8126	Recommended Spare Parts for Main P25 System Core	FORTINET FIREWALL APPLIANCE
BC Station 106	1	SQM01SUM0205	Recommended Spare Parts for Main P25 System Simulcast System	GGM 8000 GATEWAY
BC Station 106	1	CA01619AA	Recommended Spare Parts for Main P25 System Simulcast System	ADD: DC POWER
BC Station 106	1	DLN6885	Recommended Spare Parts for Main P25 System Simulcast System	FRU: XCVR 7/800 MHZ V2
BC Station 106	1	DLN6966	Recommended Spare Parts for Main P25 System Simulcast System	FRU: GCP 8000/GCM 8000/GPB 8000
BC Station 106	1	DLN6781	Recommended Spare Parts for Main P25 System Simulcast System	FRU: POWER SUPPLY
BC Station 106	1	DLN6455	Recommended Spare Parts for Main P25 System Simulcast System	CONFIGURATION/SERVICE SOFTWARE

SITE	SPARE QTY	NOMENCLATURE	PRICE PAGE CATEGORY	DESCRIPTION
BC Station 106	1	DLN6898	Recommended Spare Parts for Main P25 System Simulcast System	FRU: FAN MODULE
CORE Prime	1	DSTRAK91008E	Recommended Spare Parts for Main P25 System Simulcast System	PRIME/MASTER SITE REDUNDANT MODULAR FREQUENCY TIMING SYSTEM AC
CORE Prime	1	SQM01SUM0205	Recommended Spare Parts for Main P25 System Simulcast System	GGM 8000 GATEWAY
CORE Prime	1	CA01616AA	Recommended Spare Parts for Main P25 System Simulcast System	ADD: AC POWER
CORE Prime	1	CLN1859	Recommended Spare Parts for Main P25 System Simulcast System	2620-48 ETHERNET SWITCH
CORE Prime	1	DLN6966	Recommended Spare Parts for Main P25 System Simulcast System	FRU: GCP 8000/GCM 8000/GPB 8000
CORE Prime	1	DLN6781	Recommended Spare Parts for Main P25 System Simulcast System	FRU: POWER SUPPLY
CORE Prime	1	DLN6898	Recommended Spare Parts for Main P25 System Simulcast System	FRU: FAN MODULE
CORE	1	DSTRAK91061	Recommended Spare Parts for Main P25 System Simulcast System	FOUR PORT DDM
CORE	1	SQM01SUM0205	Recommended Spare Parts for Main P25 System Simulcast System	GGM 8000 GATEWAY
CORE	1	CA01619AA	Recommended Spare Parts for Main P25 System Simulcast System	ADD: DC POWER
CORE	4	DLN6885	Recommended Spare Parts for Main P25 System Simulcast System	FRU: XCVR 7/800 MHZ V2

SITE	SPARE QTY	NOMENCLATURE	PRICE PAGE CATEGORY	DESCRIPTION
CORE	4	DLN6895	Recommended Spare Parts for Main P25 System Simulcast System	FRU: PA 7/800 MHz
CORE	4	DLN6966	Recommended Spare Parts for Main P25 System Simulcast System	FRU: GCP 8000/GCM 8000/GPB 8000
CORE	4	DLN6781	Recommended Spare Parts for Main P25 System Simulcast System	FRU: POWER SUPPLY
CORE	1	DLN6455	Recommended Spare Parts for Main P25 System Simulcast System	CONFIGURATION/SERVICE SOFTWARE
CORE	4	DLN6898	Recommended Spare Parts for Main P25 System Simulcast System	FRU: FAN MODULE
CORE	1	DSAPM7487K248	Recommended Spare Parts for Main P25 System Simulcast System	ADVANCED POWER MONITOR, 740-870 MHZ, 36-60V DC (INC SINGLE COUPLER)
Sunrise Disp	1	B1912	Recommended Spare Parts for Console System	MCC SERIES DESKTOP SPEAKER
Sunrise Disp	1	B1914	Recommended Spare Parts for Console System	MCC SERIES DESKTOP GOOSENECK MICROPHONE
Sunrise Disp	1	B1913	Recommended Spare Parts for Console System	MCC SERIES HEADSET JACK
Sunrise Disp	1	TT2833	Recommended Spare Parts for Console System	COMPUTER, Z440 WORKSTATION WINDOWS 7 (NON RETURNABLE)
Sunrise Disp	1	B1934	Recommended Spare Parts for Console System	MCC 7500 VOICE PROCESSOR MODULE FRU
Sunrise Disp	1	CA00147AF	Recommended Spare Parts for Console System	ADD: MCC 7500 SECURE OPERATION
Sunrise Disp	1	CA00182AB	Recommended Spare Parts for Console System	ADD: AES ALGORITHM

SITE	SPARE QTY	NOMENCLATURE	PRICE PAGE CATEGORY	DESCRIPTION
Sunrise Disp	1	CLN1859	Recommended Spare Parts for Console System	2620-48 ETHERNET SWITCH
Sunrise Disp	1	SQM01SUM0205	Recommended Spare Parts for Console System	GGM 8000 GATEWAY
Sunrise Disp	1	CA01616AA	Recommended Spare Parts for Console System	ADD: AC POWER
Sunrise Disp	1	CA02086AA	Recommended Spare Parts for Console System	ADD: HIGH DENSITY ENH CONV GATEWAY
Pembroke Pines Disp	1	B1912	Recommended Spare Parts for Console System	MCC SERIES DESKTOP SPEAKER
Pembroke Pines Disp	1	B1914	Recommended Spare Parts for Console System	MCC SERIES DESKTOP GOOSENECK MICROPHONE
Pembroke Pines Disp	1	B1913	Recommended Spare Parts for Console System	MCC SERIES HEADSET JACK
Pembroke Pines Disp	1	TT2833	Recommended Spare Parts for Console System	COMPUTER, Z440 WORKSTATION WINDOWS 7 (NON RETURNABLE)
Pembroke Pines Disp	1	B1934	Recommended Spare Parts for Console System	MCC 7500 VOICE PROCESSOR MODULE FRU
Pembroke Pines Disp	1	CA00147AF	Recommended Spare Parts for Console System	ADD: MCC 7500 SECURE OPERATION
Pembroke Pines Disp	1	CA00182AB	Recommended Spare Parts for Console System	ADD: AES ALGORITHM
Coconut Creek Disp	1	B1912	Recommended Spare Parts for Console System	MCC SERIES DESKTOP SPEAKER
Coconut Creek Disp	1	B1914	Recommended Spare Parts for Console System	MCC SERIES DESKTOP GOOSENECK MICROPHONE
Coconut Creek Disp	1	B1913	Recommended Spare Parts for Console System	MCC SERIES HEADSET JACK

SITE	SPARE QTY	NOMENCLATURE	PRICE PAGE CATEGORY	DESCRIPTION
Coconut Creek Disp	1	TT2833	Recommended Spare Parts for Console System	COMPUTER, Z440 WORKSTATION WINDOWS 7 (NON RETURNABLE)
Coconut Creek Disp	1	B1934	Recommended Spare Parts for Console System	MCC 7500 VOICE PROCESSOR MODULE FRU
Coconut Creek Disp	1	CA00147AF	Recommended Spare Parts for Console System	ADD: MCC 7500 SECURE OPERATION
Coconut Creek Disp	1	CA00182AB	Recommended Spare Parts for Console System	ADD: AES ALGORITHM
CORE	1	SQM01SUM0205	Recommended Spare Parts for 8TAC Conventional System	GGM 8000 GATEWAY
CORE	1	CA01619AA	Recommended Spare Parts for 8TAC Conventional System	ADD: DC POWER
CORE	1	CLN1856	Recommended Spare Parts for 8TAC Conventional System	2620-24 ETHERNET SWITCH
CORE	1	FLN0001	Recommended Spare Parts for 8TAC Conventional System	FRU KIT, MLC8000
MICROWAVE	1	DQMWBROWARDSPARE	Recommended Spare Parts for Microwave System	Aviat spares

Schedule 5
Interfaces and Alarms

The intent of this Schedule 5 is to capture all interfaces required to achieve a fully functioning System that interfaces with all other systems required per the Agreement and the Specifications; to the extent any interface is not specifically identified herein but is required for Final Acceptance or to comply with the Agreement (inclusive of all exhibits and attachments), it is deemed included.

TYPE	DESCRIPTION
INTERFACES (unless otherwise specified, all interfaces are inbound and outbound (i.e., two way))	
	LOGGING
FIREWALL	VPI (one way)
	CAD
FIREWALL	ATIA PREMIERONE (one - or two - way, based upon functionality of CAD)
	Genesis
FIREWALL	ATIA (one way)
	ISSI Connection
FIREWALL	HMS (Plantation, Coral Springs, Fort Lauderdale) and neighboring Counties
FIREWALL	FTL Dispatch minimum 17 TGs
	RADIO MANAGEMENT
FIREWALL	Radio Management when used with Radio programming commuters will require a connection to the Administrator's IP Network (RM server and RM programming computers need to be on the same IP Network). Radio Management may also be utilized through Wi-Fi enabled APX radios and the RM Administrator's IP Network (connect via access points). Radio Management has the ability to use the ASTRO 25 Network through OTAP for Code Plug management and Flash Code updates. Radio Management also has the ability to update the firmware for APX radios utilizing the ASTRO 25 Network voice channels and the Group Services Radio feature.
	Location Solutions
FIREWALL	Integrated Voice and Data GPS
FIREWALL	Enhanced Data GPS
FIREWALL	PremierOne Automatic Location Service (ALS)
TYPE	**DESCRIPTION**
SITE SHELTER ALARMS (for each shelter) (all Site Alarms are one way)	
	BUILDING
UEM	EQUIPMENT ROOM DOOR
UEM	BULDING SMOKE ALARM
UEM	TEMERATURE HI
UEM	TEMERATURE LO
UEM	MAIN AC FAIL
UEM	AC ARRESTOR
UEM	HVAC FAIL
UEM	RF LINE DEHYDRATOR

UEM	TOWER LIGHT FAIL
	UPS
UEM	POWER FAIL UPS 1
UEM	POWER FAIL UPS 2
UEM	UPS 1 RUN
UEM	UPS 2 RUN
UEM	UPS 1 FAIL
UEM	UPS 2 FAIL
UEM	BYPASS UPS 1
UEM	BYPASS UPS 2
UEM	LO BATT UPS 1
UEM	LO BATT UPS 2
UEM	SUMMARY ALARM UPS 1
UEM	SUMMARY ALARM UPS 2
UEM	Spare 1
UEM	Spare 2
	GENERATOR
UEM	GENERATOR RUN
UEM	GENERATOR FAIL
UEM	GENERATOR DISABLE
UEM	GENERATOR LOW COOLANT LEVEL
UEM	HIGH BATT VOLTAGE WARNING
UEM	LOW BATT VOLTAGE WARNING
UEM	LOW FUEL
UEM	Generator High Temp
UEM	Generator Overspeed
UEM	Generator Underspeed
UEM	Generator Overcrank
UEM	Generator Low Oil
UEM	Generator RPM Sensor Loss
UEM	Over Voltage
UEM	Under Voltage
UEM	Over Frequency
UEM	Under Frequency
UEM	Generator Low Oil Pressure Shutdown
UEM	Generator High Oil Pressure Shutdown
UEM	Oil Pressure Sensor Fail
UEM	Oil Temperature Sensor Fail
UEM	Pre High Oil Pressure Warning
UEM	Pre High Oil Temperature Warning
UEM	Start Inhibit Oil Pressure

UEM	Pre High Coolant Temperature Shutdown
UEM	Low Coolant Temperature Warning
UEM	Generator Coolant Temperature Sensor Fail
UEM	High Fuel
UEM	Low Fuel Shutdown
UEM	Diesel/Propane Fuel Tank Alarm 1
UEM	Diesel/Propane Fuel Tank Alarm 2
UEM	Diesel/Propane Fuel Tank Alarm 3
UEM	Diesel/Propane Fuel Tank Alarm 4
UEM	Remote Generator Start
UEM	Remote Generator Stop
UEM	Generator Room Door
UEM	Notifier Panel Trouble
UEM	Humidity
UEM	EQ Room Fire Supp
UEM	Gen Room Fire Supp
UEM	Spare 1
UEM	Spare 2
UEM	Spare 3
UEM	Spare 4
	ATS
UEM	ATS NORMAL
UEM	ATS STANDBY
UEM	Transfer Complete
	DC CHARGER RECTIFER
UEM	CHARGER COMMON
UEM	CHARGER MAIN AC
UEM	CHARGER DISTRIBUTE
UEM	CHARGE HI VOLTAGE
UEM	CHARGE LOW VOLTAGE
UEM	RECITFIER FAIL
	FIRE SUPPRESSION
UEM	FM200

Schedule 6
Quality Control Plan

The Motorola Solutions Quality Management System is based on a process approach and has four main areas of focus:

- Customer Requirements
- Organizational structure
- Products, Services, and Solutions provided
- Applicable standards' requirements

The Quality Management System applies to global Motorola Solutions' processes including:

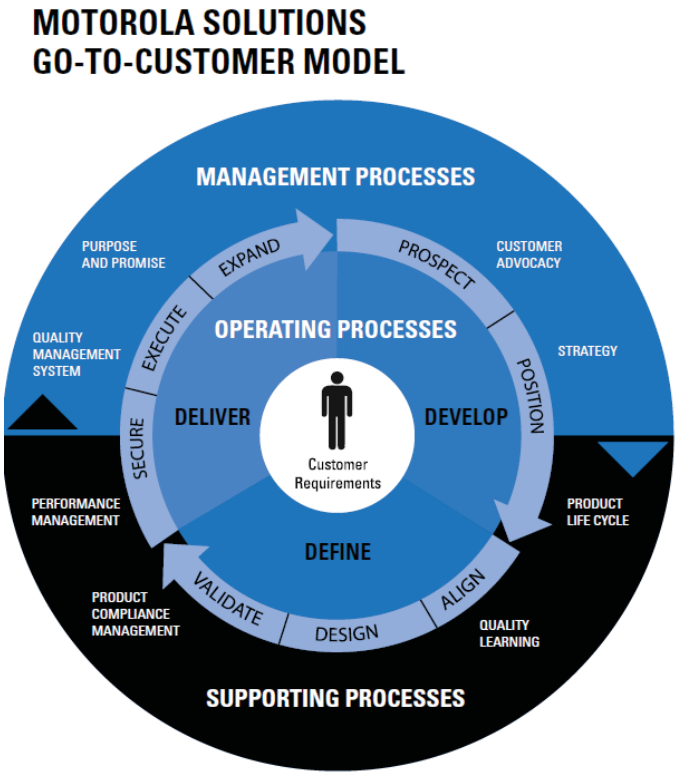
- Strategy and business development
- Design and development of products, services, and solutions
- Manufacturing, distribution, and channel management
- Sales and support functions
- Outsourced, third party processes
- Solution Support Centers

Motorola uses and will comply with the ISO 9001 as the primary standard for our Quality Management System for the duration of the Agreement, and will incorporate other standards as appropriate for our business environment or to the extent required under the Agreement.

Our Customer-Centric Business Model defines the overall interaction of the processes throughout our organization—placing customer requirements at the center. Each function within the model implements and maintains relevant processes, and conducts reviews to help ensure that every process is operating in accordance with our Quality Management System and our customers' requirements.

The business model aligns our Management, Operating, and Supporting processes to focus on external customer requirements while driving improvements on internal processes. Centered around our customers, it ensures we become your trusted partner by anticipating, meeting and exceeding your expectations in everything we do.

Methodologies and tools are used internally to drive the implementation of the Quality Management System and identify opportunities for continual improvement. These include both formal process like those listed below, as well as improvements made from lessons learned.



1. Design Changes & Document Control

Project documentation control audit report helps ensure required project documents to support all facets of design and delivery are published and available to project team members when they need them.

Various documents will be used throughout the project life cycle. The required project templates and documentation will be used to verify the adequacy of the actual processes and procedures used to develop and/or deliver products/services.

Table below identifies primary documents that may be used by the project team.

Motorola Solutions, Inc.				Passed:	14	
Internal Project QA Audit Report for PROJECT				Failed:	1	
Audit Date: 01/01/2015				Compliance:	93%	
Prepared by Bob Motorola (MOT000)						
Motorola Solutions Internal						
SI-Gate/QA Audit Requirement	**Result**	**Issue**	**Action/Recommendation/Comment**		**Action Due**	**Owner**
Recurring QA Items						
Internal Project Status Meetings	Passed	n/a	n/a		n/a	n/a
Customer Project Status Meetings	Passed	n/a	n/a		n/a	n/a
Internal Issues List is available and current	Failed	No evidence in system of record of any formal internal issues list	Work with PM to determine if there is an internal issues list being maintained offline, since there is not evidence on compass		11/30/2011	John Doe
External Issues List is available and current	Passed	n/a	External Issues List is located at http://compass.mot.com/go/. QA Manager will work with team to implement a few minor quality improvement changes.		11/30/2011	John Doe
Project Schedule is current (monthly review/update)	Passed	n/a	n/a		n/a	n/a
Project Team contact list is current (monthly review/update)	Passed	n/a	April Audit issues resolved and Project Roster is located at http://compass.mot.com/go/222657744		n/a	n/a
Contract Updates / Change Orders	Passed	n/a	n/a		n/a	n/a
Internal system of record folders are organized and files are accessible per	Passed	n/a	n/a		n/a	n/a
Effective version control is being used for required project files/docs	Passed	n/a	The files reviewed appear to be under effective version control.		n/a	n/a
Extranet system of record has proper access control. Documents for usage by Motorola Solutions personnel only should not be posted to Extranet	Passed	n/a	Overall Project team should review/organize the files/folders on the extranet		n/a	n/a
SI-Gates BU Siness Requirements						
BUS.03.06.02.01 T.D - System Installation Completed and Signed	Passed	n/a	n/a		n/a	n/a
SI-Gates Best Practices Requirements						
BP.03.08.02.05 T.D - Final Equip/BOM List	Passed	n/a	n/a		n/a	n/a
BP.03.07.04a.01 T.D - CD of As Built Doc (i.e.Cable Matrix, Inventory)	Passed	n/a	n/a		n/a	n/a
BP.03.07.04a.03 T.D - FATP (Staging) Signed	Passed	n/a	n/a		n/a	n/a
BP.03.07.05.06 MEET - Civil Work Customer Meeting Minutes	Passed	n/a	n/a		n/a	n/a
1. BP.03.06.04.01 CL - Optimization Checklist Complete	Passed	n/a	n/a		n/a	n/a

EXAMPLE

Document	Content
RFP Response	• Solution Overview • Product and Service Pricing • Project Schedule/Milestones • Technical Documentation • Additional information as specified in the RFP request
Contract	• Terms & Conditions Documentation • Financial Documentation • Technical Documentation
Project Management Plan	• Work Breakdown Structure (WBS) • Project Schedule • Estimate the effort needed to complete those tasks • Document all of the project inter-dependencies • List the assumptions and constraints
Project Quality Assurance Plan	• Identify customer requirements • Identify project deliverables to be produced • Establish quality criteria/standards for the deliverables • Gain your customers agreement with the targets set
Technical Plan	• Detailed Design • Civil and Electrical Plan • Installation Plan • Cutover Plan
Resource Plan	• Identify types of labor required for the project • Identify roles and responsibilities for each labor type • Determine number of people required to fill each role • Determine types and quantities of equipment needed • Determine amount of materials needed

Document	Content
Financial Plan	• Budget for labor, equipment and materials • Labor to be incurred during the project • Equipment needed to deliver the project • Materials needed for the project
Risk Plan	• Identify risks within your project • Categorize and prioritize each risk • Determine the likelihood of the risks occurring • Identify the impact on the project if risk does occur
Communications Management	• Define each stakeholders communication needs • Determine the method and frequency of each communication • Identify resource to attend communications events • Build a communication event schedule
Change Management	• Establish change order process • Establish document control procedures • Hardware and Software Configuration Management
Testing and Acceptance Documents	• Create a list of all project deliverables • Criteria for gaining customer acceptance • Establish acceptance standards to be met • Development of test plans as required
Service Readiness Document	• Verify that system is ready for transition from the project team to service • Document any known issues and project punch list items • Review obligations for service and support of the system
Customer Support Plan	• Document services and service level expectations • Establish communication and escalation plan • Review plan with customer

2. Material shipping, receiving, Inventory, Tracking, and storage

Motorola Solutions uses a centralized, cloud-based, Android-driven solution to manage all North America Field Inventory and Installation verification efforts. Project team members use a ruggedized handheld device for bar code scanning of all communications equipment ordered, shipped, and received at a customer's site or a temporary warehouse. With pre-loaded data, the project team members can perform efficient, real-time verification of all received equipment.

3. RF Coverage analysis and Verification

RF design is completed using the Motorola Solutions Hydra Stratus Coverage Design Tool. The coverage design is reviewed by peers and Coverage Subject Matter Experts to determine that it meets the requirements and has the correct system parameters.

When the system installation and optimization is completed, the Coverage ATP is performed. The results of the Coverage ATP are then sent back to Motorola Solutions Resource Development Engineering so that the actual results can be compared to the coverage prediction. By doing this step,

the accuracy of the prediction can be measured and possible improvements made in the following areas:

- Adjusts environmental clutter parameters, by comparing predicted and precisely measured signal strength data.
- The goal is to reduce the error between predicted and measured values to a minimum producing more accurate maps.

4. Detailed Step-By-Step Processes

Motorola quality control process includes ensuring each of the following steps are completed:

A. Site preparation

a) Site Technical (Design) Documentation
   i) Review Each Standardized Design Package
   ii) Confirm Quality Standards Have Been Met
   iii) General Issues
   iv) Site Details
   v) Communications Equipment Shelter/Room Build-Out
   vi) Towers and Antenna Support Structures
   vii) Stationary Standby Power Generators
   viii) Site Security
   ix) Grounding Systems
b) Confirm General Conformity with Standards
c) Inspections and Test Review
   i) Checklists Documenting Completed Sites
   ii) Correlation to Acceptance Test Plan
   iii) Recording Adherence to All Standards
   iv) Review of Final Documentation
   v) Observation of Constructed Facilities
   vi) Operational Tests of Equipment
   vii) Site Inspections
      (1) Work in Progress
      (2) Final R56 Audits
      (3) Site Documentation
   viii) System Inspections
      (1) Functional ATP Results
      (2) Coverage ATP Results
      (3) System Documentation
   ix) Results Reported Upon Completion
      (1) Site Inspections
      (2) Site Tests
   x) Documentation Submitted
      (1) Demonstrate Adherence
      (2) Conduct Re-Inspections when necessary

B. Field Installation and inspection

i) Site Design and Development
   (1) Provides requirements and guidelines for site design and development. Site development refers to the civil, structural, mechanical, and electrical work; and installation of supporting equipment at a communications site. Primarily new site construction. Adding onto an existing site or installing a site in an existing facility requires that the scope of work, design, and drawings be specific to these locations.
   (2) Compliance with RF Energy Exposure Standards
   (3) General Outline of Work
   (4) Planning
   (5) Constructability Review
   (6) Electrical Service
   (7) Foundation Design and Installation
   (8) Concrete and Soils Installation Monitoring
   (9) Site and Facility Acceptance Testing
   (10) Tower Design and Construction
   (11) The design and development of communications sites is critical not only to optimal functioning of the communications system, but also to the safety of installation and maintenance personnel involved with building and maintaining the system. The importance of implementing and following safety programs, during construction as well as during the system's useful life, cannot be overemphasized.
   (12) All final construction drawings and specifications for a new site should be provided by a properly licensed engineering firm. This ensures that the design is adequate for the site conditions and helps ensure that accurate records of site construction are available.

ii) Communications Site Building, Design and Installation
   (1) Definitions of Communications Sites
   (2) Building/Shelter Design and Location
   (3) Foundation Considerations
   (4) Floor Loading
   (5) Ceilings and Floors
   (6) Weatherproofing/Sealing
   (7) Heating, Ventilation, & Air Conditioning
   (8) Lightning Damage Protection
   (9) Power Source Protection
   (10) Central Office Layout
   (11) Cable Trays
   (12) Lighting
   (13) Fire Protection/Safety
   (14) Safety Equipment
   (15) On Site Communications
   (16) Signage

iii) External Grounding
   (1) Provides requirements and guidelines for designing and installing the external grounding electrode system at a communications site.
      (a) Lightning Activity and Exposure
      (b) Common Grounding
      (c) Grounding Electrode System Component and Installation Requirements

(d) Dissimilar Metals and Corrosion Control
(e) Bonding to the External Grounding Electrode System
(f) Minimum Site Grounding Requirements
(g) Grounding Roof-Mounted Antenna Masts and Metal Support Structures
(h) Grounding Rooftop Mounted Tower Structures
(i) Special Grounding Applications
(j) Special Grounding Situations

iv) Internal Grounding
(1) Provides requirements for grounding communications site equipment within a facility.
(a) Common Grounding
(b) Grounding System Components and Installation Requirements
(c) Connection Methods for Internal Grounding System
(d) Bonding Equipment to Internal Grounding System

v) Surge Protection Devices
(1) Technologies Available
(2) Suppression Mode Definitions
(3) AC Power SPD Requirements
(4) Telephone/Control/Data Net. Circuit SPDs
(5) RF Components Protection
(6) GPS Receiver Protection
(7) Tower Lighting Protection
(8) Battery Powered Protection
(9) AC Power Line SPD Test Certification Requirements

vi) Additional Grounding Systems
(1) Grounding for Stand-Alone Equipment Shelters
(2) Grounding for Small, Large, and Multi-Story Buildings
(3) Grounding for Dispatch Centers and Network Operator Positions
(4) Grounding for Integrated Communications Sites

vii) Power Sources
(1) Describes various types of power systems that are used for communications sites. It also specifies requirements for various types of power systems that are typically used at a communications site.
(a) Lock-Out/Tag-Out
(b) AC Power
(c) Power Quality
(d) Rectifier/DC Power Systems
(e) Uninterruptible Power Supplies
(f) Alternate Power Sources
(g) Battery Systems
(h) Standby Generator Systems
(i) Generator Output and Derating

viii) Equipment Installation
(1) Facility Readiness
(2) General Considerations for Layout, Work Areas, and Spacing
(3) Seismic Considerations
(4) Equipment Mounting Plumb & Squareness
(5) Equipment Anchoring
(6) Equipment Installation Within Racks or Cabinets

(7) Ancillary Equipment Mounting
(8) Equipment Cabling
(9) Electrostatic Discharge Considerations

C. System Testing and Validation

For this project, the key final product is the networked system. The quality is verified by testing the parameters agreed to in the final design documentation.

i. Factory Staging and Test

Motorola's staging process was introduced in 1994 and has proven to be a value-added process for both Motorola and our customers. By staging customers' systems in a controlled environment and executing system functionality tests prior to shipment, Motorola and our customers have been able to capitalize on the benefits of reduced implementation cycle time, decreased costs, and improved system satisfaction.

ii. Site Audits

Following the completion of work–i.e. installation of the required system equipment - a member of the Motorola field team shall audit each site to confirm workmanship standards have been adhered to. The audit activity shall be conducted against Motorola's R56 standards.

iii. System Acceptance Tests

Motorola and Broward County representatives shall perform agreed upon tests to confirm that the system functions as expected. Deficiencies and non-conformances found during the test shall be recorded and tracked until resolution.

iv. Inspections and Test Review

a. Checklists Documenting Completed Sites
b. Correlation to Acceptance Test Plan
c. Recording Adherence to All Standards
d. Review of Final Documentation
e. Observation of Constructed Facilities
f. Operational Tests of Equipment
g. Site Inspections
    i. Work in Progress
    ii. Final R56 Audits
    iii. Site Documentation
h. System Inspections
    i. Functional ATP Results
    ii. Coverage ATP Results
    iii. System Documentation
i. Results Reported Upon Completion
    i. Site Inspections
    ii. Site Tests
j. Documentation Submitted
    i. Demonstrate Adherence
    ii. Conduct Re-Inspections when necessary

D. Software regression testing

General regression testing occurs in a lab environment for each release to verify functionality inherited from prior releases. This testing verifies that existing or prior functionality is maintained as new features and repairs are added to the system. This testing is spread across all supported site types, bands, and platforms.

E. Deficiency Reporting and Correction

- Issues/Non-conformances identified during the project shall be recorded and tracked. Tracking information should include the following minimum information: Sequential List Item Number, Date identified, Item Description, Responsible Party, Expected Resolution Date, Resolution Date, Resolution Details, and Notes.
- Issues/Non-conformances should be resolved with the direct producer or the appropriate task leader, when possible.
- Issues/Non-conformances that cannot be resolved with the technical team or task leader are elevated to the project manager.
- Issues/Non-conformances that have been referred to the project manager are reviewed weekly until they are resolved. Items that have not been resolved in a timely manner shall be escalated to higher levels of management.

MOTOROLA SOLUTIONS

North America Solutions & Services Quality

Project Incident Communications

Definitions (Motorola Solutions SSC definitions based upon ITIL standard)

- **Incident:** An unplanned interruption or reduction in the quality of a product or service. Restoration is required.
- **Problem:** Post incident; root cause a defect typically linked to multiple incidents. Different than a work around solution. Root cause is the objective.
- **Technical Request:** A request for technical information or advice, including technical questions, integration "how to" support, configuration requests, licensing requests.

Severity is measured by:

- **IMPACT** (extent of lost capability)
- **URGENCY** (time sensitivity for lost capability)

Capability IMPACT	URGENCY (time) Normal	Medium	High
High	STANDARD	MAJOR	MAJOR
Medium	STANDARD	ENHANCED	MAJOR
Low	STANDARD	STANDARD	ENHANCED

HIGH Impact MAJOR Severity incidents: **A phone call or text message to key project stakeholders is recommended as a first step.**

Motorola Solutions EHS personnel expect to be notified as soon as possible in the event of an **accident** (damage >$5,000) or **injury** on a Motorola Solutions project. **Submit your report using the EHS on-line incident report form**

HOW to report an incident:

1. Send an email to your key project stakeholders and copy your NASS Regional QA Manager
   a. Subject: [project number] [severity] [short incident description]
2. Open an SSC Case when applicable.

WHEN to report an incident:

1. Any field incident that involves STOP WORK for any reason or duration.
2. Any field incident involving a non-conforming product, be it Motorola Solutions manufactured or 3rd party (i.e. product failure post install, failure at CCSi or 3rd party staging, or discovery of a non-conforming product out-of-the-box prior to installation)

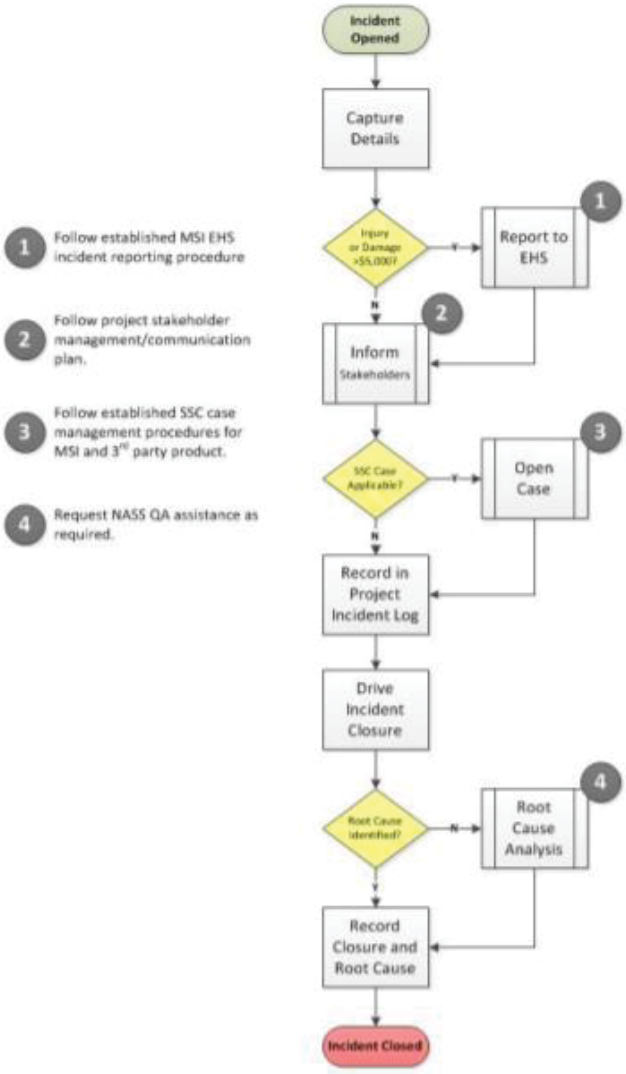
WHAT information should be provided by the reporting person:

1. **Description of incident:** Describe what happened
2. **Date of occurrence:** mm/dd/yyyy
3. **Timeline:** How long the incident lasted
4. **Incident owner name:** Single point of contact for the incident
5. **Team member names:** Others on-site when the incident occurred
6. **Source:** Motorola Solutions or 3rd party? (if product: model/description; name of vendor if 3rd party product; if worker mistake: name of team member/contractor if related to service being performed)
7. **Action taken to contain the incident**
8. (Required for internal SSC Case) **FO# of origin for product** if a product incident

Follow your **project communication plan** for customer specific expectations of notifications.

Your Regional Quality Assurance Manager will:

- Assist with opening an SSC case for the incident
- Assist with case management throughout the incident lifecycle
- Escalate awareness to executive leadership when required
- Assist with verification of facts to support a project incident report (internal or customer-facing)
- Drive root cause analysis post incident; determine if systemic or special cause and conduct after action reviews or lessons learned sessions as required



F. Implementation and Cut-over

Prior to the implementation phase of a system, a cut-over plan is developed. The purpose is to have a plan that will smoothly transition users off of an existing system and on to the new system once system acceptance is obtained. This may be as easy as issuing new portable subscribers and simply begin using them at a specific day or shift or may be very detailed. The following are some of the considerations:

- Existing radio frequencies are minimally required for both the legacy and the new system
    - Requires a phased approach to cutover
    - Requires careful consideration for existing and new system loading
    - How are users able to communicate between the users on the new system and the users still on the old system
- When using a phased approach, how will the entire system be tested
- If the legacy and new systems are to be run in parallel, are there physical space constraints for running parallel systems
    - RF antenna site space, tower antenna loading, electrical and HVAC
    - Dispatch locations – operator space constraints
- Are mobile radios required to provide coverage during cut over
    - Mobile radios take time to install and generally require the longest time to complete a cut over
    - Multiple mobiles in the same vehicle are difficult to mount and the legacy mobile will require removal after cut over is complete

As the implementation progresses, the cut over plan is constantly reviewed and adjusted as things may change. Once the implementation and cut over have been completed, the plan is reviewed to determine if there could have been any improvements to make the cut over a better transition.

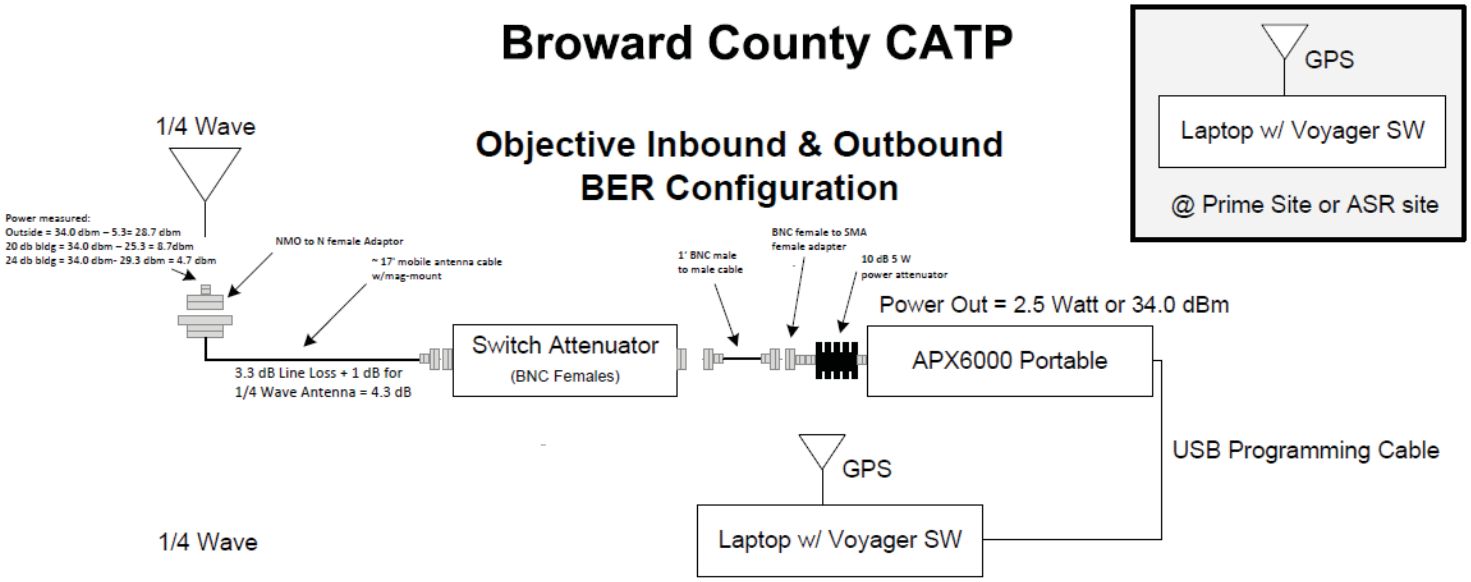
5. Training and Certification

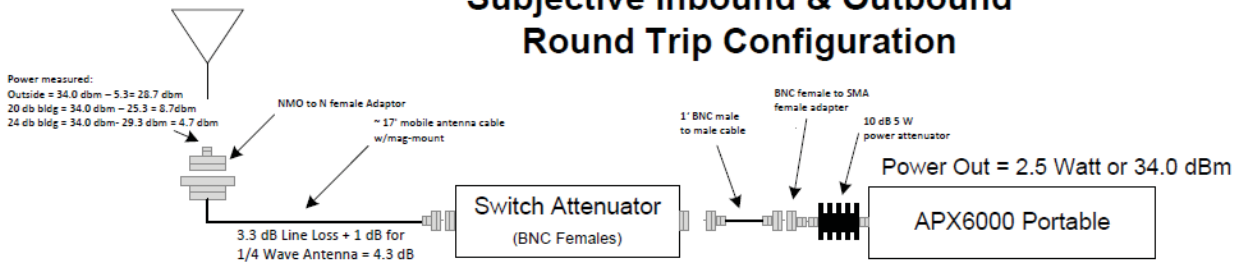
To help deliver quality and efficient training to Broward County, the MSI Training Manager/Coordinator will:

- Serve as the one point of contact for training needs participating in the DDR to ensure the Training Plan is aligned with the contract and final design.
- He/she will monitor the project implementation schedule and develop a Training Plan that stays in sync with project milestones.
- He/she will facilitate student registrations in any online prerequisite courseware.
- He/she will negotiate training dates with the customer and Core Team 60–90 days prior to training.
- He/she will manage collection of data needed for the instructors to prep and/or tailor end user materials for Broward's system and features.
- Training materials for end user level courses will be tailored and previewed by the customer. Technical materials are generic, but training delivery will be tailored to Broward's system.
- Instructors will prep with the Core Team to insure training readiness (operational labs, class times, target audience, capture customer expectations, etc.).
- Once courses are complete, he/she will monitor course evaluations and obtain customer feedback on how training is progressing. Rosters and evaluations will be shared with the Core Team.
- Technical students will receive Certificates of Completion. MSI does not offer Certification for customers.
- He/she will remain as one point of contact for Broward after system acceptance for any questions about training or continuing education on our products.

Schedule 7
Block diagrams

Broward County CATP

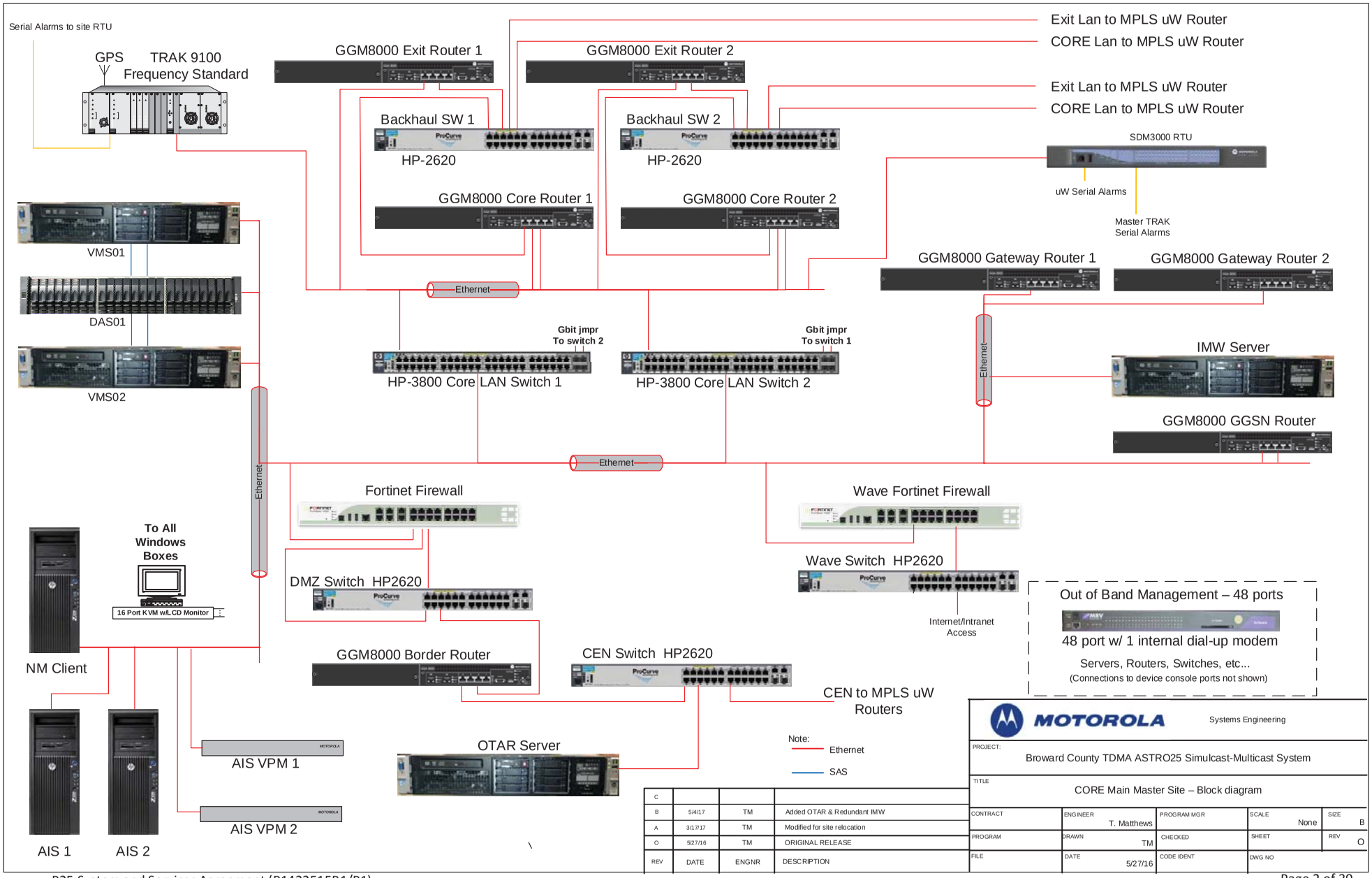




Broward CATP Attenuation 20 db area Calculations:
1. APX w/RSM on hip (swivel or equivalent) = -8.6 dB
2. Building Loss = -20 dB
3. 5.0' Test Antenna Height (standard sedan roof) = -1 dB
4. Mag Mount & 1/4 wave antenna = +4.3 dB
5. Net Attenuation at Receiver Input = 25.3 dB

Broward CATP Attenuation 24 db area Calculations:
1. APX w/RSM on hip (swivel or equivalent) = -8.6 dB
2. Building Loss = -24 dB
3. 5.0' Test Antenna Height (standard sedan roof) = -1 dB
4. Mag Mount & 1/4 wave antenna = +4.3 dB
5. Net Attenuation at Receiver Input = 29.3 dB

Broward CATP Attenuation street area Calculations:
1. APX w/RSM on hip (swivel or equivalent) = -8.6 dB
2. Building Loss = 0 dB
3. 5.0' Test Antenna Height (standard sedan roof) = -1 dB
4. Mag Mount & 1/4 wave antenna = +4.3 dB
5. Net Attenuation at Receiver Input = 5.3 dB



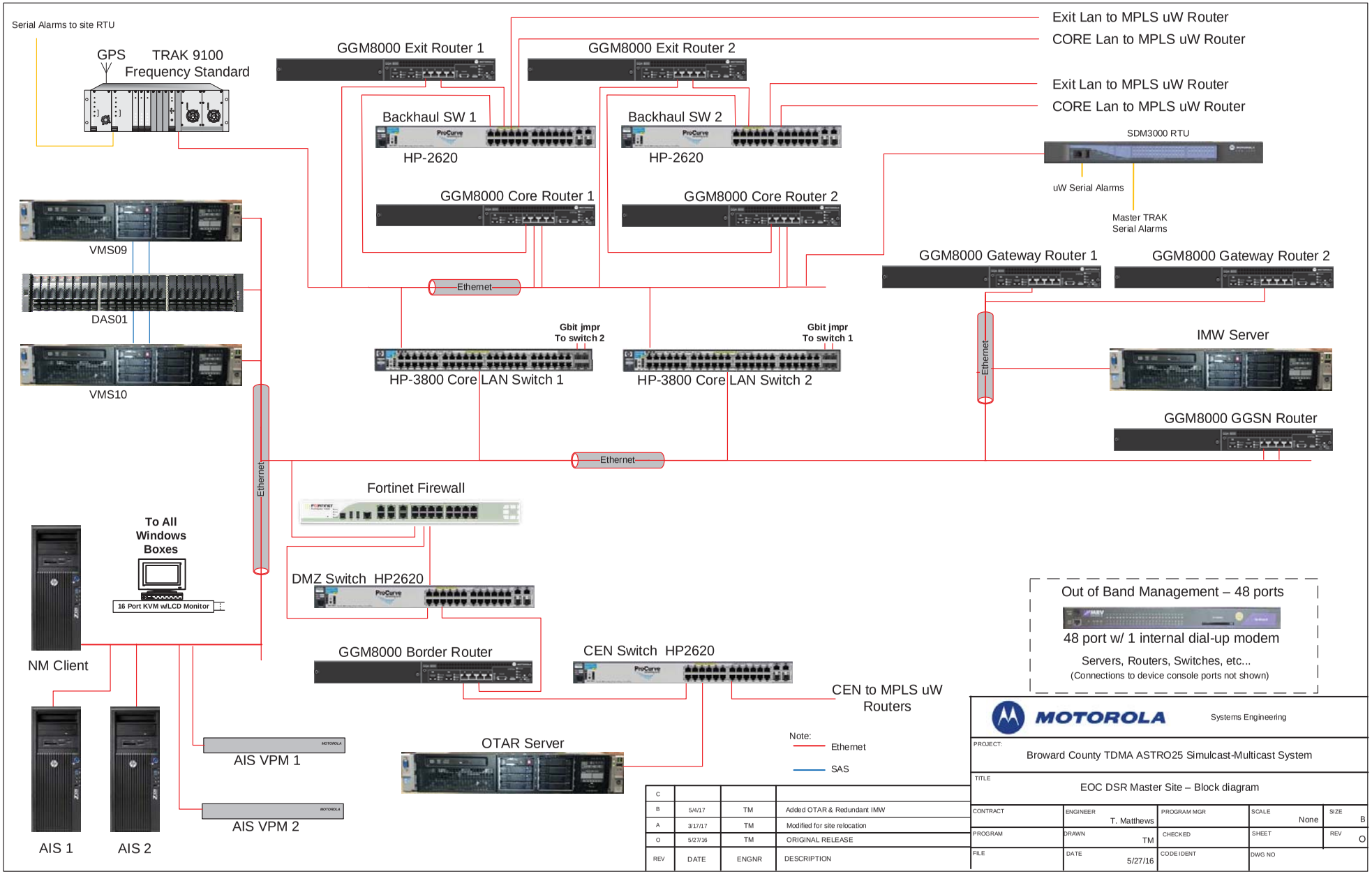
REV	DATE	ENGNR	DESCRIPTION
C			
B	5/4/17	TM	Added OTAR & Redundant IMW
A	3/17/17	TM	Modified for site relocation
O	5/27/16	TM	ORIGINAL RELEASE

MOTOROLA Systems Engineering

PROJECT: Broward County TDMA ASTRO25 Simulcast-Multicast System

TITLE: CORE Main Master Site – Block diagram

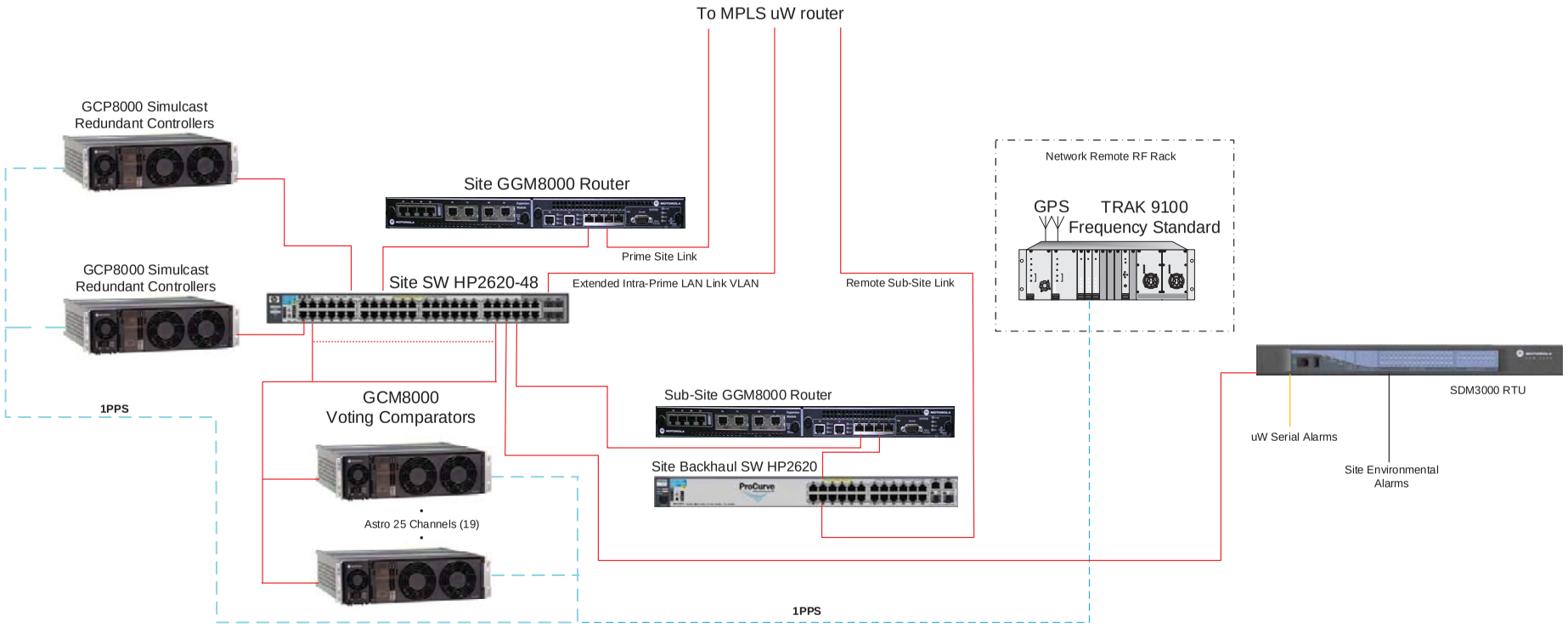
CONTRACT	ENGINEER	PROGRAM MGR	SCALE	SIZE
	T. Matthews		None	B
PROGRAM	DRAWN	CHECKED	SHEET	REV
	TM			O
FILE	DATE	CODE IDENT	DWG NO	
	5/27/16			



REV	DATE	ENGNR	DESCRIPTION
C			
B	5/4/17	TM	Added OTAR & Redundant IMW
A	3/17/17	TM	Modified for site relocation
O	5/27/16	TM	ORIGINAL RELEASE

MOTOROLA Systems Engineering

PROJECT: Broward County TDMA ASTRO25 Simulcast-Multicast System				
TITLE: EOC DSR Master Site – Block diagram				
CONTRACT	ENGINEER: T. Matthews	PROGRAM MGR	SCALE: None	SIZE: B
PROGRAM	DRAWN: TM	CHECKED	SHEET	REV: O
FILE	DATE: 5/27/16	CODE IDENT	DWG NO	



Note:
- Ethernet
- 1 pps
- Data (RS232)

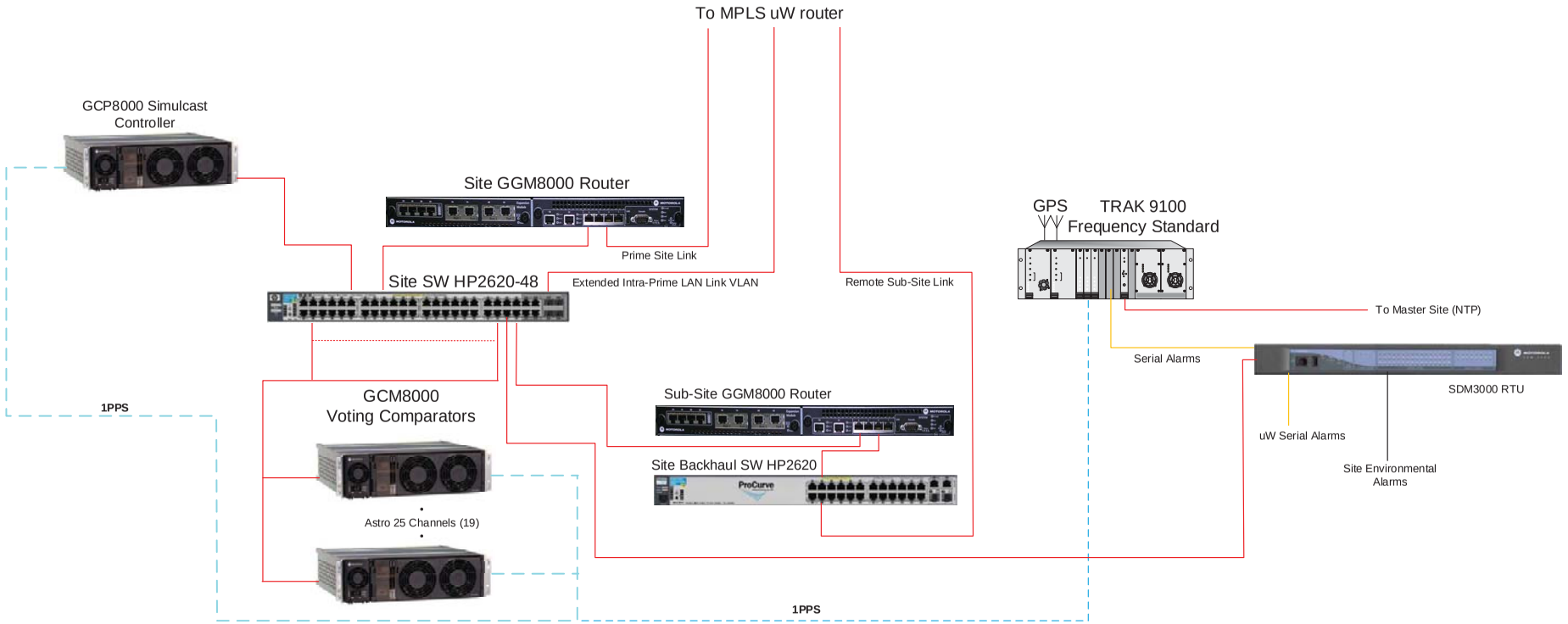
REV	DATE	ENGNR	DESCRIPTION
C			
B			
A			
O	5/27/16	TM	ORIGINAL RELEASE

MOTOROLA Systems Engineering

PROJECT: Broward County TDMA ASTRO 25 Simulcast-Multicast System

TITLE: Core Main Prime Site – Block diagram

CONTRACT	ENGINEER	PROGRAM MGR	SCALE	SIZE
	T. Matthews		None	B
PROGRAM	DRAWN	CHECKED	SHEET	REV
	TM			O
FILE	DATE	CODE IDENT	DWG NO	
	5/27/16			



Note:
- Ethernet
- 1 pps
- Data (RS232)

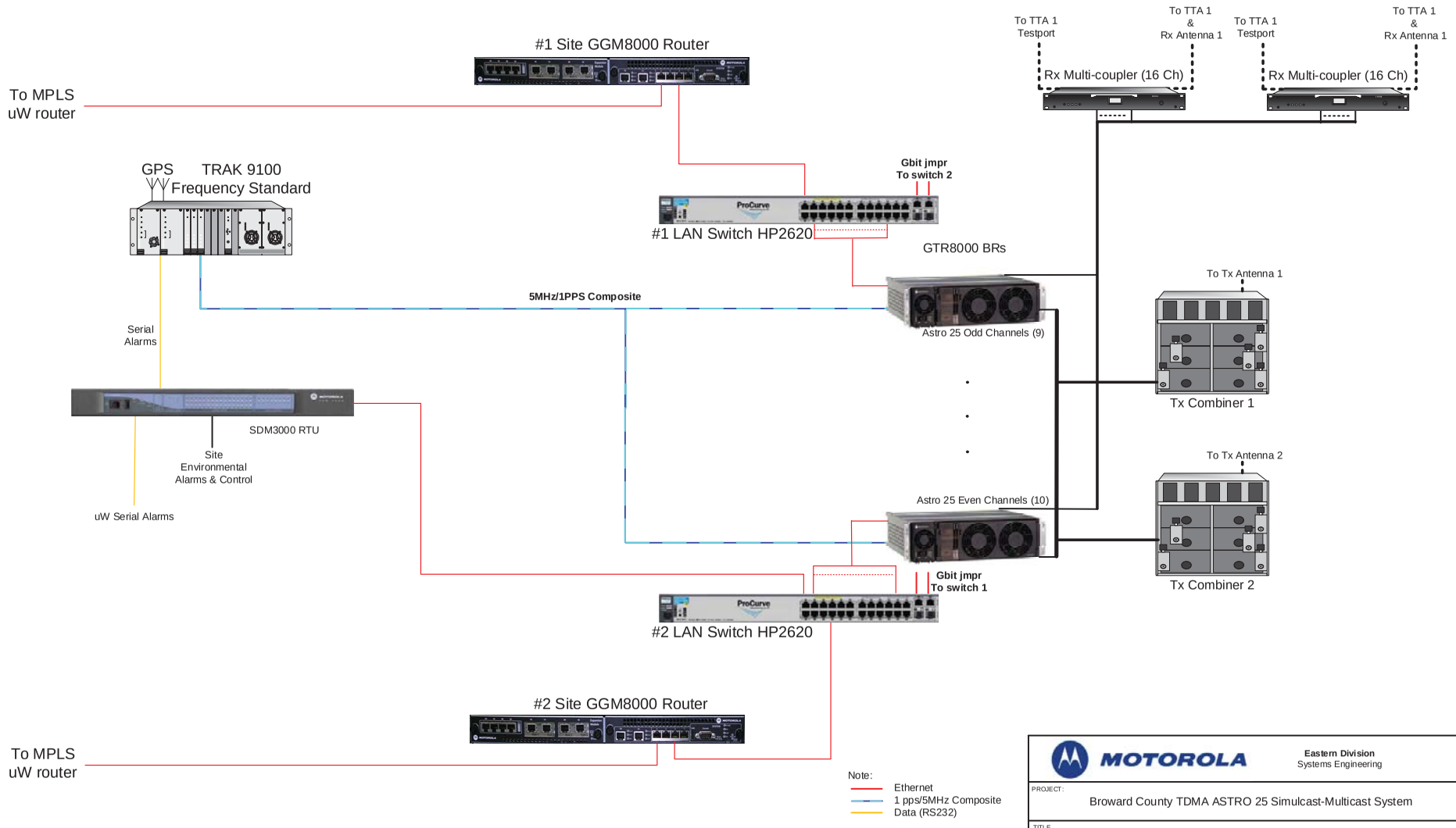
REV	DATE	ENGNR	DESCRIPTION
C			
B			
A			
O	5/27/16	TM	ORIGINAL RELEASE

MOTOROLA Systems Engineering

PROJECT: Broward County TDMA ASTRO 25 Simulcast-Multicast System

TITLE: West Hollywood GEO Prime Site – Block diagram

CONTRACT	ENGINEER	PROGRAM MGR	SCALE	SIZE
	T. Matthews		None	B
PROGRAM	DRAWN	CHECKED	SHEET	REV
	TM			O
FILE	DATE	CODE IDENT	DWG NO	
	5/27/16			



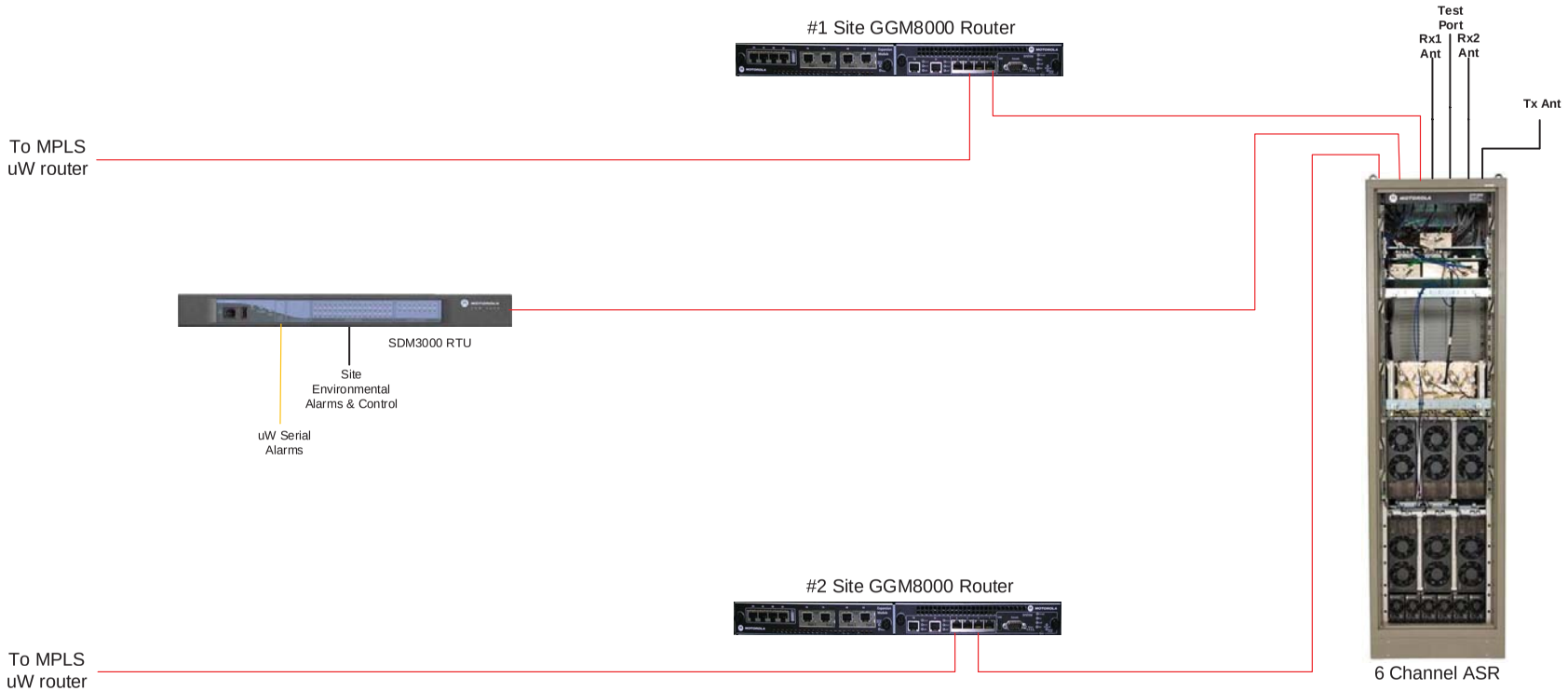
REV	DATE	ENGNR	DESCRIPTION
C			
B			
A	3/17/17	TM	Updated TTA & Multicoupler detail
O	5/27/16	TM	ORIGINAL RELEASE

MOTOROLA — Eastern Division, Systems Engineering

PROJECT: Broward County TDMA ASTRO 25 Simulcast-Multicast System

TITLE: Simulcast Remote Sites – Block diagram

CONTRACT	ENGINEER	PROGRAM MGR	SCALE	SIZE
	T. Matthews		None	B
PROGRAM	DRAWN	CHECKED	SHEET	REV
	TM			O
FILE	DATE	CODE IDENT	DWG NO	
	5/27/16			



Note:
Ethernet
Data (RS232)

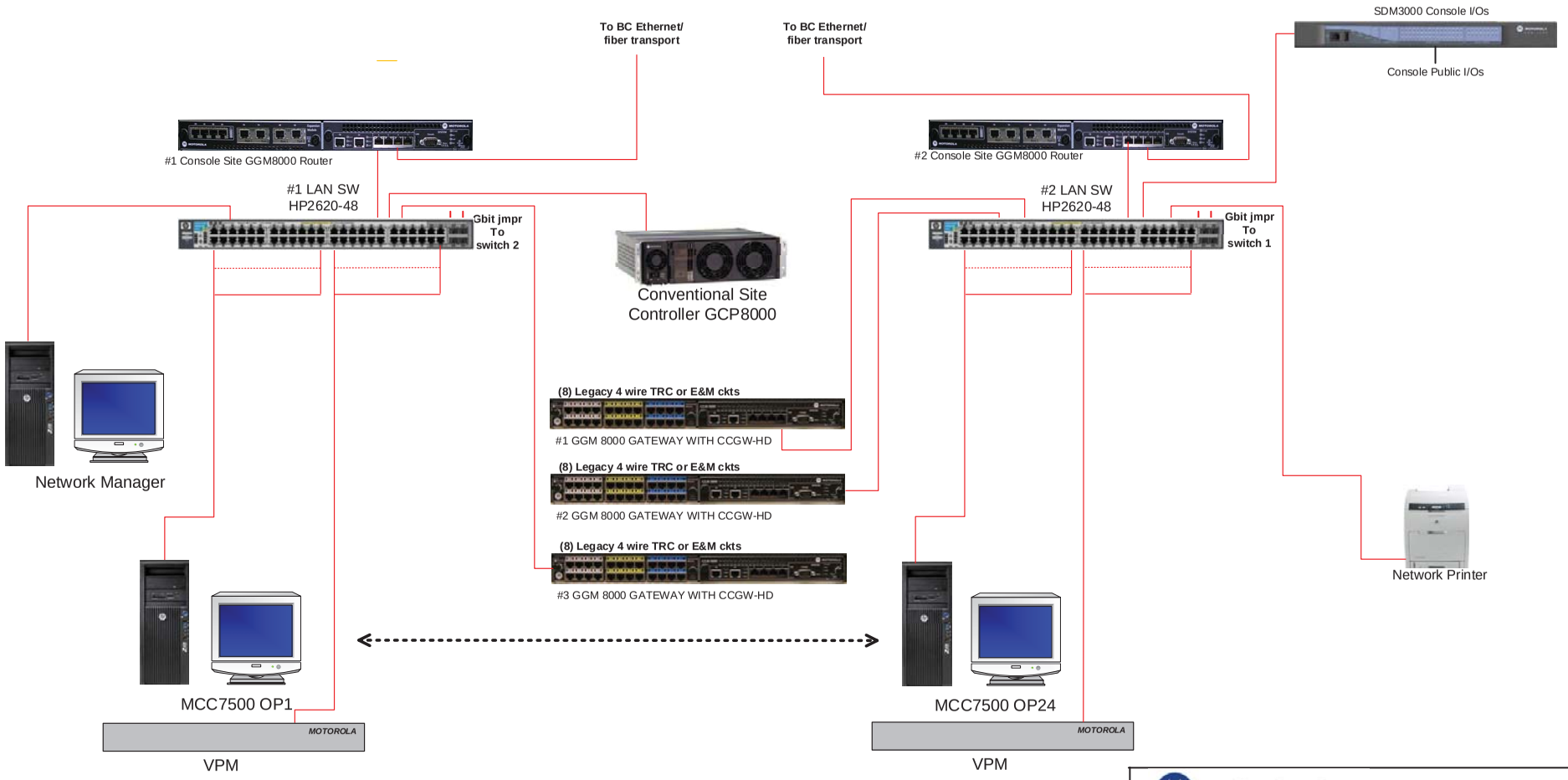
REV	DATE	ENGNR	DESCRIPTION
C			
B			
A			
O	5/27/16	TM	ORIGINAL RELEASE

MOTOROLA
Eastern Division
Systems Engineering

PROJECT: Broward County TDMA ASTRO 25 Simulcast-Multicast System

TITLE: BC Station 106 Astro Site Repeater (ASR) – Block diagram

CONTRACT	ENGINEER	PROGRAM MGR	SCALE	SIZE
	T. Matthews		None	B
PROGRAM	DRAWN	CHECKED	SHEET	REV
	TM			O
FILE	DATE	CODE IDENT	DWG NO	
	5/27/16			



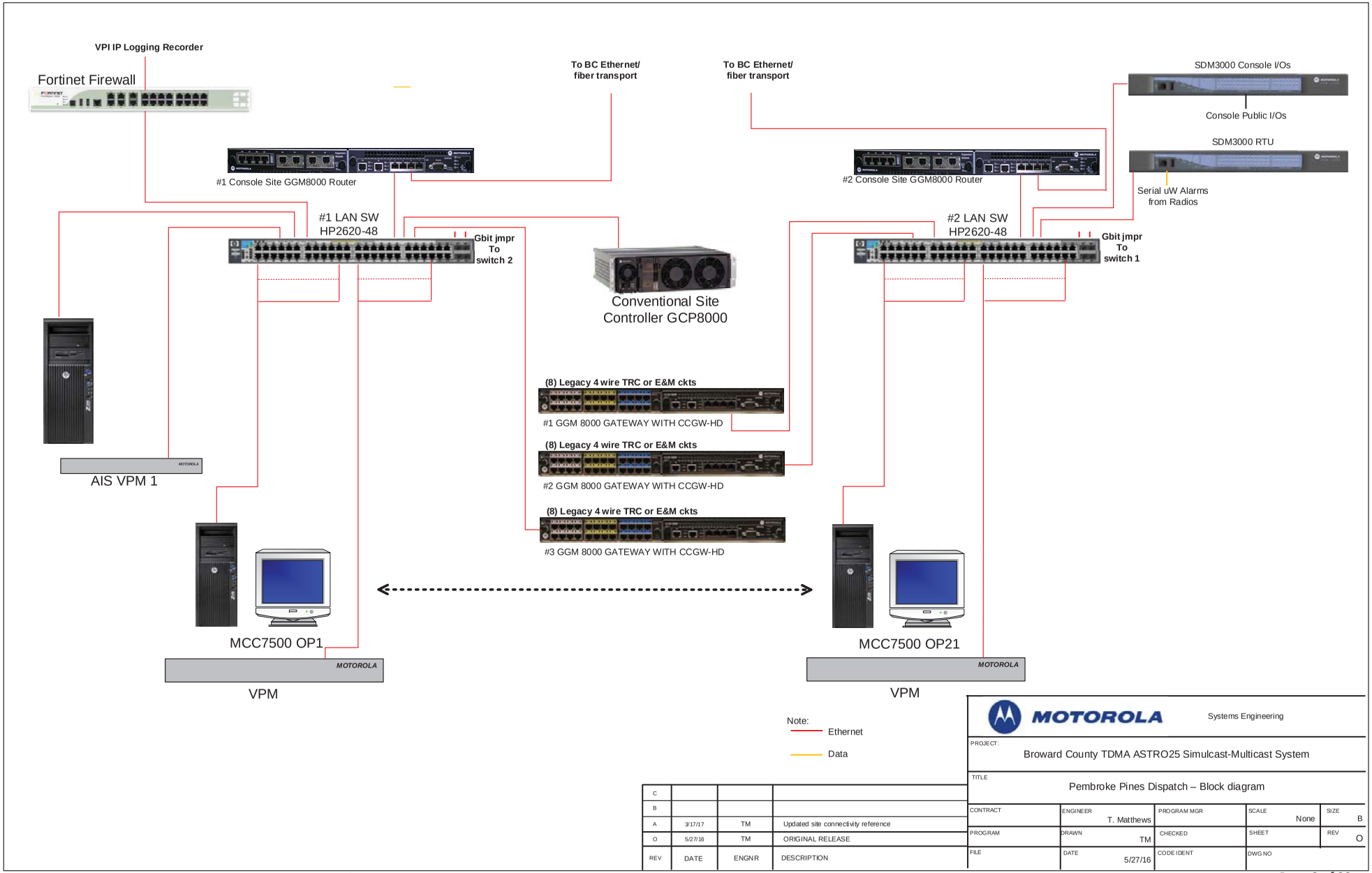
REV	DATE	ENGNR	DESCRIPTION
C			
B			
A	3/17/17	TM	Updated site connectivity reference
O	6/10/16	TM	ORIGINAL RELEASE

MOTOROLA Systems Engineering

PROJECT: Broward County TDMA ASTRO25 Simulcast-Multicast System

TITLE: Sunrise Dispatch – Block diagram

CONTRACT	ENGINEER	PROGRAM MGR	SCALE	SIZE
	T. Matthews		None	B
PROGRAM	DRAWN	CHECKED	SHEET	REV
	TM			O
FILE	DATE	CODE IDENT	DWG NO	
	6/10/16			



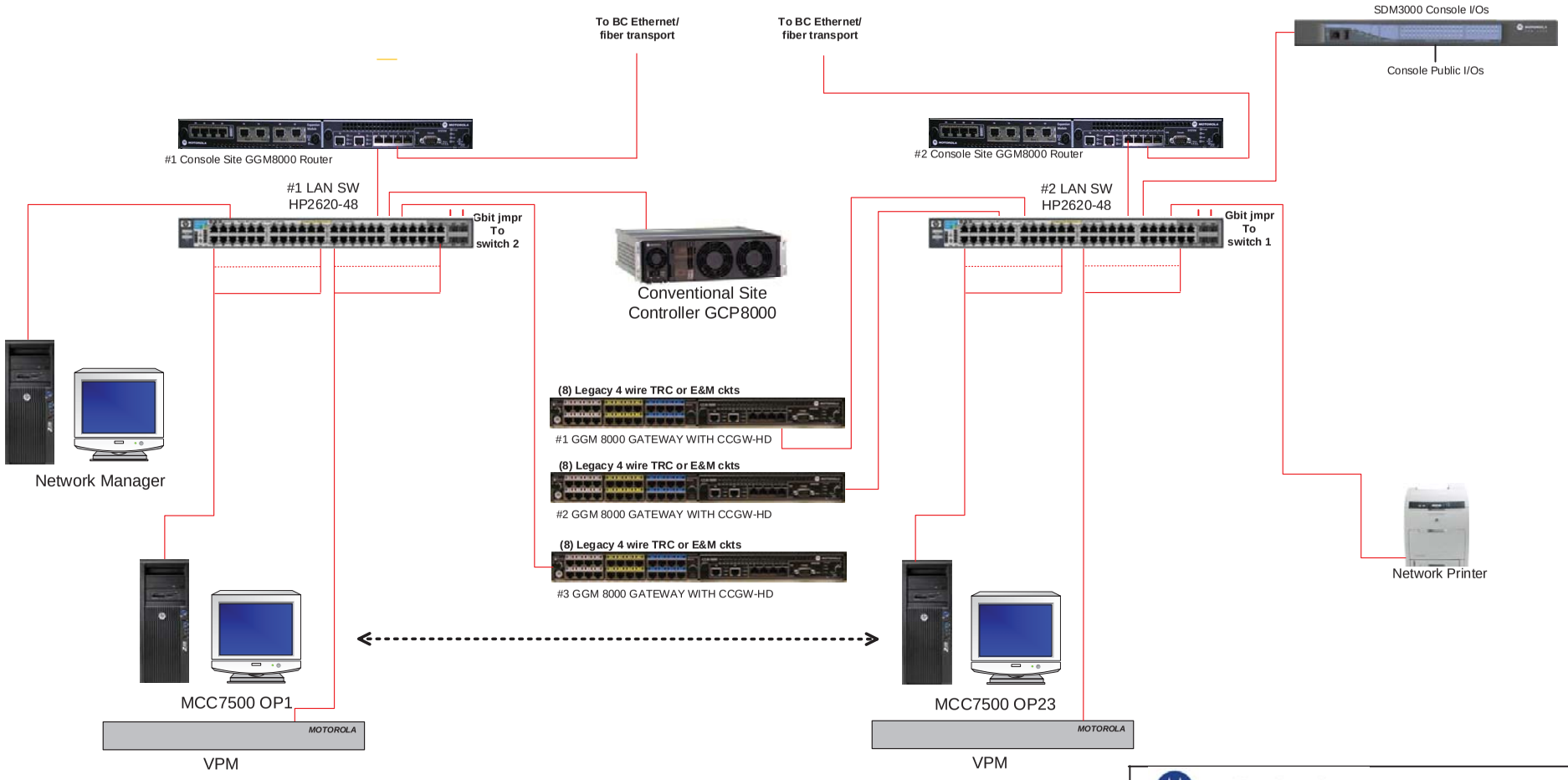
REV	DATE	ENGNR	DESCRIPTION
C			
B			
A	3/17/17	TM	Updated site connectivity reference
O	5/27/16	TM	ORIGINAL RELEASE

MOTOROLA Systems Engineering

PROJECT: Broward County TDMA ASTRO25 Simulcast-Multicast System

TITLE: Pembroke Pines Dispatch – Block diagram

CONTRACT	ENGINEER	PROGRAM MGR	SCALE	SIZE
	T. Matthews		None	B
PROGRAM	DRAWN	CHECKED	SHEET	REV
	TM			O
FILE	DATE	CODE IDENT	DWG NO	
	5/27/16			



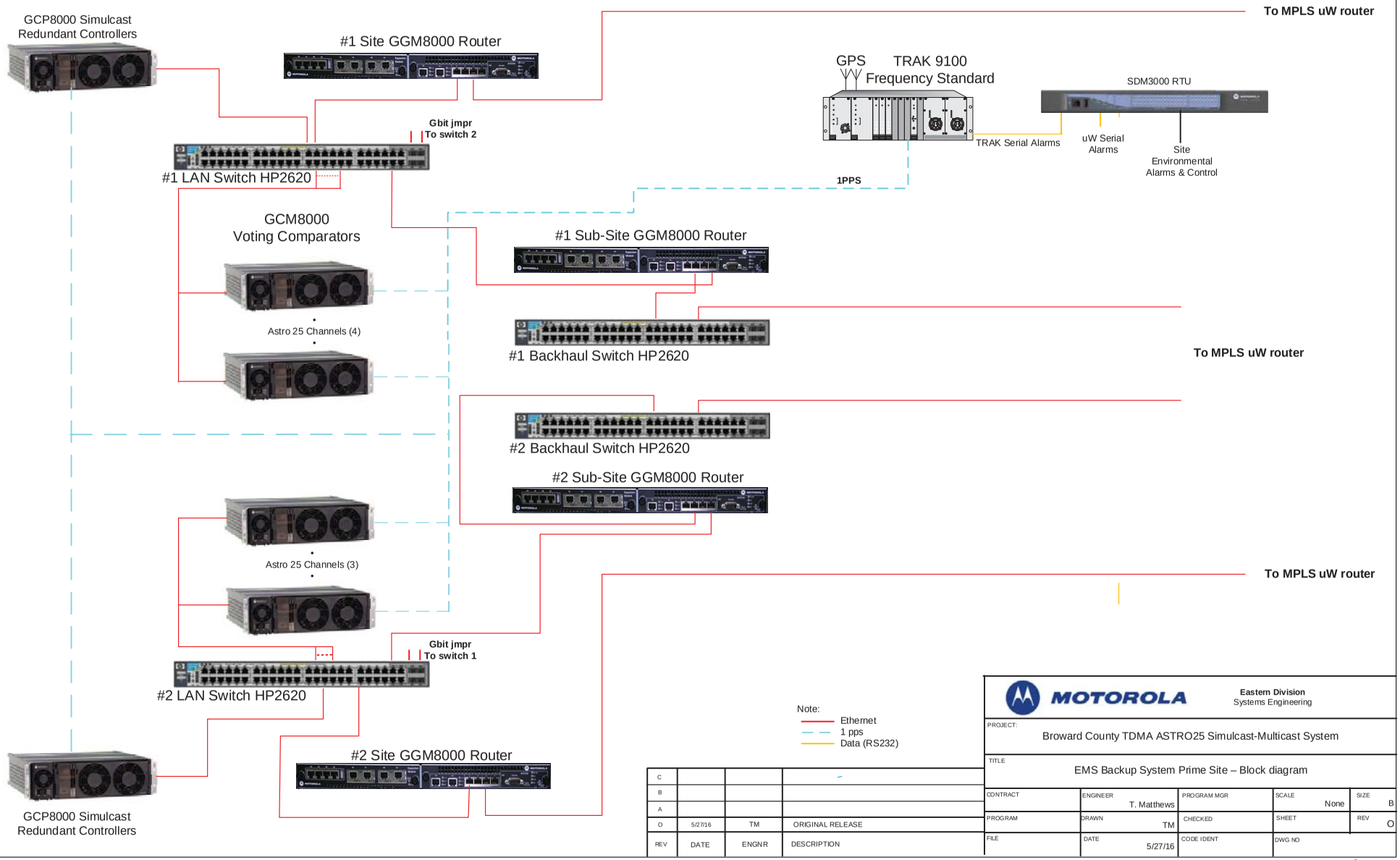
REV	DATE	ENGNR	DESCRIPTION
C			
B			
A	3/17/17	TM	Updated site connectivity reference
O	6/10/16	TM	ORIGINAL RELEASE

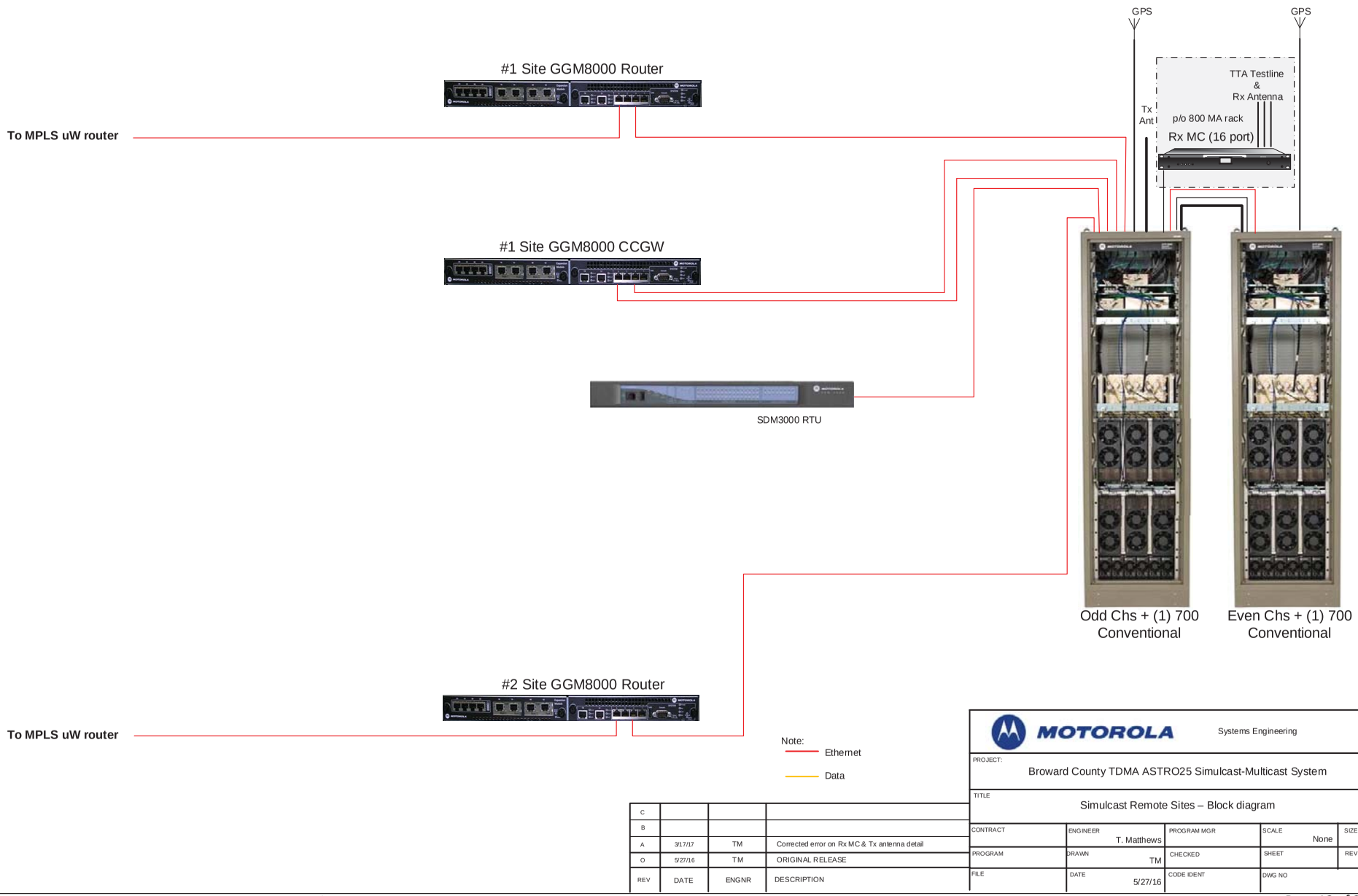
MOTOROLA Systems Engineering

PROJECT: Broward County TDMA ASTRO25 Simulcast-Multicast System

TITLE: Coconut Creeke Dispatch – Block diagram

CONTRACT	ENGINEER	PROGRAM MGR	SCALE	SIZE
	T. Matthews		None	B
PROGRAM	DRAWN	CHECKED	SHEET	REV
	TM			O
FILE	DATE	CODE IDENT	DWG NO	
	6/10/16			


GCP8000 Simulcast
Redundant Controllers
#1 Site GGM8000 Router
To MPLS uW router
GPS
TRAK 9100
Frequency Standard
SDM3000 RTU
Gbit jmpr
To switch 2
#1 LAN Switch HP2620
TRAK Serial Alarms
uW Serial
Alarms
Site
Environmental
Alarms & Control
1PPS
GCM8000
Voting Comparators
#1 Sub-Site GGM8000 Router
Astro 25 Channels (4)
#1 Backhaul Switch HP2620
To MPLS uW router
#2 Backhaul Switch HP2620
#2 Sub-Site GGM8000 Router
Astro 25 Channels (3)
To MPLS uW router
Gbit jmpr
To switch 1
#2 LAN Switch HP2620
#2 Site GGM8000 Router
GCP8000 Simulcast
Redundant Controllers
Note:
Ethernet
1 pps
Data (RS232)
C
B
A
O 5/27/16 TM ORIGINAL RELEASE
REV DATE ENGNR DESCRIPTION
MOTOROLA
Eastern Division
Systems Engineering
PROJECT:
Broward County TDMA ASTRO25 Simulcast-Multicast System
TITLE
EMS Backup System Prime Site – Block diagram
CONTRACT
ENGINEER T. Matthews
PROGRAM MGR
SCALE None
SIZE B
PROGRAM
DRAWN TM
CHECKED
SHEET
REV O
FILE
DATE 5/27/16
CODE IDENT
DWG NO



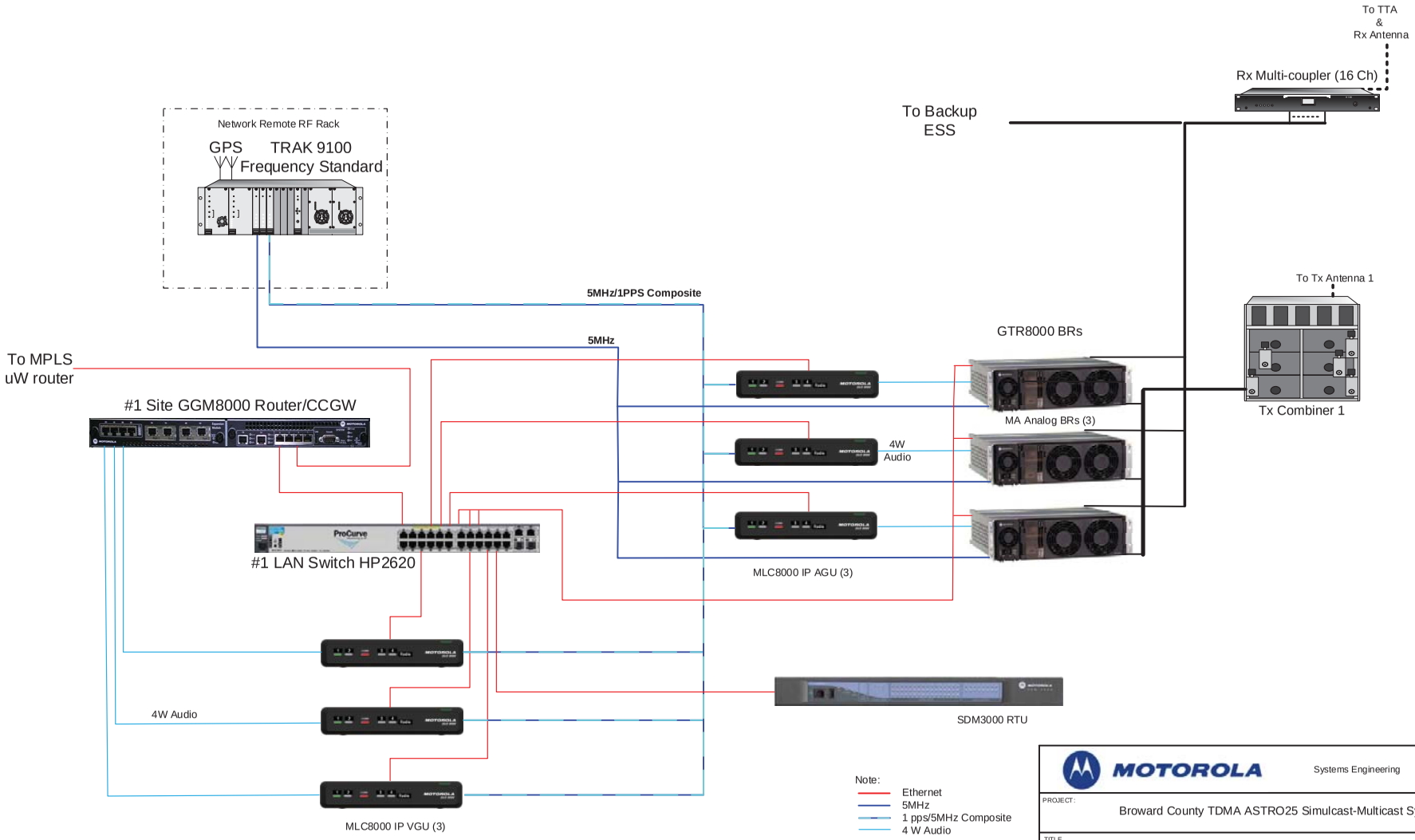
REV	DATE	ENGNR	DESCRIPTION
C			
B			
A	3/17/17	TM	Corrected error on Rx MC & Tx antenna detail
O	5/27/16	TM	ORIGINAL RELEASE

MOTOROLA Systems Engineering

PROJECT: Broward County TDMA ASTRO25 Simulcast-Multicast System

TITLE: Simulcast Remote Sites – Block diagram

CONTRACT	ENGINEER	PROGRAM MGR	SCALE	SIZE
	T. Matthews		None	B
PROGRAM	DRAWN	CHECKED	SHEET	REV
	TM			O
FILE	DATE	CODE IDENT	DWG NO	
	5/27/16			



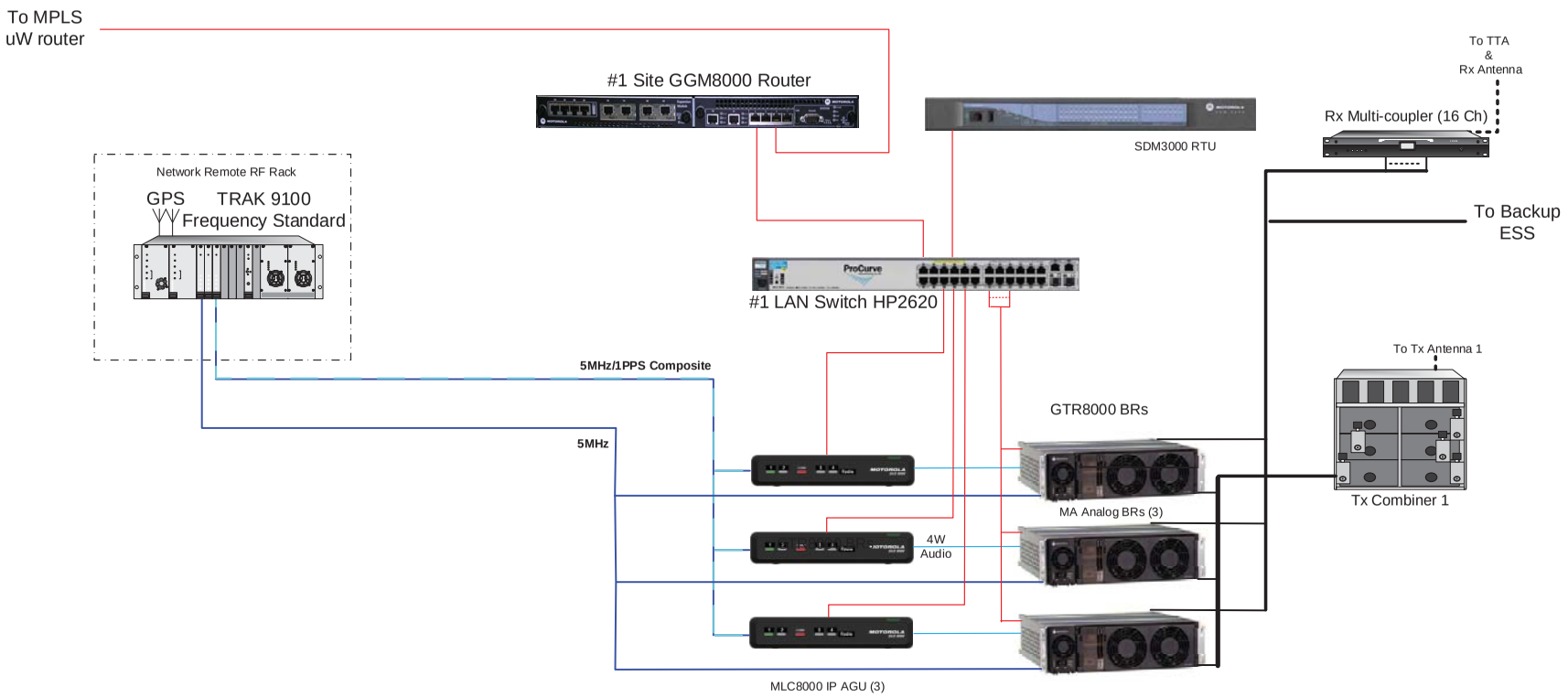
REV	DATE	ENGNR	DESCRIPTION
C			
B			
A	3/17/17	TM	Noted multicoupler feed to Backup ESS
O	5/27/16	TM	ORIGINAL RELEASE

MOTOROLA Systems Engineering

PROJECT: Broward County TDMA ASTRO25 Simulcast-Multicast System

TITLE: EMS 3 Ch 800 MA Simulcast Prime / Co-Remote – Block diagram

CONTRACT	ENGINEER	PROGRAM MGR	SCALE	SIZE
	T. Matthews		None	B
PROGRAM	DRAWN	CHECKED	SHEET	REV
	TM			O
FILE	DATE	CODE IDENT	DWG NO	
	5/27/16			



Note:
- Ethernet
- 5MHz
- 1 pps/5MHz Composite
- 4 W Audio

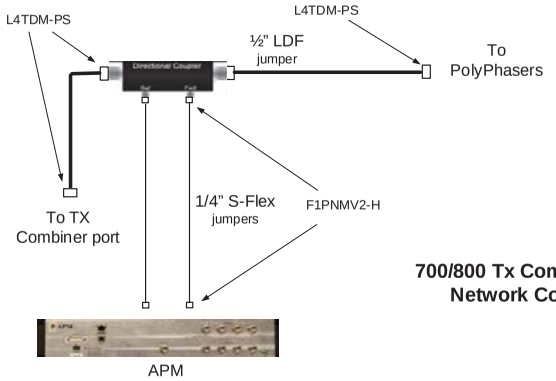
REV	DATE	ENGNR	DESCRIPTION
C			
B			
A			
O	5/27/16	TM	ORIGINAL RELEASE

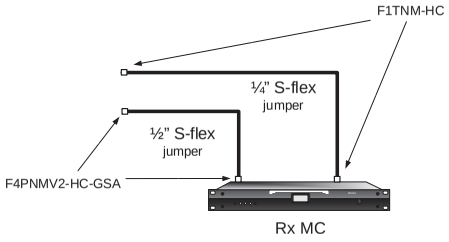
MOTOROLA Systems Engineering

PROJECT: Broward County TDMA ASTRO25 Simulcast-Multicast System

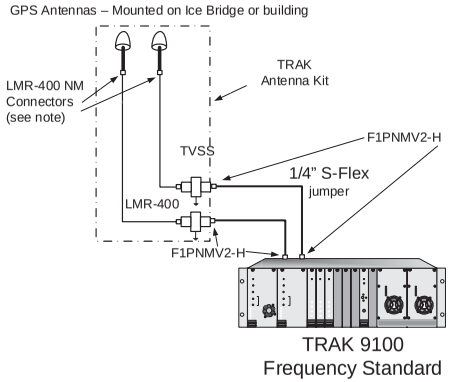
TITLE: 3 Ch 800 MA Simulcast Remotes – Block diagram

CONTRACT	ENGINEER	PROGRAM MGR	SCALE	SIZE
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PROGRAM	DRAWN	CHECKED	SHEET	REV
	TM			O
FILE	DATE	CODE IDENT	DWG NO	
	5/27/16			

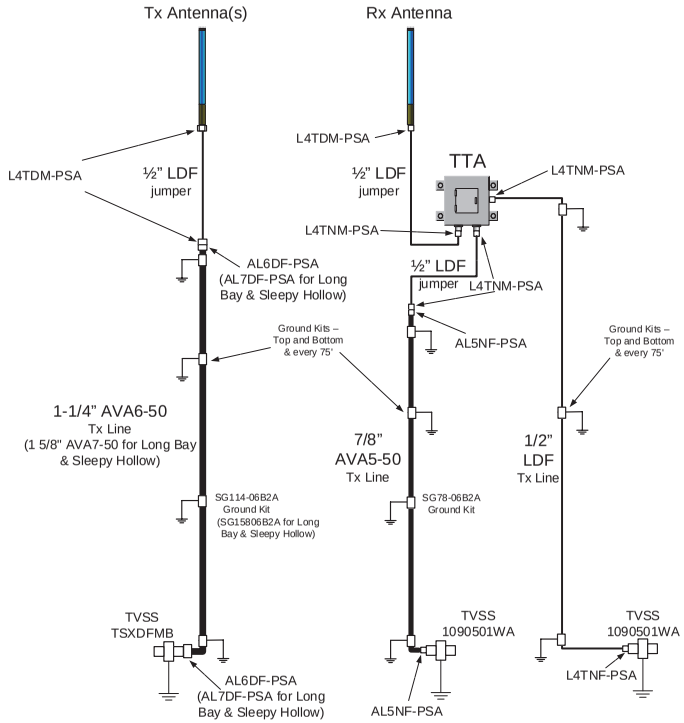




700/800 Tx Combiner & Rx MC Network Configuration



Frequency & Time Network Configuration



700/800 Antenna Network Configuration

Note:
- There are (1) Rx MC per site & (1) Tx Comb per site
- The LMR-400 connectors come installed on one end of the LMR cable

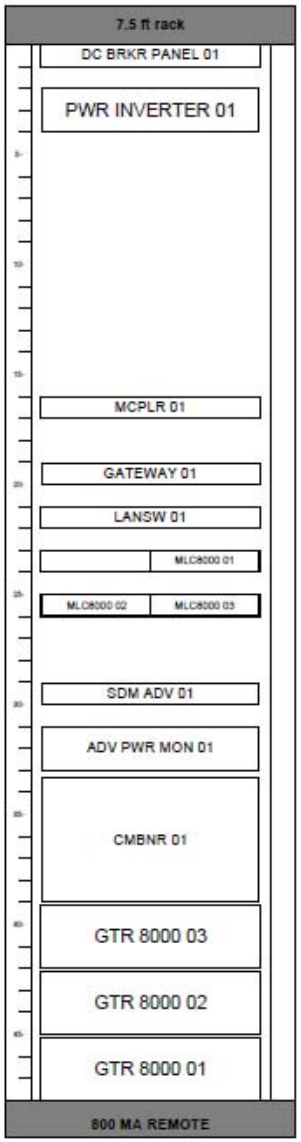
REV	DATE	ENGNR	DESCRIPTION
C			
B			
A			
O	5/27/16	TM	ORIGINAL RELEASE

MOTOROLA Systems Engineering

PROJECT: Broward County TDMA ASTRO25 Simulcast-Multicast System

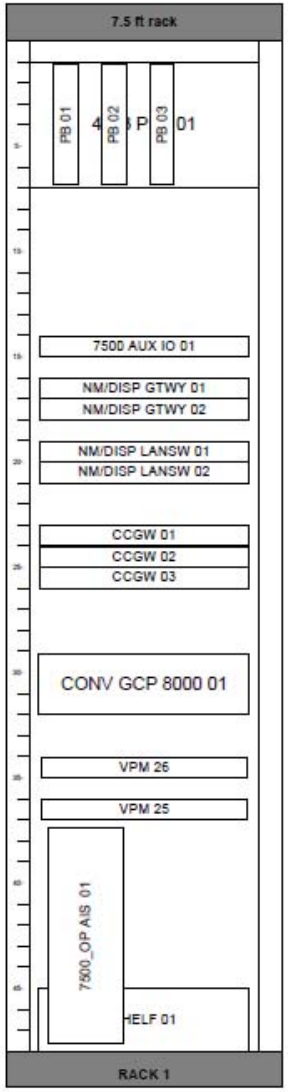
TITLE: Site Antenna Network to Equipment Diagram

CONTRACT	ENGINEER	PROGRAM MGR	SCALE	SIZE
	T. Matthews		None	B
PROGRAM	DRAWN	CHECKED	SHEET	REV
	TM			O
FILE	DATE	CODE IDENT	DWG NO	
	5/27/16			



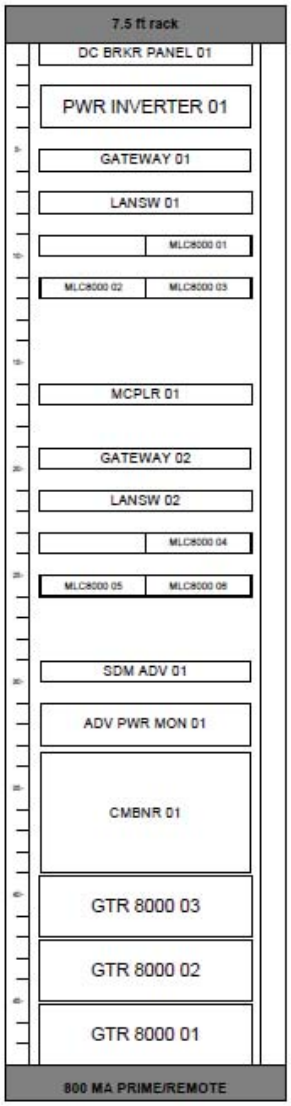
800 MA REMOTE

M			
TITLE: FL_Broward Astro 25 800 MA Remote Rack Layout			
DRAWN BY: Si Rack Report	ENGINEER: CASE26	PROGRAM MGR:	
DATE: 3/21/2017	SCALE: 1 in. to 1 ft.	PROGRAM: Visio 2007	SHT SIZE: 6
SHEET: 1 of 1	FILE NAME: 800 MA Remote.vsd		REV NO: 0



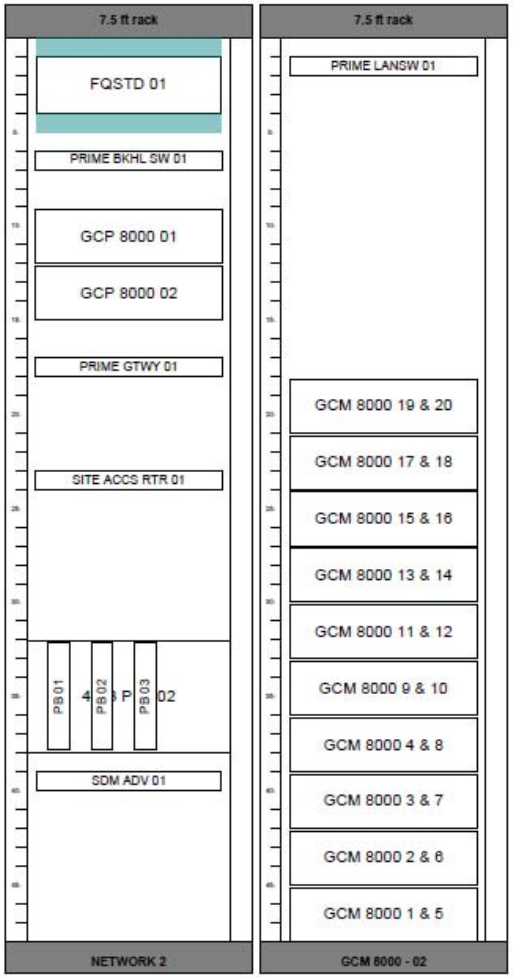
RACK 1

M			
TITLE: FL_Broward Astro 25 Coconut Creek Disp Rack Layout			
DRAWN BY: Si Rack Report	ENGINEER: CASE26	PROGRAM MGR:	
DATE: 3/22/2017	SCALE: 1 in. to 1 ft.	PROGRAM: Visio 2007	SHT SIZE: 6
SHEET: 1 of 1	FILE NAME: Coconut Creek Disp.vsd		REV NO: 0



800 MA PRIME/ REMOTE

M			
TITLE: FL_Broward Astro 25 CORE 800 MA Prime Rack Layout			
DRAWN BY: Si Rack Report	ENGINEER: CASE26	PROGRAM MGR:	
DATE: 3/21/2017	SCALE: 1 in. to 1 ft.	PROGRAM: Visio 2007	SHT SIZE: 6
SHEET: 1 of 1	FILE NAME: CORE 800 MA Prime.vsd		REV NO: 0

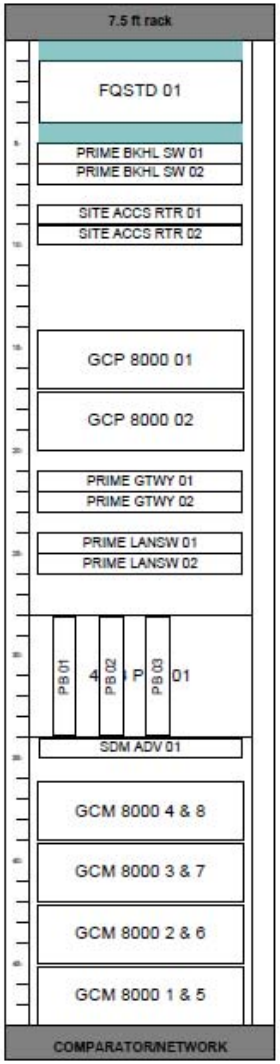


NETWORK 2 **GCM 8000 - 02**

M

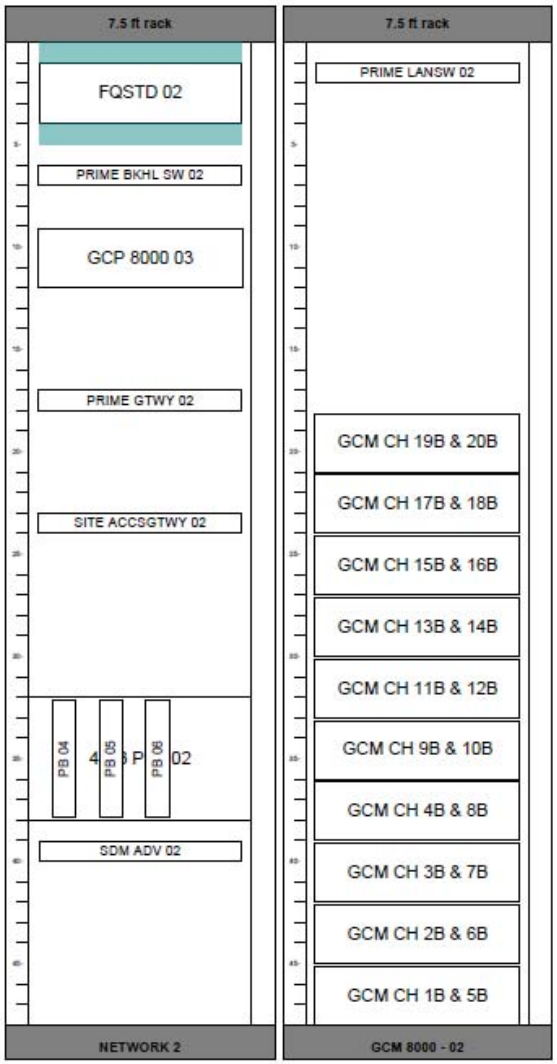
TITLE:
FL_Broward Astro 25
CORE Prime
Rack Layout

DRAWN BY:	ENGINEER:	PROGRAM MGR:	
Si Rack Report	CASE26		
DATE: 3/21/2017	SCALE: 1 in. to 1 ft.	PROGRAM: Visio 2007	SHT SIZE: 6
SHEET: 1 of 1	FILE NAME: CORE Prime.vsd		REV NO: 0



COMPARATOR/ NETWORK

M			
TITLE: FL_Broward Astro 25 EMS Backup Prime Rack Layout			
DRAWN BY: Si Rack Report	ENGINEER: CASE26	PROGRAM MGR:	
DATE: 3/21/2017	SCALE: 1 in. to 1 ft.	PROGRAM: Visio 2007	SHT SIZE: 6
SHEET: 1 of 1	FILE NAME: EMS Backup Prime.vsd		REV NO: 0

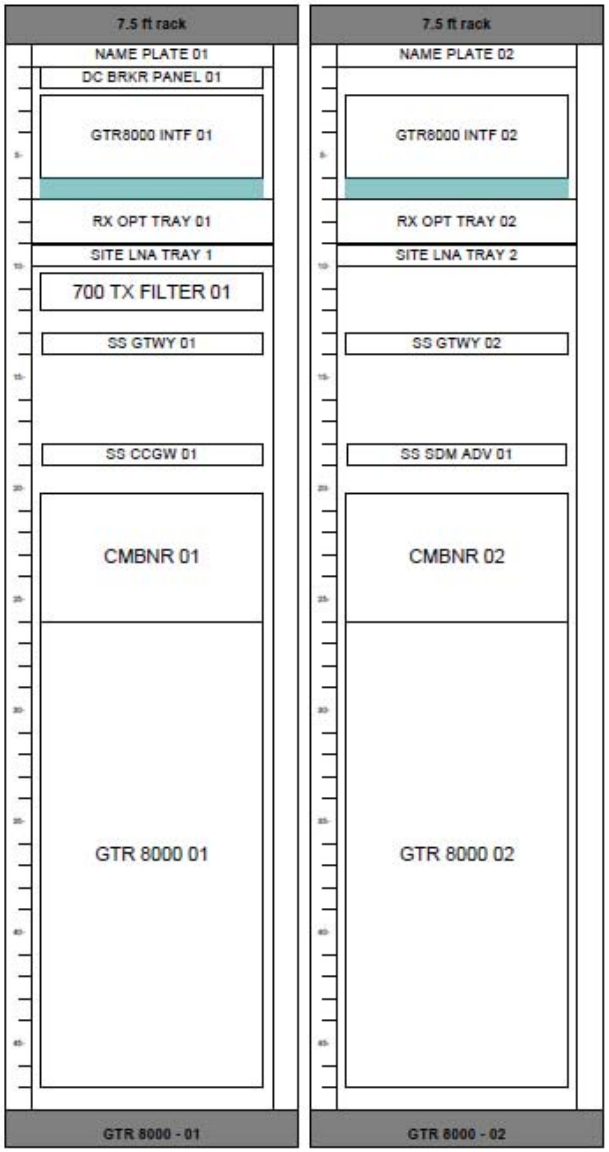


NETWORK 2 **GCM 8000 - 02**

M

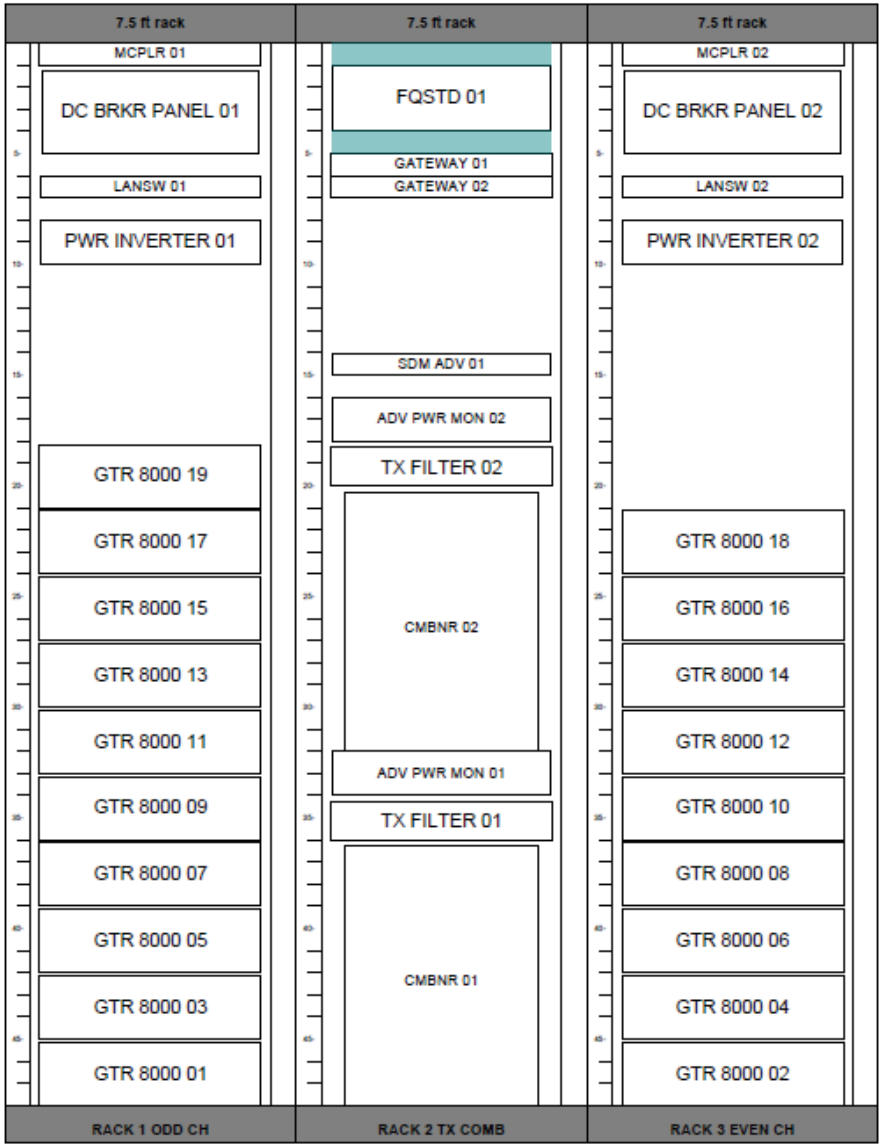
TITLE:
FL Broward Astro 25
West Hollywood Geo Prime
Rack Layout

DRAWN BY:	ENGINEER:	PROGRAM MGR:	
Si Rack Report	CASE26		
DATE:	SCALE:	PROGRAM:	SHT SIZE:
3/21/2017	1 in. to 1 ft.	Visio 2007	6
SHEET:	FILE NAME:		REV NO:
1 of 1	Hard Rock Geo Prime.vsd		0



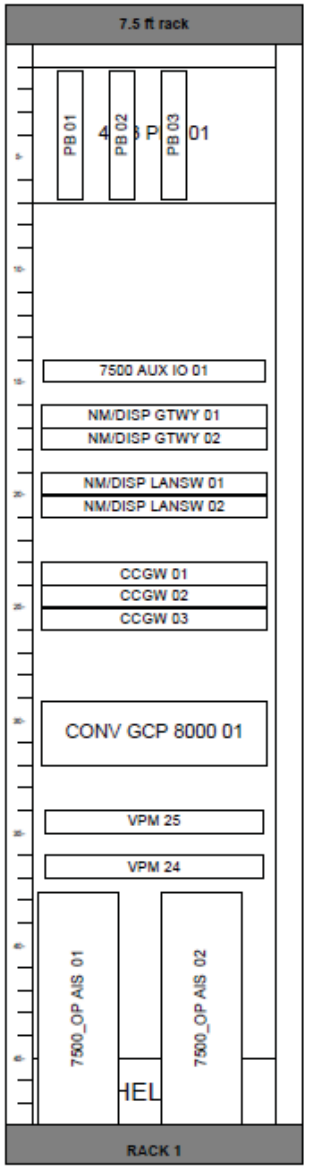
GTR 8000 - 01 **GTR 8000 - 02**

M			
TITLE: FL_Broward Astro 25 Remote BackupESS Rack Layout			
DRAWN BY: Si Rack Report	ENGINEER: CASE26	PROGRAM MGR:	
DATE: 3/21/2017	SCALE: 1 in. to 1 ft.	PROGRAM: Visio 2007	SHT SIZE: 6
SHEET: 1 of 1	FILE NAME: Remote BackupESS.vsd		REV NO: 0



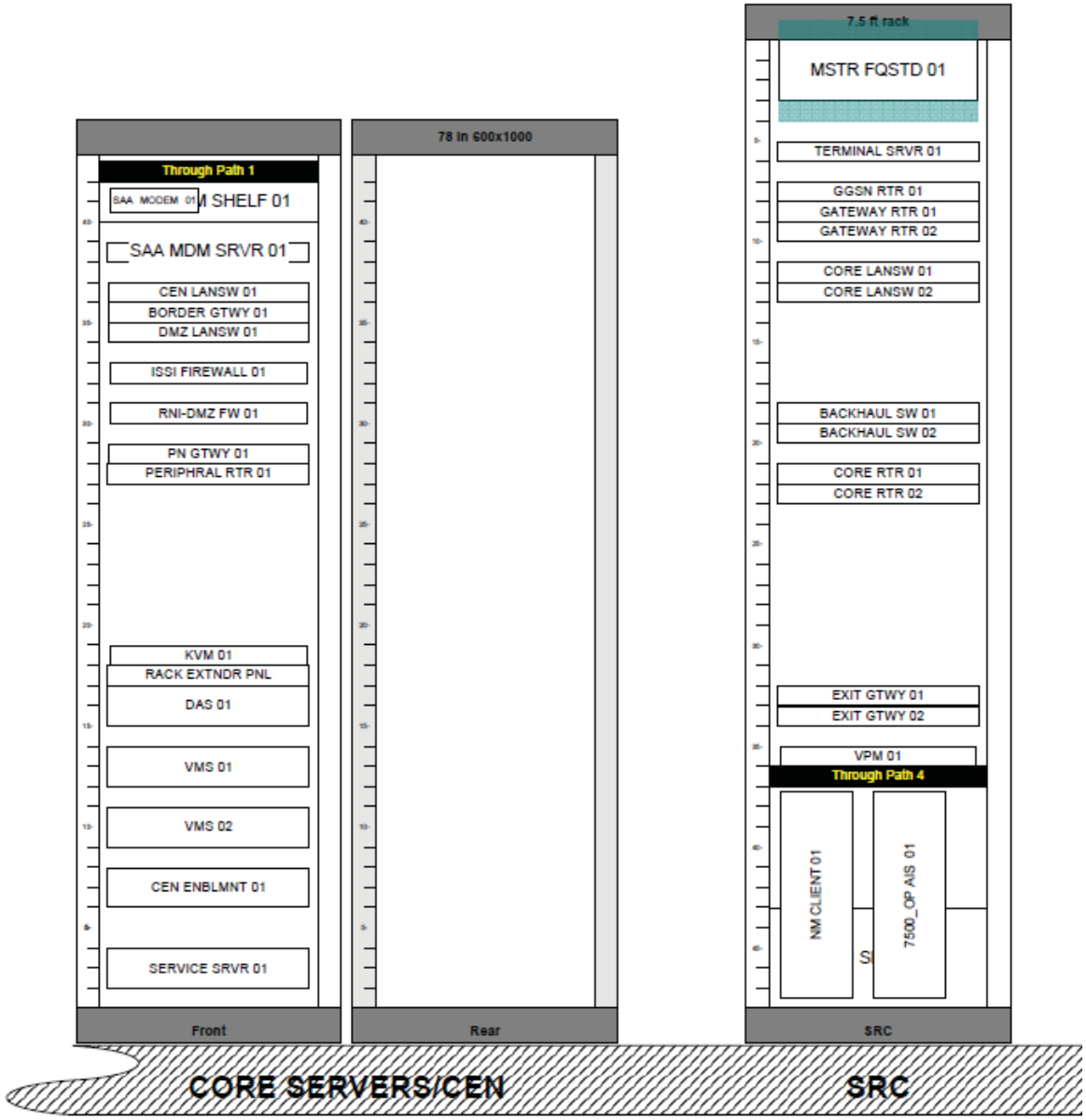
RACK 1 ODD CH **RACK 2 TX COMB** **RACK 3 EVEN CH**

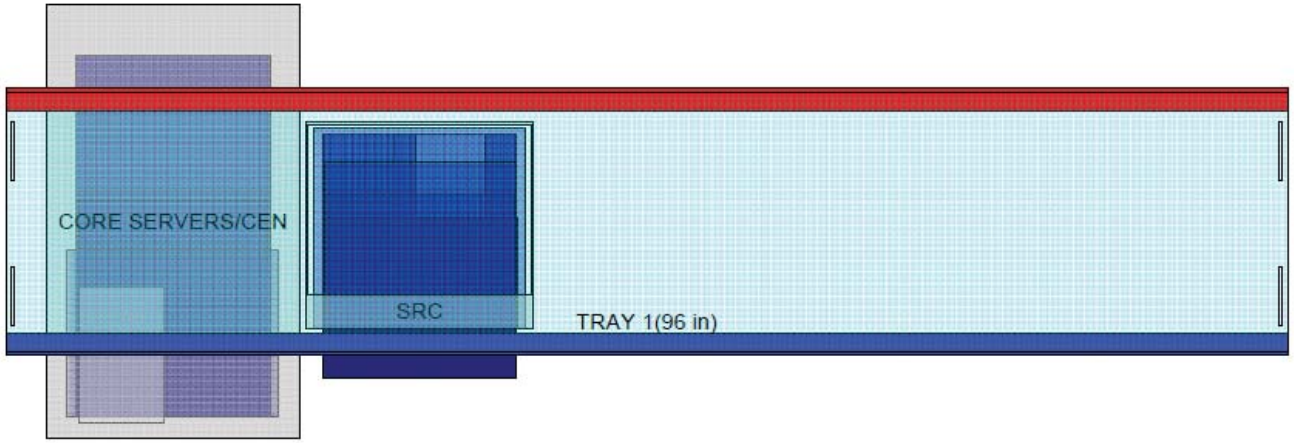
M			
TITLE: FL_Broward Astro 25 Remote SubSite Rack Layout			
DRAWN BY: Si Rack Report	ENGINEER: CASE26	PROGRAM MGR:	
DATE: 3/21/2017	SCALE: 1 in. to 1 ft.	PROGRAM: Visio 2007	SHT SIZE: 6
SHEET: 1 of 1	FILE NAME: Remote SubSite.vsd		REV NO: 0



RACK 1

M			
TITLE: FL_Broward Astro 25 Coconut Creek Disp Rack Layout			
DRAWN BY: Si Rack Report	ENGINEER: CASE26	PROGRAM MGR:	
DATE: 3/23/2017	SCALE: 1 in. to 1 ft.	PROGRAM: Visio 2007	SHT SIZE: 6
SHEET: 1 of 1	FILE NAME: Coconut Creek Disp.vsd		REV NO: 0

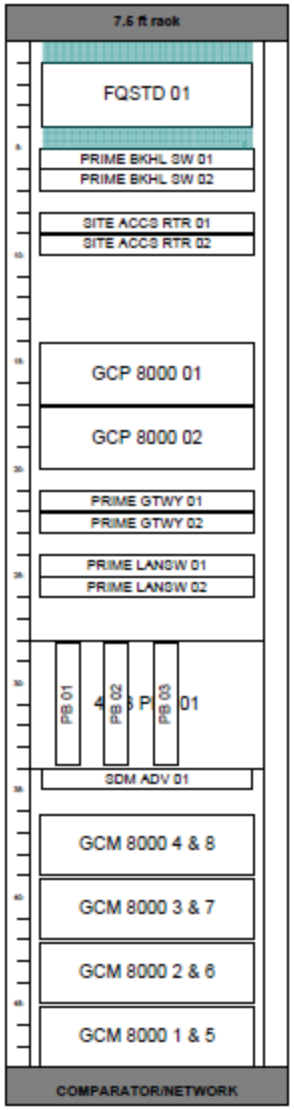

7.5 ft rack
MSTR FQSTD 01
TERMINAL SRVR 01
GGSN RTR 01
GATEWAY RTR 01
GATEWAY RTR 02
CORE LANSW 01
CORE LANSW 02
BACKHAUL SW 01
BACKHAUL SW 02
CORE RTR 01
CORE RTR 02
EXIT GTWY 01
EXIT GTWY 02
VPM 01
Through Path 4
NM CLIENT 01
7500_OP AIS 01
SRC
78 in 600x1000
Through Path 1
SAA MODEM 01
M SHELF 01
SAA MDM SRVR 01
CEN LANSW 01
BORDER GTWY 01
DMZ LANSW 01
ISSI FIREWALL 01
RNI-DMZ FW 01
PN GTWY 01
PERIPHRAL RTR 01
KVM 01
RACK EXTNDR PNL
DAS 01
VMS 01
VMS 02
CEN ENBLMNT 01
SERVICE SRVR 01
Front
Rear
CORE SERVERS/CEN
SRC



MOTOROLA SOLUTIONS

Floor Plan & Cable Tray Layout

Legend	*System:* FL_Broward Astro 25
Data & Audio	*Site:* CORE Master
RF	*File Name:* CORE Master-Racking.vsd
Equipment front is indicated by "F"	*Date:* Wednesday, March 22, 2017

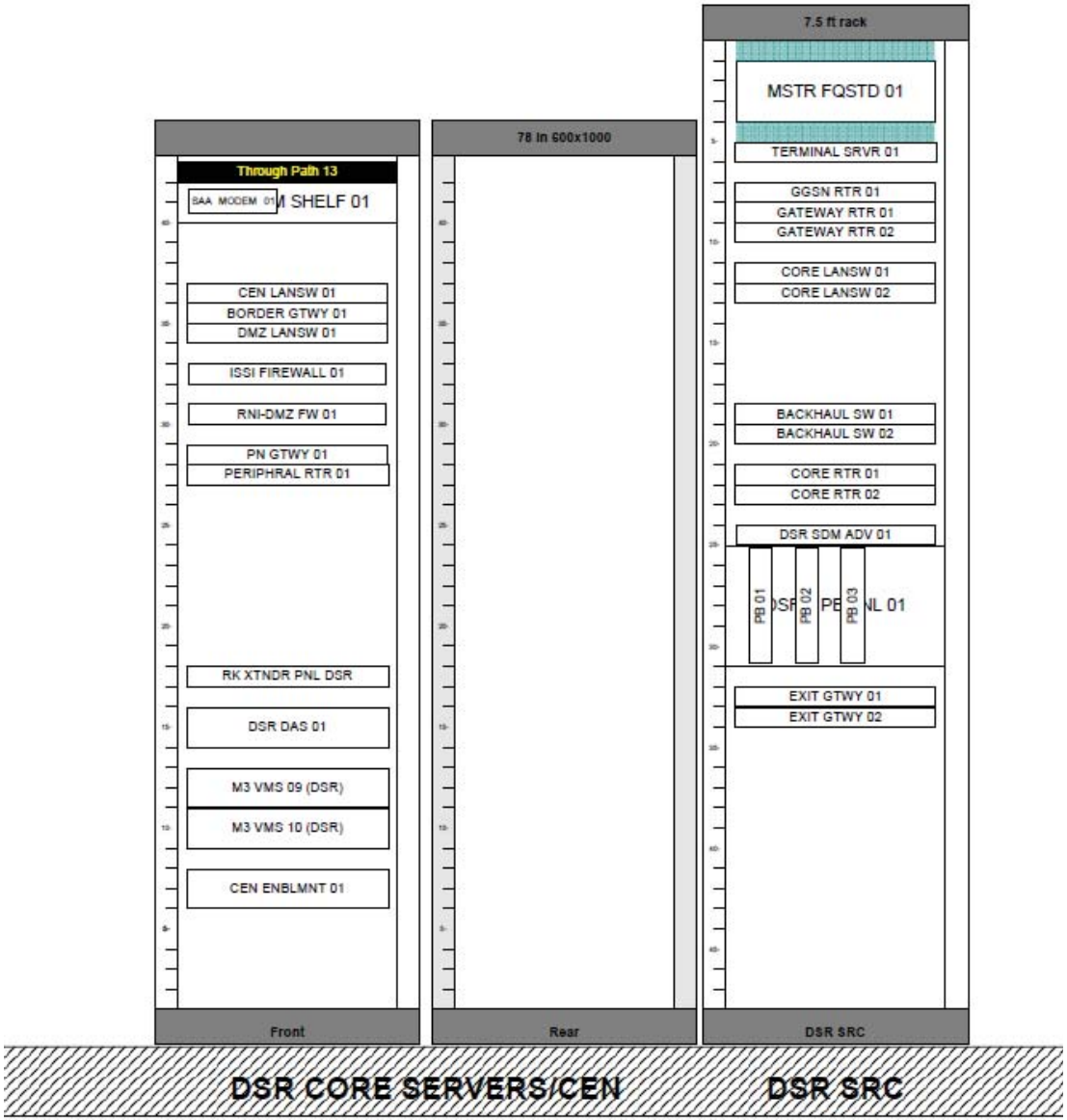


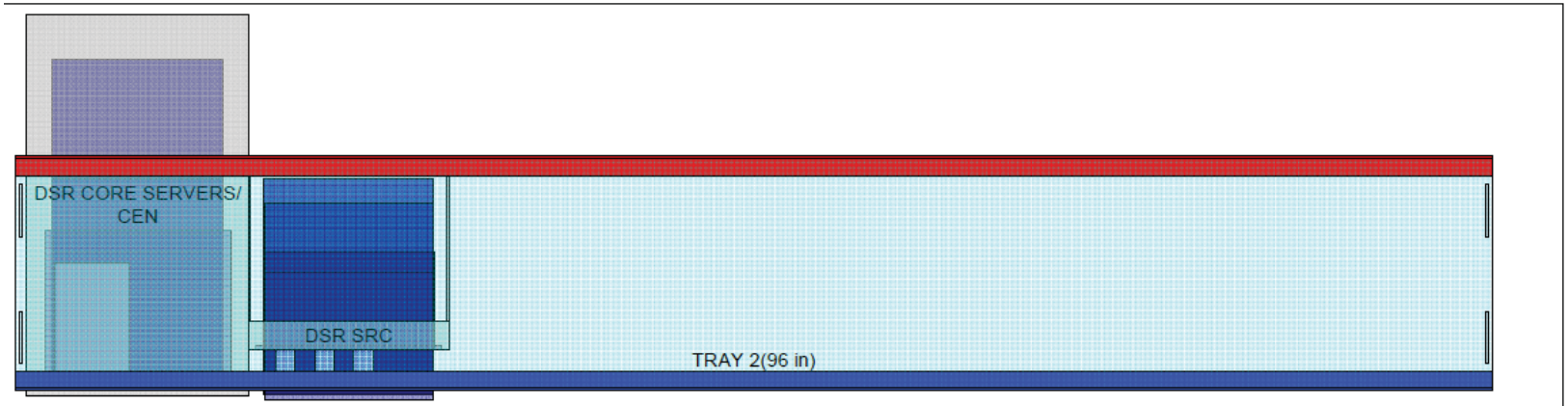
COMPARATOR/ NETWORK

M

TITLE:
FL_Broward Astro 25
EMS Backup Prime
Rack Layout

DRAWN BY: SI Rack Report	ENGINEER: CASE26	PROGRAM MGR:	
DATE: 3/21/2017	SCALE: 1 in. to 1 ft.	PROGRAM: Visio 2007	SHT SIZE: 6
SHEET: 1 of 1	FILE NAME: EMS Backup Prime.vsd		REV NO: 0


7.5 ft rack
MSTR FQSTD 01
TERMINAL SRVR 01
GGSN RTR 01
GATEWAY RTR 01
GATEWAY RTR 02
CORE LANSW 01
CORE LANSW 02
BACKHAUL SW 01
BACKHAUL SW 02
CORE RTR 01
CORE RTR 02
DSR SDM ADV 01
PB 01
PB 02
PB 03
EXIT GTWY 01
EXIT GTWY 02
78 in 600x1000
Through Path 13
SAA MODEM 01
SHELF 01
CEN LANSW 01
BORDER GTWY 01
DMZ LANSW 01
ISSI FIREWALL 01
RNI-DMZ FW 01
PN GTWY 01
PERIPHRAL RTR 01
RK XTNDR PNL DSR
DSR DAS 01
M3 VMS 09 (DSR)
M3 VMS 10 (DSR)
CEN ENBLMNT 01
Front
Rear
DSR SRC
DSR CORE SERVERS/CEN
DSR SRC



MOTOROLA SOLUTIONS

Floor Plan &
Cable Tray Layout

Legend

Data & Audio

RF

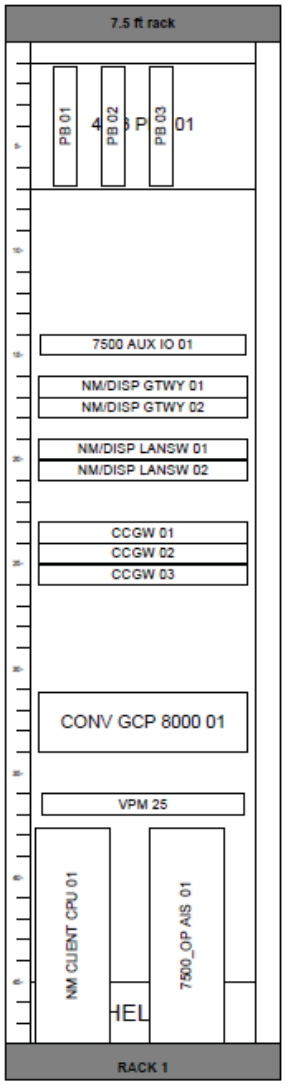
Equipment front is indicated by
"F"

System: FL_Broward Astro 25

Site: EOC DSR Master

File Name: EOC DSR Master-Racking.vsd

Date: Tuesday, March 21, 2017



RACK 1

M			
TITLE: FL_Broward Astro 25 Sunrise Dispatch Rack Layout			
DRAWN BY: Si Rack Report	ENGINEER: CASE26	PROGRAM MGR:	
DATE: 3/23/2017	SCALE: 1 in. to 1 ft.	PROGRAM: Visio 2007	SHT SIZE: 6
SHEET: 1 of 1	FILE NAME: Sunrise Dispatch.vsd		REV NO: 0





MISSION READY WHEN IT MATTERS MOST

APX™ 4000 PROJECT 25 PORTABLE RADIO

Chemical spill. Catastrophic storm. Power outage. When every minute matters, you must communicate instantly with other agencies and responders. But how do you prepare for a disaster and keep control of operating costs? That's where the APX 4000 P25 portable radio answers the call, expertly and affordably.

The APX 4000 delivers all the benefits of TDMA technology in the smallest P25 capable portable in the industry. Easy to use, tough as nails, a hard value to beat, it seamlessly connects agencies throughout your city for fast, interoperable communications.

TRUSTED APX QUALITY

The APX 4000 leverages the leading attributes of the APX family of P25 TDMA portables. From the 2-microphone design that reduces background noise so you can speak and hear clearly over heavy equipment, diesel engines and sirens to the high-spec RF performance for excellent coverage in challenging environments.

With its easy-to-use interface, color display, intelligent lighting and radio profiles, you get all the power of APX in a compact radio. Plus, you can extend the performance of your radio with a complete portfolio of industry-leading IMPRES™ smart energy and audio accessories.

COMPACT AND UNCOMPROMISING

A compact P25 Phase 2 capable portable, the APX 4000 gets the job done without getting in the way. With two dedicated knobs for volume and channel control, the APX 4000 provides readiness for any type of work setting. And its standard IP67 and MIL-STD certified to withstand dust, heat, shock, drops and water immersion, so you can count on it wherever you need it – at the factory line, power line or fire line.

P25 PERFORMANCE, INSIDE AND OUT

Loaded with key P25 features to increase safety, the APX 4000 features Mission Critical Wireless. This unique Bluetooth® solution provides an encrypted link to a high performance earpiece, GPS for quickly locating personnel outdoors, AES encryption for improved security, and over-the-air programming to program radios in the field without interrupting voice operation.

IMPROVE RESPONSE AND EXPENSES

The APX 4000 is P25 Phase 2 capable for twice the voice capacity so you can add more users without adding more frequencies or infrastructure. And it's backwards and forwards compatible with all Motorola mission critical radio systems, so you can interoperate with confidence while you improve operating expenses.

POWER UP WITH APX 4000 ACCESSORIES

- Designed, tested and certified for optimum performance with your radio.
- Complete portfolio of remote speaker microphones, headsets and Mission Critical Wireless Bluetooth® accessories.
- High-powered IMPRES™ batteries that have a slim design to fit the compact radio size.



FEATURES AND BENEFITS

Available in 700/800 MHz, VHF, UHF R1, UHF R2 and 900 MHz bands

- Trunking standards supported:
  - Clear or digital encrypted ASTRO®25 Trunked Operation
  - Capable of SmartZone®, SmartZone Omnilink, SmartNet®
- Analog MDC-1200 and Digital APCO P25 Conventional
- System Configurations
- Narrow and wide bandwidth digital receiver (6.25 kHz equivalent / 12.5 kHz / 30 kHz / 25 kHz)[1]
- Standard with 2 dedicated control knobs for volume and channel changes
- Embedded digital signaling (ASTRO & ASTRO 25)
- Man Down
- Available in 2 models
- Lightbar with Intelligent Lighting
- Radio Profiles
- Unified Call List
- Software Key
- ASTRO 25 Integrated Voice & Data
- User programmable Voice Announcement
- Meets Applicable MIL-STD-810C, D, E, F and G
- IP67 standard
- Rugged Submersible housing (2 meters for 2 hours)[2]
- Superior Audio Features:
  - 0.5 W high audio speaker
  - 2-mic noise canceling technolog
- GPS Outdoor Location Tracking
- Utilizes Windows XP, Vista and Windows 7 and 8 Customer Programming Software (CPS)
  - Supports USB communications
  - Built in FLASHport™ support
- Full portfolio of accessories including IMPRES batteries, chargers and audio devices[1]
- Mission Critical Wireless Bluetooth[2]

OPTIONAL FEATURES

- AES Encryption
- Programming Over Project 25
- Text Messaging
- Man Down
- Site Selectable Alert Tones
- P25 Over the Air Re-keying
- P25 Link Layer Authentication
- Enhanced Data
- Rugged Option: Mil Std 512.X, Delta - T

[1] Chargers and batteries for the APX 4000 radios are not compatible with other APX radios.
[2] Compatible with BT 2.1 HSP, PAN, DUN and SPP BT Profiles.
[3] When used with a Hazardous Location tested radio.

TRANSMITTER - TYPICAL PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2	900 MHz[6]
Frequency Range/ Bandsplits	700 MHz 800 MHz	763-776, 793-806 MHz 806-824, 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz	896-901, 935-940 MHz
Channel Spacing		25/12.5 kHz	30/25/12.5 kHz	25/12.5 kHz	25/12.5 kHz	12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Rated RF Output Power Adj[1]		1-3 Watts Max	1-5 Watts Max	1-5 Watts Max	1-5 Watts Max	1-2.5 Watts Max
Frequency Stability[1] (-30°C to +60°C; +25°C Ref.)		±0.00010 %	±0.00010 %	±0.00010 %	±0.00010 %	±0.00010 %
Modulation Limiting[1]		±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz	±2.5 kHz
Emissions (Conducted and Radiated)[1]		-75 dB	-75 dB	-75 dB	-75 dB	-75 dB
Audio Response[1]		+1, -3 dB	+1, -3 dB	+1, -3 dB	+1, -3 dB	+1, -3 dB
FM Hum & Noise	25 kHz 12.5 kHz	-47 dB -45 dB	-47 dB -47 dB	-47 dB -45 dB	-47 dB -45 dB	-45 dB
Audio Distortion[1]	25 kHz 12.5 kHz	1.00%	1.00%	1.00%	1.00%	1.00%

BATTERIES FOR APX 4000

Battery Capacity / Type	Dimensions (HxWxD)	Weight	Battery Part Number	Battery Capacity
Li-Ion IMPRES 1900 mAh IP67	114.5x55.04x17.85	150 grams	NNTN8128A	1900 mAh
Li-Ion IMPRES 2300 mAh IP67 Non-HazLoc	114.5x55.04x23.15	160 grams	PMNN4424AR	2300 mAh
Li-Ion IMPRES 2300 mAh IP67 HazLoc[3]	114.5x55.04x23.15	210 grams	NNTN8560A	2500 mAh
Li-Ion IMPRES 2700 mAh IP54 Non-HazLoc[3]	114.5 x 55.04 x 23.15	160 grams	PMNN4448AR	2700 mAh

RADIO MODELS





	MODEL 2	MODEL 3
Display	Full bitmap color LCD display 3 lines of text x 14 characters 1 line of icons 1 menu line x 3 menus White backlight	Full bitmap color LCD display 3 lines of text x 14 characters 1 line of icons 1 menu line x 3 menus White backlight
Keypad	Backlight keypad 3 soft keys 4 direction Navigation key Home and Data buttons	Backlight keypad 3 soft keys 4 direction navigation key 4x3 keypad Home and Data buttons
Channel Capacity	512	512
FLASHport Memory	64 MB	64 MB
700/800 MHz (763-870 MHz)	H51UCF9PW6AN Q360GK	H51UCH9PW7AN Q360GK
VHF (136-174 MHz)	H51KDF9PW6AN Q360GX	H51KDH9PW7AN Q360GX
UHF Range 1 (380-470 MHz)	H51QDF9PW6AN Q360GL	H51QDH9PW7AN Q360GL
UHF Range 2 (450-520 MHz)	H51SDF9PW6AN Q360HA	H51SDH9PW7AN Q360HA
900 MHz (896-940 MHz)	H51WCF9PW6AN Q360JF	H51WCH9PW7AN Q360JE
Buttons & Switches	Large PTT button ■ Angled On/Off Volume Control ■ 16 position top-mounted rotary switch ■ Orange emergency button ■ 3 programmable side buttons	

TRANSMITTER CERTIFICATION

700/800 (764-869 MHz)	AZ489FT7049
VHF (136-174 MHz)	AZ489FT3828
UHF Range 1 (380-470 MHz)	AZ489FT4905
UHF Range 2 (450-520 MHz)	AZ489FT4910
900 MHz (896-901, 935-940 MHz)	AZ489FT5864

FCC EMISSIONS DESIGNATORS

FCC Emissions Designators	11K0F3E, 16K0F3E, 8K10F1D, 8K10F1E, 8K10F1W, 20K0F1E*
FCC Emissions Designators for 900 MHz	11K0F3E, 8K10F1D, 8K10F1E, 8K10F1W

POWER SUPPLY

Power Supply	One rechargeable Li-Ion 1900 mAh battery standard, or 2300 mAh/2700 mAh high cap Li-Ion.

RECEIVER - TYPICAL PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2	900 MHz
Frequency Range/Bandsplits	700 MHz 800 MHz	763-776 MHz 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz	935-940 MHz
Channel Spacing		25/12.5 kHz	30/25/12.5 kHz	25/12.5 kHz	25/12.5 kHz	12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Audio Output Power at Rated[1]		500mW	500mW	500mW	500mW	500mW
Frequency Stability[1] (-30°C to +60°C; +25°C Ref.)		±0.00010 %	±0.00010 %	±0.00010 %	±0.00010 %	±0.00010 %
Analog Sensitivity[3] Digital Sensitivity[4]	12 dB SINAD 1% BER (800 MHz) 5% BER	0.250µV 0.400µV 0.250µV	0.216µV 0.277µV 0.188µV	0.234µV 0.307µV 0.207µV	0.234µV 0.307µV 0.207µV	0.236µV 0.33µV 0.222µV
Selectivity[1]	25 kHz channel 12.5 kHz channel	-76 dB -67 dB	-76 dB -70 dB	-76 dB -67 dB	-76 dB -67 dB	-67 dB
Intermodulation		-75 dB	-79 dB	-77 dB	-77 dB	-75 dB
Spurious Rejection		-76.6 dB	-80.5 dB	-80.3 dB	-80.3 dB	-80 dB
FM Hum and Noise	25 kHz 12.5 kHz	-53 dB -47 dB	-51 dB -45 dB	-50 dB -45 dB	-50 dB -45 dB	-47 dB
Audio Distortion[1]		1.00%	1.00%	1.00%	1.00%	1.00%

PORTABLE MILITARY STANDARDS 810 C, D, E , F & G

	MIL-STD 810C		MIL-STD 810D		MIL-STD 810E		MIL-STD 810F		MIL-STD 810G	
	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.
Low Pressure	500.1	I	500.2	II	500.3	II	500.4	II	500.5	II
High Temperature	501.1	I, II	501.2	I/A1, II/A1	501.3	I/A1, II/A1	501.4	I/Hot, II/Basic Hot	501.5	I/A1, II/A2
Low Temperature	502.1	I	502.2	I/C3, II/C1	502.3	I/C3, II/C1	502.4	I/C3, II/C1	502.5	I/C3, II/C1
Temperature Shock	503.1	I	503.2	I/A1C3	503.3	I/A1C3	503.4	I	503.5	I/C
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I	505.5	I/A1
Rain	506.1	I, II	506.2	I, II	506.3	I, II	506.4	I, III	506.5	I, III
Humidity	507.1	II	507.2	II	507.3	II	507.4	1 Proc	507.5	II/Aggravated
Salt Fog	509.1	I	509.2	I	509.3	I	509.4	1 Proc	509.5	1 Proc
Blowing Dust	510.1	I	510.2	I	510.3	I	510.4	I	510.5	I
Blowing Sand	1 Proc	1 Proc	510.2	II	510.3	II	510.4	II	510.5	II
Vibration	514.2	VIII/F, Curve-W	514.3	I/10, II/3	514.4	I/10, II/3	514.5	I/24	514.6	I/24
Shock	516.2	I, III, V	516.3	I, V, VI	516.4	I, V, VI	516.5	I, V, VI	516.6	I, V, VI
Shock (Drop)	516.2	II	516.2	IV	516.4	IV	516.5	IV	516.6	IV

DIMENSIONS OF THE RADIOS WITHOUT BATTERY

	Inches	Millimeters
Length	5.42	137.7
Width Push-To-Talk button	2.42	61.4
Depth Push-To-Talk button	1.41	35.75
Width Top	2.62	66.55
Depth Top	1.84	46.7
Weight of the radios without battery	10.05 oz	285 g

GPS SPECIFICATIONS

Channels	12
Tracking Sensitivity	–159 dBm
Accuracy[5]	<10 meters (95%)
Cold Start	<60 seconds (95%)
Hot Start	<10 seconds (95%)
Mode of Operation	Autonomous (Non-Assisted) GPS

ENCRYPTION

Supported Encryption Algorithms	AES/ADP/(DES-XL, DES-OFB)
Encryption Algorithm Capacity	8
Encryption Keys per Radio	Module capable of storing 1024 keys. Programmable for 48 Common Key Reference (CKR) or 16 Physical Identifier (PID)
Encryption Frame Re-sync Interval	P25 CAI 300 mSec
Encryption Keying	Key Loader
Synchronization	XL – Counter Addressing OFB – Output Feedback
Vector Generator	National Institute of Standards and Technology (NIST) approved random number generator
Encryption Type	Digital
Key Storage	Tamper protected volatile or non-volatile memory
Key Erasure	Keyboard command and tamper detection
Standards	FIPS 140-2 Level 3; FIPS 197

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature[6]	-30°C / +60°C
Storage Temperature[6]	-40°C / +85°C
Humidity	Per MIL-STD
ESD	IEC 801-2 KV
Water and Dust Intrusion	IP67
Submersion	MIL-STD 512.X

[1] Measured in the analog mode per TIA / EIA 603 under nominal conditions
[2] When used with an UL approved intrinsically safe radio
[3] Measured conductively in analog mode per TIA / EIA 603 under nominal conditions.
[4] Measured conductively in digital mode per TIA / EIA IS 102.CAAA under nominal conditions.
[5] Accuracy specs are for long-term tracking (95th percentile values >5 satellites visible at a nominal –130 dBm signal strength).
[6] Temperatures listed are for radio specifications. Battery storage is recommended at 25°C, ±5°C to ensure best performance.

Specifications subject to change without notice. All specifications shown are typical. Radio meets applicable regulatory requirements.

Motorola Solutions, Inc. 1301 East Algonquin Road Schaumburg, Illinois 60196, U.S.A. 800-367-2346
motorolasolutions.com

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CONSTANT COMMUNICATION WHEN IT MATTERS MOST

ASTRO® 25 MCC 7500 IP DISPATCH CONSOLE

Designed to ensure optimal-quality audio, reliable communication and ease of use for dispatchers, the MCC 7500 IP Dispatch Console operator positions connect directly to the ASTRO 25 system for communication with both trunked and conventional radios, and for all other dispatch activity.

Integration of the MCC 7500 Console positions with the ASTRO 25 system enables full participation in end-to-end voice encryption for secure communication, priority handling of emergency calls and agency partitioning. Each console is centrally configured and managed from the network manager, providing vital efficiency.

EASY TO USE, FLEXIBLE, AND CUSTOMIZABLE USER INTERFACE

Featuring the Elite Graphical User Interface (GUI), which has been refined and proven through years of use in mission critical dispatch operations, the MCC 7500 Console eases migration and minimizes user training requirements.

The intuitive and familiar GUI is based on Microsoft Windows® and uses easily recognized icons and aliases. The GUI's powerful customization capabilities enable the colors, sizes and locations of resources on the screens to be tailored to best meet each individual user's needs. Designated folders organize resources for flexibility in handling responsibilities from shift to shift and increased efficiency in responding to events and incidents.

Trunked and conventional radio channels are customizable with various controls, such as patch status, frequency select, coded/clear select and individual volume control, based on user preferences. Per-channel controls can be fully or partially shown, or hidden to save space on the screen.

Busy dispatchers can respond to a missed call by simply clicking on an entry in the Activity Log. The number of calls and call information displayed in the Activity Log is customizable to suit the needs of the user(s).

Telephone resources are accessed and easily patched with radio resources within the MCC 7500 Dispatch Console's GUI, eliminating the cost of having additional telephone equipment at the dispatch position and speeding communications between systems.

The status of auxiliary inputs and outputs is conveniently interpreted from the GUI with the use of familiar graphical icons, such as a door shown open or closed.

KEY INTEROPERABILITY FEATURES

Agency Partitioning

Multiple agencies can share a system to gain interoperability and cost savings benefits, while still maintaining control of their own channels, encryption keys, console configuration and more.

Priority for Emergencies
Transmit Priority Levels provide an orderly and consistent method for ensuring higher priority transmissions are able to take over resources from lower priority transmissions.

Optimized Patch Functionality
MCC 7500 Console users can patch communications between trunked and/or conventional radios that are normally unable to communicate with each other. Patched radio users see the ID or alias of the other patched radio(s), as opposed to that of the console. This minimizes confusion and the need for the dispatcher to intervene in the call. Patches are automatically re-established if interrupted so the MCC 7500 Console user can concentrate on continuing operations.

Enhanced Secure Operation
Encryption and decryption services within each dispatch operator position enable dispatchers to fully participate in secure communications while keeping the sensitive, vital information completely encrypted between the dispatcher and the radio users.

Dispatchers can interface with agencies that have different encryption configurations without any manual intervention or delay. Up to 60 calls using up to six different algorithms and multiple secure keys can be supported simultaneously.

To help reduce dispatcher stress and potential errors when managing encrypted audio situations, indicators and alerts are provided when the console mode does not match that of a received call, as well as when a patch or multi-select group is being set up between a mix of clear and secure channels.

MCC 7500 CONSOLE SOLUTION COMPONENTS

MCC 7500 Console Operator Position
MCC 7500 Console operator positions connect directly to the radio system's IP transport network without gateways or interface boxes. Audio processing, encryption, and switching intelligence for dispatch is performed within each software-based operator position, without additional centralized electronics. MCC 7500 Consoles function as integrated components of the total radio system, enabling full participation in system level features such as end-to-end encryption and agency partitioning.

Operator position hardware consists of a monitor, personal computer, keyboard and mouse/trackball/ touchscreen, speakers, audio accessories and a Voice Processor Module (VPM). The VPM allows analog devices to be connected to the digital console. The low-profile VPM can be rack mounted, furniture mounted or placed on the desktop.

The MCC 7500 Console does not require separate configuration or performance management equipment. The console system is configured and managed by the radio system's configuration manager, fault manager and performance reporting applications to provide the customer with a single point for configuring and managing the entire radio system. Changes are automatically distributed throughout the system. This centralized approach saves valuable time and effort for system administrators and technicians. Aliases for Radio PTT IDs may be managed both locally and centrally in the same system to provide agencies sharing an ASTRO 25 radio system with the flexibility to meet their alias management needs.

CONVENTIONAL GATEWAY

The Conventional Channel Gateway (CCGW) enables both analog and digital channels to interface with MCC 7500 Consoles with no need for a separate hardware network and channel banks. Conventional calls are transported between the dispatch operator positions and CCGWs on the same IP network as trunked calls.

A CCGW provides 2-wire/4-wire analog ports for analog channels, V.24 ports for older ASTRO 25 conventional channels and IP connectivity for current architecture ASTRO 25 conventional channels. Enhanced digital control of consolettes can be achieved by using a combination of analog and V.24 ports. CCGWs are available in two capacities. The standard density CCGW supports up to eight "port based" channels and up to sixteen "IP based" channels for a total of twenty four channels. The high density CCGW supports up to sixteen "port based" channels and up to sixteen "IP based" channels for a total of thirty two channels.

The 2-wire/4-wire analog ports support tone remote and ear and mouth (E&M) station control. The V.24 ports and IP connections support digital station control while a combination of analog and V.24 ports support enhanced digital control of consolettes. The CCGW also supports simple analog, MDC 1200 analog, digital-only and mixed-mode analog/digital channels.

AUXILIARY INPUT/OUTPUT SERVER

The auxiliary input/output server enables console operators to control and monitor external devices, such as doors and lights, from the console user interface. Since the MCC 7500 Console does not rely on centralized electronics, contact closures and input buffers required to interface to these devices are housed in Remote Terminal Units (RTUs). These RTUs can be physically located close to where they are needed or at any console or radio frequency (RF) site. The dispatch consoles and RTUs communicate with each other across the radio system's IP transport network.

ARCHIVING INTERFACE SERVER (AIS)

The AIS is a digital logging interface, comprised of a personal computer and a voice processor module (VPM). Each AIS works with an IP-based logging recorder. Audio and call control information is sent across the IP network between the AIS and recorder. Highly configurable, the MCC 7500 Console logging solution includes:

- Recorded audio quality equivalent to audio heard at console position
- Information associated with radio calls recorded in addition to the call audio.

- Dispatcher- and radio-initiated events on radio channels (such as changing the frequency, sending an alarm) are recorded.
- Recorder capacity based on the number of radio transmissions needed to record simultaneously, not on the number of channels it may record.
- Agency partitioning, enhancing control over which resources are recorded by what agency or department.
- Security and fault management centralized at the radio system's network manager.

CONSOLE TELEPHONY MEDIA GATEWAYS

Media gateways are used to provide dispatchers with access to analog POTS and/or T1/E1 phone lines directly from their MCC 7500 Console positions. The Session Initiation Protocol (SIP) is used to communicate with the media gateways across the console IP network. A rich set of telephony features is supported by the media gateways, enabling dispatchers to do their jobs more effectively and efficiently.

SPECIFICATIONS

System Compatibility	ASTRO® 25 System and PremierOne™ CAD Application	
Vocoder Algorithms supported	AMBE, IMBE, ACELP, G.728, G.711	
Encryption Algorithms supported	AES (256 bit), DES-OFB, DVI-XL, ADP (Advanced Digital Privacy), DES-XL, DVP-XL	
Monitor requirements With Mouse or Trackball Touchscreen	 17" minimum, 20" recommended 20" minimum	
Voice Processor Module (VPM) connections	**Connector type** RJ45 DB15	**Device** One desktop microphone, eight desktop speakers, one local logging recorder, one radio instant recall recorder, one console telephony instant recall recorder, one external telephone set, one external paging encoder, one footswitch Two headset jacks connectors
VPM mounting options	EIA 19" rack mount, console furniture mount, Desktop – supports monitor up to 80 lbs	
VPM audio inputs and outputs	600 Ohm, balanced and transformer coupled (except for microphone which is 2000 Ohm, balanced, and does not use a transformer)	
Speaker Mounting Options	Desktop, furniture mount, or wall mount (with bracket accessory)	
Dispatch Console Cable Lengths	VPM to Speaker cable VPM to Headset Jack cable Headset Jack Extension cable VPM to Microphone cable VPM to Footswitch cable	10.1 feet (3.09 meters) standard 6 feet (1.8 meters) standard 6 feet (1.8 meters) standard 10 feet (3.05 meters) standard 10 feet (3.05 meters) standard
Supported Console Site Link types	Fractional T1/E1, Single T1/E1, Multiple T1/E1s Redundant and non-redundant versions IP site links	
MCC 7500 Dispatch Console Capacities	Up to 60 simultaneous audio sessions per operator position Up to 60 simultaneous encryption/decryption sessions per secure capable operator position Up to 3 Multi-Select groups per operator position (with up to 20 members per Multi-Select group) Up to 16 Patch groups per operator position (with up to 20 members per Patch group) Up to 160 resources per operator position	
Conventional Channel Gateway	Rack mountable, 1 rack unit high T1R1, T2R2, T4R4, T8R8, T12R12, T14R14 channels Simple analog, MDC 1200 analog, pure digital, mixed mode (analog/digital) channels, consolettes Standard density CCGWs provide interfaces for up to four analog conventional channels High density CCGWs provide interfaces for up to eight analog conventional channels Each analog conventional channel interface contains the following inputs and outputs • 600 Ohm, balanced analog audio input - To accept radio audio from the channel. Can be configured to support AGC, DLM, or no input conditioning. • 600 Ohm, balanced analog audio output - To send console transmit audio to the channel • 600 Ohm, balanced analog audio output - To send console transmit and radio receive audio to a logging recorder • 1 Amp, 24 VDC relay output - For relay keying of the channel • Input buffer - To detect Carrier Operated Relay (COR) closure in the channel • Input buffer - To detect Line Operated Busy Light (LOBL) closure in the channel • Input buffer - To detect Coded/Clear closure on an Advanced Securenet channel Standard density CCGWs provide interfaces for up to four V.24 based ASTRO 25 conventional channels High density CCGWs provide interfaces for up to eight V.24 based ASTRO 25 conventional channels • V.24 to station or comparator. No Digital Interface Unit (DIU) required. Standard density CCGWs can support up to 24 conventional channels simultaneously (four analog + four V.24 based ASTRO 25 conventional + sixteen IP based ASTRO 25 conventional) High density CCGWs can support up to 32 conventional channels simultaneously (eight analog + eight V.24 based ASTRO 25 conventional + sixteen IP based ASTRO 25 conventional)	

SPECIFICATIONS

Auxiliary Input/Output Server Hardware	A simplified, user-friendly version of the MOSCAD SDM 3000 RTU is used to support most Aux I/O needs. The output relays are capable of switching 1A @ 24VDC or 1A @ 24VAC. Input buffers are capable of sensing a dry closure through 1000 feet or less (round trip) of 24 AWG wire. The RTU provides single pole Form A relay outputs. (Double pole, Form B or Form C relays must be implemented using external relays which are controlled by the RTU relays.)

Auxiliary Input/Output Capacities	**Number of Output Relays**	**Number of Input Buffers**
Single SDM 3000 RTU	16	48
Single SDM 3000 RTU with 1 expansion chassis	32	96
Single SDM 3000 RTU with 2 expansion chassis	48	144

Auxiliary Input/Output Mounting	Each SDM 3000 RTU and each SDM 3000 RTU Expansion Chassis is rack mountable in a standard 19 inch rack and is one rack unit high.
Console Telephony Media Gateway	The POTS version gateway supports up to eight analog POTS lines. The E1/T1 version gateway supports up to two E1 or two T1 connections. Each gateway is rack mountable in a standard 19 inch rack and is 1 rack unit high.

SIZE AND WEIGHT

Device	**Height**	**Width**	**Depth**	**Weight**
VPM	1.75 in (44.5 mm)	16.9 in (430 mm)	12.3 in (312 mm)	3.6 lbs (1.6 kg)
Speaker	4.9 in (124 mm)	4 in (102 mm)	Without bracket: 3.5 in (89 mm) With bracket: 5.8 in (146 mm)	0.7 lbs (0.3 kg)
Headset Jack	1.6 in (41 mm)	5 in (127 mm)	6 in (152 mm)	1.2 lbs (0.5 kg)
Microphone	Gooseneck at 90°: 4.5 in (114 mm) Gooseneck at 180°: 21.8 in (552 mm)	4.8 in (121 mm)	6.6 in (168 mm)	2.4 lbs (1.1 kg)

POWER AND CONSUMPTION THERMAL

Device	**Power Input**	**Thermal Output**
VPM	0.4 Amps at 120VAC 0.2 Amps at 240VAC	171 BTUs/hour
Speaker	Add 0.05 Amps per speaker to VPM power Input at 120VAC (0.025 Amps at 240VAC)	Add 15 BTUs/hour per speaker to VPM thermal output
Headset Jack & Microphone	negligible	negligible

CERTIFICATIONS

	The various hardware elements of the Motorola MCC 7500 IP Dispatch Console product line are certified to meet the requirements for CSA and CE.
Safety	CSA 60950-1-03 EN60950-1 2001
EMC Emissions & Immunity	FCC part 15 Class A ICES-003 EN55022 1998 + A1: 2001 + A2:2003 (CISPR-22 Class A) EN55024 + A1:2001 + A2:2003 EN61000-3-2 2000 EN61000-3-3 1995 + A1:2001
Energy Efficiency (PVM power supply only)	International Energy Efficiency Level V

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BE BETTER EQUIPPED TO BE MISSION READY

APX™ 4500 PROJECT 25 MOBILE RADIO

A downed power line or the city transit system coming to a halt during rush hour, when the unexpected strikes, you must interoperate seamlessly and securely with other agencies and responders – often across multiple Project 25 (P25) systems. You need to instantly connect and be informed to make better decisions and respond effectively. While the advanced technology of APX™ radios expertly equips you for the unexpected, your organization may be challenged to improve operating expenses.

That's where the APX 4500 P25 mobile radio fits the bill perfectly. It delivers all the benefits of TDMA technology in a compact P25 capable mobile. The APX 4500 brings together powerful technology in an easy-to-use radio that's easy on your budget. It seamlessly unifies public works, utility, rural public safety and transportation users to first responders so they can communicate effectively in the moments that matter.

CONVENIENTLY SMALL, EASY TO INSTALL

The APX 4500 is designed to get the job done without getting in the way. A simplified dash mount design makes installation quick and easy, fitting into the existing XTL™ footprint so you can reuse mounting holes and cables.

Count on the APX 4500 to withstand wet, dusty and hazardous conditions, too. Its IP56 durability rating is the highest level of certification for uncompromising durability and world class quality in a mobile performer you can hose down.

KEEPS CREWS IN TOUCH, AND UP TO THE MINUTE

Safety runs in the APX family and the APX 4500 mobile is no exception. Like all our APX P25 radios trusted by responders worldwide, the APX 4500 mobile redefines safety. Your crews can count on quick, seamless interoperability and extended range – whether they are talking from the top of a pole or the bottom of a trench. You can depend on AES encryption for secure, tamperproof voice and data communications every time they connect.

With integrated GPS in the APX 4500, you can keep an eye on workers and assets you can't see, tracking their locations continuously. The O2 control head with color display is easy to read and operate in all lighting conditions, from bright sunlight to dark streets. The intelligent lighting on the O2 control head notifies your workers when a call is received, an emergency arises, or when they are out of range. Plus, an enlarged multifunction knob makes it easy to use talk-group and volume settings when they're wearing gloves.

Over-the-air programming on the APX 4500 keeps your crews current in the field. You can update the latest mobile without interrupting voice communications while they work.

SIZED RIGHT FOR YOUR BUDGET

The APX 4500 lets you reuse many accessories which utilize the O5 and O3 control heads on XTL radios, so you can maximize your investment while you benefit from the latest technology. Since the APX 4500 is P25 Phase 2 capable for twice the voice capacity, you can add more users without adding more frequencies or infrastructure. It is backwards and forwards compatible with all Motorola mission critical radio systems, so you can interoperate with confidence while you improve operating expenses.



APX™ 4500 SPECIFICATIONS

FEATURES AND BENEFITS:

Available in 700/800 MHz, VHF, UHFR1, UHFR2, and 900 MHz. Supports NPCS band (901-902 MHz and 940-941 MHz)

Channels: Standard 512

Trunking Standards supported:
- Clear or digital encrypted Trunked Operation
- Capable of SmartZone®, SmartZone Omnilink, SmartNet®

Analog MDC-1200 and Digital APCO P25 Conventional System Configurations

Narrow and wide bandwidth digital receiver (6.25kHz/12.5kHz/25kHz/30 kHz)

Embedded digital signaling (ASTRO and ASTRO 25)

Integrated Encryption Hardware

Software Key

ASTRO 25 Integrated Voice & Data

Intelligent lighting

Radio profiles

Unified Call List

Meets applicable MIL-STD 810C, D, E, F, G

Ships standard IP56

Utlizes Windows XP, Vista and Windows 7 and 8 Customer Programming Software (CPS)*
- Supports USB Communications
- Built in FLASHport™ support

Re-use of most XTL™ accessories, plus new IMPRES accessories

OPTIONAL FEATURES:

GPS Outdoor Location Tracking

AES Encryption

Programming over Project 25 (POP25)

Text Messaging

12 character RF ID asset tracking

Tactical OTAR

* CPS version R12.00.00 and greater ordered after June 2014 will only support Windows 7 and 8

APX 4500 CONTROL HEAD PORTFOLIO



O2 RUGGED CONTROL HEAD

- Large color display with intelligent lighting
- 3 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Built in 7.5 watt speaker
- Multifunction volume/channel knob
- Night/day mode button

TRANSMITTER - TYPICAL PERFORMANCE SPECIFICATIONS

	700 MHz	800 MHz	VHF	UHF Range 1	UHF Range 2	900 MHz
Frequency Range/Bandsplits	764-776 MHz 794-806 MHz	806-824 MHz 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz	896-902MHz 935-941MHz
Channel Spacing	25/12.5 kHz	25/12.5 kHz	30/25/12.5 kHz	25/12.5 kHz	25/12.5 kHz	12.5 kHz
Maximum Frequency Separation	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Rated RF Output Power Adj*	10-30 Watts	10-35 Watts	10-50 Watts	10-40 Watts	10-45 Watts (450-485 MHz) 10-40 Watts (485-512 MHz) 10-25 Watts (512-520 MHz)	1-30W 896-901MHz 935-940MHz 1-3W 901-902MHz 940-941MHz
Frequency Stability* (–30°C to +60°C; +25°C Ref.)	0.8 PPM	±0.8 PPM	±0.8 PPM	±0.8 PPM	±0.8 PPM	±0.8 PPM
Modulation Limiting*	±5 kHz / ±2.5 kHz	±5 kHz/±4 kHz (NPSPAC) /±2.5 kHz	±5 kHz / ±2.5 kHz	±5 kHz / ±2.5 kHz	±5 kHz / ±2.5 kHz	±2.5 kHz
Modulation Fidelity (C4FM) 12.5kHz Digital Channel	1.5%	1.5%	2.5%	1.1%	1.1%	1.5%
Emissions*	Conducted+ –75/–85 dBc Radiated+ –20/–40 dBm	Conducted –75 dBc Radiated –20 dBm	Conducted –85 dBc Radiated –20 dBm	Conducted –85 dBc Radiated –20 dBm	Conducted –85 dBc Radiated –20 dBm	Conducted+ –70 dBc Radiated+ –20 dBm
Audio Response*	+1, –3 dB (EIA)	+1, –3 dB (EIA)	+1, –3 dB (EIA)	+1, –3 dB (EIA)	+1, –3 dB (EIA)	+1, –3 dB (EIA)
FM Hum & Noise 25 & 20 kHz 12.5 kHz	–50 dB –48 dB	–50 dB –48 dB	–53 dB –52 dB	–53 dB –50 dB	–53 dB –50 dB	– –45 dB
Audio Distortion* 25 & 20 kHz 12.5 kHz	0.50% 0.50%	0.50% 0.50%	0.50% 0.50%	0.50% 0.50%	0.50% 0.50%	– 0.80 %

RECEIVER – TYPICAL PERFORMANCE SPECIFICATIONS

	700 MHz	800 MHz	VHF	UHF Range 1	UHF Range 2	900 MHz
Frequency Range/Bandsplits	764-776 MHz	851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz	935-941MHz
Channel Spacing	25/12.5 kHz	25/12.5 kHz	30/25/12.5 kHz	25/12.5 kHz	25/12.5 kHz	12.5 kHz
Maximum Frequency Separation	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Audio Output Power at 3% distortion*	7.5 W or 15 W ++	7.5 W or 15 W ++	7.5 W or 15 W ++	7.5 W or 15 W ++	7.5 W or 15 W ++	7.5 W or 15 W++
Frequency Stability* (–30°C to +60°C; +25°C Ref.)	±0.8 PPM	±0.8 PPM	±0.8 PPM	±0.8 PPM	±0.8 PPM	±0.8 PPM
Analog Sensitivity* 12 dB SINAD	–121 dBm	–121 dBm	Pre-Amp –123 dBm Standard –119 dBm	Pre-Amp –123 dBm Standard –119 dBm	Pre-Amp –123 dBm Standard –119 dBm	Standard –120dBm
Digital Sensitivity 5% BER	–121.5 dBm	–121.5 dBm	–123 dBm –119 dBm	–123 dBm –119 dBm	–123 dBm –119 dBm	–121dBm
Intermodulation 25 kHz 12.5 kHz	82 dB 82 dB	82 dB 82 dB	84 dB 85 dB 86 dB 86 dB	82 dB 83 dB 86 dB 85 dB	82 dB 83 dB 86 dB 85 dB	– 82 dB
Spurious Rejection	91 dB	91 dB	95 dB	93 dB	93 dB	91 dB
Audio Distortion at rated*	2 %	2 %	2 %	2 %	2 %	2 %
Selectivity* 25 kHz 12.5 kHz 30 kHz	85 dB 75 dB —	85 dB 75 dB —	89 dB 77 dB 90 dB	83 dB 72 dB —	83 dB 72 dB —	— 74dB —

DIMENSIONS

	Inches	Millimeters
Mid Power Radio Transceiver	2 x 7 x 6.4	50.8 x 178 x 163
O2 Control Head	2.7 x 8.1 x 2.1	69 x 207 x 53
Mid Power Radio Transceiver and O2 Control Head - Dash Mount	2.7 x 8.1 x 8.8	69 x 207 x 223
Mid Power Radio Transceiver and O2 Control Head Weight	5.28 lbs	2.45 kg

RADIO MODELS

700/800 (763-870 MHz)	M24URS9PW1AN
VHF (136-174 MHz)	M24KSS9PW1AN
UHF Range 1 (380-470 MHz)	M24QSS9PW1AN
UHF Range 2 (450-520 MHz)	M24SSS9PW1AN

SIGNALING (ASTRO MODE)

Signaling Rate	9.6 kbps
Digital ID Capacity	10,000,000 Conventional / 48,000 Trunking
Digital Network Access Codes	4,096 network site addresses
ASTRO® Digital User Group Addresses	4,096 network site addresses
Project 25 – CAI Digital User Group Addresses	65,000 Conventional / 4,094 Trunking
Error Correction Techniques	Golay, BCH, Reed-Solomon codes
Data Access Control	Slotted CSMA: Utilizes infrastructure-sourced data status bits embedded in both voice and data transmissions.

GPS SPECIFICATIONS

Channels	12
Tracking Sensitivity	–153 dBm
Accuracy**	<10 meters (95%)
Cold Start	<60 seconds (95%)
Hot Start	<10 seconds (95%)
Mode of Operation	Autonomous (Non-Assisted) GPS

POWER AND BATTERY DRAIN

Model Type	136-174 MHz, 380-470 MHz, 450-520 MHz, 764-870 MHz, 896-941MHz						
Minimum RF Power Output	2-30 Watts (764-776 MHz), 2-30 Watts (794-806 MHz), 2-35 Watts (806-824 MHz), 2-35 Watts (851-870 MHz), 1-50 Watts (136-174 MHz). 1-40 Watts (380-470 MHz), 1-45 Watts (450-485 MHz), 1-40 Watts (485-512 MHz), 1-25 Watts (512-520 MHz), 1-30Watts (896-901MHz), 1-3Watts (901-902MHz), 1-30W (935-940MHz), 1-3Watts (940-941MHz)						
Operation	13.8V DC ±20% Negative Ground						
Standby at 13.8V	0.85A (764-870 MHz), 0.85A (136-174 MHz), 0.85A (380-470 MHz), 0.85A (450-520 MHz)						
Receive Current at Rated Audio at 13.8V	3.2A (764-870 MHz), 3.2A (136-174 MHz), 3.2A (380-470 MHz), 3.2A (450-520 MHz)						
Transmit Current (A) at Rated Power	136-174 MHz (10-50 Watt) 380-470 MHz (10-40 Watt) 380-470 MHz (10-40 Watt)	13A (50W) 11A (40W) 11A (45W)	8A (15W) 8A (15W) 8A (15W)	764-870 MHz (2***-35W) 896-901MHz (1-30W) 935-940MHz(1-30W) 901-902MHz(1-3W) 940-941MHz(1-3W)	12A (35W) 10A (30W) 10A (30W) 5A (3W) 5A (3W)	8A (15W) 7A(15W) 7A(15W)	

MOBILE MILITARY STANDARDS 810 C, D, E , F, G

	MIL-STD 810C		MIL-STD 810D		MIL-STD 810E		MIL-STD 810F		MIL-STD 810G	
	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.
Low Pressure	500.1	I	500.2	II	500.3	II	500.4	II	500.5	II
High Temperature Storage	501.1	I	501.2	I/A1	501.3	I/A1	501.4	I/Hot	501.5	I/A1
High Temperature Operation	501.1	II	501.2	II/A1	501.3	II/A1	501.4	II/Hot	501.5	II
Low Temperature Storage	502.1	I	502.2	I/C3	502.3	I/C3	502.4	I/C3	502.5	I/C3
Low Temperature Operation	502.1	I	502.2	II/C1	502.3	II/C1	502.4	II/C1	502.5	II
Temperature Shock	503.1	-	503.2	I/A1-C3	503.3	I/A1-C3	503.4	I/Hot-C3	503.5	I/C
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I	505.5	I/A1
Rain Blowing	506.1	I	506.2	I	506.3	I	506.4	I	506.5	I
Rain Steady	506.1	II	506.2	II	506.3	II	506.4	III	506.5	III
Humidity	507.1	II	507.2	II	507.3	II	507.4	-	507.5	II-Aggravated
Salt Fog	509.1	-	509.2	-	509.3	-	509.4	-	509.5	1 Proc
Blowing Dust	510.1	I	510.2	I	510.3	I	510.4	I	510.5	I
Blowing Sand		-	510.2	II	510.3	II	510.4	II	510.5	II
Vibration Min. Integrity	514.2	VIII/F, Curve-W	514.3	I/10	514.4	I/10	514.5	I/24	514.6	I-Cat.24
Vibration Loose Cargo	514.2	XI	514.3	II/3	514.4	II/3	514.5	II/5	514.6	-
Shock Functional	516.2	I	516.3	I	516.4	I	516.5	I	516.6	I, V, VI

ENCRYPTION

Supported Encryption Algorithms	AES and ADP
Encryption Algorithm Capacity	Single
Encryption Keys per Radio	Module capable of storing 1024 keys. Programmable for 64 Common Key Reference (CKR) or 16 Physical Identifier (PID)
Encryption Frame Re-sync Interval	P25 CAI 300 mSec
Encryption Keying	Key Loader
Synchronization	XL – Counter Addressing, OFB – Output Feedback
Vector Generator	National Institute of Standards and Technology(NIST) approved random number generator
Encryption Type	Digital
Key Storage	Tamper protected volatile or non-volatile memory
Key Erasure	Keyboard command and tamper detection
Standards	FIPS 140-2 Level 3 FIPS 197

* Measured in the analog mode per TIA/EIA 603 under nominal conditions
** Accuracy specs are for long-term tracking (95th percentile values >5 satellites visible at a nominal –130 dBm signal strength)
\+ Specs includes performance for the non-GNSS/GNSS bands
++ Output power in to 8 and 3.2 Ohm external speakers respectively

Specifications subject to change without notice. All specifications shown are typical. Radio meets applicable regulatory requirements.

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-30°C / +60°C
Storage Temperature	-40°C / +85°C
Humidity	Per MIL-STD
ESD	IEC 801-2 KV
Water and Dust Intrusion	IP56, MIL-STD

TRANSMITTER CERTIFICATION

700/800 (764-775, 793-805, 806-824, 851-869 MHz)	AZ492FT7055
VHF (136-174 MHz)	AZ492FT4916
UHF R1 (380-470 MHz)	AZ492FT3826
UHF R2 (450-520 MHz)	AZ492FT4915
900 MHz (896-901, 901-902, 935-940, 940-941 MHz)	AZ492FT5865

FCC EMISSIONS DESIGNATORS

FCC Emissions Designators	8K10F1D, 8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E, 20K0F1E, 10K0F3E (for AZ492FT5865 only)

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R3-1-2053C



ASTRO® 25 TRUNKED SYSTEMS

PROJECT 25 TDMA WITH DYNAMIC DUAL MODE

Improving spectrum efficiency is a critical issue facing government organizations. Agencies want to do more with the spectrum that they have assigned. And government spectrum bodies are mandating that equipment become more spectrum efficient. Project 25 has addressed this new requirement with the Phase 2 TDMA standard.

ASTRO 25 trunked systems are now available with Project 25 standards-based TDMA. This capability provides organizations with the flexibility required to maximize current frequency allocations with a standards-based solution while maintaining interoperability with other Project 25 systems.

PROJECT 25 TDMA STANDARD

The TIA-102 suite of standards defines Project 25 (P25) TDMA, adding spectrum-efficient TDMA voice service to the existing P25 FDMA trunked voice and packet data services.

P25 TDMA capable systems use the P25 FDMA control channel for all call requests, which allows systems to support FDMA calls as well as TDMA calls.

ENHANCED INTEROPERABILITY

At the cornerstone of all government communications is the need to interoperate with other users to support emergency response. As the new standard was created, interoperability with existing radios was one of the critical requirements. ASTRO 25 systems and APX subscribers support both P25 FDMA and P25 TDMA for interoperability.

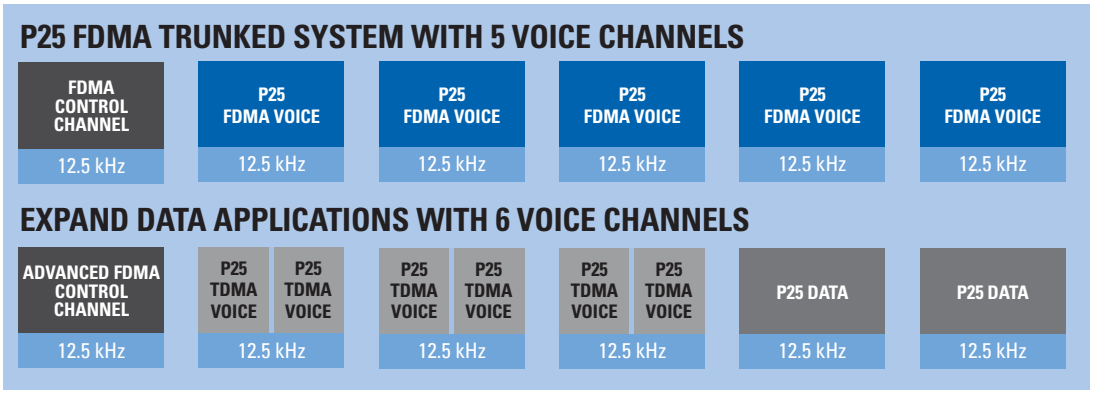
In addition to a manual method for supporting interoperability, which requires the user to manually switch talkgroups on the radio, Motorola delivers seamless interoperability with a software feature called Dynamic Dual Mode that automatically selects what protocol is used based on the resources participating in the call.

SPECTRUM MANDATES

As part of the ongoing efforts to maximize spectrum, governing bodies are mandating that radio systems must move to 6.25e spectrum-efficient methods. For example, by 2017 the FCC will require 6.25 kHz equivalent operations for 700 MHz band plans.

INCREASED VOICE CAPACITY

With P25 TDMA, organizations can double their voice capacity within their fixed allocation of frequencies. For example, they can go from having 5 simultaneous voice calls using P25 FDMA trunked operation to the ability to have up to 10 simultaneous voice calls using P25 TDMA trunked operation. ASTRO 25 TDMA provides the additional advantage of increasing the potential voice path capacity of your system by offering up to 30 voice paths at a site.



ADDITIONAL CAPACITY FOR APPLICATIONS

Use additional channel capacity afforded by P25 TDMA trunked operation to provide data applications such as OTAR, location service, OTAP and text messaging.

ASTRO 25 is a robust solution for government agencies. P25 TDMA functionality can be added to ASTRO 25 systems along with P25 FDMA trunking and conventional, 3600 trunking, analog conventional, and integrated data operation for total flexiblity.

DYNAMIC DUAL MODE

Dynamic Dual Mode, an optional feature, allows users to interoperate between P25 FDMA and P25 TDMA services. It is part of the call processing application and uses an advanced control channel that dynamically switches call assignments between FDMA and TDMA.

Dynamic Dual Mode is seamless to users and requires no intervention from users or network operators. For example, if a user in an active P25 TDMA talkgroup call, roams onto a P25 FDMA-only site, the system automatically initiates P25 FDMA mode at the next push-to-talk (PTT). Or if an active P25 TDMA talkgroup call is underway at a site and a P25 FDMA-only member of the talkgroup joins (or "affiliates") with the call, the system automatically switches the call to P25 FDMA mode at the next PTT. The FDMA-only user is now included in the call, and the call switched without any user intervention or awareness.

As an added benefit in encrypted systems, the call set-up automatically switches between FDMA and TDMA while maintaining end-to-end encryption. This provides a high level of assurance that the system remains secure from dispatcher to radio user.

IMPROVED SYSTEM OPERATION

Dynamic Dual Mode improves ease of use in ASTRO 25 systems with a mixed fleet of P25 FDMA and P25 TDMA radios.

- Radio users have seamless interoperability regardless of the operations mode.
- Dispatch operators can automatically coordinate between P25 TDMA radio users and P25 FDMA radio users with no need to track or patch users together.
- System administrators do not need to preassign base stations as P25 TDMA or P25 FDMA; the system automatically assigns the appropriate station mode based on the needs of the user.

IMPLEMENTATION CONSIDERATIONS

Starting with ASTRO 25 System Release 7.11, P25 TDMA and Dynamic Dual Mode are available in trunked, simulcast and standalone repeater configurations operating in the VHF, UHF, 700 MHz and 800 MHz bands.

On fielded ASTRO 25 systems, key system components including G-series stations, controllers and comparators, the MCC 7500 IP Dispatch Console, and APX™ radios can be software upgraded to P25 TDMA.



The APX series of trunked radios is available with P25 FDMA and P25 TDMA in the same radio. Dynamic Dual Mode automatically switches between the capabilities.

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APX™ 6000 PROJECT 25 PORTABLE RADIO

Delivering outstanding performance in a compact form factor without sacrificing the features you need most. The APX™ 6000 is the next generation of ruggedly-reliable performers that gives you the advanced features such as Mission Critical Wireless and GPS location tracking in a small, P25 Phase 2 capable radio. Whether you're on patrol or racing to a fire, the APX 6000 puts you in greater control of your safety, response time and technology investment.

Focus on the task not the technology, with the real-world ready radio that turns mission critical into mission complete.

CUTTING-EDGE FEATURES IN A COMPACT SIZE

- Innovative T-grip design gives you a secure grip and better control
- High-contrast color display is easy to read in different lighting conditions
- Top display is quick to read while looking down, at a glance or from an angle
- Universal push-to-talk button with enhanced grooves is easy to find by "touch"

EXCELLENT AUDIO YOU CAN HEAR LOUD AND CLEAR

- Excellent audio ensures voice communications are intelligible, even in high noise environments
- Dual sided 2 microphone noise canceling technology
- Equipped with the latest AMBE digital voice vocoder

FUTURE-READY TECHNOLOGY TO RELY ON TODAY

- Small P25 Phase 2 capable radio that provides twice the voice capacity
- Backwards and forwards compatible with all Motorola mission critical radio systems
- Supports applications like Mission Critical Wireless and GPS location tracking for greater safety

- Universal Push-to-Talk
- T-Grip
- Dual Battery Latch
- Orange emergency button
- 16 position rotary switch
- 2 position concentric switch
- 3 position toggle switch
- 3 programmable side buttons
- Transmit LED indicator
- Backlit Keypad:
  - Home and Data buttons
  - 3 soft keys
  - 4 direction navigation key
  - 4 x 3 keypad
- Full Bitmap Display:
  - 2 lines of icons
  - 4 lines x 14 characters of text
  - Status icons

PRODUCT DATA SHEET
APX™ 6000



FEATURES AND BENEFITS:

Available in 700/800 MHz, VHF, UHF R1, and UHF R2 bands

Trunking standards supported:

- Clear or digital encrypted ASTRO®25 Trunked Operation
- Capable of SmartZone®, SmartZone Omnilink, SmartNet®

Analog MDC-1200 and Digital APCO P25 Conventional System Configurations

Narrow and wide bandwidth digital receiver (6.25 kHz equivalent/25/20/12.5 KHz)

Embedded digital signaling (ASTRO & ASTRO 25)

Available in 3 models

ASTRO 25 Integrated Voice & Data

Software Key

Intelligent Lighting

Radio Profiles

Unified Call List (Models 2.5 and 3.5 only)

User programmable voice announcement

Meets Applicable MIL-STD-810C, D, E, F and G

IP67 standard (submersible 1 meter, 30 minutes)**

Yellow and green colored housing options

Custom recess label areas

Superior Audio Features:

- 0.5 W high audio speaker
- Dual microphones
- 2-mic noise canceling technology

Utilizes Windows XP, Vista and Windows 7 and 8 Customer Programming Software (CPS)****

- Supports USB communications
- Built in FLASHport™ support

Full portfolio of accessories including IMPRES batteries, chargers and audio devices

Mission Critical Wireless Bluetooth®***

OPTIONAL FEATURES:

Enhanced Encryption capability

GPS Outdoor Location Tracking

Programming Over Project 25

Over the Air Rekey

Text Messaging

Man Down

Rugged submersible housing** (2 meters, 2 hours)

* Per the FCC Narrowbanding rules, new products (APX6000 UHFR1, UHFR2) submitted for FCC certification after January 1, 2011 are restricted from being granted certification at 25KHz for United States - State & Local Markets only.

** Radios meet industry standards (IPx7) for immersion.

*** Compatible with BT 2.1 HSP, PAN, DUN and SPP BT Profiles

**** CPS version R12.00.00 and greater ordered after June 2014 will only support Windows 7 and 8

TRANSMITTER - TYPICAL PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	700 MHz 800 MHz	763-776, 793-806 MHz 806-824, 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing		25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Rated RF Output Power Adj[1]		1-3 Watts Max	1-6 Watts Max	1-5 Watts Max	1-5 Watts
Frequency Stability[1] (–30°C to +60°C; +25°C Ref.)		±0.00010 %	±0.00010 %	±0.00010 %	±0.00010 %
Modulation Limiting[1]		±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±2.5 kHz	±5 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz
Emissions (Conducted and Radiated)[1]		–75 dB	–75 dB	–75 dB	–75 dB
Audio Response[1]		+1, –3 dB	+1, –3 dB	+1, –3 dB	+1, –3 dB
FM Hum & Noise	700 MHz 800 MHz	-48 dB/-47 dB -46 dB/-45 dB	–47 dB –45 dB	–47 dB –45 dB	–47 dB –45 dB
Audio Distortion[1]	700 MHz 800 MHz	0.60 % 1 %	0.50 %	0.50 %	0.50 %

BATTERIES FOR APX 6000

Battery Capacity / Type	Dimensions (HxWxD)	Weight	Battery Part Number	Battery Capacity
Li-Ion IMPRES 2150 mAh IP67***	3.39" x 2.34" x 1.46"	5 oz	PMNN4403	2150 mAh
Li-Ion IMPRES 2900 mAh IP67	3.07" x 2.34" x 1.65"	6.53 oz	NNTN7038	2900 mAh
Li-Ion IMPRES 4200 mAh IP67	5.07" x 2.34" x 1.65"	11.29 oz	NNTN7034	4200 mAh
Li-Ion IMPRES 4100 mAh FM² IP67	5.07" x 2.34" x 1.65"	11.29 oz	NNTN7033	4100 mAh
NiMH IMPRES 2100 mAh IP67	5.12" x 2.34" x 1.57"	11.82 oz	NNTN7037	2100 mAh
NIMH IMPRES 2000 mAh FM² IP67	5.12" x 2.34" x 1.57"	11.82 oz	NNTN7036	2000 mAh
NiMH IMPRES 2000 mAh FM² Rugged	5.12" x 2.34" x 1.57"	11.82 oz	NNTN7035	2000 mAh
NiMH IMPRES 2100 mAh Rugged	5.12" x 2.34" x 1.57"	11.82 oz	NNTN7573	2100 mAh
Li-Ion IMPRES 2300 mAh FM² Rugged	3.39" x 2.34" x 1.65"	6.53 oz	NNTN8092	2300 mAh

***Standard shipping battery

RADIO MODELS





	MODEL 1.5	MODEL 2.5	MODEL 3.5
Display	Full bitmap monochromatic LCD top display 1 line text x 8 characters 1 line of icons No menu support Multi-color backlight	Top display plus: Full bitmap color LCD display 4 lines of text x 14 characters 2 lines of icons 1 menu line x 3 menus White backlight	Top display plus: Full bitmap color LCD display 4 lines of text x 14 characters 2 lines of icons 1 menu line x 3 menus White backlight
Keypad	none	Backlight keypad 3 soft keys 4 direction Navigation key Home and Data buttons	Backlight keypad 3 soft keys 4 direction navigation key 4x3 keypad Home and Data buttons
Channel Capacity*	96	1000	1000
FLASHport Memory	64 MB	64 MB	64 MB
700/800 MHz (763-870 MHz)	H98UCD9PW5AN Q360NM	H98UCF9PW6AN Q360NN	H98UCH9PW7AN Q360EF
VHF (136-174 MHz)	H98KGD9PW5AN Q360NP	H98KGF9PW6AN Q360NR	H98KGH9PW7AN Q360EG
UHF Range 1 (380-470 MHz)	H98QDD9PW5AN Q360NS	H98QDF9PW6AN Q360NT	H98QDH9PW7AN Q360EH
UHF Range 2 (450-520 MHz)	H98SDD9PW5AN Q360NU	H98SDF9PW6AN Q360NV	H98SDH9PW7AN Q360FC
Buttons & Switches	Large PTT button ■ Angled On/Off volume control ■ Orange emergency button ■ 16 position top-mounted rotary switch ■ 2-position concentric switch ■ Multi-color backlight ■ 3-position toggle switch ■ 3 programmable side buttons		
Transmitter Certification			
700/800 (764-869 MHz)	AZ489FT5863		
VHF (136-174 MHz)	AZ489FT3829		
UHF Range 1 (380-470 MHz)	AZ489FT4892		
UHF Range2 (450-520 MHz)	AZ489FT4903		
FCC Emissions Designators			
FCC Emissions Designators	11K0F3E, 16K0F3E, 8K10F1D, 8K10F1E, 8K10F1W, 20K0F1E**		
Power Supply			
Power Supply	One rechargeable 2150 mAh Li-Ion Battery Standard (PMNN4403), with alternate battery options available.		

*Enhancement package available

**Per the FCC Narrowbanding rules, new products (APX6000 UHFR1, UHFR2) submitted for FCC certification after January 1, 2011 are restricted from being granted certification at 25KHz for United States - State & Local Markets only.

RECEIVER - TYPICAL PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	700 MHz 800 MHz	763-776 MHz 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing		25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Audio Output Power at Rated[1]		500mW	500mW	500mW	1000 mW
Frequency Stability[1] (–30°C to +60°C; +25°C Ref.)		±0.00010 %	±0.00010 %	±0.00010 %	±0.00010 %
Analog Sensitivity[3] Digital Sensitivity[4]	12 dB SINAD 1% BER (800 MHz) 5% BER	0.25 µV 0.35 µV (0.33 µV) 0.25 µV	0.22 µV 0.28 µV 0.19 µV	0.23 µV 0.31 µV 0.21 µV	0.23 µV 0.31 µV 0.21 µV
Selectivity[1]	25 kHz channel 12.5 kHz channel	75.7 dB 67.5 dB	79.3 dB 70 dB	78.3 dB 68.1 dB	78.3 dB 67.5 dB
Intermodulation		80 dB	80.5 dB	80.2 dB	80.2 dB
Spurious Rejection		76.6 dB	93.2 dB	80.3 dB	80.3 dB
FM Hum and Noise	25 kHz 12.5 kHz	-54 dB -48 dB	-53.8 dB -48 dB	-53.5 dB -47.4 dB	–53.5 dB –47.4 dB
Audio Distortion[1]		.9 %	1.20 %	0.91 %	0.91 %

PORTABLE MILITARY STANDARDS 810 C, D, E , F & G

	MIL-STD 810C		MIL-STD 810D		MIL-STD 810E		MIL-STD 810F		MIL-STD 810G	
	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.
Low Pressure	500.1	I	500.2	II	500.3	II	500.4	II	500.5	II
High Temperature	501.1	I, II	501.2	I/A1, II/A1	501.3	I/A1, II/A1	501.4	I/Hot, II/Basic Hot	501.5	I/A1, II/A2
Low Temperature	502.1	I	502.2	I/C3, II/C1	502.3	I/C3, II/C1	502.4	I/C3, II/C1	502.5	I/C3, II/C1
Temperature Shock	503.1	I	503.2	I/A1C3	503.3	I/A1C3	503.4	I	503.5	I/C
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I	505.5	I/A1
Rain	506.1	I, II	506.2	I, II	506.3	I, II	506.4	I, III	506.5	I, III
Humidity	507.1	II	507.2	II	507.3	II	507.4	1 Proc	507.5	II/Aggravated
Salt Fog	509.1	I	509.2	I	509.3	I	509.4	1 Proc	509.5	1 Proc
Blowing Dust	510.1	I	510.2	I	510.3	I	510.4	I	510.5	I
Blowing Sand	1 Proc	1 Proc	510.2	II	510.3	II	510.4	II	510.5	II
Immersion	512.1	I	512.2	I	512.3	I	512.4	I	512.5	I
Vibration	514.2	VIII/F, Curve-W	514.3	I/10, II/3	514.4	I/10, II/3	514.5	I/24	514.6	I/24
Shock	516.2	I, III, V	516.3	I, V, VI	516.4	I, V, VI	516.5	I, V, VI	516.6	I, V, VI
Shock (Drop)	516.2	II	516.2	IV	516.4	IV	516.5	IV	516.6	IV

DIMENSIONS OF THE RADIOS WITHOUT BATTERY

	Inches	Millimeters
Length	5.47	139
Width Push-To-Talk button	2.39	60.7
Depth Push-To-Talk button	1.40	35.6
Width Top	2.98	75.7
Depth Top	1.58	40.1
Depth Bottom of Battery	1.24	31.5
Weight of the radios without battery	10.9 oz	309 g

ENCRYPTION

Supported Encryption Algorithms	ADP, AES, DES, DES-XL, DES-OFB, DVP-XL
Encryption Algorithm Capacity	8
Encryption Keys per Radio	Module capable of storing 1024 keys. Programmable for 64 Common Key Reference (CKR) or 16 Physical Identifier (PID)
Encryption Frame Re-sync Interval	P25 CAI 300 mSec
Encryption Keying	Key Loader
Synchronization	XL – Counter Addressing OFB – Output Feedback
Vector Generator	National Institute of Standards and Technology (NIST) approved random number generator
Encryption Type	Digital
Key Storage	Tamper protected volatile or non-volatile memory
Key Erasure	Keyboard command and tamper detection
Standards	FIPS 140-2 Level 3 FIPS 197

GPS SPECIFICATIONS

Channels	12
Tracking Sensitivity	–159 dBm
Accuracy[5]	<10 meters (95%)
Cold Start	<60 seconds (95%)
Hot Start	<10 seconds (95%)
Mode of Operation	Autonomous (Non-Assisted) GPS

RUGGED OPTION SPECIFICATIONS

*Hazardous Location/ Intrinsic Safety (IS)	Division 1- Class I , Groups C, D Class II groups E, F, G Class III Div 2, Class I A, B, C, D
Leakage (immersion)	MIL-STD-810 C, D, E, F and G Method 512.X Procedure I
Housing Availability	Black (Standard), Public Safety Yellow and High Impact Green

* Only when ordered with IS battery

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature[6]	-30°C / +60°C
Storage Temperature[6]	-40°C / +85°C
Humidity	Per MIL-STD
ESD	IEC 801-2 KV
Water and Dust Intrusion	IP67, MIL-STD
Immersion	MIL-STD 512.X/I

[1] Measured in the analog mode per TIA / EIA 603 under nominal conditions
[2] When used with an FM approved intrinsically safe radio
[3] Measured conductively in analog mode per TIA / EIA 603 under nominal conditions.
[4] Measured conductively in digital mode per TIA / EIA IS 102.CAAA under nominal conditions.
[5] Accuracy specs are for long-term tracking (95th percentile values >5 satellites visible at a nominal –130 dBm signal strength).
[6] Temperatures listed are for radio specifications. Battery storage is recommended at 25°C, ±5°C to ensure best performance.

Specifications subject to change without notice. All specifications shown are typical. Radio meets applicable regulatory requirements.

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R3-4-2035J



THE LIGHTWEIGHT HEAVYWEIGHT

APX™ 6000XE PROJECT 25 PORTABLE RADIO

In the heat of a wildfire or the smoke of a structure fire, you can't afford to struggle with controls or strain to hear commands. You need a radio so reliable and responder-focused, it's second nature to use. Working with first responders around the world, we developed APX™ radios to be safer and tougher than others – and to deliver innovative technology in an ultra-rugged, glove-friendly form.

Our APX 6000XE is the "lightweight heavyweight" – a small, single band radio with extreme ergonomics and excellent audio that takes on the tough tasks of fire service and EMS. It's the two-way radio that can strengthen safety precisely because it is engineered for extreme conditions.

REAL-WORLD RUGGEDNESS

Everything about the APX 6000XE is designed with first responders in mind – starting with a large top display with intelligent lighting so you can see information at a glance. Then oversized controls that are easy to operate when you're wearing bulky gloves – including the volume and channel selector and X-large emergency button. With its rugged MIL specs, FM certification and optional color housings, it's the portable performer you can rely on in the harshest environments.

LOUD, CLEAR AND NOISE-CANCELLING

Racing to a medical emergency or reporting from a rural fire, you need crystal-clear audio— and the APX 6000XE delivers. Its dual microphone design locates the talker while it cancels out ambient noise. Not only is the APX 6000XE equipped with the latest AMBE digital voice vocoder, its extreme audio profile reduces background noise and improves voice clarity. Plus, a unique speaker grill design improves water runoff to keep communications going strong.

SMALL SIZE, BIG TECHNOLOGY

- Three lightweight, mission extreme models
- Easy-to-use keypad for front panel programming and text messaging
- P25 Phase 2 capable for twice the voice capacity
- Backwards and forwards compatible with all Motorola mission critical radio systems
- Mission Critical Wireless accessories and GPS location tracking application help improve safety



APX™ 6000XE SPECIFICATIONS

FEATURES AND BENEFITS:

Available in 700/800 MHz, VHF, UHF R1 and UHF R2 bands

Trunking standards supported:
- Clear or digital encrypted ASTRO®25 Trunked Operation
- Capable of SmartZone®, SmartZone Omnilink, SmartNet®

Analog MDC-1200 and Digital APCO P25 Conventional System Configurations

Narrow and wide bandwidth digital receiver (6.25KHz equivalent/12.5KHz/30KHz/25KHz)*

Embedded digital signaling (ASTRO & ASTRO 25)

Available in 3 models

ASTRO 25 Integrated Voice & Data

Software Key

Intelligent Lighting

Radio Profiles

Unified Call List (Models 2 and 3 only)

User programmable voice announcement

Meets Applicable MIL-STD-810C, D, E, F and G

Ships standard Intrinsically Safe and Rugged**

Yellow and green colored housing options

Custom recess label areas

Superior Audio Features:
- 0.5 W high audio speaker
- Dual microphones
- Extreme audio profile

Utilizes Windows XP, Vista and Windows 7 and 8 Customer Programming Software (CPS)***
- Supports USB communications
- Built in FLASHport™ support

Full portfolio of accessories including the XE Remote Speaker Microphone specifically designed for performance in extreme environments

Mission Critical Wireless Bluetooth®**

OPTIONAL FEATURES:

GPS Outdoor Location Tracking

Enhanced Encryption capability

Programming Over Project 25

Over the Air Rekey

Text Messaging

Man Down

* Per the FCC Narrowbanding rules, new products (APX6000XE UHFR1, UHFR2) submitted for FCC certification after January 1, 2011 are restricted from being granted certification at 25KHz for United States - State & Local Markets only.

** Compatible with BT 2.1 HSP, PAN, DUN and SPP BT Profiles

*** CPS version R12.00.00 and greater ordered after June 2014 will only support Windows 7 and 8

TRANSMITTER - TYPICAL PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	700 MHz 800 MHz	763-775MHz; 793-805MHz 806-824MHz; 851-869MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing		25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Rated RF Output Power Adj[1]	700 MHz 800 MHz	1-2.5 Watts 1-3 Watts	1-6 Watts	1-5 Watts	1-5 Watts
Frequency Stability[1] (–30°C to +60°C; +25°C Ref.)		±0.00010 %	±0.00010 %	±0.00010 %	±0.00010 %
Modulation Limiting[1]		±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz
Emissions (Conducted and Radiated)[1]		–75 dB	–75 dB	–75 dB	–75 dB
Audio Response[1]		+1, –3 dB	+1, –3 dB	+1, –3 dB	+1, –3 dB
FM Hum & Noise	700 MHz 800 MHz	–48 dB –47 dB	–47 dB –45 dB	–47 dB –45 dB	–47 dB –45 dB
Audio Distortion[1]	700 MHz 800 MHz	0.60 % 1 %	0.50 %	0.50 %	0.50 %

BATTERIES FOR APX 6000XE

Battery Capacity / Type	Dimensions (HxWxD)	Weight	Battery Part Number	Battery Capacity
Li-Ion IMPRES 2300 mAh FM[2] Rugged***	3.39" x 2.34" x 1.46"	6.53 oz	NNTN8092	2300 mAh
Li-Ion IMPRES 2150 mAh IP67	3.39" x 2.34" x 1.46"	5 oz	PMNN4403	2150 mAh
Li-Ion IMPRES 2900 mAh IP67	3.07" x 2.34" x 1.65"	6.53 oz	NNTN7038	2900 mAh
Li-Ion IMPRES 4200 mAh IP67	5.07" x 2.34" x 1.65"	11.29 oz	NNTN7034	4200 mAh
Li-Ion IMPRES 4100 mAh FM[2] IP67	5.07" x 2.34" x 1.65"	11.29 oz	NNTN7033	4100 mAh
NiMH IMPRES 2100 mAh IP67	5.12" x 2.34" x 1.57"	11.82 oz	NNTN7037	2100 mAh
NIMH IMPRES 2000 mAh FM[2] IP67	5.12" x 2.34" x 1.57"	11.82 oz	NNTN7036	2000 mAh
NiMH IMPRES 2000 mAh FM[2] Rugged	5.12" x 2.34" x 1.57"	11.82 oz	NNTN7035	2000 mAh
NiMH IMPRES 2100 mAh Rugged	5.12" x 2.34" x 1.57"	11.82 oz	NNTN7573	2100 mAh

** Rugged batteries exceed industry standards (IPx7) for submersibility and provide a higher level of water protection- -MIL-STD-810E, Method 512.3 Immersion. These batteries meet the incremental requirement of submersion in 1 meter of fresh water that is 27C colder than the product.

***Standard shipping battery





RADIO MODELS

	MODEL 1.5	MODEL 2.5	MODEL 3.5
Display	Full bitmap monochromatic LCD top display 1 line text x 8 characters 1 line of icons No menu support Multi-color backlight	Top display plus: Full bitmap color LCD display 4 lines of text x 14 characters 2 lines of icons 1 menu line x 3 menus White backlight	Top display plus: Full bitmap color LCD display 4 lines of text x 14 characters 2 lines of icons 1 menu line x 3 menus White backlight
Keypad	none	Backlight keypad 3 soft keys 4 direction Navigation key Home and Data buttons	Backlight keypad 3 soft keys 4 direction navigation key 4x3 keypad Home and Data buttons
Channel Capacity*	96	1000	1000
FLASHport Memory	64 MB	64 MB	64 MB
700/800 MHz (763-870 MHz)	H98UCD9PW5AN Q360NW	H98UCF9PW6AN Q360NX	H98UCH9PW7AN Q360FE
VHF (136-174 MHz)	H98KGD9PW5AN Q360NY	H98KGF9PW6AN Q360NZ	H98KGH9PW7AN Q360FF
UHF Range1 (380-470 MHz)	H98QDD9PW5AN Q360PA	H98QDF9PW6AN Q360PB	H98QDH9PW7AN Q360FH
UHF Range2 (450-520 MHz)	H98SDD9PW5AN Q360PC	H98SDF9PW6AN Q360PD	H98SDH9PW7AN Q360FK
Buttons & Switches	Large PTT button • Angled On/Off volume control • Orange emergency button • 16 position top-mounted rotary switch 2-position concentric switch • 3-position toggle switch • 3 programmable side buttons		
Transmitter Certification			
700/800 (764-869 MHz)	AZ489FT5863		
VHF (136-174 MHz)	AZ489FT3829		
UHF Range 1 (380-470 MHz)	AZ489FT4892		
UHF Range 2 (450-520 MHz)	AZ489FT703		
FCC Emission Designators			
FCC Emission Designators	11K0F3E, 16K0F3E, 8K10F1D, 8K10F1E, 8K10F1W, 20K0F1E**		
Power Supply			
Power Supply	One rechargeable 2300 mAh FM/Rugged Li-Ion Battery Standard (NNTN8092), with alternate battery options available.		

* Enhancement package available

** Per the FCC Narrowbanding rules, new products (APX6000XE UHFR1, UHFR2) submitted for FCC certification after January 1, 2011 are restricted from being granted certification at 25KHz for United States - State & Local Markets only.

RECEIVER - TYPICAL PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	700 MHz 800 MHz	763-776 MHz 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing		25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Audio Output Power at Rated[1]		500mW	500mW	500mW	1000 mW
Frequency Stability[1] (–30°C to +60°C; +25°C Ref.)		±0.00010 %	±0.00010 %	±0.00010 %	±0.00010 %
Analog Sensitivity[3] Digital Sensitivity[4]	12 dB SINAD 1% BER (800 MHz) 5% BER	0.250 µV 0.347 µV (0.333 µV) 0.251 µV	0.216 µV 0.277 µV 0.188 µV	0.234 µV 0.307 µV 0.207 µV	0.234 µV 0.307 µV 0.207 µV
Selectivity[1]	25 kHz channel 12.5 kHz channel	75.7 dB 67.5 dB	79.3 dB 70 dB	78.3 dB 68.1 dB	78.3 dB 67.5 dB
Intermodulation		80 dB	80.5 dB	80.2 dB	80.2 dB
Spurious Rejection		76.6 dB	93.2 dB	80.3 dB	80.3 dB
FM Hum and Noise	25 kHz 12.5 kHz	-54 dB -48 dB	-53.8 dB -48 dB	-53.5 dB -47.4 dB	–53.5 dB –47.4 dB
Audio Distortion[1]		0.9 %	1.20 %	0.91 %	0.91 %

PORTABLE MILITARY STANDARDS 810 C, D, E , F & G

	MIL-STD 810C		MIL-STD 810D		MIL-STD 810E		MIL-STD 810F		MIL-STD 810G	
Low Pressure	500.1	I	500.2	II	500.3	II	500.4	II	500.5	II
High Temperature	501.1	I, II	501.2	I/A1, II/A1	501.3	I/A1, II/A1	501.4	I/Hot, II/Basic Hot	501.5	I/A1, II/A2
Low Temperature	502.1	I	502.2	I/C3, II/C1	502.3	I/C3, II/C1	502.4	I/C3, II/C1	502.5	I/C3, II/C1
Temperature Shock	503.1	I	503.2	I/A1C3	503.3	I/A1C3	503.4	I	503.5	I/C
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I	505.5	I/A1
Rain	506.1	I, II	506.2	I, II	506.3	I, II	506.4	I, III	506.5	I, III
Humidity	507.1	II	507.2	II	507.3	II	507.4	1 Proc	507.5	II/Aggravated
Salt Fog	509.1	I	509.2	I	509.3	I	509.4	1 Proc	509.5	1 Proc
Blowing Dust	510.1	I	510.2	I	510.3	I	510.4	I	510.5	I
Blowing Sand	1 Proc	1 Proc	510.2	II	510.3	II	510.4	II	510.5	II
Immersion	512.1	I	512.2	I	512.3	I	512.4	I	512.5	I
Vibration	514.2	VIII/F, Curve-W	514.3	I/10, II/3	514.4	I/10, II/3	514.5	I/24	514.6	I/24
Shock	516.2	I, III, V	516.3	I, V, VI	516.4	I, V, VI	516.5	I, V, VI	516.6	I, V, VI
Shock (Drop)	516.2	II	516.2	IV	516.4	IV	516.5	IV	516.6	IV

DIMENSIONS OF THE RADIOS WITHOUT BATTERY

	Inches	Millimeters
Length	6.15	156.2
Width Push-To-Talk button	2.39	60.7
Depth Push-To-Talk button	1.40	35.5
Width Top	3.32	84.3
Depth Top	2.13	54.1
Depth Bottom of Battery	1.24	31.5
Weight of the radios without battery	13.9 oz	394.1 g

ENCRYPTION

Supported Encryption Algorithms	ADP, AES, DES, DES-XL, DES-OFB, DVP-XL
Encryption Algorithm Capacity	8
Encryption Keys per Radio	Module capable of storing 1024 keys. Programmable for 64 Common Key Reference (CKR) or 16 Physical Identifier (PID)
Encryption Frame Re-sync Interval	P25 CAI 300 mSec
Encryption Keying	Key Loader
Synchronization	XL – Counter Addressing OFB – Output Feedback
Vector Generator	National Institute of Standards and Technology (NIST) approved random number generator
Encryption Type	Digital
Key Storage	Tamper protected volatile or non-volatile memory
Key Erasure	Keyboard command and tamper detection
Standards	FIPS 140-2 Level 3 FIPS 197

GPS SPECIFICATIONS

Channels	12
Tracking Sensitivity	–159 dBm
Accuracy[5]	<10 meters (95%)
Cold Start	<60 seconds (95%)
Hot Start	<10 seconds (95%)
Mode of Operation	Autonomous (Non-Assisted) GPS

RUGGED OPTION SPECIFICATIONS

Leakage (immersion)	MIL-STD-810 C,D,E,F and G Method 512.X Procedure I
Housing Availability	Black (Standard), Public Safety Yellow and High Impact Green

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature[6]	-30°C / +60°C
Storage Temperature[6]	-40°C / +85°C
Humidity	PER MIL-STD
ESD	IEC 801-2 KV
Water and Dust Intrusion	IP67 and MIL-STD's noted above
Immersion	MIL-STD 512.X/I

[1] Measured in the analog mode per TIA / EIA 603 under nominal conditions
[2] When used with an FM approved intrinsically safe radio
[3] Measured conductively in analog mode per TIA / EIA 603 under nominal conditions.
[4] Measured conductively in digital mode per TIA / EIA IS 102.CAAA under nominal conditions.
[5] Accuracy specs are for long-term tracking (95th percentile values >5 satellites visible at a nominal –130 dBm signal strength).
[6] Temperatures listed are for radio specifications. Battery storage is recommended at 25°C, ±5°C to ensure best performance.

Specifications subject to change without notice. All specifications shown are typical.

Radio meets applicable regulatory requirements.

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R3-4-2041G



FLEXIBLE DESIGN – SOFTWARE CONFIGURABLE

G-SERIES SITE EQUIPMENT FOR ASTRO 25 SYSTEMS

Motorola's ASTRO® 25 networks are designed to meet the current and future requirements for Project 25 (P25) solutions. Our G-series portfolio of RF stations, receivers, site controllers and comparators is designed to maximize channel up-time, simplify system technology refresh, enable smaller, more efficient site design and minimize the cost of ownership.

Our G-series equipment is designed so that many upgrades, migrations, and conversions can be completed with only software installations, allowing new features to be quickly added to your existing system with a simple download. You can easily add P25 TDMA and Dynamic Channel Assignment; Information Assurance, Network Security and system release updates. Furthermore, you can migrate from conventional to trunking, 3600 to P25 trunking and from 12.5 kHz P25 FDMA to 6.25e kHz P25 TDMA.

Designed to carry your needs into the future, the G-series hardware platform has built-in functionality and flexibility with an AC/DC - 48VDC power supply and two-branch receive diversity capacity, as well as a linear power amplifier for improved coverage in P25 FDMA Simulcast systems.



GTR 8000 Expandable Site Subsystem

SIMULCAST

Motorola is an industry leader in simulcast system solutions with more mission critical systems fully operational in the field than any other LMR systems provider. The G-series site equipment is designed with simulcast system design and functionality in mind. GTR 8000 Base Radios feature a linear modulation (LSM) that provides industry-leading P25 coverage in VHF, UHF, 700/800 MHz and 900 MHz. LSM enables simulcast systems to be deployed with greater site spacing without sacrificing coverage or capability, resulting in fewer sites to build and maintain. It also allows current systems to deploy IP-based simulcast without the need to add fill-in sites.

SERVICING MADE EASY

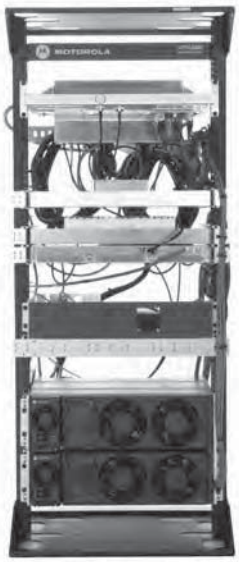
G-series site equipment has many features built in to support ease of service. Six basic modules create the entire G-series platform resulting in reduced spare parts inventory. Modules have front access to improve serviceability with hot-swap support to ensure channels are back on the air in minimum possible time. Standard Battery Revert and Charging capability is built into every G-series power supply. Integrating these capability eliminates the need for a large uninterrupted power supply and saves valuable site space.

A built-in GPS with frequency reference distribution is optionally available on the GTR 8000 Expandable Site Subsystem, which can significantly reduce or eliminate site visits.

Software upgrades are more stable and performed with less downtime in the GTR 8000 base radio. One version of software can run actively while another version is downloading. Using a remote IP connection, the user can decide when to switch between the two versions of software allowing the system manager to prepare for software downloads.

OPTIMIZED NETWORK SECURITY

Information Assurance capabilities are standard with G-series equipment and can be configured or disabled depending on your specific system maintenance and security requirements. G-series products provide the necessary boundary defense capabilities required in mission critical infrastructure today including local user accounts and password controls, user privilege model support (two levels), local and remote access services controls, secure shell services support, SNMPv3, central authentication, general operating system and network services hardening, and device test services controls.



GTR 8000 Site Subsystem

SYSTEM CONFIGURATIONS

ASTRO 25 CONVENTIONAL

ASTRO® 25 Conventional is a feature-rich conventional system solution on the common-hardware G-series platform. The GTR 8000 Base Radios, GPW 8000 Receivers, and GCM 8000 Comparators can be used together or separately to build everything from a small, single repeater site to a large, countywide or statewide receiver-voting or simulcast conventional system.

The hardware will support IP-only circuit system design while connectivity with consoles can be either IP-based or 4-wire depending on migration plans and system specific operational requirements. GTR 8000 can be configured for either base station or standalone repeater operation. GPW 8000 Receivers and GCM 8000 Comparators improve the in-bound subscriber signal coverage and re-broadcast a quality improved composite signal respectively in simulcast or receiver voting systems.

Sixteen configurable channel personalities enable the station to change channel bandwidth and frequency setting via IP or v.24 commands. General purpose I/O offers 12 logic inputs and 12 logic outputs that can be programmed via the user-friendly GTR 8000 Configuration Service Software (Windows® application) for a highly customized alarm reporting solution and station operation.

ASTRO 25 Conventional can also be deployed as a system overlay with ASTRO 25 Trunking systems by adding a GTR 8000 Base Radio configured for conventional operation to an existing trunking GTR 8000 Expandable Site Subsystem and sharing the common wide-area network connections as well as RF cavity combiners and receiver multicouplers.

ASTRO 25 DATA

ASTRO 25 trunking and conventional systems can be enabled with P25 Integrated Data functionality so users can leverage their investment in voice infrastructure for basic data needs. Enhanced Data is a software feature in systems with Integrated Data. Enhanced Data optimizes the data channels in an ASTRO 25 system for data applications that require short inbound data messages like location, telemetry and biometrics, and can improve data efficiency by 12x. For example, with Enhanced Data, customers can set quicker location polling rates for a larger number of users on their system, therefore providing better real-time view to resource locations. Based on customer requirements, ASTRO 25 Enhanced Data allows for data to be prioritized over voice, protecting channels for data use and enabling agency shared data channels. If higher data throughput is a requirement, Motorola offers HPD as an overlay on ASTRO 25 trunking systems to provide the same coverage footprint for both systems.

ASTRO 25 TRUNKING

GTR 8000 Base Radios, GPW 8000 Receivers, GCP 8000 Site Controllers, and GCM 8000 Comparators are the building blocks of an ASTRO® 25 trunking system. Site repeater and simulcast system architectures in P25 FDMA and P25 TDMA offer the flexibility to deliver communications that fit user requirements.

G-series equipment is capable of both Project 25 FDMA and Project 25 TDMA in ASTRO 25 trunking systems. Dynamic Channel Assignment is optional for GTR 8000 Base Radios as part of the ASTRO 25 Dynamic Dual Mode system option, and offers seamless interoperability between P25 FDMA and P25 TDMA users, dynamically allocating a call based on available resources without any user intervention or awareness. The P25 TDMA trunking features are offered across the complete trunking portfolio to address the needs of users ranging from single site to statewide radio systems.

ASTRO 25 trunking is a fully scalable solution from as small as a single trunking site to large statewide systems that include a mix of site repeater and simulcast operation as well as additional data and mutual aid overlays. G-series equipment configured for trunking supports both V.24 circuit-based architectures as well as state-of-the-art IP-based system designs. GPW 8000 Receivers and GCM 8000 Comparators improve the in-bound subscriber signal coverage and re-broadcast a quality improved composite signal respectively in simulcast or receiver voting systems.

Motorola offers industry-leading channel resiliency in trunking systems with the GTR 8000 Expandable Site Subsystem. The architecture ensures that no single point of failure can remove more than one channel from service at the RF sites. Plus, the sites are simultaneously simplified through the integration of base station frequency references, Ethernet LAN switches and network gateways.

Motorola also offers a turn-key P25 trunking site with the ASTRO 25 Express system, a GTR 8000 Expandable Site Subsystem designed to operate as a single-site solution. Stations, site controllers, Ethernet switches, RF combiners and multicouplers are all integrated into a single rack or cabinet. If more capacity is required, additional cabinets can be added to the site.

ANALOG CONVENTIONAL

The GTR 8000 and GPW 8000 products support analog conventional operation in 800 MHz, UHF 380-524 MHz and VHF 136-174 MHz. Analog standalone repeater, receiver voting and simulcast capabilities are available and include a 100 ppb/2 year internal frequency reference for optimal audio performance on 12.5 KHz analog channels.

The G-series equipment provides full support for analog 4-wire circuit connectivity. Over an IP network, technicians can remotely adjust line level settings and tone remote operational modes. 16 configurable analog personalities enable the station to change channel bandwidth and frequency settings via TRC (tone remote control) or WildCard general purpose I/O. The general purpose I/O offers 12 logic inputs and 12 logic outputs, which can be programmed via the user friendly Configuration Service Software (Windows® application) for a highly customized alarm-reporting solution and station operation.

3600 TRUNKING

The GTR 8000 base radio supports 3600 trunking operation, enabling new future-ready base radios to be added to existing SmartZone systems with SmartX. The GTR 8000 is software upgradeable to P25 trunking when the time is right to migrate to P25. 3600 trunking operation is available on both simulcast and intellirepeater systems, in either analog or digital mode.

The GTR 8000 supports WildCard general purpose I/O with 12 logic inputs and 12 logic outputs, which can be programmed via the user friendly Configuration Service Software (Windows® application) for a highly customized alarm-reporting solution and station operation.

Using an IP connection, the GTR 8000 can be monitored, configured and software updated from a convenient, remote location.

G-SERIES SITE EQUIPMENT PRODUCTS

GTR 8000 EXPANDABLE SITE SUBSYSTEM

A space-efficient, single rack design, the GTR 8000 Expandable Site Subsystem (ESS) integrates up to six GTR 8000 Base Radios, redundant GCP 8000 Site Controllers or GPB 8000 Reference Distribution Modules, redundant Ethernet LAN switches, redundant network gateways, transmit combiners, and receiver multicouplers. This enables a highly resilient architecture that provides industry-leading protection against single points of failure at the RF sites while providing a turn-key site solution that minimizes site cabling connections and installation effort.

It supports ASTRO 25 simulcast and site repeater trunking operation, 3600 simulcast and intellirepeater trunking operation with SmartX, HPD, and P25 digital and analog conventional operation. When ordered as an ASTRO 25 Express System, the GTR 8000 Expandable Site Subsystem is the industry's only turn-key, single-site Project 25 trunking solution.

GTR 8000 BASE RADIO

Designed to support ASTRO 25 trunking simulcast, 3600 trunking simulcast with SmartX, HPD, and P25 and analog conventional operation, GTR 8000 Base Radios offer additional design flexibility for infrastructure sites where equipment may have to be interchanged individually during a technology refresh or when used as a station replacement for QUANTAR™ or STR 3000 stations.

GPW 8000 RECEIVER

In conventional and trunking voting or simulcast voting applications, the GPW 8000 Receiver increases in-bound signal coverage for subscribers. Physical space is optimized at receive-only sites with the GPW 8000 space efficient dual receive module design.

GTR 8000 SITE SUBSYSTEM

This configuration supports HPD with the redundant site controllers and GTR 8000 Base Radio configured for data operation. The specially designed low-loss RF system ensures that HPD signal coverage equals the coverage available from the integrated voice and data solution allowing complete data coverage in an ASTRO® 25 system without the inconvenience of fill-in sites for coverage holes.

GCP 8000 SITE CONTROLLER

The GCP 8000 Site Controller is used at an ASTRO 25 trunking site to assign voice and data channels, manage and report alarms on site resources, provide Ethernet switching capability, and provide a frequency reference to GTR 8000 Base Radios. The frequency reference is provided either via a GPS receiver or an ultra high stability oscillator. The nature of these frequency references eliminates or minimizes site visits for frequency tuning servicing.

GCM 8000 COMPARATOR

The GCM 8000 Comparator supports up to 32 trunking sub-sites and up to 64 conventional sites for simulcast or receiver voting. It performs frame-by-frame voting on multiple received signals and recombines the frames to produce a signal with the best possible audio quality. GPS launch-delay timing ensures seamless broadcast of the voted frames from multiple voice signals into one high-quality transmit signal. GPS launch-delay timing ensures seamless broadcast of data packets from multiple voice signals into one high-quality transmit signal.

GTR 8000 EXPANDABLE SITE SUBSYSTEM (SQM01SUM7054A)

GENERAL PERFORMANCE

	HPD	INTEGRATED VOICE & DATA				
	700/800 MHz	**900 MHz**	**700/800 MHz**	**UHF: 380-524 MHz**	**VHF: 136-174 MHz**	**High Power 800 MHz**
Number of Channels	1-5	1-6	1-6	1-6	1-6	2-6
Height with 7.5 ft Rack	90.4 in (230 cm)	90.4 in (230 cm)	90.4 in (230 cm)	90.4 in (230 cm)	90.4 in (230 cm)	90.4 in (230 cm)
Footprint (W x D) with 7.5 ft Rack	20.5 x 23.5 in (52 x 60 cm)	20.5 x 23.5 in (52 x 60 cm)	20.5 x 23.5 in (52 x 60 cm)	20.5 x 23.5 in (52 x 60 cm)	20.5 x 23.5 in (52 x 60 cm)	20.5 x 23.5 in (52 x 60 cm)
Weight (fully configured) with 7.5 ft Rack	520 lbs (235 kg)	575 lbs (260 kg)	520 lbs (235 kg)	UHF 380-435 MHz: 475 lbs (215 kg) UHF 450-512 MHz: 565 lbs (260 kg)	475 lbs (215 kg)	538 lbs (246 kg)
Temperature Range	–22 to 140 °F (–30 to 60°C)	–22 to 140 °F (–30 to 60°C)	–22 to 140 °F (–30 to 60°C)	–22 to 140 °F (–30 to 60°C)	–22 to 140 °F (–30 to 60°C)	–22 to 140 °F (–30 to 60°C)
Power Requirements	AC: 90-264 VAC, 47-63 Hz DC: 43.2-60 VDC	AC: 90-264 VAC, 47-63 Hz DC: 43.2-60 VDC	AC: 90-264 VAC, 47-63 Hz DC: 43.2-60 VDC	AC: 90-264 VAC, 47-63 Hz DC: 43.2-60 VDC	AC: 90-264 VAC, 47-63 Hz DC: 43.2-60 VDC	AC: 90-264 VAC, 47-63 Hz DC: 43.2-60 VDC
Power Consumption (fully configured)						
Power Efficiency Package	2200 W	C4FM: 3700 W LSM: 4100 W	C4FM, FM: 2755 W LSM, H-DPQSK: 2900 W	C4FM, FM: 2325 W LSM, H-DPQSK: 2500 W	C4FM, FM: 2500 W LSM, H-DPQSK: 2100 W	C4FM, FM: 4310 W
Standard	2400 W	C4FM: 3700 W LSM: 4100 W	C4FM, FM: 2900 W LSM, H-DPQSK: 3100 W	C4FM, FM: 2500 W LSM, H-DPQSK: 2700 W	C4FM, FM: 2650 W LSM, H-DPQSK: 2200 W	C4FM, FM: 4580 W
Antenna Connectors	TX: 7/16 Female RX: N Female	TX: 7/16 or N Female RX: N Female	TX: 7/16 Female RX: N Female	TX: 7/16 Female RX: N Female	TX: N Female RX: BNC Female	TX: N Female RX: N Female
Channel Spacing	25 kHz	12.5 kHz	12.5/25 kHz	12.5/25 kHz	12.5/15/25/30 KHz	12.5/25 kHz
Transmit Combiner Spacing	150 kHz	12.5 kHz (Hybrid) 150 kHz (Cavity)	150 kHz	150 kHz (450 - 512 MHz) N/A (380-450, 512-524 MHz)	N/A	N/A
Modulation	TX: 64QAM, 16QAM, QPSK RX: 64QAM, 16QAM, QPSK	TX: C4FM, LSM RX: C4FM	TX: C4FM, LSM, H-DQPSK, FM RX: C4FM, H-CPM, FM	TX: C4FM, LSM, H-DQPSK, FM RX: C4FM, H-CPM, FM	TX: C4FM, LSM, H-DQPSK, FM RX: C4FM, H-CPM, FM	TX: FM, C4FM RX: C4FM, H-CPM, FM
Frequency Stability	GPS synchronized	Repeater Site: 100 ppb/2 yr Simulcast (Multisite): GPS synchronized	Repeater Site: 100 ppb/2 yr Simulcast (Multisite): GPS synchronized	Repeater Site: 100 ppb/2 yr Simulcast (Multisite): GPS synchronized	Repeater Site: 100 ppb/2 yr Simulcast (Multisite): GPS synchronized	Repeater Site: 100 ppb/2 yr Simulcast (Multisite): GPS synchronized

Specifications subject to change without notice.

GTR 8000 EXPANDABLE SITE SUBSYSTEM (SQM01SUM7054A) CONTINUED

TRANSMITTER (CABINET OUTPUT)*

	HPD	INTEGRATED VOICE & DATA				
	700/800 MHz	**900 MHz**	**700/800 MHz**	**UHF: 380-524 MHz**	**VHF: 136-174 MHz**	**High Power 800 MHz**
Frequency Range	764-776, 851-870 MHz	935-941 MHz	764-776, 851-870 MHz	380-435, 435-524 MHz	136-174 MHz	851-870 MHz
Average Power output per channel	1-20 W	2-way Hybrid: 1-37 W 3-way Hybrid: 1-22 W 4-way Hybrid: 1-17 W 5-way Hybrid: 1-12 W 6-way Hybrid: 1-10 W	1-40 W	C4FM, FM: 2-110 W (380-450, 512-524 MHz) LSM, H-DQPSK: 2-100 W (380-450, 512-524 MHz) C4FM, FM: 1-33 W (450-512 MHz) LSM, H-DQPSK: 1-30 W (450-512 MHz)	C4FM, FM: 2-100 W LSM, H-DQPSK: 2-60 W	13-134 W
Modulation Fidelity	N/A	5%	5%	5%	5%	5%
EVM	10%	N/A	N/A	N/A	N/A	N/A
Intermodulation Attenuation	80 dB	80 dB	80 dB	80 dB (450-512 MHz) 65 dB (380-450, 512-524 MHz)	55 dB	55 dB
Spurious and Harmonic Emissions Attenuation	90 dB	90 dB	90 dB	90 dB	90 dB	90 dB
Analog FM Hum and Noise						
12.5 kHz	N/A	N/A	45 dB	45 dB	45 dB	
25 kHz	N/A	N/A	50 dB	50 dB	50 dB	
Analog Audio Distortion	N/A	N/A	Less than 2% at 1000 Hz	Less than 2% (1% typical) at 1000 Hz	Less than 2% (1% typical) at 1000 Hz	Less than 2% at 1000 Hz
Emissions Designators	17K7D7D	8K70D1W, 8K10F1E 8K10F1D, 16K0F3E, 9K80D7W, 11K0F3E	8K70D1W, 8K10F1E, 8K70D7W, 8K10F7W, 8K10F1D, 16K0F3E, 9K80D7W, 11K0F3E	8K70D1W, 8K10F1E 8K10F7W, 8K10F1D, 8K70D7W, 16K0F3E, 9K80D7W, 11K0F3E	8K70D1W, 8K10F1E 8K10F7W, 8K10F1D, 8K70D7W, 16K0F3E, 9K80D7W, 11K0F3E	8K10F1E, 8K10F1D, 8K10F1W, 16K0F1D, 16K0F3E, 11K0F3E, 14K0F1D, 14K0F3

RECEIVER (TOP OF CABINET)

	HPD	INTEGRATED VOICE & DATA				
	700/800 MHz	**900 MHz**	**700/800 MHz**	**UHF: 380-524 MHz**	**VHF: 136-174 MHz**	**High Power 800 MHz**
Frequency Range	792-825 MHz	896-902 MHz	792-825 MHz	380-435, 435-524 MHz	136-174 MHz	806-825 MHz
Analog Sensitivity 12 dB SINAD	N/A	N/A	12.5 kHz: –123 dBm 25 kHz: -122 dBm	12.5 kHz: -117 dBm (380-450, 512-524 MHz) 12.5 kHz: –121.5 dBm (450-512 MHz) 25 kHz: -116 dBm (380-450, 512-524 MHz) 25 kHz: –120.5 dBm (450-512 MHz)	12.5/15 kHz: –118 dBm 25/30 kHz: -117 dBm	12.5 kHz: –123 dBm 25 kHz: -122 dBm
Digital Sensitivity 1% Bit Error Rate Static (BER)						
64 QAM	–101 dBm	N/A	N/A	N/A	N/A	N/A
16 QAM	–108 dBm	N/A	N/A	N/A	N/A	N/A
QPSK	–115 dBm	N/A	N/A	N/A	N/A	
Digital Sensitivity 5% Bit Error Rate Static (BER)						
C4FM	N/A	–123 dBm	–123 dBm	–117 dBm (380-450, 512-524 MHz) –121.5 dBm (450-512 MHz)	–118 dBm	–123 dBm
H-CPM	N/A	N/A	–121 dBm	–119.5 dBm (450-512 MHz)	–116 dBm	N/A
Intermodulation Rejection	75 dB**	80 dB	80 dB	80 dB	80 dB	80 dB
Digital Adjacent Channel Rejection	50 dB**	60 dB	60 dB	60 dB	60 dB	60 dB

* Includes Transmitter RF Distribution System for 900 MHz, 700/800 MHz, and UHF 450-512 MHz. Does not include Transmitter RF Distribution System for VHF, UHF 380-450, 512-524 MHz and High Power 800 MHz.
** Reference signal is QPSK

GTR 8000 EXPANDABLE SITE SUBSYSTEM (SQM01SUM7054A) CONTINUED

RECEIVER (TOP OF CABINET)

	HPD	INTEGRATED VOICE & DATA				
	700/800 MHz	**900 MHz**	**700/800 MHz**	**UHF: 380-524 MHz**	**VHF: 136-174 MHz**	**High Power 800 MHz**
Analog Adjacent Channel Rejection (EIA603)						
Analog 12.5 kHz	N/A	N/A	75 dB	75 dB	75 dB	75 dB
Analog Adjacent Channel Rejection (TIA603D)						
Analog 12.5 kHz	N/A	N/A	50 or 60 dB (adjustable)	50 or 60 dB (adjustable)	50 or 60 dB (adjustable)	50 or 60 dB (adjustable)
Analog 25 kHz	N/A	N/A	80 dB	80 dB	80 dB	80 dB
Spurious and Image Response Rejection	90 dB**	100 dB	100 dB	85 dB (380-435 MHz) 100 dB (450-512 MHz)	90 dB	100 dB
Analog Audio Response	N/A	N/A	+1, -3 dB from 6 dB per octave de-emphasis; 300-3000 Hz referenced to 1000 Hz at line output	+1, -3 dB from 6 dB per octave de-emphasis; 300-3000 Hz referenced to 1000 Hz at line output	+1, -3 dB from 6 dB per octave de-emphasis; 300-3000 Hz referenced to 1000 Hz at line output	+1, -3 dB from 6 dB per octave de-emphasis; 300-3000 Hz referenced to 1000 Hz at line output
Analog Audio Distortion	N/A	N/A	3% or 5% (adjustable)	3% or 5% (adjustable)	3% or 5% (adjustable)	3% or 5% (adjustable)
Analog FM Hum and Noise						
12.5 kHz	N/A	N/A	45 dB	45 dB	45 dB	45 dB
25 kHz	N/A	N/A	50 dB	50 dB	50 dB	50 dB
Intermediate Frequency	1st: 73.35 MHz 2nd: 2.16 MHz	1st: 73.35 MHz 2nd: 2.16 MHz	1st: 73.35 MHz 2nd: 2.16 MHz	1st: 73.35 MHz 2nd: 2.16 MHz	1st: 44.85 MHz 2nd: 2.16 MHz	1st: 73.35 MHz 2nd: 2.16 MHz

TRANSMITTER RF DISTRIBUTION SYSTEM

	700/800 MHz Cavity	**900 MHz Hybrid**		**UHF: 450-512 MHz Cavity**
Frequency Range	764-776, 851-870 MHz	935-941 MHz		450-512 MHz
Insertion Loss (150 kHz spacing)	3.1 dB typ	2-way loss: 4.4 dB typ 3-way loss: 6.3 dB typ 4-way loss: 7.6 dB typ 5-way loss: 8.8 dB typ 6-way loss: 9.7 dB typ		4.5 dB typ
Tx-Tx Isolation (150 kHz spacing)	32 dB	20 dB		32 dB

RECEIVER RF DISTRIBUTION SYSTEM

	700/800/900 MHz			**UHF: 450-512 MHz**	
Frequency Range	792-825 MHz or 896-902 MHz			450-512 MHz	
	Typical	**Limit**		**Typical**	**Limit**
Noise Figure	3.8 dB	5 dB		4.6 dB	5.5 dB
Gain	13 dB	–16 to 24 dB adjustable		10 dB	–16 to 24 dB adjustable
3rd Order Output Intercept	21 dBm			19 dBm	
Amplifier Intercept		35 dBm			40 dBm
Preselector Bandwidth	792-825 MHz or 896-902 MHz			2 or 3.5 MHz	
RF Input Connector Type	N			N	
RF Output Connector Type	BNC			BNC	

* Includes Transmitter RF Distribution System for 900 MHz, 700/800 MHz, and UHF 450-512 MHz. Does not include Transmitter RF Distribution System for VHF, UHF 380-450, 512-524 MHz and High Power 800 MHz.
** Reference signal is QPSK

GCP 8000 SITE CONTROLLER (T7038A)

GENERAL PERFORMANCE

	HPD	INTEGRATED VOICE & DATA
Channel Capacity	5	Repeater Site: 28 Simulcast (Multicast): 30
Size (HxWxD)	5.25 x 19 x 18 in (133 x 483 x 457 mm)	5.25 x 19 x 18 in (133 x 483 x 457 mm)
Weight	40 lbs (18 kg)	40 lbs (18 kg)
Temperature Range	–22 to 140 °F (–30 to 60°C)	–22 to 140 °F (–30 to 60°C)
Rack Option	19 in standard rack mountable	19 in standard rack mountable
Frequency Stability	GPS Synchronized	Simulcast (Multisite): External

ELECTRICAL

Power Requirements	AC: 90-264 VAC, 47-63 Hz DC: 43.2-60 VDC	AC: 90-264 VAC, 47-63 Hz DC: 43.2-60 VDC
Power Consumption	AC: 160 W DC: 80 W	AC: 130 W DC: 60 W

GCM 8000 COMPARATOR (T7321A)

GENERAL PERFORMANCE

	INTEGRATED VOICE & DATA
Channel Capacity	1 or 2
Size (HxWxD)	5.25 x 19 x 18 in (133 x 483 x 457 mm)
Weight	40 lbs (18 kg)
Temperature Range	–22 to 140 °F (–30 to 60°C)
Rack Option	19 in standard rack mountable
Time Stability	External Reference

ELECTRICAL

Power Requirements	AC: 90-264 VAC 47-63Hz DC: 43.2-60 VDC
Power Consumption	AC: 1 module 130 W AC: 2 modules 160 W DC: 1 module 60 W DC: 2 modules 80 W

GTR 8000 BASE RADIO (T7039A)

GENERAL PERFORMANCE

	HPD	INTEGRATED VOICE & DATA			
	700/800 MHz	**700/800 MHz**	**UHF: 380-524 MHz**	**VHF: 136-174 MHz**	**High Power 800 MHz**
Size (HxWxD)	5.25 x 19 x 18 in (133 x 483 x 457 mm)	5.25 x 19 x 18 in (133 x 483 x 457 mm)	5.25 x 19 x 18 in (133 x 483 x 457 mm)	5.25 x 19 x 18 in (133 x 483 x 457 mm)	5.25 x 19 x 18 in (133 x 483 x 457 mm)
Weight	46 lbs (21 kg)	46 lbs (21 kg)	46 lbs (21 kg)	46 lbs (21 kg)	48 lbs (22 kg)
Temperature Range	–22 to 140 °F (–30 to 60°C)	–22 to 140 °F (–30 to 60°C)	–22 to 140 °F (–30 to 60°C)	–22 to 140 °F (–30 to 60°C)	–22 to 140 °F (–30 to 60°C)
Power Requirements	AC: 90-264 VAC, 47-63 Hz DC: 43.2-60 VDC	AC: 90-264 VAC, 47-63 Hz DC: 43.2-60 VDC	AC: 90-264 VAC, 47-63 Hz DC: 43.2-60 VDC	AC: 90-264 VAC, 47-63 Hz DC: 43.2-60 VDC	AC: 90-264 VAC, 47-63 Hz DC: 43.2-60 VDC
Power Consumption Power Efficiency Package Standard	 325 W 325 W	 C4FM, FM: 405 W LSM, H-DPQSK: 425 W C4FM, FM: 430W LSM, H-DPQSK: 470 W	 C4FM, FM: 410 W LSM, H-DPQSK: 445 W C4FM, FM: 435 W LSM, H-DPQSK: 455 W	 C4FM, FM: 405 W LSM, H-DPQSK: 315 W C4FM, FM: 435 W LSM, H-DPQSK: 345 W	 C4FM, FM: 700 W C4FM, FM: 725 W
Antenna Connectors TX	N female	N female	N female	N female	N female
Antenna Connectors RX	BNC female	BNC female N female **	BNC female N female **	BNC female N female **	BNC female N female **
Channel Spacing	25 kHz	12.5/25 kHz	12.5/25 kHz	12.5/15/25/30 kHz	12.5/25 kHz
Modulation	TX: 64QAM, 16QAM, QPSK RX: 64QAM, 16QAM, QPSK	TX: C4FM, LSM, H-DQPSK, FM RX: C4FM, H-CPM, FM	TX: C4FM, LSM, H-DQPSK, FM RX: C4FM, H-CPM, FM	TX: C4FM, LSM, H-DQPSK, FM RX: C4FM, H-CPM, FM	TX: FM, C4FM RX: C4FM, H-CPM, FM
Frequency Stability	External Reference	100 ppb/2 yr or External Reference	100 ppb/2 yr or External Reference	100 ppb/2 yr or External Reference	100 ppb/2 yr or External Reference

TRANSMITTER

	700/800 MHz	**700/800 MHz**	**UHF: 380-435 MHz UHF: 435-524 MHz**	**VHF: 136-174 MHz**	**High Power 800 MHz**
Frequency Range	764-776, 851-870 MHz	764-776, 851-870 MHz	380-435, 435-524 MHz	136-174 MHz	851-870 MHz
Power Output	2-50 W	2-100 W	C4FM, FM: 2-110 W H-DQPSK, LSM: 2-100 W	C4FM, FM: 2-100 W H-DQPSK, LSM: 2-60 W	15-150W
Electronic Bandwidth	Full Bandwidth	Full Bandwidth	Full Bandwidth	Full Bandwidth	Full Bandwidth
Modulation Fidelity	N/A	5%	5%	5%	5%
EVM	10%	N/A	N/A	N/A	N/A
Intermodulation Attenuation	80 dB	80 dB	65 dB	55 dB	55 dB
Spurious and Harmonic Emissions Attenuation	90 dB	90 dB	90 dB	90 dB	90 dB
Analog FM Hum and Noise 12.5 kHz 25 kHz	 N/A N/A	 45 dB 50 dB	 45 dB 50 dB	 45 dB 50 dB	 45 dB 50 dB
Analog Audio Distortion	N/A	Less than 2% at 1000 Hz	Less than 2% (1% typical) at 1000 Hz	Less than 2% (1% typical) at 1000 Hz	Less than 2% at 1000 Hz
Emissions Designators	17K7D7D	8K70D1W, 8K10F1E, 8K70D7W, 8K10F7W, 8K10F1D, 16K0F3E, 9K80D7W, 11K0F3E	8K70D1W, 8K10F1E 8K10F7W, 8K10F1D, 8K70D7W, 16K0F3E, 9K80D7W, 11K0F3E	8K70D1W, 8K10F1E 8K10F7W, 8K10F1D, 8K70D7W, 16K0F3E, 9K80D7W, 11K0F3E	8K10F1E, 8K10F1D, 8K10F1W 16K0F1D, 16K0F3E, 11K0F3E 14K0F1D, 14K0F3

RECEIVER

	700/800 MHz	**700/800 MHz**	**UHF: 380-435 MHz UHF: 435-524 MHz**	**VHF: 136-174 MHz**	**High Power 800 MHz**
Frequency Range	792-825 MHz	792-825 MHz	380-435, 435-524 MHz	136-174 MHz	806-825 MHz
Analog Sensitivity (12 dB SINAD)	N/A	12.5 kHz: –118 dBm 25 kHz: -117 dBm	12.5 kHz: –118 dBm 25 kHz: -117 dBm	12.5 kHz: –119 dBm 25/30 kHz: -118 dBm	12.5 kHz: –118 dBm 25 kHz: -117 dBm
Digital Sensitivity 1% Bit Error Rate Static (BER) 64 QAM 16 QAM QPSK	 –98 dBm –104 dBm –111 dBm	 N/A N/A N/A	 N/A N/A N/A	 N/A N/A N/A	 N/A N/A N/A
Digital Sensitivity 5% Bit Error Rate Static (BER) C4FM H-CPM	 N/A N/A	 –118 dBm –116 dBm	 –118 dBm –116 dBm	 –119 dBm –117 dBm	 –118 dBm –116 dBm

* Reference signal is QPSK ** Optional Preselector

Specifications subject to change without notice.

GTR 8000 BASE RADIO (T7039A) CONTINUED

RECEIVER

	HPD	INTEGRATED VOICE & DATA			
	700/800 MHz	**700/800 MHz**	**UHF: 380-435 MHz UHF: 435-524 MHz**	**VHF: 136-174 MHz**	**High Power 800 MHz**
Intermodulation Rejection	75 dB*	85 dB	85 dB	85 dB	85 dB
Digital Adjacent Channel Rejection	50 dB*	60 dB	60 dB	60 dB	60 dB
Analog Adjacent Channel Rejection (EIA603) Analog 12.5 kHz	N/A	75 dB	75 dB	75 dB	75 dB
Analog Adjacent Channel Rejection (TIA603D)					
Analog 12.5 kHz	N/A	50 or 60 dB (adjustable)	50 or 60 dB (adjustable)	50 or 60 dB (adjustable)	50 or 60 dB (adjustable)
Analog 25 kHz	N/A	80 dB	80 dB	80 dB	80 dB
Spurious and Image Response Rejection	85 dB*	85 dB 100 dB**	85 dB 100 dB**	90 dB 95 dB**	85 dB 100 dB**
Analog Audio Response	N/A	+1, -3 dB from 6 dB per octave de-emphasis; 300-3000 Hz referenced to 1000 Hz at line output	+1, -3 dB from 6 dB per octave de-emphasis; 300-3000 Hz referenced to 1000 Hz at line output	+1, -3 dB from 6 dB per octave de-emphasis; 300-3000 Hz referenced to 1000 Hz at line output	+1, -3 dB from 6 dB per octave de-emphasis; 300-3000 Hz referenced to 1000 Hz at line output
Analog Audio Distortion	N/A	3% or 5% (adjustable)	3% or 5% (adjustable)	3% or 5% (adjustable)	3% or 5% (adjustable)
Analog FM Hum and Noise					
12.5 kHz					
25 kHz	N/A	45 dB	45 dB	45 dB	45 dB
	N/A	50 dB	50 dB	50 dB	50 dB
Intermediate Frequency	1st: 73.35 MHz 2nd: 2.16 MHz	1st: 73.35 MHz 2nd: 2.16 MHz	1st: 73.35 MHz 2nd: 2.16 MHz	1st: 44.85 MHz 2nd: 2.16 MHz	1st: 73.35 MHz 2nd: 2.16 MHz

GPW 8000 RECEIVER (T7540A)

GENERAL PERFORMANCE

	INTEGRATED VOICE & DATA					
	700/800 MHz		**UHF: 380-435 MHz UHF: 435-524 MHz**		**VHF: 136-174 MHz**	
Size (HxWxD)	5.25 x 19 x 18 in (133 x 483 x 457 mm)		5.25 x 19 x 18 in (133 x 483 x 457 mm)		5.25 x 19 x 18 in (133 x 483 x 457 mm)	
Weight	36 lbs (16 kg)		36 lbs (16 kg)		36 lbs (16 kg)	
Temperature Range	–22 to 140 °F (–30 to 60°C)		–22 to 140 °F (–30 to 60°C)		–22 to 140 °F (–30 to 60°C)	
Power Requirements						
AC	90-264 VAC, 47-63 Hz		90-264 VAC, 47-63 Hz		90-264 VAC, 47-63 Hz	
DC	43.2-60 VDC		43.2-60 VDC		43.2-60 VDC	
Power Consumption	1 Module	2 Module	1 Module	2 Module	1 Module	2 Module
AC – Power Efficiency Package	40 W	65 W	40 W	65 W	40 W	65 W
DC – Power Efficiency Package	30 W	50 W	30 W	50 W	30 W	50 W
AC	80 W	105 W	80 W	105 W	80 W	105 W
DC	50 W	75 W	50 W	75 W	50 W	75 W
Antenna Connectors RX	BNC female N female **		BNC female N female **		BNC female N female **	
Channel Spacing	12.5/25 kHz		12.5/25 kHz		12.5/15/25/30 kHz	
Modulation	C4FM, FM		C4FM, FM		C4FM, FM	
Frequency Stability	Conventional: 100 ppb/2 yr		Conventional: 100 ppb/2 yr		Conventional: 100 ppb/2 yr	

* Reference signal is QPSK ** Optional Preselector

Specifications subject to change without notice.

GPW 8000 RECEIVER (T7540A) CONTINUED

RECEIVER

	INTEGRATED VOICE & DATA - CONVENTIONAL		
	700/800 MHz	**UHF: 380-435 MHz UHF: 435-524 MHz**	**VHF: 136-174 MHz**
Frequency Range	792-825 MHz	380-435 MHz, 435-524 MHz	136-174 MHz
Analog Sensitivity 12 dB SINAD	12.5 kHz: –118 dBm 25 kHz: -117 dBm	12.5 kHz: –118 dBm 25 kHz: -117 dBm	12.5/15 kHz: –119 dBm 25/30 kHz: -118 dBm
Digital Sensitivity 5% Bit Error Rate Static (BER)			
C4FM	–118 dBm	–118 dBm	–119 dBm
H-CPM	–116 dBm	–116 dBm	–117 dBm
Intermodulation Rejection	85 dB	85 dB	85 dB
Digital Adjacent Channel Rejection	60 dB	60 dB	60 dB
Analog Adjacent Channel Rejection (EIA603)			
Analog 12.5 kHz Analog 25 kHz	75 dB	75 dB	75 dB
Analog Adjacent Channel Rejection (TIA603D)			
Analog 12.5 kHz	50 or 60 dB (adjustable)	50 or 60 dB (adjustable)	50 or 60 dB (adjustable)
Analog 25 kHz	80 dB	80 dB	80 dB
Spurious and Image Response Rejection	85 dB 100 dB*	85 dB 100 dB*	90 dB 95 dB*
Analog Audio Response	+1, -3 dB from 6 dB per octave de-emphasis; 300-3000 Hz referenced to 1000 Hz at line output	+1, -3 dB from 6 dB per octave de-emphasis; 300-3000 Hz referenced to 1000 Hz at line output	+1, -3 dB from 6 dB per octave de-emphasis; 300-3000 Hz referenced to 1000 Hz at line output
Analog Audio Distortion	3% or 5% (adjustable)	3% or 5% (adjustable)	3% or 5% (adjustable)
Analog FM Hum and Noise			
Analog 12.5 kHz	45 dB	45 dB	45 dB
Analog 25 kHz	50 dB	50 dB	50 dB
Intermediate Frequency	1st: 73.35 MHz 2nd: 2.16 MHz	1st: 73.35 MHz 2nd: 2.16 MHz	1st: 44.85 MHz 2nd: 2.16 MHz

* Optional Preselector.

GTR 8000 SITE SUBSYSTEM (T7133A)

GENERAL PERFORMANCE

	HPD
	700/800 MHz
Number of Channels	1
Height	27 RU, 50.4 in (128 cm)
Footprint (W x D)	20.9 x 25.4 in (53 x 64.5 cm)
Weight	225 lbs (102 kg)
Temperature Range	–22 to 140 °F (–30 to 60°C)
Power Requirements	AC: 90-264 VAC, 47-63 Hz DC: 43.2-60 VDC
Power Consumption (fully configured)	AC: 615 W DC: 495 W
Antenna Connectors TX	N Female
Antenna Connectors RX	N Female
Channel Spacing	25 kHz
Modulation	TX: 64QAM, 16QAM, QPSK RX: 64QAM, 16QAM, QPSK
Frequency Stability	GPS synchronized

TRANSMITTER INCLUDING RFDS

	HPD
	700/800 MHz
Frequency Range	764-776, 851-870 MHz
Average Power output per channel	1-27 W
Electronic Bandwidth	Full Bandwidth
Error Vector Magnitude	10%
Spurious and Harmonic Emissions Attenuation	90 dB
Emissions Designators	17K7D7D

RECEIVER INCLUDING RFDS

	HPD
	700/800 MHz
Frequency Range	792-825 MHz
Sensitivity 1% Bit Error Rate Static (BER)	
64 QAM	–101 dBm
16 QAM	–108 dBm
QPSK	–115 dBm
Intermodulation Rejection	75 dB*
Adjacent Channel Rejection	50 dB*
Spurious and Image Response Rejection	90 dB*
Intermediate Frequency	
1st	73.35 MHz
2nd	2.16 MHz
Preselector Bandwidth	792-825 MHz

* Reference signal is QPSK.

FCC TYPE ACCEPTANCE

FCC DESIGNATION

Frequency Range	Type	Power Output	Type Acceptance Number
136-174 MHz	Transmitter	2-100 W	ABZ89FC3790B, ABZ89FC3799B
136-174 MHz	Receiver	N/A	ABZ89FR3791B
406-435 MHz	Transmitter	2-110 W	ABZ89FC4821B
406-435 MHz	Receiver	N/A	ABZ89FR4822B
435-512 MHz	Transmitter	2-110 W	ABZ89FC4819B
435-512 MHz	Receiver	N/A	ABZ89FR4820B
764-776 MHz	Transmitter	2-100 W 2-50 W (HPD)	ABZ89FC5812B
851-870 MHz	Transmitter	2-100 W 2-50 W (HPD)	ABZ89FC5810B
792-825 MHz	Receiver	N/A	ABZ89FR5811B
935-941 MHz	Transmitter	2-120 W	ABZ89FC5823B
896-902 MHz	Receiver	N/A	ABZ89FR5824B
851-870 MHz	Transmitter	15-150W	ABZ89FC5825B

EU REGULATORY COMPLIANCE

CE mark is available on the GTR 8000 Base Radio (T7039A) and GPW 8000 Receiver (T7540A) in the following frequency ranges: UHF 380-525 MHz and VHF 136-174 MHz.

Specifications subject to change without notice.

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APX™ 6500

PROJECT 25 MOBILE RADIO

We've put exceptional flexibility into an advanced mission critical mobile radio that's easy to operate and intuitive to use. The APX 6500 P25 mobile allows users to choose from 4 control heads, mid and high power models and multiple installation configurations in an easy to install design. Innovative safety features such as GPS location tracking, intelligent lighting and one-touch controls help to keep first responders safer than ever before.

Focus on the task not the technology, with the hardworking mission critical mobile that turns mission critical into mission complete.



FLEXIBLE PLATFORM

- Interchangeable control heads that best support your operational needs - O2, O3, O5, O7 and O9
- Two transceiver options - high-power and mid-power
- Dual control head support offered on the O2, O5, O7 and O9 control heads

EASY TO INSTALL AND EFFORTLESS TO USE

- Mid-power model fits into any existing XTL footprint, so you can reuse mounting holes and cables
- High-power model trunnion design lets you remove the radio without removing the cables
- 12 character RF ID label helps you track information without uninstalling your radio

CUTTING-EDGE TECHNOLOGY AND ADVANCED FEATURES

- Project 25 Phase 2 technology provides twice the voice capacity
- Integrated GPS lets you locate and track an individual or vehicle
- Advanced features like intelligent lighting, radio profiles and text messaging improve communication and coordination



APX™ 6500 SPECIFICATIONS

FEATURES AND BENEFITS:

Available in 700/800 MHz, VHF, UHF R1 and UHF R2 bands

Channels: 870*

Trunking Standards supported:

- Clear or digital encrypted Trunked Operation
- Capable of SmartZone®, SmartZone Omnilink, SmartNet®

Analog MDC-1200 and Digital APCO P25 Conventional System Configurations

Narrow and wide bandwidth digital receiver (6.25kHz/12.5kHz/20kHz/25kHz)

Embedded digital signaling (ASTRO and ASTRO 25)

Integrated Encryption Hardware

Software Key

ASTRO 25 Integrated Voice & Data

Intelligent lighting

Radio profiles

Unified Call List

Meets applicable MIL-STD 810C, D, E, F and G

Ships standard IP54

Utlizes Windows XP, Vista and Windows 7 and 8 Customer Programming Software (CPS)**

- Supports USB Communications
- Built in FLASHport™ support

Re-use of most XTL™ accessories, plus new IMPRES accessories

OPTIONAL FEATURES:

Enhanced Encryption Software Options

Programming over Project 25 (POP25)

Text Messaging

Over the Air Rekeying (OTAR)

12 character RF ID asset tracking

Tactical OTAR

GPS Outdoor Location Tracking

Siren and Light Interface Module

*Enhancement package available

** CPS version R12.00.00 and greater ordered after June 2014 will only support Windows 7 and 8

TRANSMITTER - TYPICAL PERFORMANCE SPECIFICATIONS

	700 MHz	800 MHz	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	764-776 MHz 794-806 MHz	806-824 MHz 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz
Maximum Frequency Separation	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Rated RF Output Power Adj*	10-30 Watts	10-35 Watts	10-50 Watts or 25-110 Watts	10-40 Watts or 25-110 Watts	10-45 Watts (450-485 MHz) 10-40 Watts (485-512 MHz) 10-25 Watts (512-520 MHz)
Frequency Stability* (–30°C to +60°C; +25°C Ref.)	±0.00015 %	±0.00015 %	±0.0002 %	±0.0002 %	±0.0002 %
Modulation Limiting*	±5 kHz / ±2.5 kHz	±5 kHz/±4 kHz (NPSPAC) /±2.5 kHz	±5 kHz / ±2.5 kHz	±5 kHz / ±2.5 kHz	±5 kHz / ±2.5 kHz
Modulation Fidelity (C4FM) 12.5kHz Digital Channel	±2.8 kHz	±2.8 kHz	±2.8 kHz	±2.8 kHz	±2.8 kHz
Emissions*	Conducted+ –75/–85 dBc Radiated+ –20/–40 dBm	Conducted –75 dBc Radiated –20 dBm	Conducted –85 dBc Radiated –20 dBm	Conducted –85 dBc Radiated –20 dBm	Conducted –85 dBc Radiated –20 dBm
Audio Response*	+1, –3 dB (EIA)	+1, –3 dB (EIA)	+1, –3 dB (EIA)	+1, –3 dB (EIA)	+1, –3 dB (EIA)
FM Hum & Noise 25 kHz 12.5 kHz	–50 dB –48 dB	–50 dB –48 dB	–53 dB –52 dB	–53 dB –50 dB	–53 dB –50 dB
Audio Distortion*	2 %	2 %	2 %	2 %	2 %

DIMENSIONS

	Inches	Millimeters
Mid Power Radio Transceiver	2 x 7 x 8.6	50.8 x 177.8 x 218.4
O5 Control Head	2 x 7 x 2.5	50.8 x 180.3 x 63.5
O2 Control Head	2.7 x 8 x 2.1	68.4 x 206 x 52.83
O7 Control Head	2 x 7 x 1.5	50.8 x 178 x 40
Mid Power Radio Transceiver and O5 Control Head–Dash Mount	2 x 7 x 9.6	50.8 x 180.3 x 243.8
Mid Power Radio Transceiver and O2 Control Head - Dash Mount	2.7 x 8 x 10.5	68.4 x 206 x 268
Mid Power Radio Transceiver and O7 Control Head - Dash Mount	2 x 7 x 10.3	50.8 x 178 x 262
Mid Power Radio Transceiver and Remote Mount	2.0 x 7 x 9.6	50.8 x 180.3 x 243.8
High Power Radio Transceiver	2.9 x 11.5 x 8.8	74 x 293 x 223
High Power Radio Transceiver with Handle	3.4 x 11.5 x 8.8	87 x 293 x 223
Mid Power Radio Transceiver and O5 Control Head Weight	6.6 lbs	3.0 kg
Mid Power Radio Transceiver and O2 Control Head Weight	7.12 lbs	3.23 kg
Mid Power Radio Transceiver and O7 Control Head Weight	6.74 lbs	3.06 kg
High Power Radio Transceiver Weight With Trunnion Without Trunnion	14.2 lbs 12 lbs	6.4 kg 5.4 kg

APX 6500 CONTROL HEAD PORTFOLIO







02 RUGGED CONTROL HEAD

- Large color display with intelligent lighting
- 3 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Built in 7.5 watt speaker
- Multiple control head configuration (up to 2)
- Multifunction volume/ channel knob
- Night/day mode button

03 HAND HELD CONTROL HEAD

- Large color display with intelligent lighting
- 2 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Integrated full size DTMF keypad
- Hand-held control head with intuitive user interface
- Two quick-access side buttons
- Display contrast selector

05 STANDARD CONTROL HEAD

- Tri-color display with intelligent lighting
- 2 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Available with Keypad Microphone
- Multiple control head configuration (up to 2)
- Display contrast selector

07 ENHANCED CONTROL HEAD

- Large color display with intelligent lighting
- 3 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Available with Lighting & Siren Controls or DTMF Keypad
- Multiple control head configuration (up to 2)
- Multifunction volume/ channel knob
- Night/day mode button

09 INTEGRATED CONTROL HEAD

- Extra-large full color display with intelligent lighting
- 2 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Integrated full size DTMF keypad
- Large programmable one-touch buttons
- Dedicated siren controls
- Integrated Response Selector
- Night/day mode button

RECEIVER – TYPICAL PERFORMANCE SPECIFICATIONS

		700 MHz	800 MHz	VHF		UHF Range 1		UHF Range 2	
Frequency Range/Bandsplits		764-776 MHz	851-870 MHz	136-174 MHz		380-470 MHz		450-520 MHz	
Channel Spacing		25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz		25/20/12.5 kHz		25/20/12.5 kHz	
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit		Full Bandsplit		Full Bandsplit	
Audio Output Power at 3% distortion*		7.5 W or 15 W ++	7.5 W or 15 W ++	7.5 W or 15 W ++		7.5 W or 15 W ++		7.5 W or 15 W ++	
Frequency Stability* (–30°C to +60°C; +25°C Ref.)		+/-0.8 PPM	+/-0.8 PPM	+/-0.8 PPM		+/-0.8 PPM		+/-0.8 PPM	
Analog Sensitivity*	12 dB SINAD	-121 dBm	-121 dBm	Pre-Amp -123 dBm	Standard -119 dBm	Pre-Amp -123 dBm	Standard -119 dBm	Pre-Amp -123 dBm	Standard -119 dBm
Digital Sensitivity	5% BER	-121.5 dBm	-121.5 dBm	-123 dBm	-119 dBm	-123 dBm	-119 dBm	-123 dBm	-119 dBm
Intermodulation	25 kHz	82 dB	82 dB	84 dB	86 dB	82 dB	86 dB	82 dB	86 dB
	12.5 kHz	82 dB	82 dB	85 dB	86 dB	83 dB	85 dB	83 dB	85 dB
Spurious Rejection		91 dB	91 dB	95 dB		93 dB		93 dB	
Audio Distortion at rated*		1.20%	1.20%	1.20%		1.20%		1.20%	
FM Hum & Noise	25 kHz	59 dB	59 dB	59 dB		55 dB		57 dB	
	12.5 kHz	50 dB	50 dB	50 dB		50 dB		50 dB	
Selectivity*	25 kHz	85 dB	85 dB	85 dB		85 dB		85 dB	
	12.5 kHz	75 dB	75 dB	75 dB		75 dB		75 dB	
	30 kHz	—	—	90 dB		—		—	

SIGNALING (ASTRO MODE)

Signaling Rate	9.6 kbps
Digital ID Capacity	10,000,000 Conventional / 48,000 Trunking
Digital Network Access Codes	4,096 network site addresses
ASTRO® Digital User Group Addresses	4,096 network site addresses
Project 25 – CAI Digital User Group Addresses	65,000 Conventional / 4,094 Trunking
Error Correction Techniques	Golay, BCH, Reed-Solomon codes
Data Access Control	Slotted CSMA: Utilizes infrastructure-sourced data status bits embedded in both voice and data transmissions.

GPS SPECIFICATIONS

Channels	12
Tracking Sensitivity	–153 dBm
Accuracy**	<10 meters (95%)
Cold Start	<60 seconds (95%)
Hot Start	<10 seconds (95%)
Mode of Operation	Autonomous (Non-Assisted) GPS

POWER AND BATTERY DRAIN

Model Type	136-174 MHz, 380-470 MHz, 450-520 MHz, 764-870 MHz						
Minimum RF Power Output	10-35 Watt (764-870 MHz), 10-50 Watts or 25-110 Watts (136-174 MHz), 10-40W or 25-110 Watts (380-470 MHz), 10-45Watts (450-485 MHz), 10-40Watts (485-512 MHz), 10-25Watts (512-520 MHz)						
Operation	13.8V DC ±20% Negative Ground						
Standby at 13.8V	0.85A (764-870 MHz), 0.85A (136-174 MHz), 0.85A (380-470 MHz), 0.85A (450-520 MHz)						
Receive Current at Rated Audio at 13.8V	3.2A (764-870 MHz), 3.2A (136-174 MHz), 3.2A (380-470 MHz), 3.2A (450-520 MHz)						
Transmit Current (A) at Rated Power	136-174 MHz (10-50 Watt) 380-470 MHz (10-40 Watt) 380-470 MHz (10-40 Watt)	13A (50W) 11A (40W) 11A (45W)	8A (15W) 8A (15W) 8A (15W)	764-870 MHz (10-35 Watt) 136-174 MHz (25-110 Watt) 380-470 MHz (25-110 Watt)	12A (50W) 20A (110W) 24A (110W)	8A (15W)	

MOBILE MILITARY STANDARDS 810 C, D, E , F & G

	MIL-STD 810C		MIL-STD 810D		MIL-STD 810E		MIL-STD 810F		MIL-STD 810G	
	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.
Low Pressure	500.1	I	500.2	II	500.3	II	500.4	II	500.5	II
High Temperature	501.1	I, II	501.2	I/A1, II/A1	501.3	I/A1, II/A1	501.4	I/Hot, II/Hot	501.5	I-A1, II
Low Temperature	502.1	I	502.2	I/C3, II/C1	502.3	I/C3, II/C1	502.4	I/C3, II/C1	502.5	I-C3, II
Temperature Shock	503.1	1 Proc	503.2	I/A1C3	503.3	I/A1C3	503.4	I	503.5	I-C
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I	505.5	I-A1
Rain	506.1	I, II	506.2	I, II	506.3	I, II	506.4	I, III	506.5	I, III
Humidity	507.1	II	507.2	II	507.3	II	507.4	1 Proc	507.5	II-Aggravated
Salt Fog	509.1	1 Proc	509.2	1 Proc	509.3	1 Proc	509.4	1 Proc	509.5	1 Proc
Blowing Dust	510.1	I	510.2	I, II	510.3	I, II	510.4	I, II	510.5	I, II
Vibration	514.1w	VIII/F, Curve-W	514.3	I/10, II/3	514.4	I/10, II/3	514.5	I/24	514.6	I-cat.24
Shock	516.2	I, III, V	516.3	I, V, VI	516.4	I, V, VI	516.5	I, V, VI	516.6	I, V, VI

ENCRYPTION

Supported Encryption Algorithms	ADP, AES, DES, DES-XL, DES-OFB, DVP-XL
Encryption Algorithm Capacity	8
Encryption Keys per Radio	Module capable of storing 1024 keys. Programmable for 64 Common Key Reference (CKR) or 16 Physical Identifier (PID)
Encryption Frame Re-sync Interval	P25 CAI 300 mSec
Encryption Keying	Key Loader
Synchronization	XL – Counter Addressing, OFB – Output Feedback
Vector Generator	National Institute of Standards and Technology(NIST) approved random number generator
Encryption Type	Digital
Key Storage	Tamper protected volatile or non-volatile memory
Key Erasure	Keyboard command and tamper detection
Standards	FIPS 140-2 Level 3 FIPS 197

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-30°C / +60°C
Storage Temperature	-40°C / +85°C
Humidity	Per MIL-STD
ESD	IEC 801-2 KV
Water and Dust Intrusion	IP54, MIL-STD

FCC TYPE ACCEPTANCE ID

BAND	OUTPUT POWER	TRANSMITTER NUMBER
764-870 MHz	10-35 Watts	AZ492FT5858
136-174 MHz	25-110 Watts	AZ492FT3821
136-174 MHz	10-50 Watts	AZ492FT3824
380-470 MHz	10-40 Watts	AZ492FT4894
380-470 MHz	25-110 Watts	AZ492FT4897
450-520 MHz	10-45 Watts	AZ492FT4896

* Measured in the analog mode per TIA/EIA 603 under nominal conditions
** Accuracy specs are for long-term tracking
(95th percentile values >5 satellites visible at a nominal –130 dBm signal strength)
\+ Specs includes performance for the non-GNSS/GNSS bands
++ Output power in to 8 and 3.2 Ohm external speakers respectively

Specifications subject to change without notice. All specifications shown are typical. Radio meets applicable regulatory requirements.

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R3-1-2047G



MISSION CRITICAL CONNECTIVITY AND PERFORMANCE

ASTRO®25 GGM 8000 GATEWAY

Government and industrial organizations rely on ASTRO 25 systems for mission critical communications. The GGM 8000 gateway has been designed and developed by Motorola as a critical sub-system in an ASTRO 25 system providing enhanced performance, capacity and security.

The GGM 8000 gateway is a purpose built device that supports numerous applications, interfaces and functions in the ASTRO 25 infrastructure system plus it provides a clean demarcation between the ASTRO 25 system and the customer's network. It provides static tunnels through the backhaul network so that it does not have to handle any special protocols, including multicast. As an integral part of the ASTRO 25 system Motorola manages the firmware, configurations and applications to ensure the highest level of system integrity, performance, and information assurance. As a modular designed gateway all modules can be replaced without removal of the chassis from the rack enhancing serviceability.

CONNECTIVITY PROVIDED

- ASTRO 25 Core
- ASTRO 25 Sites
  - MCC 7500 Dispatch
  - Trunking
  - Conventional – Analog 4 wire, Digital V.24 and/or IP
  - HPD
  - SmartX
  - ISSI
- Customer Enterprise Network (CEN)

FUNCTIONS PERFORMED

- Radio system traffic call routing (voice and data)
- Packet duplication
- High reliability control – fast failover
- Traffic Shaping (Packet fragmentation, Prioritization, and Queuing)
- Dynamic System Resilience site routing
- IP Simulcast traffic routing
- Zone Core Protection (ZCP)
- Conventional Channel Gateway (Station Control)
- Advanced Conventional Signaling (For example MDC1200 and ACIM)

PHYSICAL INTERFACES

- Ethernet and T1 interfaces for WAN connectivity
- Ethernet for Site LAN including IP Station Interfaces
- Analog and V.24 Conventional station interfaces
- FlexWAN interface for selected legacy networks

SECURITY FUNCTIONALITY

Supports data encryption over Ethernet and T1/E1 links using the IPSec and FRF.17 protocols and the optional encryption module.

- Data encryption – Data Encryption Standard (DES), Triple DES (3DES), and 256-bit Advanced Encryption Standard (AES) algorithms
- Data authentication – Message Digest 5 (MD5) algorithm and Secure Hash Algorithm (SHA)
- Public key execution – Diffie-Hellman Group 1, Group 2, and Group 5 negotiation, Group 14
- SSH (secure shell) client/server architecture – secure encrypted communications between two trusted hosts over insecure networks.
- Password Protection
- Zeroization of critical security parameters (CSPs) – Supports commands to zeroize all Key Encryption Key (KEK) related information and CSPs in the event of a security breach

CONFIGURATION

Base Platform Configuration	Enclosure; Power Subsystem (AC or DC); Base Module; Console Management Port (9 Pin); Four 10/100/1Gbps Base-T Ethernet Ports; Two T1/E1 WAN Telecommunication Ports
Optional Modules	Encryption module; Analog 4 wire/V.24 Interface kit: 4x4wire with E&M analog ports, 4xv.24 digital ports; Flexwan module: 1 multipurpose port, typically used for v.35 interface

PHYSICAL SPECIFICATIONS

Dimensions	44 cm (w) x 4.3 cm (h) x 37 cm (d)
Weight	7.3 kg (16 lb)

ENVIRONMENTAL SPECIFICATIONS

Temperature	–30 °C to 60 °C (–22 °F to 140 °F) operating for base unit with or without encryption module 0 °C to 50 °C (32 °F to 122 °F) operating for base unit configured with optional interface modules –40 °C to 85 °C (–40 °F to 185 °F) non-operating
Humidity	5 to 95% (Non-Condensing)
Heat Dissipation	163 BTU/Hour (Maximum)
Power Consumption	48 Watts (Maximum)
AC Power Configuration	
Operating Range	100V to 240V, 50/60Hz
Current Draw	Less than 0.50A at 120VAC Less than 0.25A at 220VAC
DC Power Configuration	
Operating Range	20 to 60 VDC
Current Draw	Less than 2.0A at 24VDC Less than 1.0A at 48VDC

PRODUCT SAFETY CERTIFICATIONS

North America	UL60950-1, CSA C22.2 No. 60950-1

EMC/EMI CERTIFICATIONS

North America	FCC Part 15; Class A Industry Canada ICES-003; Class A
Europe (EU)	
EN 55022	Radiated Emissions; Class A
EN 55022	Conducted Emissions; Class A
EN 61000-3-2	Harmonics
EN 61000-3-3	Flicker
EN 55024	Immunity
EN 61000-4-2	ESD Immunity
EN 61000-4-3	Radiated Immunity
EN 61000-4-4	EFT/B Immunity
EN 61000-4-5	Surge
EN 61000-4-6	Conducted Immunity
EN 61000-6-11	Voltage Interruption / Dips
Australia / New Zealand	AS/NZS CISPR 22; Class B
Japan	VCCI Class B

TELECOMMUNICATIONS APPROVALS

North America	FCC Part 68, IC CS-03
Europe (EU)	ETSI/TBR1, TBR2, TBR12, TBR13, TBR17
Australia / New Zealand	AS/ACIF S003, ACA TS016, TNA117

ENVIRONMENTAL REGULATORY

EU WEEE Directive	EN 50419 Compliant
China Management Methods (CMM)	Ministry Order #39

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R3-26-2011 (1010)



INTEROPERATE WITHOUT BOUNDARIES

APX™ 7500 MULTIBAND MOBILE RADIO

You want communication to be continuous – especially during a high-speed chase or lifesaving helicopter rescue. You depend upon every word being heard and every message being understood, with sirens blasting, engines blaring and weather howling in the background. You count on controls that are easy to locate and operate when situations get stressful. And you expect a mobile so interoperable, your personnel can communicate seamlessly – no matter how many agencies or how vast the area.

Working with public safety personnel around the world, we designed the APX™ 7500 multiband mobile radio with these must-haves in mind. Whether you want instant interoperability, easy ergonomics or loud, clear audio, the APX 7500 delivers it all, everywhere you go.

TALK TOGETHER INSTANTLY

Launching a covert operation or military response, you don't want to operate two radios in order to communicate. And you don't have to. The APX 7500 provides interoperability on demand performing across multiple digital and analog networks and operating in any two frequency bands(700/800 MHz, VHF, UHF R1 and UHF R2). Now your agency can rely on one cost-effective multiband mobile instead of installing and operating multiple radios.

INSTALL IT EASILY

Since vehicle space is limited and access can be difficult, we designed the APX 7500 mobile to fit into the existing install space of our XTL radios so you can use, install and remove it easily. You can reuse existing mounting holes and cables on the mid and high-power models. And a new high-power trunion design secures the mobile and makes installing easy— simply remove the radio without removing the cables.

PLAN TO EXPAND NOW

Every APX 7500 radio is P25 Phase 2 Capable for twice the voice capacity. That means you can add more users to your system without adding frequencies or infrastructure. Not only does the APX 7500 meet current P25 standards, it's backwards and forwards compatible and future-ready to support new technology and data applications. So you can upgrade your existing system or design a new one at your own pace.

APX 7500
PROJECT 25 MULTI-BAND MOBILE RADIO

FEATURES AND BENEFITS:

Available in 700/800 MHz, VHF, UHF R1, and UHF R2 bands

Up to 2000 Channels

Optional multiband operation

Trunking Standards supported:

- Clear or digital encrypted ASTRO® 25 Trunked Operation
- Capable of SmartZone®, SmartZone Omnilink, SmartNet®

Analog MDC-1200 and Digital APCO P25 Conventional System Configurations

Narrow and wide bandwidth digital receiver (6.25 kHz equivalent/12.5 kHz/25 kHz)*

Embedded digital signaling (ASTRO and ASTRO 25)

Integrated GPS capable

Integrated Encryption Hardware

Seamless wideband scan

Integrated Voice & Data

Software Key

Intelligent lighting

Radio profiles

Unified Call List

Expansion Slot Standard

Meets applicable MIL-specs 810C, D, E, F and G

Ships standard IP54

Utlizes Windows XP and Vista Customer Programming Software (CPS)

- Supports USB Communications
- Built in FLASHport™ support

Re-use of most XTL™ accessories

OPTIONAL FEATURES:

GPS Outdoor Location

Enhanced Encryption Software Options

Programming over Project 25 (POP25)

Text Messaging

Over the Air Re-Key (OTAR)

12 character RF ID asset tracking

Siren and Light Interface Module

* Per the FCC Narrowbanding rules, new products (APX7500 UHFR1 with UHFR2 Mid Power combination AND UHFR1 High Power with 700/800 MHz combination) submitted for FCC certification after January 1, 2011 are restricted from being granted certification at 25KHz for United States – State & Local Markets only.

APX 7500 CONTROL HEAD PORTFOLIO



O2 RUGGED CONTROL HEAD

- Large color display with intelligent lighting
- 3 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Built in 7.5 watt speaker
- Multiple control head configuration (up to 4)
- Motorcycle configuration available
- Multifunction volume/ channel knob
- Night/day mode button



O3 HAND HELD CONTROL HEAD

- Large color display with intelligent lighting
- 2 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Integrated full size DTMF keypad
- Hand-held control head with intuitive user interface
- Two quick-access side buttons
- Display contrast selector



O5 STANDARD CONTROL HEAD

- Tri-color display with intelligent lighting
- 2 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Available with Keypad Microphone
- Multiple control head configuration (up to 4)
- Motorcycle configuration available
- Display contrast selector



O7 ENHANCED CONTROL HEAD

- Large color display with intelligent lighting
- 3 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Available with Lighting & Siren Controls or DTMF Keypad
- Multiple control head configuration (up to 4)
- Configuration available
- Multifunction volume/ channel knob
- Night/day mode button



O9 INTEGRATED CONTROL HEAD

- Extra-large full color display with intelligent lighting
- 2 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Integrated full size DTMF keypad
- Large programmable one-touch buttons
- Dedicated siren controls
- Integrated Response Selector
- Night/day mode button

SIGNALLING (ASTRO MODE)

Signalling Rate	9.6 kbps
Digital ID Capacity	10,000,000 Conventional / 48,000 Trunking
Digital Network Access Codes	4,096 network site addresses
ASTRO Digital User Group Addresses	4,096 network site addresses
Project 25 – CAI Digital User Group Addresses	65,000 Conventional / 4,094 Trunking
Error Correction Techniques	Golay, BCH, Reed-Solomon codes
Data Access Control	Slotted CSMA: Utilizes infrastructure-sourced data status bits embedded in both voice and data transmissions.

MOBILE APX 7500

		Inches	Millimeters
Mid Power Radio Transceiver		2 x 7 x 8.6	50.8 x 177.8 x 218.4
O5 Control Head		2 x 7 x 2.5	50.8 x 180.3 x 63.5
O2 Control Head		2.7 x 8 x 2.1	68.4 x 206 x 52.83
O7 Control Head		2 x 7 x 1.5	50.8 x 178 x 40
Mid Power Radio Transceiver and O5 Control Head - Dash Mount		2 x 7 x 9.6	50.8 x 180.3 x 243.8
Mid Power Radio Transceiver and O2 Control Head - Dash Mount		2.7 x 8 x 10.5	68.4 x 206 x 268
Mid Power Radio Transceiver and O7 Control Head - Dash Mount		2 x 7 x 10.3	50.8 x 178 x 262
Mid Power Radio Transceiver and Remote Mount		2.0 x 7 x 9.6	50.8 x 180.3 x 243.8
High Power Radio Transceiver		2.9 x 11.5 x 8.8	74 x 293 x 223
High Power Radio Transceiver with Handle		3.4 x 11.5 x 8.8	87 x 293 x 223
Mid Power Radio Transceiver and O5 Control Head Weight		6.6 lbs	3.0 kg
Mid Power Radio Transceiver and O2 Control Head Weight		7.12 lbs	3.23 kg
Mid Power Radio Transceiver and O7 Control Head Weight		6.74 lbs	3.06 kg
High Power Radio Transceiver Weight	With Trunnion Without Trunnion	14.2 lbs 12 lbs	6.4 kg 5.4 kg

TRANSMITTER - TYPICAL PERFORMANCE SPECIFICATIONS

	700 MHz	800 MHz	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	764-776 MHz 794-806 MHz	806-824 MHz 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing	25/12.5 kHz	25/12.5 kHz	30/25/12.5 kHz	25/12.5 kHz	25/12.5 kHz
Maximum Frequency Separation	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Rated RF Output Power Adj*	10-30 Watts	10-35 Watts	10-50 Watts or 25-110 Watts	10-40 Watts or 25-110 Watts	10-45 Watts (450-485 MHz) 10-40 Watts (485-512 MHz) 10-25 Watts (512-520 MHz)
Frequency Stability* (–30°C to +85°C; +25°C Ref.)	±0.8 PPM	±0.8 PPM	±0.8 PPM	±0.8 PPM	±0.8 PPM
Modulation Limiting*	±5 kHz / ±2.5 kHz	±5 kHz/±4 kHz (NPSPAC) /±2.5 kHz	±5 kHz / ±2.5 kHz	±5 kHz / ±2.5 kHz	±5 kHz / ±2.5 kHz
Modulation Fidelity (C4FM) 12.5kHz Digital Channel	1.10%	1.10%	1.10%	1.10%	1.10%
Emissions*	Conducted+ –75/–85 dBc | Radiated+ –20/–40 dBm	Conducted –75 dBc | Radiated –20 dBm	Conducted –85 dBc | Radiated –20 dBm	Conducted –85 dBc | Radiated –20 dBm	Conducted –85 dBc | Radiated –20 dBm
Audio Response*	+1, –3 dB (EIA)	+1, –3 dB (EIA)	+1, –3 dB (EIA)	+1, –3 dB (EIA)	+1, –3 dB (EIA)
FM Hum & Noise* 25 kHz 12.5 kHz	50 dB 48 dB	50 dB 48 dB	53 dB 52 dB	53 dB 50 dB	53 dB 50 dB
Audio Distortion* 25 & 20 kHz 12.5 kHz	0.50% 0.50%	0.50% 0.50%	0.50% 0.50%	0.50% 0.50%	0.50% 0.50%

RECEIVER – TYPICAL PERFORMANCE SPECIFICATIONS

	700 MHz	800 MHz	VHF		UHF Range 1		UHF Range 2	
Frequency Range/Bandsplits	764-776 MHz	851-870 MHz	136-174 MHz		380-470 MHz		450-520 MHz	
Channel Spacing	25/12.5 kHz	25/12.5 kHz	30/25/12.5 kHz		25/12.5 kHz		25/12.5 kHz	
Maximum Frequency Separation	Full Bandsplit	Full Bandsplit	Full Bandsplit		Full Bandsplit		Full Bandsplit	
Audio Output Power at 3% distortion*	7.5 W or 15 W ++	7.5 W or 15 W ++	7.5 W or 15 W ++		7.5 W or 15 W ++		7.5 W or 15 W ++	
Frequency Stability* (–30°C to +60°C; +25°C Ref.)	+/-0.8 PPM	+/-0.8 PPM	+/-0.8 PPM		+/-0.8 PPM		+/-0.8 PPM	
Analog Sensitivity* 12 dB SINAD	-121 dBm	-121 dBm	Pre-Amp -123 dBm	Standard -119 dBm	Pre-Amp -123 dBm	Standard -119 dBm	Pre-Amp -123 dBm	Standard -119 dBm
Digital Sensitivity 5% BER	-121.5 dBm	-121.5 dBm	-123 dBm	-119 dBm	-123 dBm	-119 dBm	-123 dBm	-119 dBm
Intermodulation 25 kHz	82 dB	82 dB	84 dB	86 dB	82 dB	86 dB	82 dB	86 dB
Intermodulation 12.5 kHz	82 dB	82 dB	85 dB	86 dB	83 dB	85 dB	83 dB	85 dB
Spurious Rejection	91 dB	91 dB	95 dB		93 dB		93 dB	
Audio Distortion at rated*	1.20%	1.20%	1.20%		1.20%		1.20%	
FM Hum & Noise 25 kHz	59 dB	59 dB	59 dB		55 dB		57 dB	
FM Hum & Noise 12.5 kHz	50 dB	50 dB	50 dB		50 dB		50 dB	
Selectivity* 25 kHz	85 dB	85 dB	85 dB		85 dB		85 dB	
Selectivity* 12.5 kHz	75 dB	75 dB	75 dB		75 dB		75 dB	
Selectivity* 30 kHz	—	—	90 dB		—		—	

POWER AND BATTERY DRAIN

Model Type	136-174 MHz, 380-470 MHz, 450-520 MHz, 764-870 MHz					
Minimum RF Power Output	10-35 Watt (764-870 MHz), 10-50 Watts or 25-110 Watts (136-174 MHz), 10-40W or 25-110 Watts (380-470 MHz), 10-45Watts (450-485 MHz), 10-40Watts (485-512 MHz), 10-25Watts (512-520 MHz)					
Operation	13.8V DC ±20% Negative Ground					
Standby at 13.8V	0.85A (764-870 MHz), 0.85A (136-174 MHz), 0.85A (380-470 MHz), 0.85A (450-520 MHz)					
Receive Current at Rated Audio at 13.8V	3.2A (764-870 MHz), 3.2A (136-174 MHz), 3.2A (380-470 MHz), 3.2A (450-520 MHz)					
Transmit Current (A) at Rated Power	136-174 MHz (10-50 Watt)	13A (50W)	8A (15W)	764-870 MHz (10-35 Watt)	12A (50W)	8A (15W)
	380-470 MHz (10-40 Watt)	11A (40W)	8A (15W)	136-174 MHz (25-110 Watt)	20A (110W)	
	450-520 MHz (10-45 Watt)	11A (45W)	8A (15W)	380-470 MHz (25-110 Watt)	24A (110W)	

GPS SPECIFICATIONS

Channels	12
Tracking Sensitivity	–153 dBm
Accuracy[5]	<10 meters (95%)
Cold Start	<60 seconds (95%)
Hot Start	<10 seconds (95%)
Mode of Operation	Autonomous (Non-Assisted) GPS

MOBILE MILITARY STANDARDS 810 C, D, E , F & G

	MIL-STD 810C		MIL-STD 810D		MIL-STD 810E		MIL-STD 810F		MIL-STD 810G	
	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.
Low Pressure	500.1	I	500.2	II	500.3	II	500.4	II	500.5	II
High Temperature	501.1	I, II	501.2	I/A1, II/A1	501.3	I/A1, II/A1	501.4	I/Hot, II/ Hot	501.5	I/A1, II
Low Temperature	502.1	I	502.2	I/C3, II/C1	502.3	I/C3, II/C1	502.4	I/C3, II/C1	502.5	I/C3, II
Temperature Shock	503.1	1 Proc	503.2	I/A1C3	503.3	I/A1C3	503.4	I	503.5	I/C
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I	505.5	I/A1
Rain	506.1	I, II	506.2	I, II	506.3	I, II	506.4	I, III	506.5	I, III
Humidity	507.1	II	507.2	II	507.3	II	507.4	1 Proc	507.5	II/Aggravated
Salt Fog	509.1	1 Proc	509.2	1 Proc	509.3	1 Proc	509.4	1 Proc	509.5	1 Proc
Blowing Dust	510.1	I	510.2	I, II	510.3	I, II	510.4	I, II	510.5	I, II
Vibration	514.2	VIII/F, Curve-W	514.3	I/10, II/3	514.4	I/10, II/3	514.5	I/24	514.6	I/24
Shock	516.2	I, III, V	516.3	I, V, VI	516.4	I, V, VI	516.5	I, V, VI	516.6	I, V, VI

ENCRYPTION

Supported Encryption Algorithms	ADP, AES, DES, DES-XL, DES-OFB, DVP-XL
Encryption Algorithm Capacity	8
Encryption Keys per Radio	Module capable of storing 1024 keys. Programmable for 128 Common Key Reference (CKR) or 16 Physical Identifier (PID)
Encryption Frame Re-sync Interval	P25 CAI 300 mSec
Encryption Keying	Key Loader
Synchronization	XL – Counter Addressing OFB – Output Feedback
Vector Generator	National Institute of Standards and Technology (NIST) approved random number generator
Encryption Type	Digital
Key Storage	Tamper protected volatile or non-volatile memory
Key Erasure	Keyboard command and tamper detection
Standards	FIPS 140-2 Level 3 FIPS 197

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-30°C / +60°C
Storage Temperature	-40°C / +85°C
Humidity	Per MIL-STD
ESD	IEC 801-2 KV
Water and Dust Intrusion	IP54 MIL-STD

FCC TYPE ACCEPTANCE ID

FCC ID	BAND AND POWER LEVEL
AZ492FT3821	25-110 Watts (136-174 MHz)
AZ492FT4898	25-110 Watts (136-174 MHz) and 25-110 Watts (380-470 MHz)
AZ492FT4895	10-50 Watts (136-174 MHz) and 10-40Watts (380-470 MHz)
AZ492FT5858	10-35 Watt (764-870 MHz)
AZ492FT7037	10-50 Watts (136-174 MHz) and 10-35 Watt (764-870 MHz)
AZ492FT7035	25-110 Watts (136-174 MHz) and 10-35 Watt (764-870 MHz)
AZ492FT3824	10-50 Watts (136-174 MHz)
AZ492FT4894	10-40 Watts (380-470 MHz)
AZ492FT4897	25-110 Watts (380-470 MHz)
AZ492FT4896	10-45 Watts (450-520 MHz)
AZ492FT7043	10-40 WATTS (380-470 MHz) and 10-35 Watt (764-870 MHz)
AZ492FT7044	10-45 Watts (450-520 MHz) and 10-35 Watt (764-870 MHz)

* Measured in the analog mode per TIA / EIA 603 single-tone method under nominal conditions

** Accuracy specs are for long-term tracking (95th percentile values >5 satellites visible at a nominal –130 dBm signal strength)

\+ Specs includes performance for the non-GNSS/GNSS bands

++ Output power in to 8 and 3.2 Ohm external speakers respectively

Specifications subject to change without notice. All specifications shown are typical.

Radio meets applicable regulatory requirements.

For more information about how to interoperate without boundaries, visit motorolasolutions.com/apx

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R3-1-2037F

MOTOROLA

SDM 3000

Monitoring Devices in Communication Sites

ELEMENT MANAGER FOR COMMUNICATION SITES

Site Device Manager 3000 is an intelligent Remote Terminal Unit (RTU) specifically created for use in Network Fault Management systems. The SDM 3000 allows the system operators and technical staff to retrieve fault information via FullVision INM (Integrated Network Manager), MOSCAD GMC element manager or via a Web browser tool.

It connects to a variety of communications and support devices to monitor their activity and report problems to a supervisory center.

MULTI PROTOCOL AND PROXY CAPABILITY

The SDM 3000 unit incorporates a scalable, intelligent Network Manager proxy agent based on advanced hardware; Linux based firmware and Plug-In SW components. The SDM 3000 RTU can communicate with multiple devices using a variety of media and protocols such as serial/ASCII, Ethernet/TCP/IP and discrete digital I/O or analog inputs. The unit also supports XML for logging messages, NTP for Network Time Sync, HTTP for Web Browser, etc. Information from these multiple sources is translated to SNMP for forwarding.

The best modem protocols for the communication task are used while providing commonly accepted information exchange to other devices.

PORT AND I/O FLEXIBILITY

Serial and Ethernet/IP ports permit connectivity to on-site devices to remotely monitor their operation. In cases where additional I/O is required to monitor discrete devices such as security systems, HVAC equipment, Tower lighting and power systems, an expansion unit is available.

Multiple ports, multiple communication protocols and variable speed data handling allow most data devices to be interfaced to the SDM 3000.

BUILT IN WEB SERVER

Using a standard Web Browser, you can access the status of all monitored devices, view extensive Event or Diagnostic Logs or SNMP Traps as well as download new firmware and monitoring software.

The Web Server is a convenient tool that includes secure access from a technician's computer to the entire network.

REMOTE ACCESS TO LOCAL TERMINALS AND CONSOLES

Telnet support provides connectivity to local device consoles via SDM 3000 serial ports. Even without Telnet, device craft ports can be accessed by using the RSS application layer supplied with the SDM 3000 Builder configuration utility.

Reach–Through connectivity for continued support of all legacy equipment.

FULL CERTIFICATION FOR MOTOROLA SYSTEMS AND NETWORK MANAGERS

The SDM 3000 is certified for all ASTRO®25 6.7 and later and 7.X systems and Motorola Network Managers: FullVision INM and MOSCAD GMC.



The SDM 3000 is the newest unit in the Motorola Network Fault Management family of monitoring products. It adds two very important enhancements to the standard NMO monitoring supplied by the built-in box agents and FullVision INM manager. The first is providing important monitoring and control of critical RF and support equipment required at most remote sites. This includes third party devices such as Channel Banks, microwave radios, GPS, Antenna monitoring, power management and site security. This crucial data is only available through the SDM 3000 which reports to its Graphic Master Central (GMC) manager or a subset to FullVision INM. The second is providing additional information on Motorola manufactured devices such as Base Stations, Site Controllers and Comparators through a separate IP polling mechanism in addition to receiving all the SNMP Trap messages.

TYPICAL THIRD PARTY NETWORK FAULT MANAGEMENT APPLICATIONS

Antenna Monitoring

- Forward Power
- Reflected Power
- Receive Path Test
- Antenna VSWR
- Tower Lighting

Site Security

- Intrusion Alarm
- Fire Alarm
- Smoke Alarm
- Access Control

Power Management

- AC Power Status
- Main Battery Voltage
- Battery Charging Current
- Generator Status, Operation
- Fuel/Oil Levels, Remote Exercise

Environmental Alarms

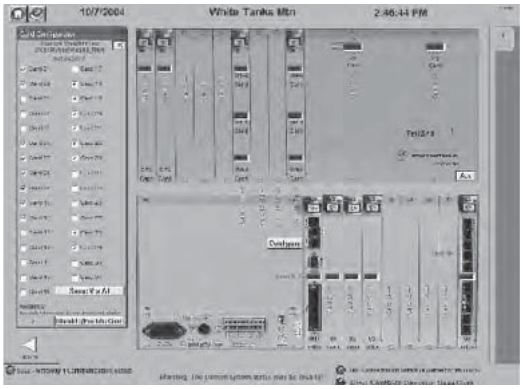
- HVAC Operation & Alarms
- Air Flow
- Ambient Temperature
- Relative Humidity
- Flood Water Level



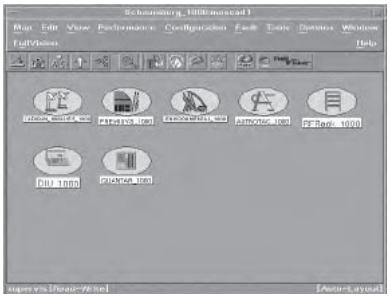
Rear Panel View of F4544 and F4548

MOTOROLA NETWORK MANAGERS

The SDM 3000 reports all Status and Events information to MOSCAD GMC and a functional subset to FullVision INM Element Managers. The SDM 3000 is required to receive or output information to these devices.



GMC View of TeNSr channel bank at a Site



FullVision INM View of SDM 3000

The following tables include the Specifications and Model numbers for the four types of SDM 3000 units:

SDM 3000 SPECIFICATIONS – ADVANCED UNIT MODEL F4544A

Ethernet Port	Data rates	10/100 Mb/s
	Port Description	2 Ethernet user Ports; 1 Console Port
RS232 Port	Data rates	Up to 115,200 Kb/s
	Port Description	3 Full Flow Control RS232 1 Non Flow Control RS232
RS232/RS485 Port	Data rates	Up to 115,200 Kb/s
	Port Description	Full Flow Control RS232 or RS485
I/O RS485 Port	Data Rates	115,200 Kb/s
	Port Description	RS485 Port for I/O Communication
Discrete Inputs/Outputs	I/O Descriptions	48 Digital Inputs (wet/dry contacts) 16 Digital Outputs (SPST relay, contact rating 75 VA/30W, 0.5A@30Vac/60Vdc) 8 Analog Inputs (±5 VDC, 12 bits including sign)
LED Displays	CPU Display	Front Panel: Console Port LEDs (2 LEDs),Communication Ports LEDs (9 Bi-color LEDs), PWR LED, Diagnostic LED Rear Panel: Communication Ports LEDs on the connectors RJ45 - 16 LEDs (2 x 8)
	I/O Display	48 Digital Input LEDs, 16 Digital Output LEDs
Operating Power	Primary Power IN	±24 VDC (18.6-32V)/Max 14W or ±48 VDC (36-60V)/Max 14W 100-240 VAC; 47-440 Hz, Max 20W
	Auxiliary Power IN	12 VDC /Max 12W Alternate/Backup power source
	Two 12 VDC Power OUT	Combined drain from two outputs, max 12W (12V@1A). Each output can supply power to one SDM 3000 I/O expansion unit (1A fuse for each AUX OUT).
Physical	Dimensions	1 Rack Unit high (17"W x 1.65"H x 12.9"D, 435 x 42 x 328 mm)
	Weight	Approx. 2.5 kg (5.5 pounds)
	Temperature	Operating: –30 to +60°C (excluding lithium battery –20 to +60°C); Storage: –55 to +85°C
	Humidity	90-95% RH @ +50°C

SDM 3000 SPECIFICATIONS – BASIC UNIT, MODEL F4543A

Ethernet Port	Data rates	10/100 Mb/s
	Port Description	1 Ethernet user Port; 1 Console Port
RS232 Port	Data rates	Up to 115,200 Kb/s
	Port Description	Full Flow Control RS232
RS232/RS485 Port	Data rates	Up to 115,200 Kb/s
	Port Description	Full Flow Control RS232 or RS485
I/O RS485 Port	Data Rates	115,200 Kb/s
	Port Description	RS485 Port for I/O Communication
Discrete Inputs/Outputs	I/O Descriptions	48 Digital Inputs (wet/dry contacts) 16 Digital Outputs (SPST relay, contact rating 75 VA/30W, 0.5A@30Vac/60Vdc)
LED Displays	CPU Display	Front Panel: Console Port LEDs on the connector (2 LEDs), Communication Ports LEDs (4 Bi-color LEDs), PWR LED, Diagnostic LED Rear Panel: Communication Ports LEDs on the connectors RJ45 - 8 LEDs (2 x 4)
	I/O Display	48 Digital Input LEDs, 16 Digital Output LEDs
Operating Power	Primary Power IN	±24 VDC (18.6-32V)/Max 14W or ±48 VDC (36-60V)/Max 14W 100-240 VAC; 47-440 Hz, Max 20W
	Auxiliary Power IN	12 VDC /Max 12W Alternate/Backup power source
	Two 12 VDC Power OUT	Combined drain from two outputs, max 10W (12V@1A). Each output can supply power to one SDM 3000 I/O expansion unit (1A fuse for each AUX OUT).
Physical	Dimensions	1 Rack Unit high (17"W x 1.65"H x 12.9"D, 435 x 42 x 328 mm);
	Weight	Approx. 2.5 kg (5.5 pounds)
	Temperature	Operating: –30 to +60°C (excluding lithium battery –20 to +60°C); Storage: –55 to +85°C
	Humidity	90-95% RH @ +50°C

SDM 3000 I/O EXPANSION UNIT SPECIFICATIONS – ADVANCED UNIT, MODEL F4548A

Communication Ports I/O (RS485)	Data rates	115,200 Kb/s
	Number of Ports	2
	Port Description	Multiple RS485 Ports (IN/OUT)
Discrete Inputs/Outputs	I/O Descriptions	48 Digital Inputs (wet/dry contacts) 16 Digital Outputs (SPST relay, contact rating 75 VA/30W, 0.5A@30Vac/60Vdc) 8 Analog Inputs (±5 VDC, 12 bits including sign)
LED Displays	CPU Display	Front Panel: I/O Comm. LED (1 Bi-color LED), PWR LED, Diagnostic LED Rear Panel: I/O Comm. Ports LEDs on the IN connector RJ45 (2 LEDs)
	I/O Display	48 Digital Input LEDs 16 Digital Output LEDs
Operating Power	Primary Power IN	±24 VDC (18.6-32V)/Max 7W ±48 VDC (36-60V)/ Max 7W 100-240 VAC, 47-440 Hz, Max 10W
	12VDC Power IN	12 VDC /Max 6W Alternate/Backup power source;
	Two 12 VDC Power OUT	Combined drain from two outputs, max 12W (12V@1A.) 1A fuse for each AUX OUT.
Physical	Dimensions	1 Rack Unit high (17"W x 1.65"H x 12.9"D, 435 x 42 x 328 mm)
	Weight	Approx. 2.5 kg (5.5 pounds).
	Temperature	Operating: –30 to +60°C; Storage: –55 to +85°C
	Humidity	90-95% RH @ +50°C

SDM 3000 I/O EXPANSION UNIT SPECIFICATIONS – BASIC UNIT, MODEL F4547A

Communication Ports I/O (RS485)	Data rates	115,200 Kb/s
	Number of Ports	2
	Port Description	Multiple RS485 Ports (IN/OUT)
Discrete Inputs/Outputs	I/O Descriptions	48 Digital Inputs (wet/dry contacts) 16 Digital Outputs (SPST relay, contact rating 75 VA/30W, 0.5A@30Vac/60Vdc)
LED Displays	CPU Display	Front Panel: I/O Comm. LED (1 Bi-color LED), PWR LED, Diagnostic LED Rear Panel: I/O Comm. Ports LEDs on the IN connector RJ45 (2 LEDs)
	I/O Display	48 Digital Input LEDs, 16 Digital Output LEDs
Operating Power	Primary Power IN	±24 VDC (18.6-32V)/Max 7W ±48 VDC (36-60V)/ Max 7W 100-240 VAC, 47-440 Hz, Max 10W
	12VDC Power IN	12 VDC /Max 6W Alternate/Backup power source
	Two 12 VDC Power OUT	Combined drain from two outputs, max 12W (12V@1A.) 1A fuse for each AUX OUT.
Physical	Dimensions	1 Rack Unit high (17"W x 1.65"H x 12.9"D, 435 x 42 x 328 mm)
	Weight	Approx. 2.5 kg (5.5 pounds).
	Temperature	Operating: –30 to +60°C; Storage: –55 to +85°C
	Humidity	90-95% RH @ +50°C

REGULATORY STANDARDS

Safety	UL listed: UL 60950-1, CSA 22.2-950-1, EN60950-1, IEC 60950-1
Radiated & Conducted Emission	CFR 47 FCC part 15, subpart B (class B); CE EMC: EN55022 (class B), EN50081-1, EN61000-6-3, EN61000-3-2, EN61000-3-3 (AC only)
Electro-Static Discharge	EN55024/EN61000-4-2 (air discharge 8 kV, contact discharge 4 kV)
Surge	EN55024/EN61000-4-5
Radiated Immunity	EN55024/EN61000-4-3 3 V/m 80%AM @ 1kHz
Electrical Fast Transients	EN55024/EN61000-4-4 AC: 1.0kV DC & I/Os: 0.5kV
Conducted RF Immunity	EN55024/EN61000-4-6 (3 Vrms)
Power Freq Magnetic Field	EN55024/EN61000-4-8 (1 A/m)
Voltage Dips & Interruptions	EN55024/EN61000-4-11 95% AC reduction for 0.5 period; 30% AC reduction for 25 periods; 95% AC reduction for 250 periods

Specifications subject to change without notice.

MOTOROLA

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APX™ 8000 ALL-BAND P25 PORTABLE RADIO

UNLIMITED MOBILITY. UNCOMPROMISING PERFORMANCE.

Take command with a 4-in-1 radio that offers limitless interoperability, the clearest, loudest audio and seamless Wi-Fi® connectivity. The compact, rugged and secure APX 8000 redefines mission critical communications.

ALL BANDS, NO BOUNDARIES

With four RF bands and multi-mode system access, the APX 8000 knows no limits when it comes to interoperability. Communicate across borders using a single device. Use analog MDC 1200 or digital P25 mode, conventional or trunked operation, SmartNet or SmartZone legacy systems, clear or secure - all across 7/800MHz, VHF and UHF Range 1 & 2 bands.

HEAR AND BE HEARD MORE CLEARLY

Whether it's loud or windy, whether you whisper or yell, the APX 8000 adaptive audio engine and ultra-loud speaker brings clarity into every conversation. The radio dynamically changes the level of noise suppression, microphone gain, windporting and speaker equalization on the fly to consistently produce the loudest, clearest audio in any environment.

VOICE AND DATA, ALL AT ONCE

With Wi-Fi® access, the APX 8000 can quickly receive new codeplugs, firmware and software features in order to redeploy the radio fleet with ease as users keep talking without interruption. Mission Critical Wireless Bluetooth® connects quickly and securely with remote speaker microphones, surveillance kits and the LEX L10 Mission Critical LTE Handheld for radio remote control.

FIT FOR THE MISSION

Intuitively designed with a familiar look and feel, the compact APX 8000 is always comfortable to use, from your holster to your grip. It contains 4 radio bands packaged into the award-winning design of the APX 6000. The all-band antenna is flexible so it doesn't get in the way.

RUGGED, ROBUST & RELIABLE

With a water-tight seal, drop-resistant dual battery latch, pressure-tested tempered glass display and a shock-absorbing aluminum alloy endoskeleton, the APX 8000 is ready for unpredictable environments. It can survive 2 meter water submersion for 2 hours (IP68) and Motorola's renowned Accelerated Life Test.

DESIGNED TO SECURE & PROTECT

The APX 8000's voice and data is secured by multiple hardware encryption algorithms (AES, DES, ADP), up to 128 keys and the ability to re-key over the air so that sensitive information stays protected from scanners and eavesdroppers. P25 Radio Authentication ensures only valid users can access the system while two-factor authentication allows users to securely log in to databases.





RF BANDS:
700/800 MHz, VHF, UHF Range 1 & 2

OPERATION MODES:
9600 Baud Digital APCO P25 Phase 1 FDMA and Phase 2 TDMA Trunking

3600 Baud SmartNet®, SmartZone®, SmartZone, Omnilink Trunking

Digital APCO 25, Conventional, Analog MDC 1200, Quick Call II System Configurations

Narrow and wide bandwidth digital receiver

(6.25 kHz equivalent/25/20/12.5 KHz)

STANDARD FEATURES:
Mission Critical Wireless Bluetooth*

ASTRO 25 Integrated Voice & Data

Software Key

Text-Messaging

Voice Announcements

ISSI 8000 Roaming

Radio Profiles, Dynamic Zone

Intelligent Lighting

Single-key ADP Encryption

IP68 submersion (2 meters, 2 hours)

IMPRES Battery

ADAPTIVE AUDIO ENGINE:
1 Watt Speaker with Adaptive Equalization

Adaptive Dual-sided Operation

Adaptive Noise Suppression Intensity

Adaptive Gain Control

Adaptive Windporting

PROGRAMMING:
Utilizes Windows 7 & 8 Customer Programming Software (CPS) with Radio Management

OPTIONAL FEATURES:
Wi-Fi® 802.11 b/g/n

GPS Outdoor Location Tracking

RFID Volume Knob

Multi-key for 128 keys and multi-algorithm

Programming Over Project 25 (OTAP)

Over the Air Rekey (OTAR)

Digital Tone Signaling

LEX L10 Collaboration

P25 Authentication

Man Down Sensor

Rugged submersible option: MIL-STD 512.X/I, IP68 (2 meters, 4 hours)

* Compatible with BT 2.1, HSP, PAN, DUN and SPP Profiles found in off-the-shelf BT accessories

TRANSMITTER - TYPICAL PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits		764-776, 794-806 MHz 806-825, 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing		25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Rated RF Output Power Adj[1]		700 MHz: 1-2.5 Watts 800 MHz: 1-3 Watts	1-6 Watts	1-5 Watts	1-5 Watts
Frequency Stability[1] (–30°C to +60°C; +25°C Ref.)		+/- 1.0 ppm	+/- 1.0 ppm	+/- 1.0 ppm	+/- 1.0 ppm
Modulation Limiting[1]		±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz
Emissions (Conducted and Radiated)[1]		-75 dBc	-75 dBc	-75 dBc	-75 dBc
Audio Response[1]		+1, -3 dB	+1, -3 dB	+1, -3 dB	+1, -3 dB
FM Hum & Noise (25kHz / 12.5kHz)[1]	700 MHz 800 MHz	-49 dB/-47 dB -49 dB/-46 dB	-51 dB/-51 dB	-51 dB/-51 dB	-51 dB/-47 dB
Audio Distortion (25kHz / 12.5kHz)[1]	700 MHz 800 MHz	0.90 % / 0.90 % 0.60 % / 0.90 %	0.50 % / 0.90 %	0.50 % / 0.90 %	0.60 % / 0.90 %

BATTERIES FOR APX 8000

Battery Capacity / Type	Dimensions (HxWxD)	Weight	Battery Part Number	Battery Capacity
Li-Ion IMPRES 2150 mAh IP68	3.39" x 2.34" x 1.45"	5.07 oz	PMNN4403	2150 mAh
Li-Ion IMPRES 3100 mAh IP68**	3.39" x 2.34" x 1.65"	6.61 oz	NNTN7038	3100 mAh
Li-Ion IMPRES 4200 mAh IP68	5.12" x 2.34" x 1.65"	11.43 oz	NNTN7034	4400 mAh

KEY AUDIO ACCESSORIES

Name	Type	Part Number	Features
Extreme Policing (XP) RSM	Wired	NMN6271	Dual-Mic Noise Suppression, Emergency, Volume Control, Prog Button, IP68
Mission Critical Wireless (MCW) RSM	Bluetooth	RLN6554	Windporting, Audio Jack, Emergency, Volume Control, Task Light, IP55, 12 hour 5/35/60 Duty Cycle

**Ships standard with radio

RADIO MODELS





	MODEL 1.5	MODEL 2.5	MODEL 3.5
Display	Full bitmap monochromatic LCD top display 1 line text x 8 characters 1 line of icons No menu support Multi-color backlight	**Top display plus:** Full bitmap color LCD display 4 lines of text x 14 characters 2 lines of icons 1 menu line x 3 menus White backlight	**Top display plus:** Full bitmap color LCD display 4 lines of text x 14 characters 2 lines of icons 1 menu line x 3 menus White backlight
Keypad	none	Backlit keypad 3 soft keys 4 direction Navigation key Home and Data buttons	Backlit keypad 3 soft keys 4 direction navigation key 4x3 keypad Home and Data buttons
Channel Capacity	1200	3000	3000
FLASHport Memory	2 GB	2 GB	2 GB
700/800 MHz (764-870 MHz) VHF (136-174 MHz) UHF Range 1 (380-470 MHz) UHF Range 2 (450-520 MHz)	H91TGD9PW5AN	H91TGD9PW6AN	H91TGD9PW7AN
Buttons & Switches	Large PTT button ■ Angled On/Off volume control ■ Orange emergency button ■ 16 position top-mounted rotary switch ■ 2-position concentric switch ■ Multi-color backlight ■ 3-position toggle switch ■ 3 programmable side buttons		
Regulatory Information			
FCC ID	AZ489FT7061		
Industry Canada	109U-89FT7061		
Emission Designators	LMR: 8K10F1D, 8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E***, 20K0F1E*** Bluetooth: 852KF1D, 1M17F1D, 1M19F1D WLAN (Wi-Fi®): 13M7G1D, 17M0D1D, 18M1D1D		

*** In accordance with FCC mandate, the APX 8000 all band radio is restricted to 12.5kHz operation only and does NOT support 25kHz in the VHF and UHF Bands (excluding T-Band). This applies to customers under Rule Part 90.

RECEIVER - TYPICAL PERFORMANCE SPECIFICATIONS

		700	800	VHF	UHF
Frequency Range/Bandsplits		764-776 MHz	851-870 MHz	136-174 MHz	380-520 MHz
Channel Spacing		25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Audio Output Power at Rated[1]		1 Watt	1 Watt	1 Watt	1 Watt
Frequency Stability[1] (–30°C to +60°C; +25°C Ref.)		+/- 1.0 ppm	+/- 1.0 ppm	+/- 1.0 ppm	+/- 1.0 ppm
Analog Sensitivity[1] Digital Sensitivity[2]	12 dB SINAD 1% BER 5% BER 5% BER Faded	0.224 uV 0.316 uV 0.211 uV 0.562uV	0.224 uV 0.316 uV 0.211 uV 0.562 uV	0.168 uV 0.251 uV 0.149 uV 0.562 uV	0.199 uV 0.282 uV 0.158 uV 0.530 uV
Selectivity (25 kHz / 12.5 kHz)[1, 5]		79 dB / 72 dB	78 dB / 72 dB	82 dB / 77 dB	80 dB / 74 dB
Intermodulation Rejection[1]		81 dB	80 dB	82 dB	80 dB
Spurious Rejection[1]		98 dB	98 dB	92 dB	98 dB
FM Hum and Noise (25 kHz / 12.5 kHz)[1]		-55 dB / -53 dB	-54 dB / -52 dB	-57 dB / -55 dB	-56 dB / -54 dB
Audio Distortion[1]		0.9 %	0.9 %	0.9 %	0.9 %

PORTABLE MILITARY STANDARDS 810 C, D, E , F & G

	MIL-STD 810C		MIL-STD 810D		MIL-STD 810E		MIL-STD 810F		MIL-STD 810G	
	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.
Low Pressure	500.1	I	500.2	II	500.3	II	500.4	II	500.5	II
High Temperature	501.1	I, II	501.2	I/A1, II/A1	501.3	I/A1, II/A1	501.4	I/Hot, II/Hot	501.5	I/A1, II/A1
Low Temperature	502.1	I	502.2	I/C3, II/C1	502.3	I/C3, II/C1	502.4	I/C3, II/C1	502.5	I/C3, II/C1
Temperature Shock	503.1	I	503.2	I/A1C3	503.3	I/A1C3	503.4	I	503.5	I/C
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I	505.5	I/A1
Rain	506.1	I, II	506.2	I, II	506.3	I, II	506.4	I, III	506.5	I, III
Humidity	507.1	II	507.2	II	507.3	II	507.4	1 Proc	507.5	II/Aggravated
Salt Fog	509.1	I	509.2	I	509.3	I	509.4	1 Proc	509.5	1 Proc
Blowing Dust	510.1	I	510.2	I	510.3	I	510.4	I	510.5	I
Blowing Sand	1 Proc	1 Proc	510.2	II	510.3	II	510.4	II	510.5	II
Immersion[6]	512.1	I	512.2	I	512.3	I	512.4	I	512.5	I
Vibration	514.2	VIII/F, Curve-W	514.3	I/10, II/3	514.4	I/10, II/3	514.5	I/24	514.6	I/24
Shock	516.2	I, III, V	516.3	I, V, VI	516.4	I, V, VI	516.5	I, V, VI	516.6	I, V, VI
Shock (Drop)	516.2	II	516.2	IV	516.4	IV	516.5	IV	516.6	IV

DIMENSIONS OF THE RADIOS WITHOUT BATTERY

	Inches	Millimeters
Length	5.47	139
Width Push-To-Talk button	2.39	60.7
Depth Push-To-Talk button	1.40	35.6
Width Top	2.98	75.7
Depth Top	1.58	40.1
Depth Bottom of Battery	1.24	31.5
Weight of the radios without battery	11.25 oz	319 g

ENCRYPTION

Supported Encryption Algorithms	ADP, AES, DES, DES-XL, DES-OFB, DVP-XL, Localized Algorithm
Encryption Algorithm Capacity	8
Encryption Keys per Radio	Module capable of storing 1024 keys. Programmable for 128 Common Key Reference (CKR) or 16 Physical Identifier (PID)
Encryption Frame Re-sync Interval	P25 CAI 360 mSec
Encryption Keying	Key Loader and Over the Air Rekeying (OTAR)
Synchronization	XL – Counter Addressing OFB – Output Feedback
Vector Generator	National Institute of Standards and Technology (NIST) approved random number generator
Encryption Type	Digital and SecureNet
Key Storage	Tamper protected volatile or non-volatile memory
Key Erasure	Keyboard command and tamper detection
Standards	FIPS 140-2 Level 3 FIPS 197

GPS/GNSS SPECIFICATIONS

Constellations	GPS & GLONASS
Tracking Sensitivity	–164 dBm
Accuracy[3]	<5 meters (95%)
Cold Start[3]	<60 seconds (95%)
Hot Start[3]	<5 seconds (95%)
Mode of Operation	Autonomous (Non-Assisted)

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature[4]	-30ºC / +60ºC
Storage Temperature[4]	-40ºC / +85ºC
Humidity	Per MIL-STD
ESD	IEC 801-2 KV
Water and Dust Intrusion	IP68 (2 meters, 2 hours)

RUGGED OPTION SPECIFICATIONS

Leakage (immersion)[6]	MIL-STD-810 C, D, E, F and G Method 512.X Procedure I, IP68 (2 meters, 4 hours)

HOUSING COLOR

Black (Standard), Public Safety Yellow, and High Impact Green

[1] Measured conductively in analog mode per TIA / EIA 603 under nominal conditions.
[2] Measured conductively in digital mode per TIA / EIA IS 102.CAAA under nominal conditions.
[3] Measured conductively with >6 satellites visible at a nominal –130 dBm signal strength. Specs provided are 95th percentile values.
[4] Temperatures listed are for radio specifications. Battery storage is recommended at 25°C, ±5°C to ensure best performance.
[5] Measured using the TIA-603 single-tone method.
[6] Rugged option only. Specifications subject to change without notice.

All specifications shown are typical.
Radio meets applicable regulatory requirements.

WIRELESS CONNECTIVITY & SECURITY

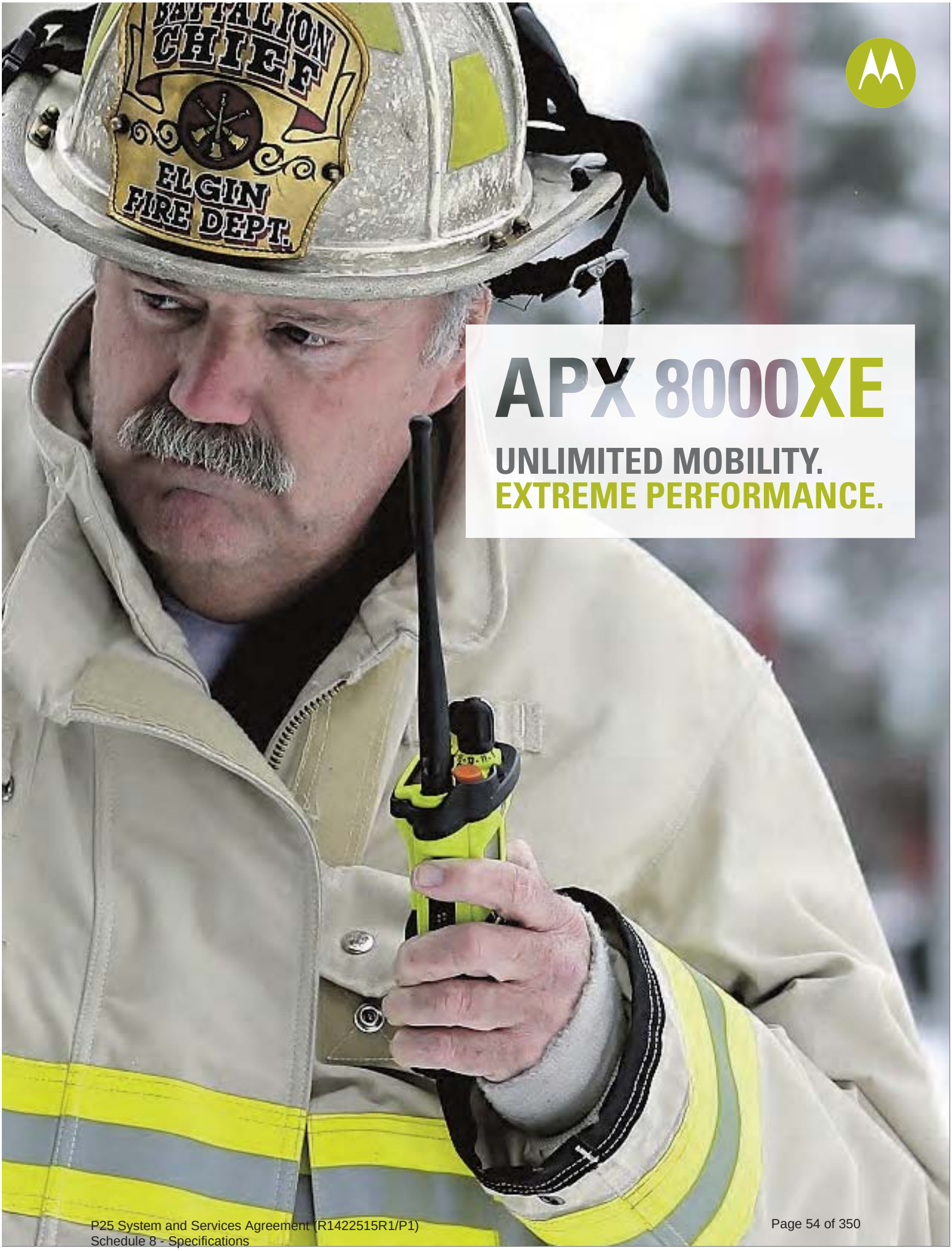
Frequency Range/Bandsplits:
Bluetooth: 2402 - 2480 MHz, WLAN (Wi-Fi®): 2400 - 2483.5 MHz

WLAN (Wi-Fi®) 802.11 b/g/n supports WPA-2, WPA, WEP security protocols; radio can be pre-provisioned with up to 20 SSIDs

Mission Critical Wireless Bluetooth 2.1 uses 96 bit encryption for pairing & 128 bit encryption for voice, signaling and data. The radio BT supports up to 6 data connections and 1 audio connection.

Motorola Solutions, Inc. 1301 East Algonquin Road Schaumburg, Illinois 60196, U.S.A. 800-367-2346 **www.motorolasolutions.com/APX8000**

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APX 8000XE

UNLIMITED MOBILITY. EXTREME PERFORMANCE.

APX™ 8000XE ALL-BAND P25 PORTABLE RADIO

Working together with firefighters around the world, we designedthe APX™ Extreme Series, a safe, and easy and efficient to use portfolio of ergonomically advanced, ultra-rugged radios and accessories. With over eighty years of experience in ergonomics, design and technology for public safety, the APX XE Series is the culmination of cross-disciplines and user input.

Firefighters said they wanted equivalent extreme features as the APX Extreme Series including a larger display, exaggerated control knobs, and the capability to communicate with surrounding municipalities within an all-band radio solution. The APX 8000XE brings together not only these requirements, but also the integration of WiFi® for programming flexibility.

The APX 8000XE is redefining mission critical communications by delivering an ultra-durable radio that combines unlimited interoperability, loud audio, and secure WiFi connectivity. With a dedicated channel knob and ability to withstand 500 degrees heat exposure, the APX XE500 Remote Speaker Microphone is the perfect companion to the APX 8000XE. When combined, the APX 8000XE All-Band Portable Radio and XE500 Remote Speaker Microphone create the ultimate mission critical solution designed for safety personnel in extreme environments.



KEY FEATURES

- Unlimited interoperability with one device
- Secure WiFi for seamless software updates
- Extra-large buttons for glove use
- IP68 submersion (2 meters, 4 hours)
- ANSI/ISA-12.12.01-2015 CAN/CSA C22.2 NO. 213-15, Nonincendive Electrical Equipment for Use in Class I, Division 2, Groups A, B, C, D; Class II, Division 2, Groups F, G; Class III, Division 2
- Integrated GPS/GLONASS for outdoor location tracking
- Equipped with FIPS - certified encryption hardware
- RFID volume knob for asset tracking (optional)
- Bluetooth-enabled APX radios capable of transmitting SCBA voice and data





MODEL 1.5
NO KEYPAD

MODEL 2.5
LIMITED KEYPAD

MODEL 3.5
FULL KEYPAD

UNLIMITED MOBILITY.
EXTREME PERFORMANCE.



ALL-BAND

Unlimited mobility

With a 4-in-1 radio, you now have the ability to stay connected and expand voice and data communications across multiple agencies with one device. Improve response time by instantly operating on digital or analog networks, in 7/800, VHF, UHF Range 1 and 2 bands at any given time.

ADAPTIVE AUDIO ENGINE

Hear and be heard

The APX 8000XE is equipped with a 3-Watt speaker, 3 integrated microphones and Adaptive Audio Engine. This changes the level of noise suppression, microphone gain, windporting and speaker equalization to produce clear and loud audio in any environment.

SECURE WIFI

Voice and data, all at once

Update your radio fleet with Integrated WiFi. This dramatically improves the speed of configuring new codeplugs, firmware and software features over-the-air with Radio Management without interrupting voice communications. Agencies can provision up to 20 secured WiFi networks so their personnel can easily access updates at the facility or in the field.



ENHANCED CONTROLS

Designed for the mission

The ergonomic design of the APX 8000XE is a well-thought out solution. Whether you're putting out fires, defending your country's coastline or working in other extreme conditions that require heavy gloves, the exaggerated control knobs are easy to grip and locate in even the most stressful moments. From display size to button positioning, this radio is easy to access and operate.

FAST, SIMPLE, SECURE

Greater mobility

APX Personnel Accountability allows Incident Commanders to quickly and accurately account for first responders through radio roll call and an interactive GUI. Real-time accountability allows incident commanders to focus on maintaining control of a chaotic fireground.

With BT standard on all APX XE radios, we are able to partner with SCBA industry leaders to provide clear in-mask communications so you can hear and be heard. Collaborations with both MSA and Scott Safety allow us to deliver clear voice and data communications.

PRODUCT DATA SHEET
APX™ 8000XE



RF BANDS

- 700/800 MHz, VHF, UHF Range 1 & 2

OPERATION MODES

- 9600 Baud Digital APCO P25 Phase 1 FDMA and Phase 2 TDMA Trunking
- 3600 Baud SmartNet®, SmartZone®, Omnilink Trunking
- Digital APCO 25, Conventional, Analog MDC 1200, Quick Call II System Configurations
- Narrow and wide bandwidth digital receiver (6.25 kHz equivalent/25/20/12.5 KHz)

STANDARD FEATURES

- Mission Critical Wireless Bluetooth*
- ASTRO 25 Integrated Voice & Data
- Integrated GPS/GLONASS for outdoor location tracking
- Software Key
- Text-Messaging
- Voice Announcements
- ISSI 8000 Roaming
- Radio Profiles, Dynamic Zone
- Intelligent Lighting
- Single-key ADP Encryption
- IP68 submersion (2 meters, 4 hours)
- IMPRES Battery
- ANSI/ISA-12.12.01-2015 CAN/CSA C22.2 NO. 213-15, Nonincendive Electrical Equipment for Use in Class I, Division 2, Groups A, B, C, D; Class II, Division 2, Groups F, G; Class III, Division 2

ADAPTIVE AUDIO ENGINE

- 3 Watt Speaker with Adaptive Equalization
- Adaptive Dual-sided Operation
- Adaptive Noise Suppression Intensity
- Adaptive Gain Control
- Adaptive Windporting

PROGRAMMING

- Utilizes Windows 7 & 8 Customer Programming Software (CPS) with Radio Management

OPTIONAL FEATURES

- WiFi 802.11 b/g/n
- RFID Volume Knob
- Multikey for 128 keys and multi-algorithm
- Programming Over Project 25 (OTAP)
- Over the Air Rekey (OTAR)
- Digital Tone Signaling
- P25 Authentication
- Man Down Sensor

* Compatible with BT 4.0, BT 2.1, HSP, PAN, DUN and SPP Profiles found in off-the-shelf BT accessories

TRANSMITTER - TYPICAL PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits		764-776, 794-806 MHz 806-825, 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing		25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Rated RF Output Power Adj[1]		700 MHz: 1-2.5 Watts 800 MHz: 1-3 Watts	1-6 Watts	1-5 Watts	1-5 Watts
Frequency Stability[1] (–30°C to +60°C; +25°C Ref.)		+/- 1.0 ppm	+/- 1.0 ppm	+/- 1.0 ppm	+/- 1.0 ppm
Modulation Limiting[1]		±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz
Emissions (Conducted and Radiated)[1]		-75 dBc	-75 dBc	-75 dBc	-75 dBc
Audio Response[1]		+1, -3 dB	+1, -3 dB	+1, -3 dB	+1, -3 dB
FM Hum & Noise (25kHz / 12.5kHz)[1]	700 MHz 800 MHz	-49 dB / -47 dB -49 dB / -46 dB	-51 dB / -51 dB	-51 dB / -51 dB	-51 dB / -47 dB
Audio Distortion (25kHz / 12.5kHz)[1]	700 MHz 800 MHz	0.90 % / 0.90 % 0.60 % / 0.90 %	0.50 % / 0.90 %	0.50 % / 0.90 %	0.60 % / 0.90 %

BATTERIES FOR APX 8000XE

Battery Capacity / Type	Dimensions (HxWxD)	Weight	Battery Part Number	Battery Capacity
Li-Ion IMPRES UL2054 DIV 2 Rugged 3400 mAh IP68**	3.4" x 2.3" x 1.7"	6.5 oz	PMNN4504A	3400 mAh
Li-Ion IMPRES UL2054 DIV 2 Rugged 4850 mAh IP68	5" x 2.3" x 1.7"	10 oz	PMNN4505A	4850 mAh

KEY AUDIO ACCESSORIES****

Name	Type	Part Number	Features
IMPRES Display RSM	Wired	HMN4104	Windporting, Audio Jack, Channel Knob, Volume Control, Orange Button, IP68
IMPRES XE RSM BLACK	Wired	NNTN8575ABLK	Windporting, Audio Jack, Strobe Light, Volume Control, Orange Button, IP68
IMPRES XE RSM GREEN	Wired	NNTN8575	Windporting, Audio Jack, Strobe Light, Volume Control, Orange Button, IP68
IMPRES XE500 RSM BLACK	Wired	PMMN4106ABLK	Adaptive Audio Engine, Audio Jack, Strobe Light, Volume Control, Channel Knob, Orange Button, IP68
IMPRES XE500 RSM GREEN	Wired	PMMN4106	Adaptive Audio Engine, Audio Jack, Strobe Light, Volume Control, Channel Knob, Orange Button, IP68

** Ships standard with radio
**** Pending Hazardous Certification

PRODUCT DATA SHEET
APX™ 8000XE

RADIO MODELS





	MODEL 1.5	MODEL 2.5	MODEL 3.5
Display	Full bitmap monochromatic LCD top display 1 line text x 8 characters 1 line of icons No menu support Multi-color backlight	**Top display plus:** Full bitmap color LCD display 4 lines of text x 14 characters 2 lines of icons 1 menu line x 3 menus White backlight	**Top display plus:** Full bitmap color LCD display 4 lines of text x 14 characters 2 lines of icons 1 menu line x 3 menus White backlight
Keypad	none	Backlit keypad 3 soft keys 4 direction navigation key Home and Data buttons	Backlit keypad 3 soft keys 4 direction navigation key 4x3 keypad Home and Data buttons
Channel Capacity	1200	3000	3000
FLASHport Memory	2 GB	2 GB	2 GB
700/800 MHz (764-870 MHz) VHF (136-174 MHz) UHF Range 1 (380-470 MHz) UHF Range 2 (450-520 MHz)	H91TGD9PW5AN	H91TGD9PW6AN	H91TGD9PW7AN
Buttons & Switches	Large PTT button • Angled On/Off volume control • X-large orange emergency button • 16 position top-mounted rotary switch 2-position concentric switch • Glove accessible 3-position switch • 3 programmable side buttons		

Regulatory Information

FCC ID	AZ489FT7061
Industry Canada	109U-89FT7061
Emission Designators	LMR: 8K10F1D, 8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E***, 20K0F1E*** Bluetooth®: 852KF1D, 1M17F1D, 1M19F1D, 1M04F1D WLAN (WiFi): 13M7G1D, 17M0D1D, 18M1D1D

*** In accordance with FCC mandate, the APX 8000XE all band radio is restricted to 12.5kHz operation only and does NOT support 25kHz in the VHF and UHF Bands (excluding T-Band). This applies to customers under Rule Part 90.

RECEIVER - TYPICAL PERFORMANCE SPECIFICATIONS

		700	800	VHF	UHF
Frequency Range/Bandsplits		764-776 MHz	851-870 MHz	136-174 MHz	380-520 MHz
Channel Spacing		25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Speech Loudness at 30cm		105 Phons	105 Phons	105 Phons	105 Phons
Audio Output Power at Rated/Max		3 Watt/5 Watt	3 Watt/5 Watt	3 Watt/5 Watt	3 Watt/5 Watt
Frequency Stability[1] (–30°C to +60°C; +25°C Ref.)		+/- 1.0 ppm	+/- 1.0 ppm	+/- 1.0 ppm	+/- 1.0 ppm
Analog Sensitivity[1] Digital Sensitivity[2]	12 dB SINAD 1% BER 5% BER 5% BER Faded	0.224 uV 0.316 uV 0.211 uV 0.562uV	0.224 uV 0.316 uV 0.211 uV 0.562 uV	0.168 uV 0.251 uV 0.149 uV 0.562 uV	0.199 uV 0.282 uV 0.158 uV 0.530 uV
Selectivity (25 kHz / 12.5 kHz)[1, 5]		79 dB / 72 dB	78 dB / 72 dB	82 dB / 77 dB	80 dB / 74 dB
Intermodulation Rejection[1]		81 dB	80 dB	82 dB	80 dB
Spurious Rejection[1]		98 dB	98 dB	92 dB	98 dB
FM Hum and Noise (25 kHz / 12.5 kHz)[1]		-55 dB / -53 dB	-54 dB / -52 dB	-57 dB / -55 dB	-56 dB / -54 dB
Audio Distortion at Rated		1.2%	1.3%	1.3%	1.2%

PORTABLE MILITARY STANDARDS 810 C, D, E , F & G

	MIL-STD 810C		MIL-STD 810D		MIL-STD 810E		MIL-STD 810F		MIL-STD 810G	
	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.
Low Pressure	500.1	I	500.2	II	500.3	II	500.4	II	500.5	II
High Temperature	501.1	I, II	501.2	I/A1, II/A1	501.3	I/A1, II/A1	501.4	I/Hot, II/Hot	501.5	I/A1, II/A1
Low Temperature	502.1	I	502.2	I/C3, II/C1	502.3	I/C3, II/C1	502.4	I/C3, II/C1	502.5	I/C3, II/C1
Temperature Shock	503.1	I	503.2	I/A1C3	503.3	I/A1C3	503.4	I	503.5	I/C
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I	505.5	I/A1
Rain	506.1	I, II	506.2	I, II	506.3	I, II	506.4	I, III	506.5	I, III
Humidity	507.1	II	507.2	II	507.3	II	507.4	1 Proc	507.5	II/Aggravated
Salt Fog	509.1	I	509.2	I	509.3	I	509.4	1 Proc	509.5	1 Proc
Blowing Dust	510.1	I	510.2	I	510.3	I	510.4	I	510.5	I
Explosive Atmosphere	-	-	-	-	-	-	511.4	I	511.5, 511.6	I
Blowing Sand	1 Proc	1 Proc	510.2	II	510.3	II	510.4	II	510.5	II
Submersion	512.1	I	512.2	I	512.3	I	512.4	I	512.5	I
Vibration	514.2	VIII/F, Curve-W	514.3	I/10, II/3	514.4	I/10, II/3	514.5	I/24	514.6	I/24
Shock	516.2	I, III, V	516.3	I, V, VI	516.4	I, V, VI	516.5	I, V, VI	516.6	I, V, VI
Shock (Drop)	516.2	II	516.2	IV	516.4	IV	516.5	IV	516.6	IV

DIMENSIONS OF THE RADIOS WITHOUT BATTERY

	Inches	Millimeters
Length	6.15	156.2
Width Push-To-Talk button	2.39	60.7
Depth Push-To-Talk button	1.40	35.5
Width Top	3.32	84.3
Depth Top	2.13	54.1
Depth Bottom of Battery	1.24	31.5
Weight of the radios without battery	13.9 oz	394.1 g

ENCRYPTION

Supported Encryption Algorithms	ADP, AES, DES, DES-XL, DES-OFB, DVP-XL, Localized Algorithm
Encryption Algorithm Capacity	8
Encryption Keys per Radio	Module capable of storing 1024 keys. Programmable for 128 Common Key Reference (CKR) or 16 Physical Identifier (PID)
Encryption Frame Re-sync Interval	P25 CAI 360 mSec
Encryption Keying	Key Loader and Over the Air Rekeying (OTAR)
Synchronization	XL – Counter Addressing OFB – Output Feedback
Vector Generator	National Institute of Standards and Technology (NIST) approved random number generator
Encryption Type	Digital and SecureNet
Key Storage	Tamper protected volatile or non-volatile memory
Key Erasure	Keyboard command and tamper detection
Standards	FIPS 140-2 Level 3 FIPS 197

GPS/GNSS SPECIFICATIONS

Constellations	GPS & GLONASS
Tracking Sensitivity	–164 dBm
Accuracy[3]	<5 meters (95%)
Cold Start[3]	<60 seconds (95%)
Hot Start[3]	<5 seconds (95%)
Mode of Operation	Autonomous (Non-Assisted)

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature[4]	-30°C / +60°C
Storage Temperature[4]	-50°C / +85°C
Humidity	Per MIL-STD
ESD	IEC 801-2 KV
Water and Dust Intrusion	IP68 (2 meters, 4 hours)

RUGGED SPECIFICATIONS

Leakage (submersion)	MIL-STD-810 C, D, E, F and G Method 512.X Procedure I, IP68 (2 meters, 4 hours)

HOUSING COLOR

Black (Standard), Public Safety Yellow, and High Impact Green

WIRELESS CONNECTIVITY & SECURITY

Frequency Range/Bandsplits:
Bluetooth: 2402 - 2480 MHz, WLAN (WiFi): 2400 - 2483.5 MHz

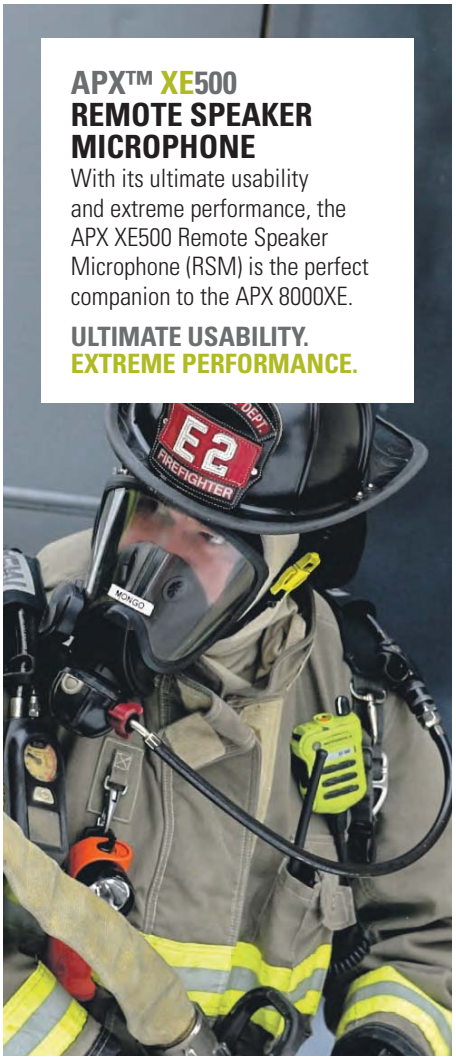
WLAN (WiFi) 802.11 b/g/n supports WPA-2, WPA, WEP security protocols; radio can be pre-provisioned with up to 20 SSIDs[6]

Mission Critical Wireless Bluetooth 2.1 uses 96 bit encryption for pairing & 128 bit encryption for voice, signaling and data. The radio BT supports up to 6 data connections and 1 audio connection

Bluetooth 4.0 Low Energy uses 128-bit AES-CCM encryption

[1] Measured conductively in analog mode per TIA / EIA 603 under nominal conditions.
[2] Measured conductively in digital mode per TIA / EIA IS 102.CAAA under nominal conditions.
[3] Measured conductively with >6 satellites visible at a nominal –130 dBm signal strength. Specs provided are 95th percentile values.
[4] Temperatures listed are for radio specifications. Battery storage is recommended at 25°C, ±5°C to ensure best performance.
[5] Measured using the TIA-603 single-tone method.
[6] 2400 - 2483.5 MHz for EMEA region and includes guardband. Channels 1 - 11 used for FCC/IC region.
Specifications subject to change without notice.

All specifications shown are typical.
Radio meets applicable regulatory requirements.



For more information, please visit: www.motorolasolutions.com/APX8000XE

Motorola Solutions, Inc. 1301 E. Algonquin Road, Schaumburg, Illinois 60196 U.S.A.

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UNLIMITED MOBILITY. UNCOMPROMISING PERFORMANCE.

APX™ 8500 ALL-BAND MOBILE RADIO

Whether you are responding to a fire call or en route to a major traffic accident, trust that the APX 8500 all-band mobile radio will deliver unlimited interoperability, ease-of-installation, and seamless Wi-Fi connectivity all while maintaining a purpose-built user experience through the familiar APX control head to efficiently manage complex operations.

EXPAND COMMUNICATIONS

You no longer have to switch between two different mobiles to collaborate with multiple agencies at a given time. Take control of your voice and data communications with one device. The APX 8500 all-band mobile radio allows for instant interoperability on digital or analog networks, smartzone system and 7/800, VHF, UHF Range 1 and 2 frequency bands.

SIMPLE DESIGN FOR EASE OF INSTALLATION

As vehicles are getting smaller and the space for equipment within is also becoming more limited. Whether your mounting preference is remote or dash, the APX 8500 mobile was designed to fit into the existing install space of our APX 7500 solution. With the exception of the new all-band QMA antenna connector, you can reuse existing mounting bracket, holes, and cables making the setup process quick and painless saving your agency maintenance time.

SECURE DATA UPDATES WITHOUT INTERRUPTIONS

Save a trip to the tech shop and get the latest software updates on your two-way mobile radio seamlessly. With integrated Wi-Fi, configuring new codeplugs, firmware and software features over-the-air with Radio Management has never been easier. The APX 8500 has the ability to also leverage the LTE network from the VML750 as another gateway to quickly send features without interrupting voice communications.



KEY FEATURES:

- Unlimited Interoperability with one device
- All-band Antenna for vehicles only
- Integrated Wi-Fi for seamless software updates
- Integrated GPS/GLONASS for outdoor location tracking
- Equipped with FIPS certified encryption hardware
- Compatible with APX control heads – O2, O3, O5, O7 and O9
- Re-use APX 7500 mounting bracket, holes and cables
- RF ID label for asset tracking

APX 8500
ALL-BAND MOBILE RADIO

RF BANDS:

700/800 MHz, VHF, UHF Range 1 and 2

OPERATION MODES: 9600 Baud Digital APCO P25 Phase 1 FDMA and Phase 2 TDMA Trunking

3600 Baud SmartZone®, Omnilink Trunking

Digital APCO 25, Conventional, Analog MDC 1200, Quick Call II System Configurations

Narrow and wide bandwidth digital receiver (6.25 kHz equivalent/25/20/12.5 KHz)

STANDARD FEATURES:

Up to 3000 Channels

ASTRO 25 Integrated Voice & Data

Software Key

Text-Messaging

Voice Announcements

ISSI 8000 Roaming

Radio Profiles, Dynamic Zone

Intelligent Lighting

Single-key ADP Encryption

Re-use of most APX 7500/6500 Accessories

Ships Standard IP56

PROGRAMMING:

Utilizes Windows 7 & 8 Customer Programming Software (CPS) with Radio Management

OPTIONAL FEATURES:

Wi-Fi® 802.11 b/g/n

GPS/GLONASS Outdoor Location Tracking

12 Character RF ID asset tracking

Multi-key for 128 keys and multi-algorithm

Programming Over Project 25 (OTAP)

Over the Air Rekey (OTAR)

Digital Tone Signaling

P25 Authentication

Rugged submersible option: MIL-Specs 810 C, D, E, F, and G

Per the FCC Narrowbanding rules, new products (APX8500 UHFR1 with UHFR2 Mid Power combination AND UHFR1 High Power with 700/800 MHz combination) submitted for FCC certification after January 1, 2011 are restricted from being granted certification at 25KHz for United States – State & Local Markets only.

APX 8500 CONTROL HEAD PORTFOLIO



O2 RUGGED CONTROL HEAD

- Large color display with intelligent lighting
- 3 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Built in 7.5 watt speaker
- Multiple control head configuration (up to 4)
- Motorcycle configuration available
- Multifunction volume/ channel knob
- Night/day mode button



O3 HAND HELD CONTROL HEAD

- Large color display with intelligent lighting
- 2 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Integrated full size DTMF keypad
- Hand-held control head with intuitive user interface
- Two quick-access side buttons
- Display contrast selector



O5 STANDARD CONTROL HEAD

- Tri-color display with intelligent lighting
- 2 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Available with Keypad Microphone
- Multiple control head configuration (up to 4)
- Motorcycle configuration available
- Display contrast selector



O7 ENHANCED CONTROL HEAD

- Large color display with intelligent lighting
- 3 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Available with Lighting & Siren Controls or DTMF Keypad
- Multiple control head configuration (up to 4)
- Configuration available
- Multifunction volume/ channel knob
- Night/day mode button



O9 INTEGRATED CONTROL HEAD

- Extra-large full color display with intelligent lighting
- 2 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Integrated full size DTMF keypad
- Large programmable one-touch buttons
- Dedicated siren controls
- Integrated Response Selector
- Night/day mode button

SIGNALLING (ASTRO MODE)

Signalling Rate	9.6 kbps
Digital ID Capacity	10,000,000 Conventional / 48,000 Trunking
Digital Network Access Codes	4,096 network site addresses
ASTRO Digital User Group Addresses	4,096 network site addresses
Project 25 – CAI Digital User Group Addresses	65,000 Conventional / 4,094 Trunking
Error Correction Techniques	Golay, BCH, Reed-Solomon codes
Data Access Control	Slotted CSMA: Utilizes infrastructure-sourced data status bits embedded in both voice and data transmissions.

MOBILE APX 8500

		Inches	Millimeters
Mid Power Radio Transceiver		2 x 7 x 8.6	50.8 x 177.8 x 218.4
O5 Control Head		2 x 7 x 2.5	50.8 x 180.3 x 63.5
O2 Control Head		2.7 x 8 x 2.1	68.4 x 206 x 52.83
O7 Control Head		2 x 7 x 1.5	50.8 x 178 x 40
Mid Power Radio Transceiver and O5 Control Head - Dash Mount		2 x 7 x 9.6	50.8 x 180.3 x 243.8
Mid Power Radio Transceiver and O2 Control Head - Dash Mount		2.7 x 8 x 10.5	68.4 x 206 x 268
Mid Power Radio Transceiver and O7 Control Head - Dash Mount		2 x 7 x 10.3	50.8 x 178 x 262
Mid Power Radio Transceiver and Remote Mount		2.0 x 7 x 9.6	50.8 x 180.3 x 243.8
High Power Radio Transceiver		2.9 x 11.5 x 8.8	74 x 293 x 223
High Power Radio Transceiver with Handle		3.4 x 11.5 x 8.8	87 x 293 x 223
Mid Power Radio Transceiver and O5 Control Head Weight		6.6 lbs	3.0 kg
Mid Power Radio Transceiver and O2 Control Head Weight		7.12 lbs	3.23 kg
Mid Power Radio Transceiver and O7 Control Head Weight		6.74 lbs	3.06 kg
High Power Radio Transceiver Weight	With Trunnion Without Trunnion	14.2 lbs 12 lbs	6.4 kg 5.4 kg

TRANSMITTER - TYPICAL PERFORMANCE SPECIFICATIONS

	700 MHz	800 MHz	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	764-776, 794-806 MHz 806-825, 851-870 MHz	764-776, 794-806 MHz 806-825, 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing	25/12.5 kHz	25/12.5 kHz	30/25/12.5 kHz	25/12.5 kHz	25/12.5 kHz
Maximum Frequency Separation	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Rated RF Output Power Adj*	1-30 Watts	1-35 Watts	1-50 Watts or	1-40 Watts	1-45 Watts (450-485 MHz) 1-40 Watts (485-512 MHz) 1-25 Watts (512-520 MHz)
Frequency Stability* (–30°C to +85°C; +25°C Ref.)	±0.8 PPM	±0.8 PPM	±0.8 PPM	±0.8 PPM	±0.8 PPM
Modulation Limiting*	±5 kHz / ±2.5 kHz	±5 kHz/±4 kHz (NPSPAC) /±2.5 kHz	±5 kHz / ±2.5 kHz	±5 kHz / ±2.5 kHz	±5 kHz / ±2.5 kHz
Modulation Fidelity (C4FM) 12.5kHz Digital Channel	1.10%	1.10%	1.10%	1.10%	1.10%
Emissions*	Conducted+ –75/–85 dBc Radiated+ –20/–40 dBm	Conducted –75 dBc Radiated –20 dBm	Conducted –85 dBc Radiated –20 dBm	Conducted –85 dBc Radiated –20 dBm	Conducted –85 dBc Radiated –20 dBm
Audio Response*	+1, –3 dB (EIA)	+1, –3 dB (EIA)	+1, –3 dB (EIA)	+1, –3 dB (EIA)	+1, –3 dB (EIA)
FM Hum & Noise* 25 kHz 12.5 kHz	50 dB 48 dB	50 dB 48 dB	53 dB 52 dB	53 dB 50 dB	53 dB 50 dB
Audio Distortion* 25 & 20 kHz 12.5 kHz	0.50% 0.50%	0.50% 0.50%	0.50% 0.50%	0.50% 0.50%	0.50% 0.50%

RECEIVER – TYPICAL PERFORMANCE SPECIFICATIONS

		700 MHz	800 MHz	VHF		UHF Range 1		UHF Range 2	
Frequency Range/Bandsplits		764-776 MHz, 805-806	851-870 MHz	136-174 MHz		380-470 MHz		450-520 MHz	
Channel Spacing		25/12.5 kHz	25/12.5 kHz	30/25/12.5 kHz		25/12.5 kHz		25/12.5 kHz	
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit		Full Bandsplit		Full Bandsplit	
Audio Output Power at 3% distortion*		7.5 W or 15 W ++	7.5 W or 15 W ++	7.5 W or 15 W ++		7.5 W or 15 W ++		7.5 W or 15 W ++	
Frequency Stability* (–30°C to +60°C; +25°C Ref.)		+/-0.8 PPM	+/-0.8 PPM	+/-0.8 PPM		+/-0.8 PPM		+/-0.8 PPM	
Analog Sensitivity*	12 dB SINAD	-121 dBm	-121 dBm	Pre-Amp -123 dBm	Standard -119 dBm	Pre-Amp -123 dBm	Standard -119 dBm	Pre-Amp -123 dBm	Standard -119 dBm
Digital Sensitivity	5% BER	-121 dBm	-121 dBm	-123 dBm	-119 dBm	-123 dBm	-119 dBm	-123 dBm	-119 dBm
Intermodulation	25 kHz	82 dB	82 dB	82 dB	86 dB	82 dB	86 dB	82 dB	86 dB
	12.5 kHz	82 dB	82 dB	82 dB	86 dB	82 dB	85 dB	82 dB	85 dB
Spurious Rejection		91 dB	91 dB	93 dB		93 dB		93 dB	
Audio Distortion at rated*		1.20%	1.20%	1.20%		1.20%		1.20%	
FM Hum & Noise	25 kHz	55 dB	55 dB	55 dB		55 dB		55 dB	
	12.5 kHz	50 dB	50 dB	50 dB		50 dB		50 dB	
Selectivity*	25 kHz	85 dB	85 dB	85 dB		85 dB		85 dB	
	12.5 kHz	75 dB	75 dB	75 dB		75 dB		75 dB	
	30 kHz	—	—	90 dB		—		—	

POWER AND BATTERY DRAIN

Model Type	136-174 MHz, 380-470 MHz, 450-520 MHz, 764-870 MHz					
Minimum RF Power Output	1-35 Watt (764-870 MHz), 1-50 Watts (136-174 MHz), 1-40W or 25-110 Watts (380-470 MHz), 1-45Watts (450-485 MHz), 1-40Watts (485-512 MHz), 1-25Watts (512-520 MHz)					
Operation	13.8V DC ±20% Negative Ground					
Standby at 13.8V	1.2A (764-870 MHz), 1.2A (136-174 MHz), 1.2A (380-470 MHz), 1.2A (450-520 MHz)					
Receive Current at Rated Audio at 13.8V	3.2A (764-870 MHz), 3.2A (136-174 MHz), 3.2A (380-470 MHz), 3.2A (450-520 MHz)					
Transmit Current (A) at Rated Power	136-174 MHz (1-50 Watt)	13A (50W)	8A (15W)	764-870 MHz (1-35 Watt)	12A (50W)	8A (15W)
	380-470 MHz (1-40 Watt)	11A (40W)	8A (15W)			
	450-520 MHz (1-45 Watt)	11A (45W)	8A (15W)			



MOBILE MILITARY STANDARDS 810 C, D, E , F & G

	MIL-STD 810C		MIL-STD 810D		MIL-STD 810E		MIL-STD 810F		MIL-STD 810G	
	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.
Low Pressure	500.1	I	500.2	II	500.3	II	500.4	II	500.5	II
High Temperature	501.1	I, II	501.2	I/A1, II/A1	501.3	I/A1, II/A1	501.4	I/Hot, II/ Hot	501.5	I/A1, II
Low Temperature	502.1	I	502.2	I/C3, II/C1	502.3	I/C3, II/C1	502.4	I/C3, II/C1	502.5	I/C3, II
Temperature Shock	503.1	1 Proc	503.2	I/A1C3	503.3	I/A1C3	503.4	I	503.5	I/C
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I	505.5	I/A1
Rain	506.1	I, II	506.2	I, II	506.3	I, II	506.4	I, III	506.5	I, III
Humidity	507.1	II	507.2	II	507.3	II	507.4	1 Proc	507.5	II/Aggravated
Salt Fog	509.1	1 Proc	509.2	1 Proc	509.3	1 Proc	509.4	1 Proc	509.5	1 Proc
Blowing Dust	510.1	I	510.2	I, II	510.3	I, II	510.4	I, II	510.5	I, II
Vibration	514.2	VIII/F, Curve-W	514.3	I/10, II/3	514.4	I/10, II/3	514.5	I/24	514.6	I/24
Shock	516.2	I, III, V	516.3	I, V, VI	516.4	I, V, VI	516.5	I, V, VI	516.6	I, V, VI

ENCRYPTION

Supported Encryption Algorithms	ADP, AES, DES, DES-XL, DES-OFB, DVP-XL
Encryption Algorithm Capacity	8
Encryption Keys per Radio	Module capable of storing 1024 keys. Programmable for 128 Common Key Reference (CKR) or 16 Physical Identifier (PID)
Encryption Frame Re-sync Interval	P25 CAI 300 mSec
Encryption Keying	Key Loader
Synchronization	XL – Counter Addressing OFB – Output Feedback
Vector Generator	National Institute of Standards and Technology (NIST) approved random number generator
Encryption Type	Digital
Key Storage	Tamper protected volatile or non-volatile memory
Key Erasure	Keyboard command and tamper detection
Standards	FIPS 140-2 Level 3 FIPS 197

GPS SPECIFICATIONS

Channels	12
Tracking Sensitivity	–153 dBm
Accuracy[5]	<10 meters (95%)
Cold Start	<60 seconds (95%)
Hot Start	<10 seconds (95%)
Mode of Operation	Autonomous (Non-Assisted) GPS

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-30°C / +60°C
Storage Temperature	-40°C / +85°C
Humidity	Per MIL-STD
ESD	IEC 801-2 KV
Water and Dust Intrusion	IP56 MIL-STD

FCC TYPE ACCEPTANCE ID

TBD

* Measured in the analog mode per TIA / EIA 603 single-tone method under nominal conditions

+ Specs includes performance for the non-GNSS/GNSS bands

++ Output power in to 8 and 3.2 Ohm external speakers respectively

Accuracy specs are for long-term tracking (95th percentile values >5 satellites visible at a nominal –130 dBm signal strength)

Specifications subject to change without notice. All specifications shown are typical.

Radio meets applicable regulatory requirements.

For more information about how to interoperate without boundaries,
visit motorolasolutions.com/apx

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APX RADIO MANAGEMENT

RADIO PROGRAMMING MADE SIMPLE



Managing your radio fleet is an important part of day-to-day operations. But it can also be expensive and time consuming. Updates to add or remove channels, upgrade firmware, or add purchased features through FLASHport upgrade, take substantial time and resources because each radio has to be programmed individually. Motorola's Customer Programming Software Radio Management application simplifies APX™ radio configuration and management, saving you time and money while ensuring your users can accomplish their mission without interruption.

The APX CPS Management application can program up to 16 radios at one time and track which radios have been successfully programmed, providing a clear view of the entire radio fleet and a codeplug history for each radio.

ACCESS AND SHARE CODEPLUGS

When codeplug updates occur, the radio codeplug database can be stored on a network server allowing remote programmers to access and program radios and share a codeplug template across multiple radios. Changes to codeplug templates can be automatically applied to all affected radios while radio programming jobs can be scheduled ahead of time giving you more flexibility and operational efficiency.

MINIMIZE DOWNTIME

Save time and fuel by programming radios either via a USB port on a local or remote PC, or with Over-the-Air-Programming (OTAP) on a Project 25 system. With USB programming, a Device Programmer application resides on a PC and you can connect up to 16 radios via a USB hub to expedite the programming. To read/write multiple radios through a single computer or USB hub, the radios must be programmed with a unique IP address the first time they are read/written.

No application knowledge or application interaction is necessary by the user to program a radio with the Device Programmer application. The user simply plugs the radio into a USB port and the application automatically reads and writes the updates from the server to the radio.

Radio Management batch programming of APX radios via OTAP can only occur with a Motorola ASTRO® 25 Project 25 system, which has voice priority over data, so a user's call, emergency notifications or critical communications will not be interrupted with OTAP. Should an OTAP session be interrupted with communications, programming will resume after the call without the need to restart, expediting the process.

RADIO MANAGEMENT COMPONENTS



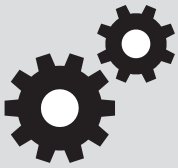
RM CLIENT

Radio management user interface is integrated into the CPS, giving radio managers a unified view into their radio fleet from a single dashboard.



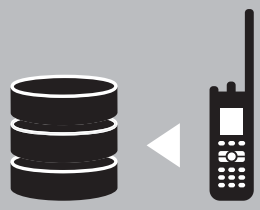
RM SERVER

Provides radio managers with flexible options for managing radios, templates, codeplug data and programming jobs via a hardware or cloud based database.



JOB PROCESSOR

Responsible for preprocessing of programming jobs by validating and transforming template and radio data into a format that can be written to the radio.



DEVICE PROGRAMMER

Performs read and write jobs to the APX radios.

FLEXIBLE ARCHITECTURE

RM INSTALLED ON ONE COMPUTER

All Radio Management components are installed on a single machine.

Use Case: A small self-maintained agency can gain the benefit of the integrated database that maintains all the template versions and keeps tracks all radio information and updates without having to maintain separate spreadsheets and codeplug files in the computer directory. An administrator can schedule jobs on the terminal, log out or lock the computer, and allow radio users to update their APX radios via the connected USB cable on their own time, without his or her presence required.

- Install all three Radio Management parts – CPS, RM Server and RM Device Programmer on a single PC
- Configuration is automatically handled by the RM Device Programmer
- Simple installation with full RM functionality

RM INSTALLED ON MULTIPLE COMPUTERS

Allows the Device Programmer to program radios at different locations by distributing the workload across multiple computers, a centrally located server and a remote RM client.

Use Case: A medium-sized agency can have two radio administrators. They can log into the centralized server located at the County IT building via the RM Clients on their personal laptops to make changes and schedule jobs. Meanwhile, there can be three programming kiosks (RM Device Programmers) throughout the county. Radio users can come to receive updates on their own convenience and avoid driving to and from the radio shop – one kiosk at the Fire Station, one at the Police Station, and one at City Hall. Fire-fighters, police officers and general government radio users all have a nearby kiosk for radio programming.

- Install the RM Server and RM Device Programmer at a central location at your shop
- Install the CPS on one or more PCs
- Share the same configuration database with multiple users who can access it remotely

FULLY DISTRIBUTED RM SYSTEM

Multiple Job Processors, RM Clients and RM Device Programmers share the workload and allow configuration and programming from different locations.

Use Case: A large-scale operation has a centrally-located RM Server in an IT server room along with four Job Processor servers that enable a higher throughput of jobs. RM Device Programmers are installed at each of the programming kiosks in the key government buildings, police stations, fire stations, and correctional facilities. The RM Device Programmers are also installed in all the MW810 mobile computers in the police vehicle fleet. These mobile computers can be used to program the APX mobile radios in the vehicle using the front microphone port USB interface on the APX control head. The radio shop has three RM Device Programmer computers and each one has a USB hub with 16 programming cables so that 48 radios can be programmed in parallel whenever future firmware upgrades need to be deployed. The RM Clients are also installed in the five personal laptops of the respective Radio Fleet Technicians.

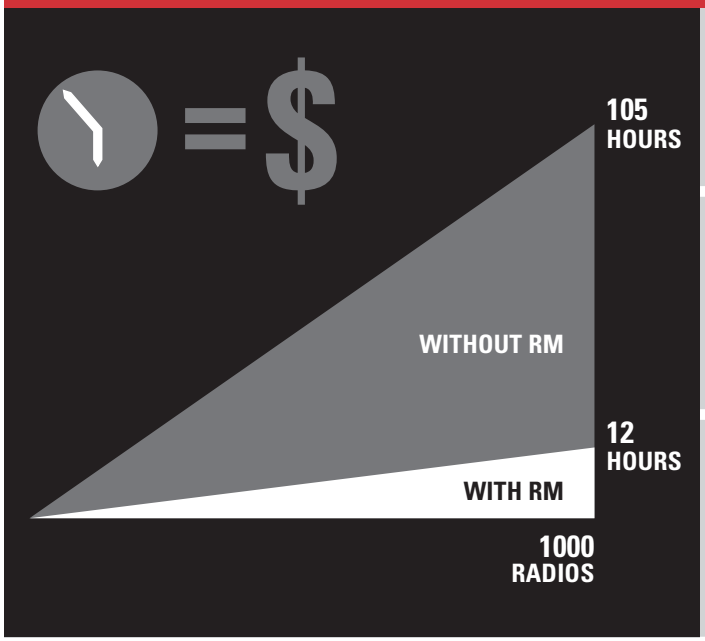
- Install the CPS, RM Server and up to five wired RM Device Programmer's on separate PCs
- Keep the RM Server at your shop
- Conveniently and remotely access codeplug configurations on the RM Server from your CPS
- Install light-weight RM Device Programmers at customer's site
- It's green! No more driving around burning up fossil fuels for codeplug changes

RADIO MANAGEMENT ADVANTAGES

- Efficient radio inventory management
- Centralized radio configuration and codeplug management
- Automated radio updates of both codeplugs and software flash versions
- Remote over the air programming via the P25 radio system
- Batch programming via USB configuration (up to 16 radios at one time)
- No missed calls with Over-the-Air Programming due to voice priority with Motorola's ASTRO 25 systems



CPS RADIO MANAGEMENT (RM) REDUCES TOTAL COST OF OWNERSHIP



HOW LONG DOES IT TAKE TO FLASH 1,000 RADIOS?

WITHOUT RM
105 HOURS
13 WORKING DAYS

WITH RM
12 HOURS
1.5 WORKING DAYS



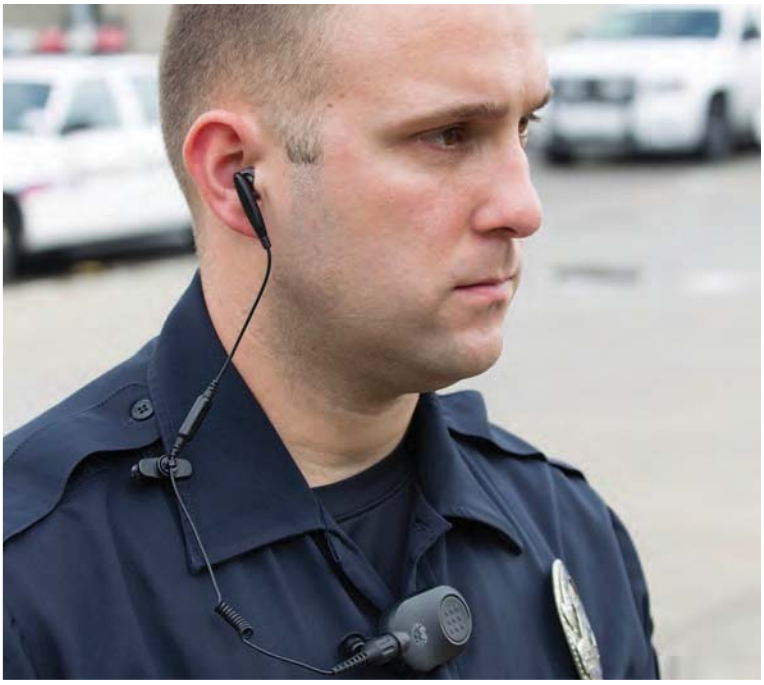
* Time shown are average estimates based on small sample of actual data on APX 7000

For additional information, contact your Motorola representative or visit **motorolasolutions.com**.

Motorola Solutions, Inc. 1301 E. Algonquin Road, Schaumburg, Illinois 60196 U.S.A. **motorolasolutions.com**

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APX™ PROJECT 25 RADIO ACCESSORIES

SAFETY WITHOUT COMPROMISE

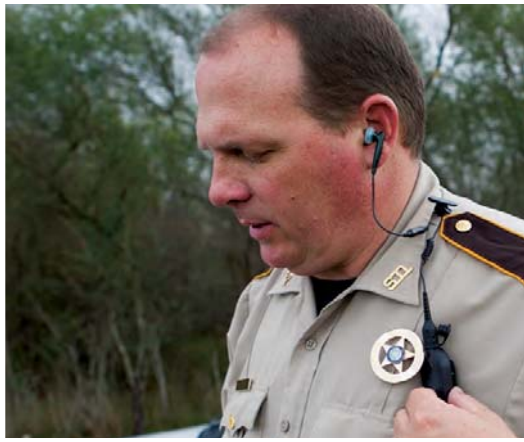




MISSION CRITICAL PERFORMANCE THAT PUTS SAFETY FIRST



APX PORTABLE RADIO ACCESSORIES



Motorola P25 APX radios deliver what first responders need to increase their safety and improve their situational awareness.

Get the most out of your APX radio by extending its power and reliability with APX accessories. They are the only accessories, tested and certified for use with APX radios. Our accessories endure rigorous testing to help keep you safer. There's simply no substitute for APX accessories.

Hazards that can impede other batteries, don't affect ours. We build superior batteries specifically for Motorola radios, then test them in real-world conditions against other manufacturers to prove they are the toughest and most reliable around.



APX 7000 SERIES | APX 7000XE SERIES | APX 6000 SERIES



APX 6000XE SERIES | APX 4000 SERIES | APX 4000 SERIES | APX 3000 SERIES | APX 1000 SERIES | SRX 2200 SERIES

MOTOROLA'S EXCLUSIVE AUDIO FEATURES ARE MADE FOR MISSION CRITICAL MOMENTS

IMPRES™ ENERGY: YOUR BATTERY SAFER, SMARTER, POWERED FOR LONGER

Only IMPRES technology gives you the most accurate information on the state of your battery so you know it's fully charged to last the entire shift. IMPRES batteries can be charged 150 more times than a standard battery.

DUAL-MIC NOISE SUPPRESSION: I HEAR YOU, EVEN WHEN YOU CAN'T HEAR YOURSELF

Virtually blocks out all background noise in demanding and extreme noise environments so you can always communicate clearly.

IMPRES™ AUDIO: I HEAR YOU, HOWEVER YOU SPEAK

Ensure your voice is heard clearer, crisper, and louder regardless of level or direction you're speaking into the accessory.

WINDPORTING AUDIO: I HEAR YOU, NOT THE WIND

Reduce the effect of wind and other outdoor noise so your messages are always heard clearly.

NOISE-CANCELING AUDIO: HEAR YOU, NOT THE NOISE

Reduce the effect of background crowd noise, sounds of sirens and horns so your messages are always heard clearly.

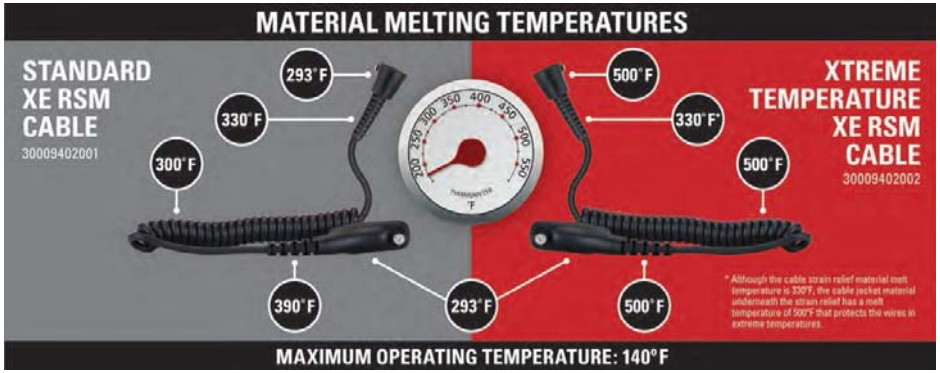
APX PORTABLE RADIO ACCESSORIES



XE REMOTE SPEAKER MICROPHONE (RSM)

Designed by Firefighters for Firefighters.
This Microphone has exaggerated controls you can operate with bulky gloves and an asymmetrical shape so you can find the controls you need without looking. Dual Mic Noise Suppression allows clear communications in demanding and extreme noise environments.

I HEAR YOU, EVEN WHEN YOU CAN'T HEAR YOURSELF



COMPATIBILITY	ACCESSORY			FEATURES											MARKET[1]						
XE REMOTE SPEAKER MICROPHONE (RSM)																					
APX PORTABLE RADIOS	REMOTE SPEAKER MICROPHONES	DESCRIPTION	PART NUMBER	IMPRES	WINDPORTING OR NOISE-CANCELING	VOLUME CONTROL[2]	ORANGE PROGRAMMABLE BUTTON	DISPLAY	CHANNEL CONTROL	PROGRAMMABLE BUTTON	AUDIO JACK	IP RATING*	INTRINSIC SAFETY RATING	SIZE (WITHOUT CLIP), (MM)	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
	XE RSM WITH XTREME TEMPERATURE CABLE																				
APX 7000 SERIES APX 7000XE SERIES		Xtreme Temperature Cable High Impact Green Housing	NNTN8575A	●	Dual Mic Noise Suppression	Step				1		IP68	FM	75 x 100 x 33		●					
		Xtreme Temperature Cable Black Housing	NNTN8575ABLK	●	Dual Mic Noise Suppression					1		IP68	FM	75 x 100 x 33		●					
		Xtreme Temperature Cable Yellow Housing	NNTN8575AYLW	●	Dual Mic Noise Suppression					1		IP68	FM	75 x 100 x 33		●					
	XE RSM WITH STANDARD CABLE																				
APX 6000 SERIES APX 6000XE SERIES		Standard Cable High Impact Green Housing	NNTN8203A	●	Dual Mic Noise Suppression	Step				1		IP68	FM	75 x 100 x 33		●					
		Standard Cable Black Housing	NNTN8203ABLK	●	Dual Mic Noise Suppression					1		IP68	FM	75 x 100 x 33		●					
		Standard Cable Yellow Housing	NNTN8203AYLW	●	Dual Mic Noise Suppression					1		IP68	FM	75 x 100 x 33		●					

[2] Two settings switch for volume – high and low.
* International Protection (IP) is a global standard for rating dust and water protection. The first digit IP5x or IP6x represents increased levels of dust protection, while the second digit, IPx7 represents withstanding submersion in 1 meter of fresh water for 30 minutes. Higher ratings indicate a higher level of water protection – MIL-STD-810E, Method 512.3 (Immersion). These batteries meet the incremental requirement of submersion to 1 meter of fresh water for 30 minutes. Specification is greater than the product for 2 hours.

[1] These are recommended uses based on typical use case for each market listed.

P25 System and Services Agreement (R142251551(P1)
Schedule 6 - Specifications

APX PORTABLE RADIO ACCESSORIES



APX™ XP REMOTE SPEAKER MICROPHONE

DUAL MIC NOISE SUPPRESSION

This Remote Speaker Microphone with its thin design and optimized ergonomics is ideal for police officers and other public safety users.

With Dual Mic Noise Suppression, you will be heard despite traffic noise and sirens in the background.

When it gets dirty, just wash the microphone head to ensure your communication is not compromised.

WIRELESS REMOTE SPEAKER MICROPHONE

Secure pairing is easier than ever with voice prompts as there is no need to navigate menus or enter codes.

Removing the cord from the RSM makes getting ready for work quicker than ever. No more worrying about getting tangled with the seatbelt or other equipment.

This wireless RSM features a large, but recessed push-to-talk and emergency buttons to ensure that users have easy access to controls but don't have to worry about accidental activation. Additional features include volume control, an audio jack, 360 degree rotatable clip, as well as a task light that allows you to read items such as a driver's license in the dark.

COMPATIBILITY | **ACCESSORY** | **FEATURES** | **MARKET**[1]

REMOTE SPEAKER MICROPHONES (RSM) Our robust portfolio includes Remote Speaker Microphones and secondary audio accessories engineered to give you clearer communications even in loud environments.

All remote speaker microphones are built with top quality materials including durable **Kevlar®** cables that survive tough working conditions.

APX PORTABLE RADIOS	REMOTE SPEAKER MICROPHONES	DESCRIPTION	PART NUMBER	IMPRES	WINDPORTING OR NOISE-CANCELING	VOLUME CONTROL[2]	ORANGE PROGRAMMABLE BUTTON	DISPLAY	CHANNEL CONTROL	PROGRAMMABLE BUTTON	AUDIO JACK	IP RATING	INTRINSIC SAFETY RATING	SIZE (WITHOUT CLIP), (MM)	POLICE	FIRE	EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES SRX 2200 SERIES		IMPRES XP RSM with Dual Mic Noise Suppression, Volume Control, 1-Programmable Button and Orange Button. Rugged, Submersible (IP68)	NMN6271	●	Dual Mic Noise Suppression	 Step				1		IP68		95 x 69 x 27	●			●	●	●			●
		IMPRES XP RSM with Dual Mic Noise Suppression, 3.5mm threaded jack, Volume Control, 1-Programmable Button and Orange Button (IP55)	NMN6274	●	Dual Mic Noise Suppression	 Step				1	3.5 mm	IP55		95 x 69 x 27	●			●	●	●			●
		Wireless RSM with Battery, Clip (RLN6544) and Dual Unit Charger (PMLN7120)	RLN6554		Windporting	 Step				1	3.5 mm	IP55		88 x 63 x 26	●		●	●	●	●			●

[2] Two settings switch for volume – high and low.

[1] These are recommended uses based on typical use case for each market listed.

IMPRES AUDIO (MOTOROLA EXCLUSIVE): Ensure your voice is heard clearer, crisper, and louder regardless of level or direction you're speaking into the accessory.

WINDPORTING (MOTOROLA EXCLUSIVE) OR NOISE-CANCELLING: Windporting reduces the effect of wind and other outdoor noises on your microphone performance and prevents water from clogging the microphone and distorting your transmission. Noise-cancelling microphones negates crowd or machinery noise so your voice comes through loud and clear anytime you speak directly into the microphone.

AUDIO JACK: Connect a variety of comfortable earpiece styles to the remote speaker microphone for a more discreet communication option.

ORANGE BUTTON: This essential programmable button on top of the microphone is easily activated if you are in trouble. This button can also be set for any programmable feature on the radio, such as emergency.

PROGRAMMABLE BUTTON: This programmable button allows you to access key features while you keep your radio on your belt or hidden under a jacket.

VOLUME CONTROL: Conveniently access the volume control. Toggle switch allows you to easily adjust between high and low volume as needed.

IP RATING: The international standard for rating dust and water protection. The first digit represents the level of dust protection: 5 provides excellent protection from dust. The second digit represents water protection. IP54 provides protection from water sprayed from all directions, IP55 protects against driving rain, 💧IP57 resists submersion in 1 meter of fresh water for 30 minutes and 💧IP68 exceeds industry specs. Product is Ruggedized and is heated at 27°C higher than the water temperature for 2 hours then immediately immersed to a depth of 1 meter for another 2 hours.

INTRINSIC SAFETY RATING: Motorola-approved accessories are a critical part of the overall radio system certified by a recognized testing organization as intrinsically safe. Non-Motorola approved accessories may not be certified for APX and if used, could result in equipment that is NOT approved or unsafe in a hazardous environment.

APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY | **ACCESSORY** | **FEATURES** | **MARKET**[1]

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APX PORTABLE RADIOS	REMOTE SPEAKER MICROPHONES	DESCRIPTION	PART NUMBER	IMPRES	WINDPORTING OR NOISE-CANCELING	VOLUME CONTROL[2]	ORANGE PROGRAMMABLE BUTTON	DISPLAY	CHANNEL CONTROL	PROGRAMMABLE BUTTON	AUDIO JACK	IP RATING*	INTRINSIC SAFETY RATING	SIZE (WITHOUT CLIP), (MM)	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES SRX 2200 SERIES		IMPRES Display RSM with Audio Jack, Channel Selector, Volume Control, 2-Programmable Buttons and Orange Button. Windporting, Rugged, Submersible (IP68)	HMN4104	●	Windporting	Step		●	●	2	8-Pin	IP68	FM	68 x 106 x 31	●	●	●	●	●	●	●
		IMPRES Display RSM with Audio Jack, Volume Control, 2-Programmable Buttons and Orange Button. Windporting, Rugged, Submersible (IP68)	HMN4103	●	Windporting	Step		●		2	8-Pin	IP68	FM	68 x 106 x 31	●	●	●	●	●	●	●
		IMPRES RSM with Audio Jack, Volume Control, 2-Programmable Buttons and Orange Button. Windporting, Rugged, Submersible (IP68)	HMN4101	●	Windporting	Step				2	8-Pin	IP68	FM	68 x 106 x 31	●	●	●	●	●	●	●
		IMPRES RSM Windporting, Rugged (IP68)	PMMN4083	●	Windporting					0		IP68	FM TIA[1]	60 x 78 x 28	●	●	●	●	●	●	●
		IMPRES RSM with 3.5mm Threaded and NON-Threaded Audio Jack and Orange Button. Noise Cancelling (IP54) NOT INTENDED FOR FIRE MARKETS	PMMN4084	●	Noise-Canceling					0	3.5 mm	IP54	FM TIA[1]	60 x 78 x 28	●		●	●	●	●	●
		IMPRES Windporting RSM with Volume Toggle Switch, Orange Button, 3.5mm NON-Threaded Jack (IP55)	PMMN4099	●	Windporting	 High/Low[2]				1	3.5 mm	IP55		60 x 78 x 28	●		●	●	●		●
SRX 2200 SERIES		Windporting RSM, small, submersible (IP57), Coyote Brown	NNTN8235		Windporting					0		IP57	FM	55 x 60 x 27			●				
		Windporting RSM with NON-Threaded 3.5mm Audio Jack, small (IP54), Coyote Brown	NNTN8236		Windporting					0	3.5 mm	IP54	FM	55 x 60 x 27			●				
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES SRX 2200 SERIES		IMPRES RSM with NON-Threaded Audio Jack, Orange Button, Noise Cancelling (IP54) NOT INTENDED FOR FIRE MARKETS	PMMN4062	●	Noise-Canceling					0	3.5 mm	IP54	FM TIA[1]	60 x 78 x 28	●		●	●	●	●	●
		IMPRES RSM with Volume Toggle Switch, Orange Button and 1-Programmable Button, Windporting (IP57)	PMMN4065	●	Windporting	 High/Low[2]				1		IP57	FM TIA[1]	60 x 78 x 28	●		●	●	●	●	●
		IMPRES RSM with NON-Threaded Audio Jack, Windporting (IP55)	PMMN4069	●	Windporting					0	3.5 mm	IP55	FM TIA[1]	60 x 78 x 28	●		●	●	●	●	●

[1] These are recommended uses based on typical use case for each market listed.

[2] Two settings switch for volume – high and low.

* International Protection (IP) is a global standard for rating dust and water protection. The first digit (IP5x or IP6x represents increased levels of dust protection, while the second digit, IPx7 represents withstanding submersion in 1 meter of fresh water for 30 min. Higher numbers denote higher standards. All accessories and cables have a higher level of water protection – MIL-STD-810E, Method 512.3 (Immersion). These batteries meet the incremental requirement of submersion under 1 m of fresh water for 30 min. Testing is performed at 20°C (68°F) with the radio powered off and no battery under than the product for 2 hours.

P25 System and Services Agreement (R1422515C1P1)
Schedule B - Specifications

APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY		
REMOTE SPEAKER MICROPHONE ACCESSORIES AND REPLACEMENT PARTS			
APX PORTABLE RADIOS	REMOTE SPEAKER MICROPHONES ACCESSORIES AND REPLACEMENT PARTS	DESCRIPTION	PART NUMBER
XE RSM REPLACEMENT PARTS			
APX 7000 SERIES		Xtreme Temperature Replacement Cable for XE RSM (NNTN8203 and NNTN8575 series)	30009402002
APX 7000XE SERIES		Standard Temperature Replacement Cable for XE RSM (NNTN8203 series)	30009402001
APX 6000 SERIES		Clip Assembly with brass insert designed to work with the Boston Leather Straps (AY000223A01, AY000229A01) requires Clip Button NNTN8749	NNTN8271
APX 6000XE SERIES		Clip Button	NNTN8749
ACCESSORIES AND REPLACEMENT PARTS			
APX 7000 SERIES		Dual Unit Charger,rapid rate charger, 120V (US Plug)	PMLN7120
APX 7000XE SERIES		Vehicular Charger	PMLN6716
APX 6000 SERIES		Wireless RSM with Battery and Clip	RLN6544
APX 6000XE SERIES		Wireless RSM Battery, 1750mA LiIon	PMNN4461
APX 4000 SERIES			
APX 3000 SERIES			
SRX 2200 SERIES		D Ring Swivel Clip (12 pack)	NNTN4990

FIRE MARKET SOLUTION





The XE RSM clip paired with a clip button allows easy and secure access to your RSM when used with a Boston Radio Strap with Button Back Holder.

† UL certified for use in hazardous areas when used with a UL certified HX450 approved APX 4000 two-way radio



APX WIRELESS RSM

Every feature on this RSM has been purposefully designed. Large, yet recessed push-to-talk and emergency buttons are easy to access and designed to prevent accidental activation. Additional features include a volume control, audio jack and task light that allows you to read items such as a driver's license in the dark. This RSM features all of the advanced capabilities of Mission Critical Wireless including enhanced security, fast push-to-talk and quick touch pairing with voice prompts that confirm pairing actions. This RSM also features a removable and rechargeable battery. Charge the RSM on the go with the vehicular charger or in the office with the dual-unit desk charger.

APX PORTABLE RADIO ACCESSORIES

REMOTE SPEAKER MICROPHONE ACCESSORIES AND REPLACEMENT PARTS

COMPATIBILITY	ACCESSORY			FEATURES		
PORTABLE RADIOS	REMOTE SPEAKER MICROPHONE ACCESSORIES AND REPLACEMENT PARTS	DESCRIPTION	PART NUMBER	EARPIECE TYPE	CONNECTOR TYPE	INTRINSIC SAFETY RATING
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES SRX 2200 SERIES		Receive-Only Earpiece with Comfort Eartube, FM approved	RLN4941†			
		Receive-Only Earpbud, Single Wire, Threaded 3.5 mm connector	BDN6781			
		Receive-Only Earbud, FM approved	AARLN4885†			
		EP7 Sonic Defender, use with RLN4941	RLN6511 RLN6512 RLN6513			
		Receive-Only Covered Earbud with coiled cord	AARLN4885	Foam Earbud	3.5mm	FM
		Receive-Only Earpiece with translucent tube and rubber eartip	RLN4941	Clear Rubber Eartip	3.5mm	FM
		D-Shell Rx-Only Earpiece	PMLN4620	Over-the-Ear	3.5mm	FM
		Receive-Only Flexible Earpiece	WADN4190	Over-the-Ear	3.5mm	FM TIA†
		Receive and Transmit Boomless Temple Transducer (for HMN4104, HMN4103 and HMN4101 only)	RMN5116	Over-the-Head	8-Pin	FM
		Receive-Only Earpiece with translucent tube and rubber eartip (for HMN4104, HMN4103 and HMN4101 only)	RLN6424	Clear Rubber Eartip	8-Pin	FM
		Replacement Foam Plugs for RLN5887 and RLN6242. Noise reduction = 24dB. (Pack of 50 pairs)	5080384F72	Foam Eartip		
		Replacement Rubber Eartip for RLN6424 (Pack of 25)	5080370E97			

NOTE: See page 24 for high noise earpiece solutions. † UL certified TIA 4950 approved when used with a UL certified TIA 4950 approved APX 4000 two knob radio



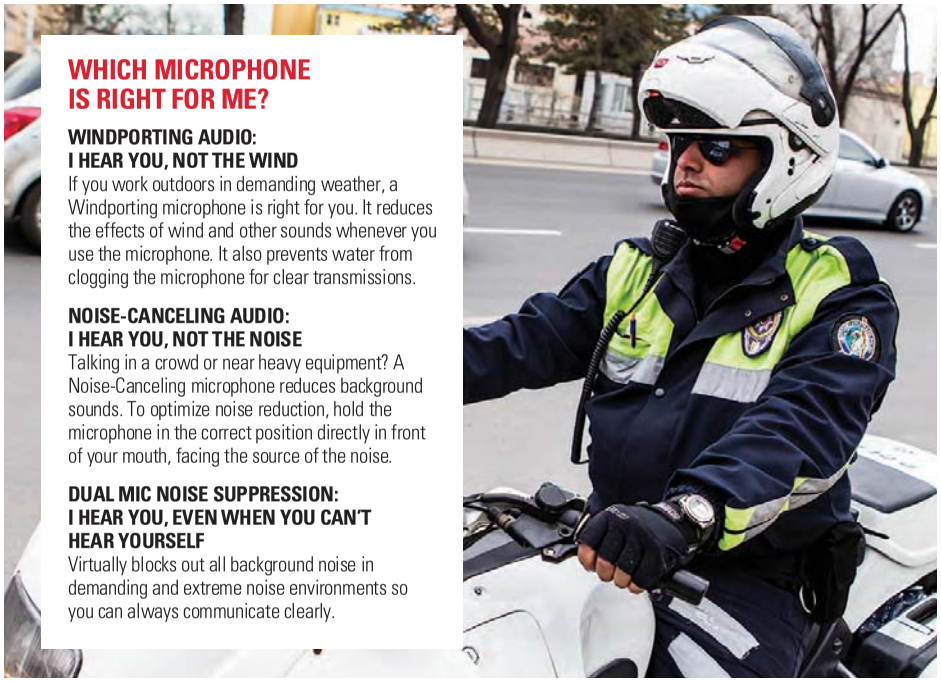
WHICH MICROPHONES ARE 50% LOUDER AND CLEARER?

APX Remote Speaker Microphones and Public Safety Microphones deliver audio that is clearer, easier to understand, and up to 50% louder. That's because they have the same speaker found in APX portable radios for the best-in-class accessory audio available.

APX PORTABLE RADIO ACCESSORIES

REMOTE SPEAKER MICROPHONE ACCESSORIES AND REPLACEMENT PARTS

COMPATIBILITY	ACCESSORY			
PORTABLE RADIOS	REMOTE SPEAKER MICROPHONES ACCESSORIES AND REPLACEMENT PARTS	DESCRIPTION	PART NUMBER	CONNECTOR TYPE
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES SRX 2200 SERIES		Display RSM Interface Cable, 5-Pin Nexus Female Receptacle	PMKN4107	5-Pin Nexus Female
		Display RSM Interface Cable 4-Pin Nexus Male Plug	PMKN4112	4-Pin Nexus Male
		Display RSM Interface Cable, 12-Pin Hirose Male Connector	PMKN4113	12-Pin Hirose Male
		Replacement Coil Cord Kit for HMN4104, 4103 and 4101	3075336B17	
		Replacement Coil Cord Kit for PMMN4062, PMMN4065, PMMN4069, PMMN4083 and PMMN4099.	RLN6075	



WHICH MICROPHONE IS RIGHT FOR ME?

WINDPORTING AUDIO: I HEAR YOU, NOT THE WIND
If you work outdoors in demanding weather, a Windporting microphone is right for you. It reduces the effects of wind and other sounds whenever you use the microphone. It also prevents water from clogging the microphone for clear transmissions.

NOISE-CANCELING AUDIO: I HEAR YOU, NOT THE NOISE
Talking in a crowd or near heavy equipment? A Noise-Canceling microphone reduces background sounds. To optimize noise reduction, hold the microphone in the correct position directly in front of your mouth, facing the source of the noise.

DUAL MIC NOISE SUPPRESSION: I HEAR YOU, EVEN WHEN YOU CAN'T HEAR YOURSELF
Virtually blocks out all background noise in demanding and extreme noise environments so you can always communicate clearly.

PUBLIC SAFETY MICROPHONES

Our robust portfolio includes Public Safety Microphones and secondary audio accessories engineered to give you clearer communications even in loud environments.

COMPATIBILITY	ACCESSORY			FEATURES									MARKET[1]						
APX PORTABLE RADIOS	PUBLIC SAFETY MICROPHONES	DESCRIPTION	PART NUMBER	IMPRES	WINDPORTING OR NOISE-CANCELING	VOLUME CONTROL[2]	ORANGE PROGRAMMABLE BUTTON	PROGRAMMABLE BUTTON	AUDIO JACK	IP RATING*	INTRINSIC SAFETY RATING	SIZE (MM)	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 7000 700/800 MHz only APX 6000 700/800 MHz only APX 3000 700/800 MHz only		IMPRES Windporting Public Safety Microphone (30 inch cable) with 3.5mm NON-Threaded Audio Jack, Volume Control, Orange Button. PSM Antenna required. Large (IP55). VHF not supported.	PMMN4061	●	Windporting	Hi/Low		1	3.5 mm	IP55	FM	60 x 78 x 28	●				●		
		IMPRES Windporting Public Safety Microphone (24 inch cable) with 3.5mm NON-Threaded Audio Jack, Volume Control, Orange Button. PSM Antenna required. Large (IP55). VHF not supported.	PMMN4060	●	Windporting	Hi/Low		1	3.5 mm	IP55	FM	60 x 78 x 28	●				●		
		IMPRES Windporting Public Safety Microphone (18 inch cable) with 3.5mm NON-Threaded Audio Jack, Volume Control, Orange Button. PSM Antenna required. Large (IP55). VHF not supported.	PMMN4059	●	Windporting	Hi/Low		1	3.5 mm	IP55	FM	60 x 78 x 28	●				●		

[2] Two settings switch for volume – high and low.

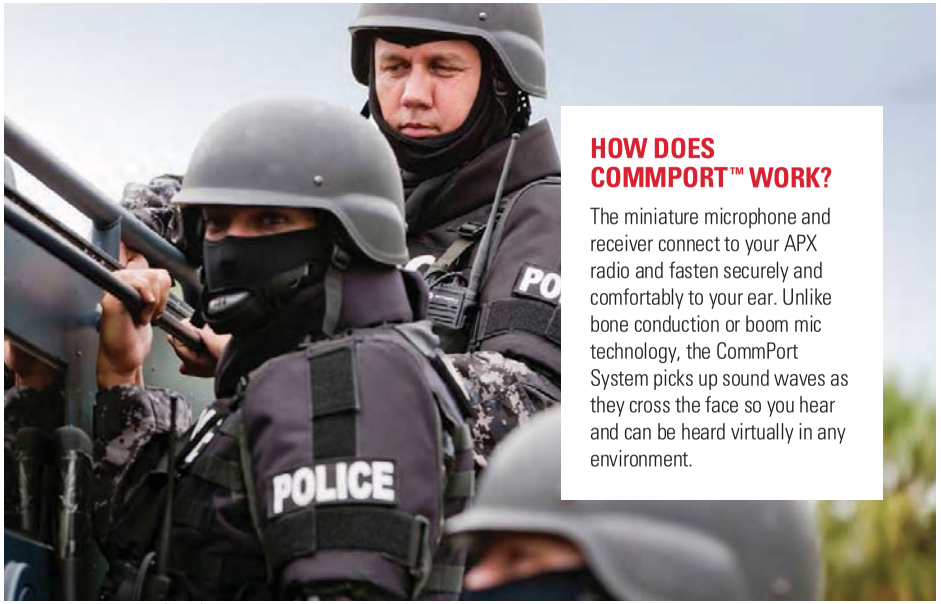
* International Protection (IP) is a global standard for rating dust and water protection. The first digit (IP5x or IP6x) represents increased levels of dust protection, while the second digit, IPx7 represents withstanding submersion in 1 meter of fresh water for 30 minutes. Polycarbonate/ABS material (PMLN7078) submersible battery that provides a higher level of water protection – MIL-STD-810E, Method 512.3 (Immersion). These batteries meet the incremental requirement of submersion in 1 meter of fresh water for 30 minutes. These batteries are rated lower than the product for 2 hours.

[1] These are recommended uses based on typical use case for each market listed.

P25 System and Services Agreement (R1422515R1/P1)
Schedule 8 - Specifications

APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY			FEATURES		
COMMPORT™ Integrated microphone/receiver lets you talk discreetly and hear clearly and still be aware of everything around you, from traffic noise to other responders.						
APX PORTABLE RADIOS	EARPIECES	DESCRIPTION	PART NUMBER	EARPIECE TYPE	MICROPHONE	PTT
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES SRX 2200 SERIES		Integrated Ear Microphone/Receiver System with Palm PTT (Includes adapter BDN6783)	RLN6480	Over-the-Ear, Clear Silicone Eartube	On Earpiece, Above Ear	Palm
		Integrated Ear Microphone/Receiver System with PTT on Adapter (Includes adapter BDN6783)	RLN6482	Over-the-Ear, Clear Silicone Eartube	On Earpiece, Above Ear	On Adapter
		Integrated Ear Microphone/Receiver System with Snap-On-Side PTT (Includes adapter BDN6783)	RLN6481	Over-the-Ear, Clear Silicone Eartube	On Earpiece, Above Ear	Side
		Integrated Ear Microphone/Receiver System with Ring PTT (Includes adapter BDN6783)	RLN6483	Over-the-Ear, Clear Silicone Eartube	On Earpiece, Above Ear	Ring
		Integrated Ear Microphone/Receiver System with Body PTT (Includes adapter BDN6783)	RLN6484	Over-the-Ear, Clear Silicone Eartube	On Earpiece, Above Ear	Body



HOW DOES COMMPORT™ WORK?

The miniature microphone and receiver connect to your APX radio and fasten securely and comfortably to your ear. Unlike bone conduction or boom mic technology, the CommPort System picks up sound waves as they cross the face so you hear and can be heard virtually in any environment.

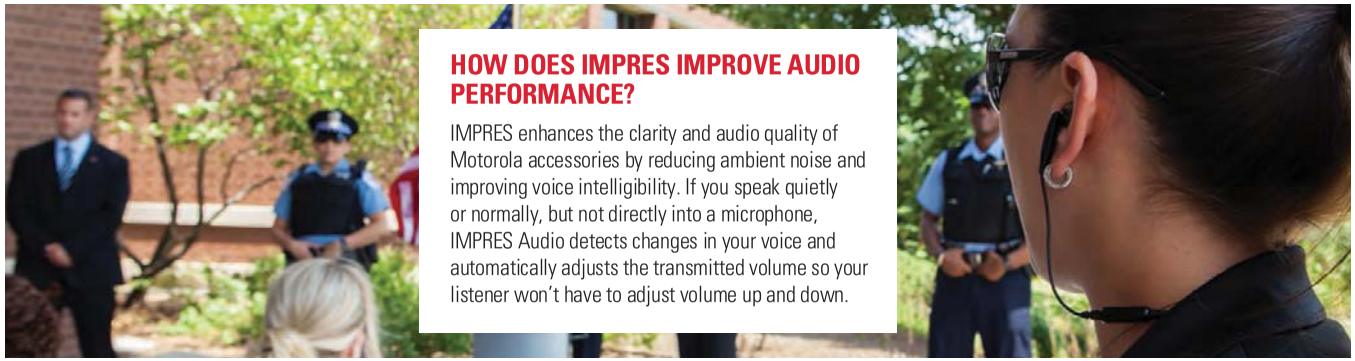
COMPATIBILITY	ACCESSORY		
COMMPORT™			
APX PORTABLE RADIOS	ACCESSORIES AND REPLACEMENT PARTS	DESCRIPTION	PART NUMBER
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES SRX 2200 SERIES		Replacement Palm PTT for RLN6480	NKN6510
		Replacement Cable for RLN6481	NKN6508
		Replacement Snap-On-Side PTT for RLN6482	NKN6525
		Replacement Ring PTT for RLN6483	NKN6512
		Replacement Remote Body PTT for RLN6484	NNTN4188
		Ear Microphone Assembly	NTN8819
		CommPort Maintenance Kit (Includes 10 replacement ear tubes, 10 microphone seals and 2 windscreens)	NTN8821
		Adhesive Pads for secure attachment to ear (Pack of 90)	NTN8986
		Ear Straps for secure attachment to ear (pack of 10)	NTN8988
		Replacement Ear Tubes (pack of 10)	RLN5037
		Replacement Collar Clip	4285838B01
		Back Cover Clip	4202006A01



APX PORTABLE RADIO ACCESSORIES

EAR MICROPHONE SYSTEM

COMPATIBILITY	ACCESSORY			FEATURES						MARKET†						
APX PORTABLE RADIOS	EAR MICROPHONE SYSTEM	DESCRIPTION	PART NUMBER	IMPRES	EARPIECE TYPE	MICROPHONE	PTT	PROGRAMMABLE BUTTON	INTRINSIC SAFETY RATING	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES SRX 2200 SERIES APX 1000 SERIES		IMPRES Ear Microphone with Bone Conduction and programmable button, black	PMLN5653	●	In-Ear Mic	In-Ear Mic	Large, Ring-guarded, Recessed		FM APPROVED FOR APX™ 7000, APX 7000XE, APX 6000, APX 6000XE	●		●	●			
		Earguard with Adjustable Loop	0180300E25													
		Earholder, Black, Small	0180358B32													
		Earholder, Black, Medium	0180358B33													
		Earholder, Black, Large	0180358B34													
		Earholder, Clear, Medium	0180358B36													
		Earholder, Clear, Large	0180358B37													



HOW DOES IMPRES IMPROVE AUDIO PERFORMANCE?

IMPRES enhances the clarity and audio quality of Motorola accessories by reducing ambient noise and improving voice intelligibility. If you speak quietly or normally, but not directly into a microphone, IMPRES Audio detects changes in your voice and automatically adjusts the transmitted volume so your listener won't have to adjust volume up and down.

SURVEILLANCE KITS AND EARPIECES

Transmit and receive discreetly with a variety of surveillance kits that feature a streamlined design and rugged cables that withstand tough conditions. A quick-disconnect, durable and comfortable translucent tube enables easy sharing between shifts.

Two-wire kits have one wire for receiving transmissions and one wire with a combined microphone and push-to-talk.
Three-wire kits feature separate wires for receiving transmissions, push-to-talk and microphone.

COMPATIBILITY	ACCESSORY			FEATURES						MARKET†						
APX PORTABLE RADIOS	SURVEILLANCE ACCESSORIES	DESCRIPTION	PART NUMBER	IMPRES	EARPIECE TYPE	MICROPHONE	PTT	PROGRAMMABLE BUTTON	INTRINSIC SAFETY RATING	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 7000 SERIES APX 7000XE SERIES		1-Wire Receive-only earpiece, black	PMLN6125	●	Ear Hanger				FM TIA†	●		●	●			
APX 6000 SERIES APX 6000XE SERIES		1-Wire Receive-only earpiece, beige	PMLN6126	●	Ear Hanger				FM TIA†	●		●	●			
APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES SRX 2200 SERIES		IMPRES 2-Wire Surveillance Kit, programmable button, black	PMLN6127	●	Ear Hanger	 Mic and PTT combined on a single wire	 Mic and PTT combined on a single wire		FM TIA†	●		●	●			
		IMPRES 2-Wire Surveillance Kit, programmable button, beige	PMLN6128	●	Ear Hanger				FM TIA†	●		●	●			

† UL certified TIA 4950 approved when used with a UL certified TIA 4950 approved APX 4000 two knob radio

†These are recommended uses based on typical use case for each market listed.

IMPRES AUDIO (MOTOROLA EXCLUSIVE): Ensure your voice is heard clearer, crisper, and louder regardless of level or direction you're speaking into the accessory.

MICROPHONE AND PTT: Some accessories have a microphone on the same wire as push-to-talk (2-Wire surveillance kit) or on a separate wire (3-Wire surveillance kits). Microphones are small, easy to mount and hide during surveillance operations, yet powerful enough to pick up whispered transmissions and reduce ambient noise.

PROGRAMMABLE BUTTON: This programmable button allows you to access key features while you keep your radio on your belt or hidden under a jacket.

INTRINSIC SAFETY RATING: Motorola-approved accessories are a critical part of the overall radio system certified by a recognized testing organization as intrinsically safe. Non-Motorola approved accessories may not be certified for APX and if used, could result in equipment that is NOT approved or unsafe in a hazardous environment.

APX PORTABLE RADIO ACCESSORIES

SURVEILLANCE KITS

COMPATIBILITY	ACCESSORY			FEATURES						MARKET[1]						
APX PORTABLE RADIOS	SURVEILLANCE ACCESSORIES	DESCRIPTION	PART NUMBER	IMPRES	EARPIECE TYPE	MICROPHONE	PTT	PROGRAMMABLE BUTTON	INTRINSIC SAFETY RATING	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES SRX 2200 SERIES		IMPRES 2-Wire Surveillance Kit with translucent tube, programmable button, black	PMLN6129	●	Clear Rubber Eartip	 Mic & PTT combined on a single wire	 Mic & PTT combined on a single wire		FM TIA[1]	●		●	●			
		IMPRES 2-Wire Surveillance Kit with translucent tube, programmable button, beige	PMLN6130	●	Clear Rubber Eartip				FM TIA[1]	●		●	●			
		IMPRES 3-Wire Surveillance Kit with translucent tube, programmable button, black	PMLN6123	●	Clear Rubber Eartip	 Separate wire	 Separate wire		FM TIA[1]	●		●	●			
		IMPRES 3-Wire Surveillance Kit with translucent tube, programmable button, beige	PMLN6124	●	Clear Rubber Eartip				FM TIA[1]	●		●	●			
		2-Wire Surveillance Kit, with Extra Loud Earpiece, Beige, Hirose Connector. Requires NNTN7869 Hirose Adapter	ZMN6038		Ear Hanger	Mic & PTT combined on a single wire	Mic & PTT combined on a single wire			●		●	●			
		3-Wire Surveillance Kit, with Extra Loud Earpiece, Beige, Hirose Connector. Requires NNTN7869 Hirose Adapter	ZMN6039		Ear Hanger	Separate wire	Separate wire			●		●	●			
		2-Wire Surveillance Kit, Beige, Hirose Connector. Requires NNTN7869 Hirose Adapter	ZMN6032		Ear Hanger	Mic & PTT combined on a single wire	Mic & PTT combined on a single wire			●		●	●			
		3-Wire Surveillance Kit, Beige, Hirose Connector. Requires NNTN7869 Hirose Adapter	ZMN6031		Ear Hanger	Separate wire	Separate wire			●		●	●			
		1-Wire Receive-Only Surveillance Kit with Earpiece, Beige, 3.5mm Threaded. Requires BDN6783.	BDN6664		Ear Hanger				FM approved with APX6000/6000XE and APX7000/7000XE	●		●	●			
		1-Wire Receive-Only Surveillance Kit with Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6726		Ear Hanger				FM approved with APX6000/6000XE and APX7000/7000XE	●		●	●			
		1-Wire Receive-Only Surveillance Kit with Extra-Loud Earpiece, Beige, 3.5mm Threaded. Requires BDN6783.	BDN6665		Ear Hanger				FM approved with APX6000/6000XE and APX7000/7000XE	●		●	●			
		1-Wire Receive-Only Surveillance Kit with Extra-Loud Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6727		Ear Hanger				FM approved with APX6000/6000XE and APX7000/7000XE	●		●	●			

[1]These are recommended uses based on typical use case for each market listed.

APX PORTABLE RADIO ACCESSORIES

SURVEILLANCE KITS

COMPATIBILITY	ACCESSORY							MARKET[1]						
APX PORTABLE RADIOS	SURVEILLANCE ACCESSORIES	DESCRIPTION	PART NUMBER	EARPIECE TYPE	MICROPHONE	PTT	INTRINSIC SAFETY RATING	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES SRX 2200 SERIES		1-Wire Receive-Only Surveillance Kit with Translucent Tube, Beige, 3.5mm Threaded. Requires BDN6783	RLN5314	Clear rubber eartip				●		●	●			
		1-Wire Receive-Only Surveillance Kit with Translucent Tube, Black, 3.5mm Threaded. Requires BDN6783	RLN5313	Clear rubber eartip				●		●	●			
		2-Wire Surveillance Kit with Translucent Tube, Black, 3.5mm Threaded. Requires BDN6783	RLN5312	Clear rubber eartip	Mic & PTT combined on a single wire	Mic & PTT combined on a single wire		●		●	●			
		1-Wire Receive-Only Surveillance Kit with Volume Control and Earpiece, Beige, 3.5mm Threaded. Requires BDN6783.	BDN6666	Ear Hanger			FM approved with APX6000/6000XE and APX7000/7000XE	●		●	●			
		1-Wire Receive-Only Surveillance Kit with Volume Control and Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6728	Ear Hanger			FM approved with APX6000/6000XE and APX7000/7000XE	●		●	●			
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES SRX 2200 SERIES		2-Wire Surveillance Kit with Earpiece, Beige, 3.5mm Threaded. Requires BDN6783.	BDN6667	Ear Hanger	Mic & PTT combined on a single wire	Mic & PTT combined on a single wire	FM approved with APX6000/6000XE and APX7000/7000XE	●		●	●			
		2-Wire Surveillance Kit with Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6729	Ear Hanger	Mic & PTT combined on a single wire	Mic & PTT combined on a single wire	FM approved with APX6000/6000XE and APX7000/7000XE	●		●	●			
		2-Wire Surveillance Kit with Extra-Loud Earpiece, Beige, 3.5mm Threaded. Requires BDN6783.	BDN6669	Ear Hanger	Mic & PTT combined on a single wire	Mic & PTT combined on a single wire	FM approved with APX6000/6000XE and APX7000/7000XE	●		●	●			
		2-Wire Surveillance Kit with Extra-Loud Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6731	Ear Hanger	Mic & PTT combined on a single wire	Mic & PTT combined on a single wire	FM approved with APX6000/6000XE and APX7000/7000XE	●		●	●			
		3-Wire Surveillance Kit with Earpiece, Beige, 3.5mm Threaded. Requires BDN6783.	BDN6668	Ear Hanger	Separate wire	Separate wire	FM approved with APX6000/6000XE and APX7000/7000XE	●		●	●			
		3-Wire Surveillance Kit with Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6730	Ear Hanger	Separate wire	Separate wire	FM approved with APX6000/6000XE and APX7000/7000XE	●		●	●			
		3-Wire Surveillance Kit with Extra-Loud Earpiece, Beige, 3.5mm Threaded. Requires BDN6783.	BDN6670	Ear Hanger	Separate wire	Separate wire	FM approved with APX6000/6000XE and APX7000/7000XE	●		●	●			
		3-Wire Surveillance Kit with Extra-Loud Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6732	Ear Hanger	Separate wire	Separate wire	FM approved with APX6000/6000XE and APX7000/7000XE	●		●	●			

[1]These are recommended uses based on typical use case for each market listed.



APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY			FEATURES	
SURVEILLANCE KIT ACCESSORIES AND REPLACEMENT PARTS					
APX PORTABLE RADIOS	SURVEILLANCE ACCESSORIES	DESCRIPTION	PART NUMBER	EARPIECE TYPE	COMPATIBLE SURVEILLANCE KITS
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES SRX 2200 SERIES		Completely Discreet Earpiece Kit with Neckloop, Beige, Includes RLN4921, RLN4920 and RNN4005	RLN4922		
		Phonak Nano Ear Receiver, Beige (Neckloop must be ordered separately)	GMLN5261		
		Phonak Nano Ear Receiver, Brown (Neckloop must be ordered separately)	GMLN5262		
		Replacement Earwax guards. 5 per pack. Compatible with RLN4922	RLN4919		
		Optional Retention Hooks, Pack of 10	NNTN8457		
		Phonak Phonito Intra Ear Receiver Included in the RLN4922	RLN4921		
		Phonak Inductive Neckloop Included in the RLN4922	RLN4920		
		1.4 Volt Battery – Pack of 6	RNN4005		
		Low Noise Kit with Quick Disconnect translucent tube and 1clear rubber eartip	RLN6242	Clear rubber eartip	PMLN6123, PMLN6124, PMLN6129, PMLN6130
		Replacement standard clear rubber eartip, Pack of 50	RLN6282	Clear rubber eartip	PMLN6123, PMLN6124, PMLN6125, PMLN6126, PMLN6127, PMLN6128, PMLN6129, PMLN6130
		Replacement Foam Plugs for RLN5887 and RLN6242. Noise reduction = 24dB* Pack of 50 pairs.	5080384F72	Foam eartip	PMLN6123, PMLN6124, PMLN6129, PMLN6130
		Low Noise Kit with 1 clear rubber eartip	RLN5886	Clear rubber eartip	RLN5882, RLN5883, PMLN5111, PMLN5112, PMLN6125, PMLN6126
		High Noise Kit* with 2 foam earplugs	RLN5887	Foam eartip	
		Clear EP7-Small Hearing Protectors [Sonic Defenders] Ultra Earplugs Noise reduction = 28dB	RLN6511	Comply™ foam eartip	RLN5882, RLN5883, PMLN5111, PMLN5112, PMLN6123, PMLN6124, PMLN6125, PMLN6126, PMLN6127, PMLN6128, PMLN6129, PMLN6130
		Clear EP7-Medium Hearing Protectors [Sonic Defenders] Ultra Earplugs Noise reduction = 28dB	RLN6512	Comply™ foam eartip	
		Clear EP7-Large Hearing Protectors [Sonic Defenders] Ultra Earplugs Noise reduction = 28dB	RLN6513	Comply™ foam eartip	

* For High Noise Kit solution - combine RLN6242 Low Noise Kit with translucent tube and clear rubber eartip and RLN6281 Replacement Foam Plugs for RLN6242. Noise reduction = 24dB.



COMPATIBILITY	ACCESSORY			FEATURES
SURVEILLANCE KIT ACCESSORIES AND REPLACEMENT PARTS				
APX PORTABLE RADIOS	SURVEILLANCE ACCESSORIES	DESCRIPTION	PART NUMBER	EARPIECE TYPE
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES SRX 2200 SERIES		Small Clear Comfortable Earpiece, right ear	RLN4760	Clear comfortable earpiece
		Medium Clear Comfortable Earpiece, right ear	RLN4761	Clear comfortable earpiece
		Large Clear Comfortable Earpiece, right ear	RLN4762	Clear comfortable earpiece
		Small Clear Comfortable Earpiece, left ear	RLN4763	Clear comfortable earpiece
		Medium Clear Comfortable Earpiece, left ear	RLN4764	Clear comfortable earpiece
		Large Clear Comfortable Earpiece, left ear	RLN4765	Clear comfortable earpiece
SURVEILLANCE KIT AUDIO ADAPTERS				
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES SRX 2200 SERIES		3.5mm Threaded Audio Adapter	BDN6783	BDN6664, BDN6665, BDN6666, BDN6667, BDN6668, BDN6669, BDN6726, BDN6727, BDN6728, BDN6729, BDN6730, BDN6731, BDN6732, BDN6670
		6 Pin Hirose Keyload & Audio Adapter, FM/IS rated	NNTN7869	ZMN6031, ZMN6032, ZMN6038, ZMN6039

APX PORTABLE RADIO ACCESSORIES



XBT HEAVY-DUTY WIRELESS HEADSET IN USE

It's the middle of a shift and with machinery running at full speed, your workplace is a noisy place to be. You need to communicate on your radio while still being aware of everything around you. XBT heavy-duty headsets connect wirelessly to your radio, suppressing noise for clearer communications. With patented SENS™ situational awareness technology, these headsets ensure you'll hear critical communications from co-workers in the field with you.

COMPATIBILITY	ACCESSORY			FEATURES								MARKET[1]						
HEADSETS																		
APX PORTABLE RADIOS	HEADSETS	DESCRIPTION	PART NUMBER	IMPRES	HEADSET TYPE	SPEAKER	NOISE-CANCELLING / NOISE-REDUCTION	MICROPHONE	PTT	INTRINSIC SAFETY RATING	WEIGHT	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES SRX 2200 SERIES		IMPRES Temple Transducer with boom microphone and inline push-to-talk 7580384M19 - Replacement rubber temple cover (1 pair)	PMLN5101	●	Behind-the-Head	Bone Conduction		Boom	In-line	FM	Lightweight	●		●		●	●	●
		Earset D-Shell	PMLN5096		Over-the-Ear	Single-Ear		Boom	In-line		Lightweight							
		Ultra Lite Headset	PMLN5102		Over-the-Head	Single-Ear		Boom	In-line		Lightweight							
		Lightweight Over-the-Head Headset single muff with in-line push-to-talk and boom mic REX4648 - replacement foam earpad and microphone cover kit	RMN5058		Over-the-Head	Single-Ear		Boom	In-line	FM TIA[1]	Lightweight			●		●	●	●
		Heavy-Duty Behind-the-Head Headset with Noise-Cancelling boom microphone, noise reduction = 24dB	PMLN5275		Behind-the-Head	Dual-Ear	●	Boom	In-line	FM TIA[1]	Heavy-Duty					●	●	●
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES SRX 2200 SERIES		XBT Operations Critical Wireless Behind-the-Neck Headset	RLN6490*		Behind-the-Neck	Dual-Ear	●	Boom	Radio, headset or wireless PTT pod		Heavy-Duty					●		●
		XBT Operations Critical Wireless Headband Style Headset	RLN6491*		Over-the-Head	Dual-Ear	●	Boom	Radio, headset or wireless PTT pod		Heavy-Duty					●		●

[1]These are recommended uses based on typical use case for each market listed.

*[1] Requires FM IS approved Windows 10 tablet and FM IS certified TIA-4950-approved APX 4000 two knob radio
*[2] Requires APX MODELS WITH FULL KEYPAD. Minimum radio requirements: Code-Plug Version – R13.00.01 Firmware – R13.00.05 Option Board – R08.00.00

P25 System and Services Agreement (R1422515R1/P1)
Schedule 8 Specifications

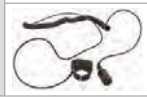
APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY				FEATURES					
3M PELTOR HEAVY DUTY HEADSETS										
APX PORTABLE RADIOS	3M PELTOR HEAVY DUTY HEADSETS	DESCRIPTION AND ADAPTER TYPE	PART NUMBER	PELTOR PART NUMBER	HEADSET TYPE	CONNECTOR TYPE	SPEAKER	NOISE REDUCTION RATING (NRR)	NOISE CANCELLING MICROPHONE	PTT (APX)
DIRECT CONNECT										
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES SRX 2200 SERIES		MT Series Over-The-Head Headset, direct radio connect	RMN5137	MT7H79A-C5063-34	Over-The-Head	Connects directly to Radio	Dual-Ear	25dB	Boom	On Ear Cup
		MT Series Neckband Headset, direct radio connect	RMN5138	MT7H79B-C5063-34	Neckband	Connects directly to Radio	Dual-Ear	24dB	Boom	On Ear Cup
		MT Series Hard Hat Attached Headset, direct radio connect	RMN5139	MT7H79P3E-C5063-34	Hard Hat Attached	Connects directly to Radio	Dual-Ear	21dB	Boom	On Ear Cup
PTT ADAPTER CONFIGURATIONS										
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES SRX 2200 SERIES		MT Series Over-the-Head Headset with Nexus connector	PMLN6088	MT7H79A-34	Over-the-Head	Nexus	Dual-Ear	25dB	Boom	Requires PTT Adapter PMLN6095
		MT Series Neckband Headset with Nexus connector	RLN6477	MT7H79B-34	Neckband	Nexus	Dual-Ear	24dB	Boom	Requires PTT Adapter PMLN6095
		MT Series Hard Hat Attached with Nexus connector	RMN4051	MT7H79P3E-34	Hard Hat Attached	Nexus	Dual-Ear	21dB	Boom	Requires PTT Adapter PMLN6095
		TacticalPro Series Over-The-Head Headset with Nexus connector	RMN4052	MT15H7A-34	Over-The-Head	Nexus	Dual-Ear	26dB	Boom	Requires PTT Adapter PMLN6095
		TacticalPro Series Neckband Headset with Nexus connector	RMN5135	MT15H7B-07-34	Neckband	Nexus	Dual-Ear	25dB	Boom	Requires PTT Adapter PMLN6095
		TacticalPro Series Hard Hat Attached with Nexus connector	RMN4053	MT15H7P3E-34	Hard Hat Attached	Nexus	Dual-Ear	22dB	Boom	Requires PTT Adapter PMLN6095
		PTT Nexus Adapter	PMLN6095	FL5063-34						
RSM CONFIGURATIONS										
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES SRX 2200 SERIES		HT Series Listen Only Over-The-Head Headset with 3.5mm NON threaded connector	RMN4055	HTM79A-34	Over-The-Head	3.5mm NON threaded	Dual-Ear	25dB	(Listen-Only)	APX radio requires RSM: PMMN4062, PMMN4069 or PMMN4084
		HT Series Listen Only Neckband Headset with 3.5mm NON threaded connector	RMN5132	HTM79B-34	Neckband	3.5mm NON threaded	Dual-Ear	24dB	(Listen-Only)	
		HT Series Listen Only Hard Hat Attached Headset with 3.5mm NON threaded connector	RMN5133	HTM79P3E-34	Hard Hat Attached	3.5mm NON threaded	Dual-Ear	23dB	(Listen-Only)	



COMPATIBILITY	ACCESSORY			
REPLACEMENT PARTS				
APX PORTABLE RADIOS	REPLACEMENT PARTS	DESCRIPTION	PART NUMBER	PELTOR PART NUMBER
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES SRX 2200 SERIES		Earmuff Hygiene Kit Black Earseals	RLN4923	HY79
		Hygiene Tape for Microphone	RLN6542	HYM1000
		Boom Microphone Wind Screen	RLN6543	M40/1
		Metal Boom with Microphone	RMN5131	MT7N

APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY			FEATURES				MARKET[1]						
HEARING PROTECTION														
APX PORTABLE RADIOS	SURVEILLANCE ACCESSORIES	DESCRIPTION	PART NUMBER	IMPRES	HEADSET TYPE	SPEAKER	NOISE-CANCELLING / NOISE-REDUCTION	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES SRX 2200 SERIES		Clear EP7-Small Hearing Protectors [Sonic Defenders] Ultra Earplugs, noise reduction = 28dB	RLN6511		Comply™ Foam Ear tip		Noise Reduction					●	●	●
		Clear EP7-Medium Hearing Protectors [Sonic Defenders] Ultra Earplugs, noise reduction = 28dB	RLN6512		Comply™ Foam Ear tip		Noise Reduction					●	●	●
		Clear EP7-Large Hearing Protectors [Sonic Defenders] Ultra Earplugs, noise reduction = 28dB	RLN6513		Comply™ Foam Ear tip		Noise Reduction					●	●	●
TACTICAL SOLUTIONS														
APX 7000 SERIES		Tactical PTT/VOX Interface Module	PMLN6765					●	●	●	●	●		●
APX 7000XE SERIES		Tactical PTT Only Interface Module	PMLN6827					●	●	●	●	●		●
APX 6000 SERIES		Tactical Boomless Temple Transducer (requires Interface Module PMLN6765 or PMLN6827)	PMLN6766		Over-the-head	Bone Conduction	Noise Cancelling	●		●	●	●		●
APX 6000XE SERIES		Tactical Throat Microphone (requires Interface Module PMLN6765 or PMLN6827)	PMLN6828		Neckband	Earbud	Noise Cancelling	●		●	●	●		●
APX 4000 SERIES		Tactical Ear Microphone (requires Interface Module PMLN6765 or PMLN6827)	PMLN6829		In-Ear	In-Ear	Noise Cancelling	●	●			●		●
APX 3000 SERIES		Tactical Temple Transducer / Boom Mic (requires Interface Module PMLN6765 or PMLN6827)	PMLN6833		Over-the-head	Bone Conduction	Noise Cancelling	●			●	●		●
SRX 2200 SERIES		Tactical Remote Body PTT (for use with Interface Module PMLN6765 or PMLN6827)	PMLN6767					●	●	●	●	●		●
		Tactical Remote Ring PTT (for use with Interface Module PMLN6765 or PMLN6827)	PMLN6830						●		●			●

[1]These are recommended uses based on typical use case for each market listed.

WHAT ARE THE EP7 SONIC DEFENDERS ULTRA EARPLUGS?

RLN6511, RLN6512, RLN6513

The EP7 Sonic Defenders Ultra Earplugs provide extra comfort and/or noise protection for users wearing surveillance accessories or users wearing heavy duty headsets / helmets. With a foam-tipped stem design and soft memory-foam Comply™ Canal Tips, these comfortable earplugs protect your hearing without blocking your ability to hear routine sounds or conversations. Safe sounds are allowed to pass through into the ear canal, while potentially harmful noises (above 85dB) are reduced through a filter.

Filter caps are included and can be inserted for additional hearing protection or removed for use with surveillance kits.* With a patented EarLock® technology to hold them in place, all-day comfort, and a low-profile design, these earplugs can be worn while wearing a helmet or mask, or while using a phone or heavy duty headset. Lanyard is included in each earplug kit, as shown in picture.

*EP7 earpiece will not provide full 28dB Noise Reduction when the noise-reducing filter is removed.

Motorola's Tactical Solution offers a high performance interface enhanced by high speed DSP (Digital Signal Processor) which only detects the human voice.

Providing steady and trouble free transmission without clipping your message even in the noisiest environments.

Combined with various headset assures efficient and safer operation in a variety of work environments.

APX PORTABLE RADIO ACCESSORIES



HOW DO MISSION CRITICAL WIRELESS ACCESSORIES HELP ME?

They free you from being physically connected to the radio and are ideal for surveillance operations. They look CONSUMER, but are mission critical in performance and provide exceptional flexibility, high security, superior audio performance and a new dimension of freedom. Carry your radio in a backpack, bag or purse without being constrained by wires. YOUR RADIO, UNLEASHED.

COMPATIBILITY	ACCESSORY			FEATURES										MARKET[1]						
MISSION CRITICAL WIRELESS ACCESSORIES (MCW) This portfolio is a game changer, giving you the flexibility to remove the radio from your belt and stay connected within 30 feet.																				
PORTABLE RADIOS	ACCESSORIES	DESCRIPTION	PART NUMBER	EARPIECE TYPE	MICROPHONE	PTT	TALK TIME (HOURS) 5/5/90 DUTY CYCLE	CHARGE TIME (HOURS)	WEIGHT (GRAMS)	SIZE (MILLIMETERS)	RANGE (FEET LINE OF SIGHT)	IP RATING*	INTRINSIC SAFETY RATING[2]	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES SRX 2200 SERIES		Mission Critical Wireless Earpiece with 12" cable and push-to-talk pod	NTN2570	Over-the-Ear (CommPort™)	Directional, above the Earpiece	●	10	3	43	70 x 41 x 25	30	IP54	FM	●	●	●	●	●		●
		Mission Critical Wireless push-to-talk pod	NTN2571	N/A	N/A	●	10	3	43	70 x 41 x 25	30	IP54	FM	●	●	●	●	●		●
		Mission Critical Wireless Remote Control Keyfob with programmable buttons	NNTN8442	N/A	N/A	●	10	3	26	67 x 32 x 16	30	IP54		●			●			

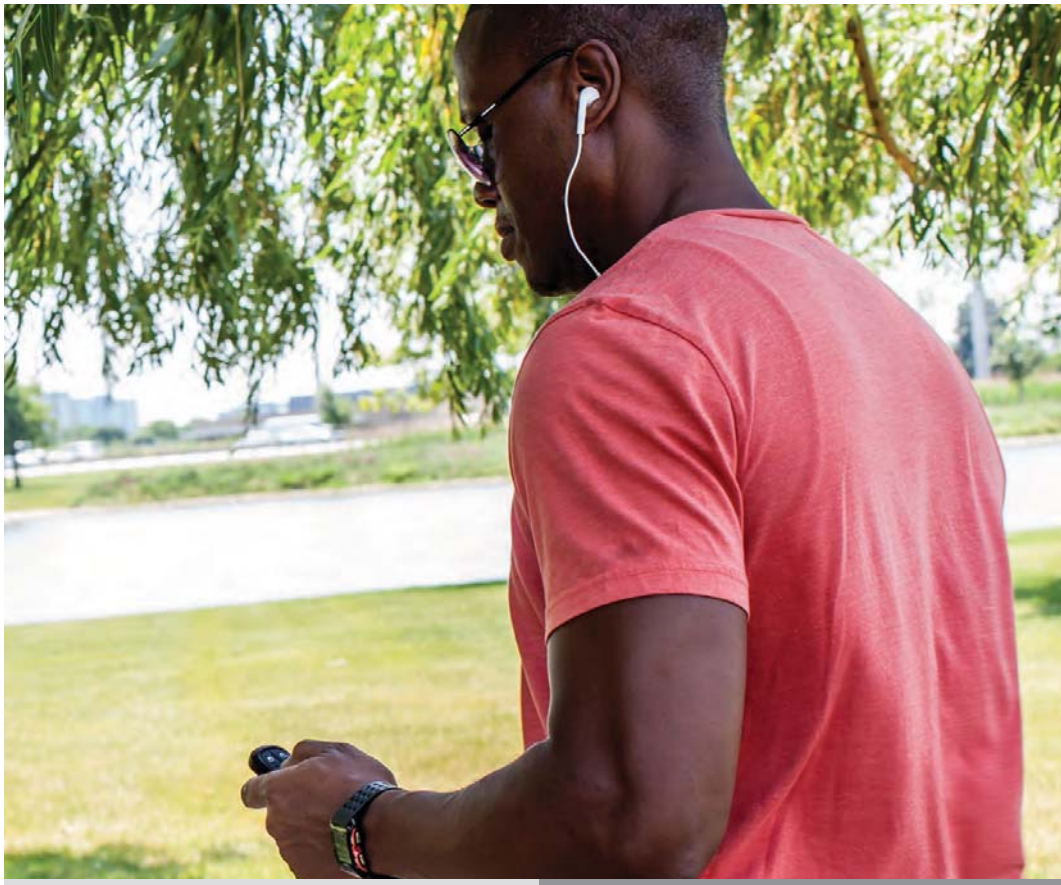
[1] These are recommended uses based on typical use case for each market listed.
[2] Accessory solution is FM certified when used with an FM certified radio system and FM certified adapter if required.
* International Protection (IP) is a global standard for rating dust and water protection. The first digit IP5x or IP6x represents increased levels of dust protection, while the second digit, IPx7 represents withstanding submersion in 1 meter of fresh water for 30 minutes. Rugged batteries exceed industry standards (IPx7) for submersibility and provide a higher level of water protection – MIL-STD-810E, Method 512.3 (Immersion). These batteries meet the incremental requirement of submersion in 1 meter of fresh water that is 27C colder than the product for 2 hours.

EARPIECE TYPE: Choose the right fit for your operations – a simple, low cost, discreet earbud or the rugged, high performance CommPort™ style earpiece.

MICROPHONE: The in-line microphone on the earbud earpiece is designed for general use, while the directional microphone on the CommPort™ style earpiece is ideal for lower noise environments.

APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY			FEATURES		
MISSION CRITICAL WIRELESS ACCESSORIES This portfolio is a game changer, giving you the flexibility to remove the radio from your belt and stay connected within 30 feet.						
PORTABLE RADIOS	**ACCESSORIES**	**DESCRIPTION**	**PART NUMBER**	**EARPIECE TYPE**	**MICROPHONE**	**PTT**
APX 7000 SERIES		1- Wire Surveillance kit with Translucent Acoustic tube for Wireless PTT Pods	PMLN7052	Clear Rubber Eartip	In-line	On Pod, ordered separately
		1- Wire Earbud for Wireless Push-to-Talk pod with 11.5" cable, Black	NNTN8294	Earbud	In-line	On Pod, ordered separately
		1- Wire Earbud for Wireless Push-to-Talk pod with 45" cable, Black	NNTN8295	Earbud	In-line	On Pod, ordered separately
		Covert Audio Kit for Mission Critical Wireless PTT Pod	NNTN8296	1 earbud and 2 earbud headsets	In-line	On Pod, ordered separately
		Y-Adapter and Retention Hook for Mission Critical Wireless Push-to-Talk Pod	NNTN8385		Directional, on separate wire	On Pod, ordered separately
APX 7000XE SERIES		Neckloop for Discreet Earpiece Kit	RLN4920			
		Accessory Kit, Completely Discreet Wireless Surveillance Kit	NNTN8434			
APX 6000 SERIES		Commercial 3.5 Earbud Headset Adapter, 10 per pack	NNTN8737			
		Replacement Wireless Earpiece 12 inch cable	NTN2572	Over-the-Ear (CommPort™)	Directional above the ear comport mic	On Pod, ordered separately
APX 6000XE SERIES		Mission Critical Wireless Covert Pack-N-Go Kit, Basic. Kit includes: NNTN8296 Basic Mission Critical Wireless Covert Kit, NTN2571 Mission Critical Wireless Push-to-Talk (PTT) Pod and NNTN8442 Mission Critical Wireless Remote Control Unit	RLN6489	Earbud and earbud headset	On Y-Adapter or in-line on earbuds	On PTT and MCW Keyfob
APX 4000 SERIES		Mission Critical Wireless Covert Pack-N-Go Kit, Advanced. Kit includes: All contents of Covert Pack-n-Go Kit plus RLN4922 Completely Discreet Earpiece Kit and NNTN8385 Wireless Neckloop Y-adapter	RLN6501	Completely Discreet Earpiece, earbud and earbud headset	On Y-Adapter or in-line on earbuds	On PTT and MCW Keyfob
APX 3000 SERIES		Wireless Earpiece Maintenance Kit with 10 silicone ear tubes, 10 microphone seal strips and 2 foam windscreens for NTN2572 Over-the-Ear earpiece	NTN8821	Over-the-Ear (CommPort™)		
SRX 2200 SERIES		Ear strap for CommPort™ earpiece to secure earpiece to ear (10 per pack)	NTN8988	Over-the-Ear (CommPort™)		
		Eartubes for CommPort™ earpiece (10 per pack)	RLN5037	Over-the-Ear (CommPort™)		
		Replacement ear tips kit for wireless ear buds (20 Small, 20 Medium, 20 Large and 10 clips)	NNTN8361	Earbud		
		Replacement Swivel Clip for Wireless PTT Pod	PMLN6246			
		Replacement or spare micro-usb plug-in charger (US)	PMPN4027			





WHAT MAKES THE COVERT PACK-AND-GO KIT A MUST-HAVE?

Organize and stow all your APX wireless accessories on the go, all in one place. Keep this durable kit in a backpack or messenger bag and you'll always have the right accessories on hand. With a dozen secure straps and deep mesh pockets, you can access exactly what you need when an operation happens.

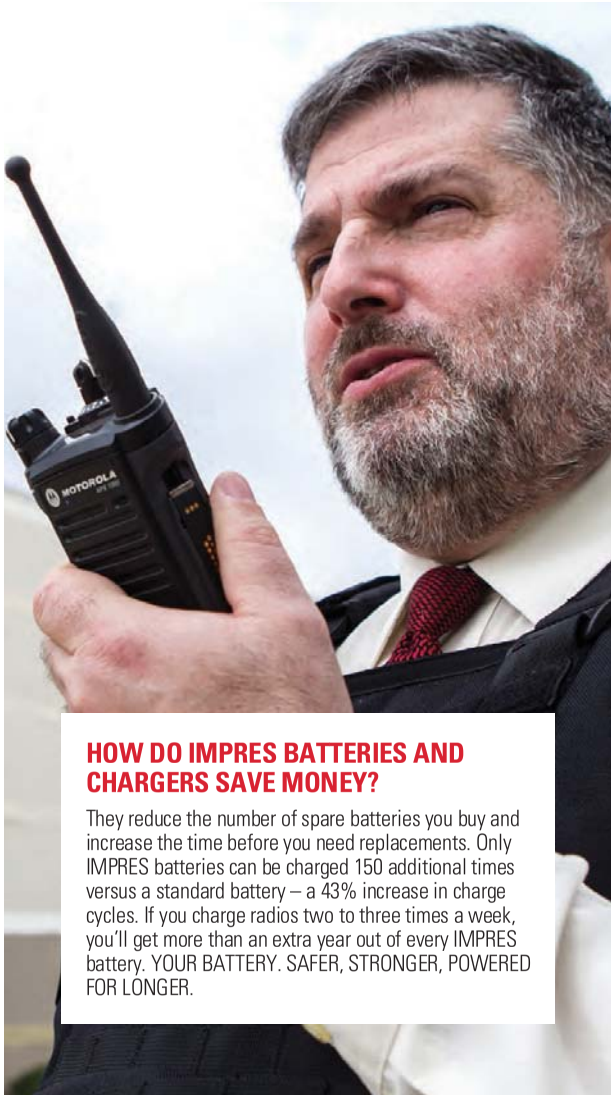
APX PORTABLE RADIO ACCESSORIES

MOTOROLA IMPRES TWO-WAY BATTERIES The only batteries developed, tested and certified for optimal performance with your APX radio.
APX batteries are Proven Tough, in lab test after lab test, to withstand shocks, knocks, drops and shakes and outperform the other brands.

COMPATIBILITY	ACCESSORY			FEATURES							
PORTABLE RADIOS	BATTERIES	DESCRIPTION	PART NUMBER	IMPRES	CHEMISTRY	TYPICAL RATED CAPACITY (mAh)	APPROXIMATE OPERATIONAL TIME (HOURS) 5/5/90 DUTY CYCLE	DIMENSIONS (MILLIMETERS) (H x W x D)	WEIGHT (MAX. GRAMS)	INTRINSIC SAFETY RATING	IP RATING*
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES SRX 2200 SERIES		IMPRES Li-Ion 2200 mAh Slim, Submersible Battery-IP67	PMNN4403	●	Li-Ion	2200	10.5	86 x 59 x 37	142		IP67
		IMPRES Li-Ion 3100 mAh Submersible Battery-IP67	NNTN7038	●	Li-Ion	3100	14	86 x 59 x 42	185		IP67
		IMPRES Li-Ion 2350 mAh, Intrinsically Safe - FM, Submersible, Rugged Battery-IP68	NNTN8092	●	Li-Ion	2350	11	86 x 59 x 42	160	FM	IP68
		IMPRES Li-Ion 4400 mAh -30°C Rated Submersible, Rugged Battery-IP68	NNTN7034	●	Li-Ion	4400	20.5	130 x 59 x 42	285		IP68
		IMPRES Li-Ion 4300 mAh Intrinsically Safe - FM, Submersible, Rugged Battery-IP68	NNTN7033	●	Li-Ion	4300	19.5	130 x 59 x 42	285	FM	IP68
		IMPRES NiMH 2300 mAh, Submersible Battery-IP67	NNTN7037	●	NiMH	2300	10.5	136 x 59 x 40	335		IP67
		IMPRES NiMH 2300 mAh, Submersible Rugged Battery-IP68	NNTN7573	●	NiMH	2300	10.5	136 x 59 x 40	335		IP68
		IMPRES NiMH 2200 mAh Intrinsically Safe - FM, Submersible Battery-IP67	NNTN7036	●	NiMH	2200	10.5	136 x 59 x 40	335	FM	IP67
		IMPRES NiMH 2200 mAh Intrinsically Safe - FM, Submersible Rugged Battery-IP68	NNTN7035	●	NiMH	2200	10.5	136 x 59 x 40	335	FM	IP68
		APX Clamshell Battery Pack (requires 12 AA Alkaline batteries, not included), Submersible Battery-IP57	PMNN4439		AA Alkaline/ Li-Ion	Alkaline: 2700 Li-Ion: 6100	Alkaline: 12 Li-Ion: 27	165 x 60 x 60	Alkaline: 476 Li-Ion: 380		IP57
SRX 2200 SERIES		Military, Li-Ion 3100 mAh, Submersible, Rugged Battery-IP68, Coyote Brown	NNTN8182		Li-Ion	3100	14	86 x 59 x 42	185		IP68

* International Protection (IP) is a global standard for rating dust and water protection. The first digit IP5x or IP6x represents increased levels of dust protection, while the second digit, IPx7 represents withstanding submersion in 1 meter of fresh water for 30 minutes. Rugged batteries exceed industry standards (IPx7) for submersibility and provide a higher level of water protection – MIL-STD-810E, Method 512.3 (Immersion). These batteries meet the incremental requirement of submersion in 1 meter of fresh water that is 27C colder than the product for 2 hours.

† UL certified TIA 4950 approved when used with a UL certified TIA 4950 approved APX 4000 two knob radio



HOW DO IMPRES BATTERIES AND CHARGERS SAVE MONEY?

They reduce the number of spare batteries you buy and increase the time before you need replacements. Only IMPRES batteries can be charged 150 additional times versus a standard battery – a 43% increase in charge cycles. If you charge radios two to three times a week, you'll get more than an extra year out of every IMPRES battery. YOUR BATTERY. SAFER, STRONGER, POWERED FOR LONGER.

APX PORTABLE RADIO ACCESSORIES



COMPATIBILITY | **ACCESSORY** | **FEATURES**

MOTOROLA IMPRES TWO-WAY BATTERIES The only batteries developed, tested and certified for optimal performance with your APX radio.
APX batteries are Proven Tough, in lab test after lab test, to withstand shocks, knocks, drops and shakes and outperform the other brands.

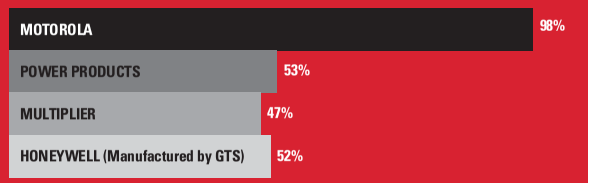
PORTABLE RADIOS	BATTERIES	DESCRIPTION	PART NUMBER	IMPRES	CHEMISTRY	TYPICAL RATED CAPACITY (mAh)	APPROXIMATE OPERATIONAL TIME (HOURS) 5/5/90 DUTY CYCLE	DIMENSIONS (MILLIMETERS) (H x W x D)	WEIGHT (MAX. GRAMS)	INTRINSIC SAFETY RATING	IP RATING*
APX 4000 SERIES		IMPRES Li-Ion 2000 mAh Slim, Submersible, Battery-IP67	NNTN8128	●	Li-Ion	2000	8.5	115 x 52 x 18	160		IP67
		APX 4000 two knob radio IMPRES Hi-Cap Li-Ion 2500 mAh battery Submersible (IP57), Intrinsically Safe (TIA4950)	NNTN8560	●	Li-Ion	2500	11	113 x 52 x 23	195	TIA†	IP57
APX 3000 SERIES		IMPRES Li-Ion 2350 mAh Submersible, Battery-IP67	PMNN4424	●	Li-Ion	2350	10.5	115 x 52 x 23	170		IP67
APX 1000 SERIES		IMPRES Li-Ion 2800 mAh Submersible, Battery-IP67	PMNN4448	●	Li-Ion	2800	13	115 x 52 x 23	170		IP67
		IMPRES Li-Ion 2350 mAh Intrinsically Safe - FM, Submersible, Battery-IP67	NNTN8129	●	Li-Ion	2350	10.5	115 x 52 x 23	170	FM	IP67
APX 3000 SERIES		IMPRES Li-Ion 1300 mAh Slim, Submersible, Battery-IP67	NNTN8305	●	Li-Ion	1300	6	115 x 52 x 14	98		IP67

KNOCKS. DROPS. SHOCKS. VIBRATION. STATIC.

If your radio gets banged on a ride, rattled by heavy equipment or shocked by static electricity, our batteries will stay true and stand tough. These rigorous lab tests prove that Motorola radio batteries perform robustly and reliably, despite the toughest conditions. What's more, we stand behind every battery we build.

See www.motorolasolutions.com/proventough for details.

PROVEN TOUGH BATTERY TESTING PASS RATE



APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY			FEATURES							
CHARGER SOLUTIONS Choose from a variety of solutions including single-unit, unique dual-unit, multi-unit, travel and vehicular chargers and be confident your radio is charged and ready to go the moment you need it.											
PORTABLE RADIOS	CHARGERS	DESCRIPTION	PART NUMBER	IMPRES	CHEMISTRY	POWER SOURCE	DIMENSIONS (MILLIMETERS) (H x W x D)	NUMBER OF POCKETS	RECONDITIONING CAPABLE	CHARGING CURRENT (MAX.)	NUMBER OF DISPLAYS
DESKTOP, SINGLE AND MULTI-UNIT CHARGERS											
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES SRX 2200 SERIES		IMPRES Single-Unit Rapid Rate Charger, 120V (US Plug)	WPLN7080	●	Li-Ion, NiMH	120VAC	60 x 97 x 163	1	●	Rapid Rate	
APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES		IMPRES Single-Unit Rapid Rate Charger, 120V (US Plug)	WPLN4232	●	Li-Ion, NiMH	120VAC	60 x 97 x 163	1	●	Rapid Rate	
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES SRX 2200 SERIES		IMPRES Dual-Unit Rapid Rate Charger with 2 Displays, 120V (US plug)	NNTN7593	●	Li-Ion, NiMH	120VAC	64 x 142 x 208	2	●	Rapid Rate	2
		IMPRES Dual-Unit Rapid Rate Charger, 120V (US plug)	NNTN7586	●	Li-Ion, NiMH	120VAC	64 x 142 x 208	2	●	Rapid Rate	
		IMPRES Multi-Unit Rapid Rate Charger with 6 Displays, 120V (US plug)	NNTN7073	●	Li-Ion, NiMH	120VAC	153 x 445 x 292	6	●	Rapid Rate	6
		IMPRES Multi-Unit Rapid Rate Charger with 1 Display, 120V (US plug)	NNTN7065	●	Li-Ion, NiMH	120VAC	153 x 445 x 292	6	●	Rapid Rate	1
APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES		IMPRES Multi-Unit Rapid Rate Charger with 6 Displays, 120V (US plug)	WPLN4219	●	Li-Ion, NiMH	120VAC	153 x 445 x 292	6	●	Rapid Rate	6
		IMPRES Multi-Unit Rapid Rate Charger with 1 Display, 120V (US plug)	WPLN4212	●	Li-Ion, NiMH	120VAC	153 x 445 x 292	6	●	Rapid Rate	1
SRX 2200 SERIES		Military, IMPRES Multi-Unit Rapid Rate, Charger, 120V (US Plug) with Pocket Inserts	NNTN8185	●	Li-Ion, NiMH	120VAC	153 x 445 x 292	6	●	Rapid Rate	
VEHICULAR, TRAVEL CHARGERS AND VEHICULAR ADAPTER (VA)											
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES SRX 2200 SERIES		IMPRES Single-Unit Rapid Rate Vehicular Charger	NNTN7624	●	Li-Ion, NiMH	12VDC hardwire	82 x 97 x 200	1		Rapid Rate	
APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES		IMPRES Single-Unit Rapid Rate Vehicular Charger	NNTN7616	●	Li-Ion, NiMH	12VDC hardwire	82 x 97 x 200	1		Rapid Rate	
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES SRX 2200 SERIES		Travel Charger with voltage regulated vehicular charger adapter, custom charger base, mounting bracket, and coil cord	RLN6434		Li-Ion, NiMH	12VDC cigarette lighter adapter	67 x 67 x 70	1			
APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES		Travel Charger with voltage regulated vehicular charger adapter, custom charger base, mounting bracket, and coil cord	NNTN8525		Li-Ion, NiMH	12VDC cigarette lighter adapter	64 x 67 x 57	1			
APX 6000 SERIES APX 6000XE SERIES SRX 2200 SERIES VHF IS NOT SUPPORTED		APX Vehicular Adapter includes fused power cable, 2 keys for the lock, screws for attaching VA to the trunnion & quick start guide. Trunnion mounting bracket NTN8940 must be ordered separately.	NNTN8527*		Li-Ion		254 x 137 x 84	1		Rapid Rate	
		Trunnion Mounting Bracket	NTN8940								

*Radios require firmware version, R13.00.00 or later. Not compatible with VHF radios.



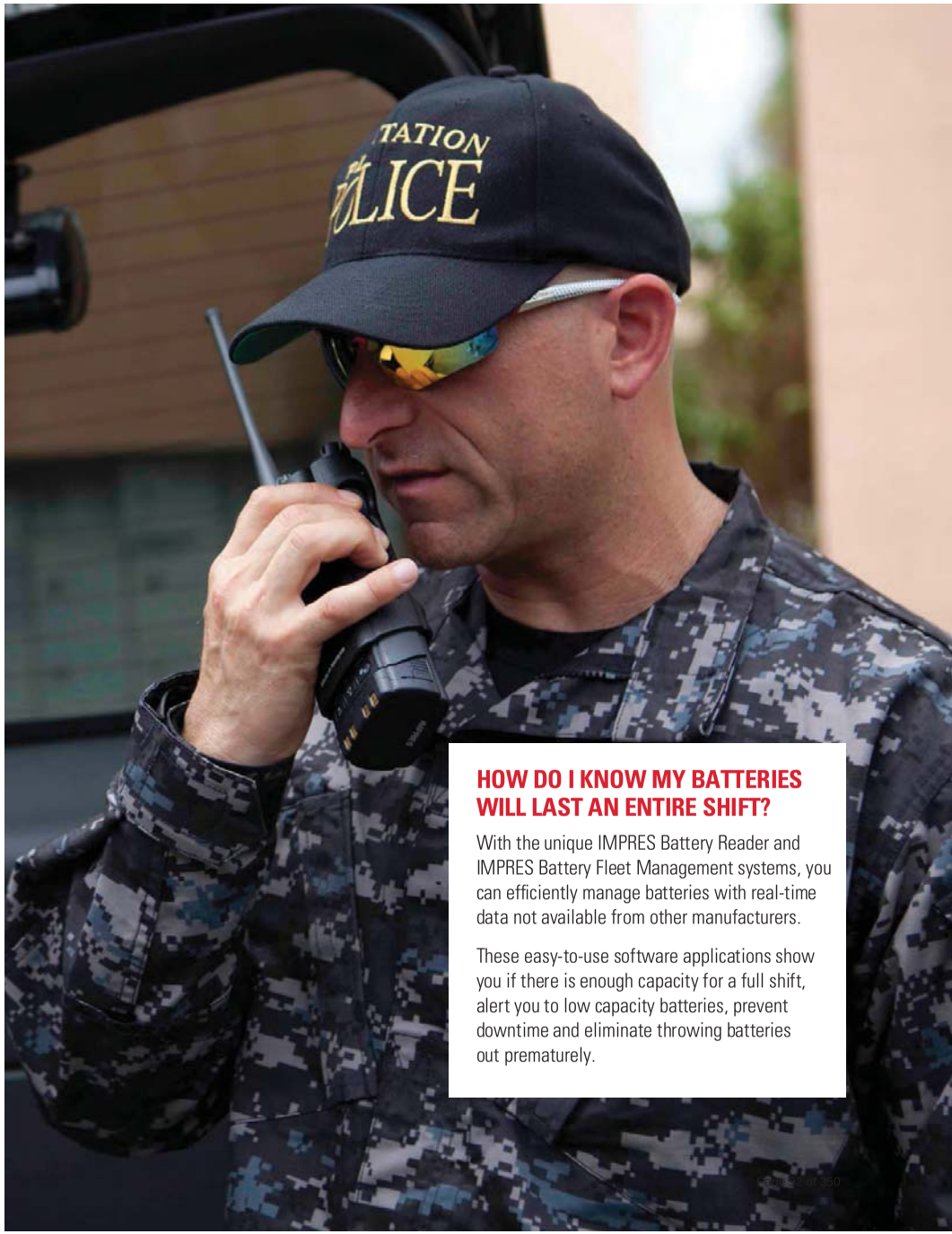
IMPRES BATTERIES AND CHARGERS: Get the most out of every battery and eliminate the surprise of "low battery alerts". IMPRES Display chargers tell you exactly how much capacity is in an IMPRES battery before you attach it to your radio and exactly when an IMPRES battery has reached the end of service life.

BATTERY WARRANTY: Take advantage of the longest warranty in the industry. Our warranty protects against any defects in workmanship for **four years** – twice as long as most leading competitive batteries.

NUMBER OF POCKETS: APX multi-unit chargers let you simultaneously charge up to 6 radios and/or batteries.

APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY		
CHARGER SOLUTIONS			
APX PORTABLE RADIOS	**CHARGER ACCESSORIES**	**DESCRIPTION**	**PART NUMBER**
SINGLE AND MULTI-UNIT CHARGER ACCESSORIES			
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES SRX 2200 SERIES		Display Module for IMPRES Multi-Unit Charger	RLN5382
		Wall Mount Bracket for IMPRES Multi-Unit Charger	NLN7967
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES SRX 2200 SERIES		Insert for WPLN4108/4130 XTS Multi-Unit Charger (6 per pack)	NNTN7686
		Insert for NTN1873/WPLN4111 XTS Single-Unit Charger	NNTN7687
APX 3000 SERIES APX 4000 SERIES APX 1000 SERIES		Insert for WPLN4108/4130 XTS Multi-Unit Charger (6 per pack)	NNTN8170
		Insert for NTN1873/WPLN4111 XTS Single-Unit Charger	NNTN8169
IMPRES BATTERY MANAGEMENT TOOLS			
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES SRX 2200 SERIES		IMPRES Battery Reader	NNTN7392
		IMPRES Battery Fleet Management Software (http://www.motorolasolutions.com/US-EN/Business+Product+and+Services/Accessories/Two-Way+Radio+Accessories/Batteries/IMPRES)	NNTN7676
		IMPRES Battery Fleet Management License Key	HKVN4036
		IMPRES Battery Fleet Management Multi-Unit Charger Interface Unit	NNTN7677
		IMPRES Battery Fleet Management Single-Unit Charger Interface Unit	NNTN8045
KEYLOAD CABLES			
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES SRX 2200 SERIES		Keyloader Cable, KVL3000 & KVL4000	WPLN6904



HOW DO I KNOW MY BATTERIES WILL LAST AN ENTIRE SHIFT?

With the unique IMPRES Battery Reader and IMPRES Battery Fleet Management systems, you can efficiently manage batteries with real-time data not available from other manufacturers.

These easy-to-use software applications show you if there is enough capacity for a full shift, alert you to low capacity batteries, prevent downtime and eliminate throwing batteries out prematurely.

APX PORTABLE RADIO ACCESSORIES



CARRY SOLUTIONS

Motorola Carry Solutions were developed to meet the demands of public safety and other users who operate in the most rigorous of environments. A variety of carrying accessories are available for comfort and convenience.

LEATHER CARRY CASES

Motorola Leather Carry Cases constructed of top-grain leather are designed to withstand the harsh conditions of public safety users.

COMPATIBILITY	ACCESSORY							FEATURES
CARRY SOLUTIONS Carry cases and holders are available in sizes designed to fit your radio and battery and permit audio to be heard clearly. Our carry accessories keep your hands-free, so you can concentrate on the task at hand.								
PORTABLE RADIOS	CARRY SOLUTIONS		DESCRIPTION	PART NUMBER	MATERIAL	BELT LOOP/CLIP DIMENSION (INCHES)	SWIVEL / FIXED	D-RINGS
APX 7000 SERIES			Carry Holder for 1.5, 2.5 and 3.5 Model Radios	PMLN5331	Plastic	3	Fixed	
APX 7000XE SERIES			Carry Holder for 1.5, 2.5 and 3.5 Model Radios only	PMLN6102	Plastic	3	Fixed	
APX 6000 SERIES			Carry Holder for 1.5, 2.5 and 3.5 Model Radios	PMLN5709	Plastic	2.5	Fixed	
APX 6000XE SERIES			Carry Holder for 1.5, 2.5 and 3.5 Model Radios	PMLN5880	Plastic	3	Fixed	
APX 3000 SERIES			Covert Carry Holster	PMLN6327	Plastic	3	Fixed	
 APX 7000 SERIES			Leather Carry Case with 3" Fixed Belt Loop for NNTN7038, PMMN4403 and NNTN8092 Batteries	PMLN5323	Hard Leather	3	Fixed	●
			Leather Carry Case with 3" Fixed Belt Loop for NNTN7033 and NNTN7034 Batteries	PMLN5326	Hard Leather	3	Fixed	●
			Leather Carry Case with 3" Fixed Belt Loop for NNTN7035, NNTN7036, NNTN7037 and NNTN7573 Batteries	PMLN5329	Hard Leather	3	Fixed	●
			Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop for NNTN7038, PMMN4403 and NNTN8092 Batteries	PMLN5324	Hard Leather	2.75	Swivel	●

COMPATIBILITY	ACCESSORY							FEATURES
CARRY SOLUTIONS								
PORTABLE RADIOS	CARRY SOLUTIONS		DESCRIPTION	PART NUMBER	MATERIAL	BELT LOOP/CLIP DIMENSION (INCHES)	SWIVEL / FIXED	D-RINGS
 APX 7000 SERIES			Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop for NNTN7033 and NNTN7034 Batteries	PMLN5327	Hard Leather	2.75	Swivel	●
			Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop for NNTN7035, NNTN7036, NNTN7037 and NNTN7573 Batteries	PMLN5330	Hard Leather	2.75	Swivel	●
			Dual Display Radio Flip Leather Carry Case with 2.75" Swivel Belt Loop for NNTN7038, PMMN4403 and NNTN8092 Batteries	PMLN5560	Hard Leather	2.75	Swivel	●
APX 7000XE SERIES APX 6000XE SERIES APX 7000 SERIES APX 6000 SERIES			Molded Nylon carry case with quick disconnect swivel and adjustable lanyard	PMLN6802	Nylon		Swivel	
 APX 7000XE SERIES			Leather Carry Case with 3" Fixed Belt Loop for NNTN7038, PMMN4403 and NNTN8092 Batteries	NNTN8112	Hard Leather	3	Fixed	●
			Leather Carry Case with 3" Fixed Belt Loop for NNTN7033 and NNTN7034 Batteries	NNTN8114	Hard Leather	3	Fixed	●
			Leather Carry Case with 3" Fixed Belt Loop for NNTN7035, NNTN7036, NNTN7037 and NNTN7573 Batteries	NNTN8116	Hard Leather	3	Fixed	●

MATERIAL: Choose from comfortable and flexible nylon cases, rugged, durable hard leather cases or carry holsters.

SWIVEL OR FIXED LOOP: Secure to a belt loop and the case swings freely from side to side. The swivel latch system also allows the radio and case to be removed from the belt loop by simply inverting, lifting it up and out of the belt loop. Fixed loops provide a sturdy attachment to your belt.

APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY			FEATURES			
CARRY SOLUTIONS							
PORTABLE RADIOS	CARRY SOLUTIONS	DESCRIPTION	PART NUMBER	MATERIAL	BELT LOOP/CLIP DIMENSION (INCHES)	SWIVEL / FIXED	D-RINGS
APX 7000XE SERIES		Leather Carry Case and 2.75" Swivel Belt Loop for NNTN7038, PMMN4403 and NNTN8092 Batteries	NNTN8111	Hard Leather	2.75	Swivel	
		Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop for NNTN7033 and NNTN7034 Batteries	NNTN8113	Hard Leather	2.75	Swivel	●
		Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop for NNTN7035, NNTN7036, NNTN7037 and NNTN7573 Batteries	NNTN8115	Hard Leather	2.75	Swivel	●
		Boston Leather Carry Case with D Rings – Requires an Audio Accessory, Radio strap holds down radio by strapping over the Audio Accessory connector, used with Boston Leather radio straps	AY000222A01	Hard Leather			●
APX 6000 SERIES		Leather Carry Case with 3" Fixed Belt Loop for NNTN7038, PMMN4403 and NNTN8092 Batteries	PMLN5658	Hard Leather	3	Fixed	●
		Leather Carry Case with 3" Fixed Belt Loop for NNTN7033 and NNTN7034 Batteries	PMLN5660	Hard Leather	3	Fixed	●
		Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop for NNTN7038, PMMN4403 and NNTN8092 Batteries	PMLN5657	Hard Leather	2.75	Swivel	●
		Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop for NNTN7033 and NNTN7034 Batteries	PMLN5659	Hard Leather	2.75	Swivel	●
APX 6000XE SERIES		Leather Carry Case with 3" Fixed Belt Loop for NNTN7038, PMMN4403 and NNTN8092 Batteries	PMLN5876	Hard Leather	3	Fixed	●
		Leather Carry Case with 3" Fixed Belt Loop for NNTN7033 and NNTN7034 Batteries	PMLN5879	Hard Leather	3	Fixed	●
		Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop for NNTN7038, PMMN4403 and NNTN8092 Batteries	PMLN5875	Hard Leather	2.75	Swivel	●
		Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop for NNTN7033 and NNTN7034 Batteries	PMLN5877	Hard Leather	2.75	Swivel	●
APX 4000 SERIES APX 1000 SERIES		Leather Carry Case with 2.5" Swivel Belt Loop	PMLN6085	Hard Leather	2.5	Swivel	
		Carry case for APX 4000 two knob radios	PMLN7182	Hard Leather	2.5	Swivel	●
		Replacement belt loop for PMLN7182	PMLN7229				
SRX 2200 SERIES		Nylon, Coyote brown carry pouch designed to fit with the elite special ops "MOLLE" vest (sold separately)	NNTN8269	Nylon	Up to 5	Fixed	
		Coyote Brown Carry Case	RLN6253	Nylon	Up to 5	Fixed	



APX PORTABLE RADIO ACCESSORIES

CARRY SOLUTIONS

COMPATIBILITY	ACCESSORY			FEATURES			
PORTABLE RADIOS	CARRY SOLUTIONS	DESCRIPTION	PART NUMBER	MATERIAL	BELT LOOP/CLIP DIMENSION (INCHES)	SWIVEL / FIXED	D-RINGS
APX 7000 SERIES		Nylon Carry Case with 3" Fixed Belt Loop for NNTN7038, PMMN4403 and NNTN8092 Batteries	PMLN5322	Nylon	3	Fixed	●
		Nylon Carry Case with 3" Fixed Belt Loop for NNTN7033 and NNTN7034 Batteries	PMLN5325	Nylon	3	Fixed	●
		Nylon Carry Case with 3" Fixed Belt Loop for NNTN7035, NNTN7036, NNTN7037 and NNTN7573 Batteries	PMLN5328	Nylon	3	Fixed	●
		Carry Case for APX Radio with Clamshell Battery	PMLN6712	Nylon	Up to 5	Fixed	●
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES		2.5" Hard Plastic Belt Clip (not compatible with UHF Portable Radios)	NTN8266	Plastic	2.5		
		3" Hard Plastic Belt Clip	HLN6875	Plastic	3		
		Universal Chest Pack with Radio Holder, Pen Holder and Velcro Secured Pouch	HLN6602	Nylon			
		Break-a-Way Chest Pack with Radio Holder Pen Holder and Velcro Secured Pouch	RLN4570	Nylon			
		Replacement Strap for HLN6602 and RLN4570	1505596Z02	Nylon			
APX 4000 SERIES APX 1000 SERIES		2" Hard Plastic Belt Clip	PMLN4651	Plastic	2		
		2.5" Hard Plastic Belt Clip	PMLN7008	Plastic	2.5		
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 1000 SERIES		Replacement 2.5" Leather Swivel Belt Loop	PMLN5407	Hard Leather	2.5	Swivel	
		Replacement 2.75" Leather Swivel Belt Loop	PMLN5408	Hard Leather	2.75	Swivel	
		Replacement 3" Leather Swivel Belt Loop	PMLN5409	Hard Leather	3	Swivel	



CARRY SOLUTIONS

COMPATIBILITY	ACCESSORY			FEATURES			
PORTABLE RADIOS	CARRY SOLUTIONS	DESCRIPTION	PART NUMBER	MATERIAL	BELT LOOP/CLIP DIMENSION (INCHES)	SWIVEL / FIXED	D-RINGS
APX 7000 SERIES		Replacement Carry Case Strap with Snaps, Long. Used with NNTN8111, NNTN8112, NNTN8113, NNTN8114, NNTN8115 & NNTN8116	PMLN5800	Leather			
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES SRX 2200 SERIES		1.75" Wide Leather Belt	4200865599	Leather			
		Adjustable Nylon Carrying Strap	NTN5243	Nylon			
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES SRX 2200 SERIES		Boston Leather Fireman's Radio Strap	RLN6486	Leather			
		Boston Leather Fireman's Radio Strap - XL	RLN6487	Leather			
		Boston Leather Fireman's Radio Strap with button back holder	AY000223A01	Leather			
		Boston Leather Fireman's Radio Strap with button back holder - XL	AY000229A01	Leather			
		Boston Leather Anti-Sway Strap for Boston Leather Fireman's Radio Strap	RLN6488	Leather			

APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY			FEATURES				
ANTENNAS								
PORTABLE RADIOS	ANTENNAS	DESCRIPTION	PART NUMBER	UHF / VHF / 700/800 MHz	FREQUENCY BAND (MHz)	INTEGRATED GPS	LENGTH (CM)	TYPE
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES SRX2200 SERIES		700/800 MHz, GPS Whip Antenna	NAF5085	700/800	764-870	●	20	Whip
		UHF, GPS Whip Antenna	PMAE4065	UHF	380-520	●	14.2	Whip
APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES SRX2200 SERIES		VHF, GPS Whip Antenna	NAR6593	VHF	136-174	●	20	Whip
APX 4000 SERIES		900 MHz, GPS Antenna	PMAF4008	800/900	896-941	●	6	Whip
APX 7000 SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 1000 SERIES		1/4 Wave, 700/800 MHz, GPS Stubby Antenna	NAR6595	700/800	764-870	●	9.8	Stubby
APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 1000 SERIES		UHF Range 1, GPS Stubby Antenna	FAF5259	UHF	380-470	●	9.3	Stubby
		UHF Range 2, GPS Stubby Antenna	FAF5260	UHF	470-520	●	9.3	Stubby
APX 7000 SERIES APX 7000XE SERIES		VHF, 700/800 MHz Dual Band, GPS Whip Antenna	NAR6594	VHF, 700/800	136-174; 764-870	●	20	Whip
		VHF, UHF Dual Band, GPS Whip Antenna	PMAT4001	VHF, UHF	136-174; 380-520	●	21.8	Whip
		UHF 700/800 MHz Dual Band, GPS Whip Antenna	PMAS4001	UHF, 700/800	380-520; 764-870	●	19.7	Whip
APX 7000 SERIES (700/800 MHz only)		GPS Antenna (Directly connected to radio when a public safety microphone is used)	NAG4000	700/800		●	7	Stubby
APX 6000 SERIES (700/800 MHz only)		700/800 Public Safety Microphone Only Stubby Antenna	PMAF4002	700/800	764-870		9	Stubby
APX 3000 SERIES		Flexible Antenna, 700/800 MHz Includes one flexible antenna spacer	PMAF4006	700/800	764-870	●	41	Flexible
		Flexible Antenna, UHF Includes three flexible antenna spacers	PMAE4080	UHF	308-470	●	77	Flexible
		Flexible Antenna, VHF Includes two flexible antenna spacers	PMAD4125	VHF	136-174		44	Flexible
PROGRAMMING CABLES								
APX 7000 SERIES APX 7000XE SERIES APX 6000 SERIES APX 6000XE SERIES APX 4000 SERIES APX 3000 SERIES APX 1000 SERIES SRX 2200 SERIES		Programming and Test Cable	PMKN4013					
		Programming Cable	PMKN4012					



APX MOBILE RADIOS ACCESSORIES



APX 7500 WITH O5 CONTROL HEAD



APX 6500 WITH O5 CONTROL HEAD



APX 4500 WITH O2 CONTROL HEAD



APX 1500 WITH O2 CONTROL HEAD

COMMUNICATE SAFELY AND EASILY WHEREVER YOU GO

You count on your mobile radio to function clearly and easily so you can concentrate on the mission and communicate safely.

Get the most out of your APX radio by extending its power and reliability with APX accessories. Every mobile microphone, speaker, alarm and control station accessory is best-in-class technology, designed and optimized specifically for your APX mobile. There's simply no substitute for APX accessories.

APX MOBILE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY		
LONG RANGE WIRELESS get ready in seconds without having to worry about the wires getting in the way. No more getting tangled with your seatbelt. Work, safer, smarter and more comfortable in demanding environments.			
APX PORTABLE RADIOS	REMOTE SPEAKER MICROPHONES	DESCRIPTION	PART NUMBER
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		Long Range Wireless Mobile Accessory Kit, includes Wireless Remote Speaker Microphone (RLN6544), Mobile Microphone Bluetooth Gateway (PMMN4097C), Vehicular Charger (PMMN6716)	RLN6551
		Long Range Wireless Mobile Accessory Kit (No Power Charger), includes Wireless Remote Speaker Microphone (RLN6544), Mobile Microphone Bluetooth Gateway (PMMN4097C), Charger must be purchased separately	RLN6552
ACCESSORIES AND REPLACEMENT PARTS			
		Dual Unit Charger,rapid rate charger, 120V (US Plug)	PMLN7120
		Vehicular Charger	PMLN6716
		Wireless RSM with Battery and Clip	RLN6544
 APX 7500 SERIES		Mobile Microphone with Bluetooth Gateway	PMMN4097
 APX 6500 SERIES		Wireless RSM Battery, 1750mA Lilon	PMNN4461
 APX 4500 SERIES		D Ring Swivel Clip (12 pack)	NNTN4990
 APX 1500 SERIES		Receive-Only Earpiece with Comfort Eartube, FM approved	RLN4941†
		Receive-Only Earpbud, Single Wire, Threaded 3.5 mm connector	BDN6781
		Receive-Only Earbud, FM approved	AARLN4885†
		EP7 Sonic Defender, use with RLN4941	RLN6511 RLN6512 RLN6513





LONG RANGE WIRELESS REMOTE SPEAKER MICROPHONE (RSM)

The Long Range Wireless Remote Speaker Microphone (RSM) pairs instantly with touch pairing to the mobile microphone with Bluetooth gateway. The Long Range Wireless RSM works up to 100 meters away line-of-sight from the mobile radio, keeping you in communication where you never thought possible. Plug and play – Just attach the mobile gateway microphone to your radio, align the two devices where indicated by the blue dot and you are ready to go. Voice prompts will walk you through pairing quickly.



† UL certification pending at time of publication. Compatible with APX 7000 radio

APX MOBILE RADIO ACCESSORIES

MICROPHONES Access critical features directly on the Keypad microphone. Navigational buttons and a full keypad allow users to navigate radio menus, dial phone numbers and send text messages. Three programmable buttons are available for additional customization.

COMPATIBILITY	ACCESSORY			FEATURES	
MOBILE RADIOS	MICROPHONES	DESCRIPTION	PART NUMBER	MICROPHONE STYLE	IMPRES
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		Keypad Microphone	HMN4079	Keypad + Navigation	
		Standard Palm Microphone	HMN1090	Standard	
		Water Resistant Palm Microphone	HMN1089	Standard	
 APX 7500 SERIES		Water Resistant Palm Microphone for Motorcycle Mounted Mobiles	HMN1079	Standard	
 APX 7500 SERIES		Telephone Keypad Handset with Hang-Up Cup	HMN4097	Telephone + Keypad	
		Hang-Up Handset with Armored Cable	HKN1018	Telephone	
 APX 6500 SERIES		Handset with Hang-Up Cup	HLN1457	Telephone	
 APX 4500 SERIES		Desktop Microphone	RMN5070	Desktop	
 APX 1500 SERIES		IMPRES Visor Microphone, requires PTT Switch GLN7278 or RLN5926	RMN5054	Visor	●



IMPRES™ AUDIO ACCESSORIES

Mission critical voice transmissions have to be heard over engine, siren, road and wind noise. Fortunately, Motorola's exclusive IMPRES audio accessories are designed to optimize its output based on the accessory in use. IMPRES Visor Microphones are able to pick up and transmit the user's voice consistently to the receiving user regardless of how close they are speaking into the microphone.

COMPATIBILITY	ACCESSORY		
MOBILE MICROPHONE ACCESSORIES			
MOBILE RADIOS	MOBILE MICROPHONE ACCESSORIES	DESCRIPTION	PART NUMBER
		Microphone Hang-Up Clip	HLN5391
		Microphone Extension Cable, 2-Feet. Not compatible with HMN4097 handset or HMN4079 Keypad	PMKN4093
 APX 7500 SERIES		Microphone Extension Cable, 10-Feet. Not compatible with HMN4097 handset or HMN4079 Keypad	PMKN4033
 APX 6500 SERIES		Microphone Extension Cable, 20-Feet. Not compatible with HMN4097 handset or HMN4079 Keypad	PMKN4034
 APX 4500 SERIES		Emergency Push Button, can be used with the Visor Microphone	HLN5131
 APX 1500 SERIES		Emergency Footswitch, can be used with the Visor Microphone	HLN5113
		Footswitch Push-To-Talk, can be used with the Visor Microphone	GLN7278
		Push Button Push-To-Talk, can be used with the Visor Microphone	RLN5926
		Replacement Cable for HMN4079	3075336B10
CONTROL STATION ACCESSORIES			
		Desktop Tray with Speaker	HLN6042
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		Power Supply, 25-60W, for low power radios (cord included)	HPN4007
		110V Line Cord, Replacement Cable for HPN4007	3060665A04



APX MOBILE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY

INSTALLATION AND MOUNTING ACCESSORIES Mount your radio in your vehicle without compromising safety. Trunnion kits give you the flexibility to mount the radio under your dash, in your dash, between the seats or on the floor. Remote mount kits allow the radio to be mounted in the trunk when dash space is limited.

MOBILE RADIOS	INSTALLATION AND MOUNTING ACCESSORIES	DESCRIPTION	PART NUMBER
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		High Power Trunnion Kit; Quick Release with Lock	HLN7003
		Mid Power Trunnion Kit; Standard Installation Bracket	HLN7002
		Mid Power Trunnion Lock	HLN6372
		Remote Mount Control Head Trunnion Compatible with 02/05 and 07 control heads.	HKN6186
		Low Profile Remote Mount Control Head Trunnion Kit	HLN7031
		Motorcycle Enclosure, Black	HLN7022

COMPATIBILITY	ACCESSORY

EXTERNAL ALARM ACCESSORIES External alarm accessories enable additional switching power when external accessories are attached.

MOBILE RADIOS	EXTERNAL ALARM ACCESSORIES	DESCRIPTION	PART NUMBER
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		External Alarm Buzzer	HLN6953
		External Alarm Relays	HLN6969



COMPATIBILITY	ACCESSORY

SPEAKERS AND SIRENS Boost audio at your control station on your desk or in your vehicle with external speakers.

MOBILE RADIOS	SPEAKERS AND SIRENS	DESCRIPTION	PART NUMBER
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		Remote Mount, Water Resistant Speaker, 7.5 Watt Rated Audio	HSN4038
		Remote Mount, Water Resistant Speaker, 15 Watt Rated Audio	HSN4040
		Water Resistant Speaker, 13 Watt Rated Audio	HSN4018
		Non-Water Resistant Speaker, 13 Watt Rated Audio	HSN4032
		Siren Speaker, Round with Chrome Finish	TDN6251
		Siren Speaker, Rectangular with White Finish	TDN6252
		Siren Speaker, Round with Grey Finish	TDN6254
		Siren Speaker, Under Hood with Grey Finish	TDN6253

REPLACEMENT SIREN ACCESSORIES

APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		Status/Message Direct Entry Keypad, 8 Buttons	H1338
		Mobile Siren	HLN1439



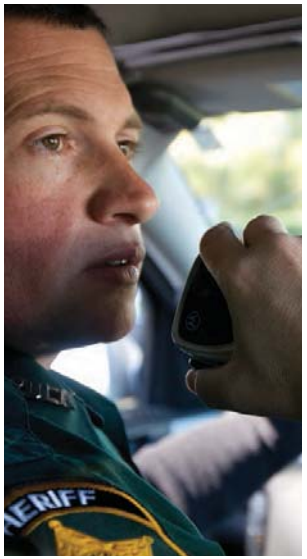
APX MOBILE RADIO ACCESSORIES



HOW CAN I COMMUNICATE SAFELY ON THE ROAD?

The IMPRES visor microphone with the external push-button or footswitch PTT lets you communicate hands-free so you can communicate safely and easily without taking your eyes off the road. IMPRES audio helps ensure your voice is heard regardless of how closely you are speaking into the microphone or how much engine, siren or road noise is in the background.

COMPATIBILITY	ACCESSORY		
SIREN ACCESSORIES			
MOBILE RADIOS	**SIREN ACCESSORIES**	**DESCRIPTION**	**PART NUMBER**
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		Siren Switchbox	HLN6819
		Mode Direct Entry Keypad, 8-Buttons	H1615
		Siren Cable, O3 Siren to Switchbox	HKN6146
		Siren Cable, Direct Keypad for O3 Control Head	HKN6145



COMPATIBILITY	ACCESSORY		
SIREN ACCESSORIES			
MOBILE RADIOS	**SIREN ACCESSORIES**	**DESCRIPTION**	**PART NUMBER**
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		Direct Entry Keypad Cable, DEK to O5 Control Head, rear connector	HKN6189
		Siren Cable, O5 Siren to Switchbox	HKN4363
UNIVERSAL RELAY CONTROLLER			
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		Universal Relay Controller for O9 Control Head, 10 DC Outputs, 15 Amps per Channel	PMUN1046
		Universal Relay Controller to Transceiver Cable	3064153H05

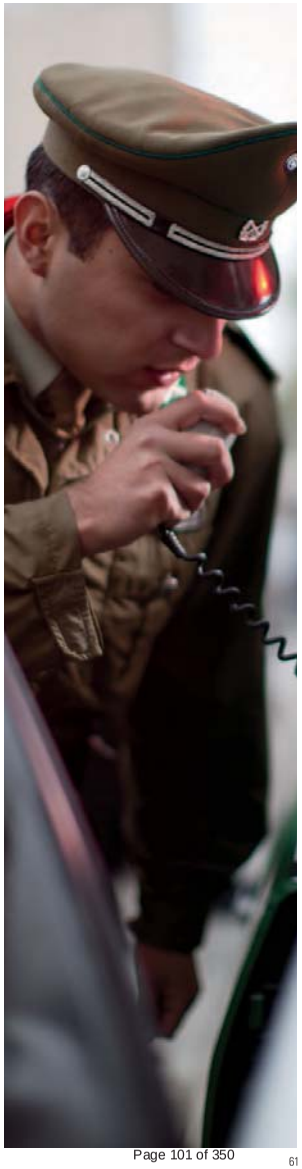


APX MOBILE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY		
CABLES			
MOBILE RADIOS	**CABLES**	**DESCRIPTION**	**PART NUMBER**
CONTROL HEAD CABLES			
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		O3 Handheld Control Head Extension Cable, 17-Feet	PMLN4958
		O3 Handheld Control Head Accessory Cable	PMLN4959
		Control Head Cable with Connections for Power, Speaker and Headset Jack	HKN6187
		Control Head Cable with Connections for Power and Speaker	HKN6188
REMOTE MOUNT CABLES			
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		Remote Mount Cable, 131-Feet	HKN6164
		Remote Mount Cable, 115-Feet	HKN6165
		Remote Mount Cable, 75-Feet	HKN6166
		Remote Mount Cable, 50-Feet	HKN6167
		Remote Mount Cable, 30-Feet	HKN6168
		Remote Mount Cable, 17-Feet	HKN6169
		Remote Mount Cable, 10-Feet	HKN6170
		Cable, Remote Control Head Vehicular Interface Port Connector for O5 Control Head	HKN6196
		Cable, Remote Control Head Mobile Accessory Port Connector for O5 Control Head	HKN6961
APX 7500 SERIES		Motorcycle Remote Cable for O5 Control Head	3075217A02



COMPATIBILITY	ACCESSORY		
CABLES			
MOBILE RADIOS	**CABLES**	**DESCRIPTION**	**PART NUMBER**
POWER CABLES			
APX 7500 SERIES		Mid Power, Dash Mount Power Cable, 10-Feet	HKN4191
APX 6500 SERIES		Mid Power, Remote Mount Power Cable, 20-Feet	HKN4192
APX 4500 SERIES		Mid Power, Rear Ignition Cable, Dash Mount	HLN6863
APX 1500 SERIES		High Power, Remote Mount Power Cable 20-Feet	HKN6110
		Motorcycle Power Cable	HKN6032
DATA CABLES			
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		RS232 Cable for Rear Accessory Port, Dash Mount Only, 6-Feet	HKN6160
		RS232 Cable for Rear Accessory Port, Remote Mount Only, 20-Feet	HKN6161
		RS232 Cable for Mobile Microphone Port	HKN6183
		RS232 Cable for J600 Transceiver Interconnect Board, 22-Feet	HKN6122
KEYLOAD CABLES			
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		Keyloader Cable, KVL3000 and KVL4000	TKN8531
		Keyload Adapter for Mobile Microphone Port	HKN6182
PROGRAMMING CABLES			
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		USB Cable, Rear Accessory Port, Remote Mount, 15-Feet (for use with customer program software)	HKN6172
		USB Cable, Rear Accessory Port, Dash Mount, 6-Feet (for use with customer program software)	HKN6163
APX 7500 SERIES APX 6500 SERIES		Programming Cable	HKN6184



APX MOBILE RADIO ACCESSORIES



ANTENNAS

For optimum range and quality, it is important to match the mobile radio's frequency with the proper Motorola antenna. These are available as standard 1/4 wave models or can include 3dB, 3.5dB or 5dB signal gain.

COMPATIBILITY	ACCESSORY			FEATURES		
ANTENNAS A variety of antennas ensure the best possible reception wherever you operate. Choose from antennas with integrated GPS to standalone RF antennas.						
MOBILE RADIOS	ANTENNAS	DESCRIPTION	PART NUMBER	UHF / VHF / (800/900 MHz)	FREQUENCY BAND (MHz)	MOUNTING STYLE
VHF ANTENNAS (RF ONLY)						
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		VHF 1/4 Wave Antenna, 136-144 MHz	HAD4006	VHF	136-144	Through-hole
		VHF 1/4 Wave Antenna, 144-150.8 MHz	HAD4007	VHF	144-150.8	Through-hole
		VHF 1/4 Wave Antenna, 150.8-162 MHz	HAD4008	VHF	150.8-162	Through-hole
		VHF 1/4 Wave Antenna, 162-174 MHz	HAD4009	VHF	162-174	Through-hole

FREQUENCY BAND: Most antennas only cover a portion of a frequency band. Our wideband UHF and VHF antennas offer coverage across the entire band, enhancing your communication flexibility.

COMPATIBILITY	ACCESSORY			FEATURES		
ANTENNAS						
MOBILE RADIOS	ANTENNAS	DESCRIPTION	PART NUMBER	UHF / VHF / (800/900 MHz)	FREQUENCY BAND (MHz)	MOUNTING STYLE
VHF ANTENNAS (RF ONLY)						
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		VHF 1/4 Wave Antenna, 136-162 MHz	HAD4016	VHF	136-162	Through-hole
		VHF 1/4 Wave Antenna, 146-174 MHz	HAD4017	VHF	146-174	Through-hole
		VHF Wideband Antenna, 136-174 MHz	HAD4021	VHF	136-174	Through-hole
		VHF Wideband Antenna 3.0 dB Gain, 136-174 MHz	HAD4022	VHF	136-174	Through-hole
		VHF Wideband Antenna 3.0 dB Gain, 136-174 MHz	RAD4010ARB	VHF	136-174	Through-hole

APX MOBILE RADIO ACCESSORIES

ANTENNAS A variety of antennas ensure the best possible reception wherever you operate. Choose from antennas with integrated GPS to standalone RF antennas.

COMPATIBILITY	ACCESSORY			FEATURES		
MOBILE RADIOS	ANTENNAS	DESCRIPTION	PART NUMBER	UHF / VHF / (800/900 MHz)	FREQUENCY BAND (MHz)	MOUNTING STYLE
VHF ANTENNAS (RF ONLY)						
APX 7500 SERIES		VHF 1/4 Wave Antenna, 136-144 MHz	RAD4002ARB	VHF	136-144	Motorcycle
		VHF 1/4 Wave Antenna, 144-150.8 MHz	RAD4003ARB	VHF	144-150.8	Motorcycle
		VHF 1/4 Wave Antenna, 150.8-162 MHz	RAD4004ARB	VHF	150.8-162	Motorcycle
		VHF 1/4 Wave Antenna, 162-174 MHz	RAD4005ARB	VHF	162-174	Motorcycle
UHF ANTENNAS (RF ONLY)						
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		UHF 1/4 Wave Antenna, 380-433 MHz	HAE6012	UHF	380-433	Through-hole
		UHF 1/4 Wave Antenna, 450-470 MHz	HAE4003	UHF	450-470	Through-hole
		UHF 1/4 Wave Antenna, 450-470 MHz	HAE4004	UHF	450-470	Through-hole
		UHF 3 dB Gain Antenna, 450-495 MHz	HAE4012	UHF	450-495	Through-hole
		UHF 3 dB Gain Antenna, 494-512 MHz	HAE4013	UHF	494-512	Through-hole
		UHF 3.5 dB Gain Antenna, 380-433 MHz	HAE6010	UHF	380-433	Through-hole

COMPATIBILITY	ACCESSORY			FEATURES		
MOBILE RADIOS	ANTENNAS	DESCRIPTION	PART NUMBER	UHF / VHF / (800/900 MHz)	FREQUENCY BAND (MHz)	MOUNTING STYLE
UHF ANTENNAS (RF ONLY)						
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		UHF 3.5 dB Gain Antenna, 450-470 MHz	HAE4011	UHF	450-470	Through-hole
		UHF 5 dB Gain Antenna, 380-433 MHz	HAE6011	UHF	380-433	Through-hole
		UHF 5 dB Gain Antenna, 455-470 MHz	RAE4014ARB	UHF	455-470	Through-hole
		UHF 5 dB Gain Antenna, 494-512 MHz	RAE4016ARB	UHF	494-512	Through-hole
		UHF 2 dB Gain Wideband Antenna, 380-470 MHz	HAE6013	UHF	380-470	Through-hole
		UHF 2 dB Gain Wideband Antenna, 450-512 MHz	HAE6015	UHF	450-512	Through-hole
		UHF 2 dB Gain Wideband Antenna, 380-520 MHz	HAE6031	UHF	380-520	Through-hole
		UHF Wideband Low Profile Antenna, 450-512 MHz	HAE6016	UHF	450-512	Through-hole
APX 7500 SERIES		UHF 1/4 Wave Antenna, 380-433 MHz	HAE6014	UHF	380-433	Motorcycle
		UHF 1/4 Wave Antenna, 425-470 MHz	HAE6032	UHF	425-470	Motorcycle

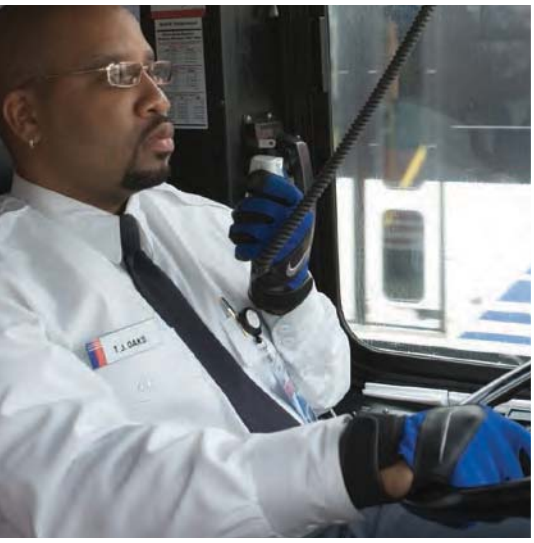
APX MOBILE RADIO ACCESSORIES

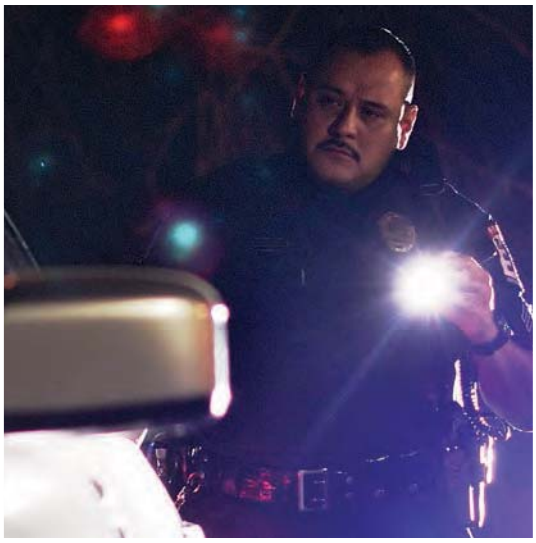
ANTENNAS A variety of antennas ensure the best possible reception wherever you operate. Choose from antennas with integrated GPS to standalone RF antennas.

COMPATIBILITY	ACCESSORY			FEATURES		
MOBILE RADIOS	ANTENNAS	DESCRIPTION	PART NUMBER	UHF / VHF / 800/900 MHz)	FREQUENCY BAND (MHz)	MOUNTING STYLE
UHF ANTENNAS (RF ONLY)						
APX 7500 SERIES		UHF 1/4 Wave Antenna, 450-482 MHz	HAE6033	UHF	450-482	Motorcycle
		UHF 1/4 Wave Antenna, 482-512 MHz	HAE6034	UHF	482-512	Motorcycle
		UHF 1/4 Wave Low Profile Antenna, 450-512 MHz	HAE6035	UHF	450-512	Motorcycle
700/800 MHZ ANTENNAS (RF ONLY)						
APX 7500 SERIES		1/4 Wave Antenna, 762-870 MHz	HAF4016	700/800	762-870	Through-hole
APX 6500 SERIES		3 dB Gain Low Profile Antenna, 762-870 MHz	HAF4013	700/800	762-870	Through-hole
APX 4500 SERIES		3 dB Gain Elevated Feed Antenna, 762-870 MHz	HAF4014	700/800	762-870	Through-hole
APX 1500 SERIES		3 dB Gain Collinear Antenna, 762-870 MHz	HAF4017	700/800	762-870	Through-hole

COMPATIBILITY	ACCESSORY			FEATURES		
MOBILE RADIOS	ANTENNAS	DESCRIPTION	PART NUMBER	UHF / VHF / 800/900 MHz)	FREQUENCY BAND (MHz)	MOUNTING STYLE
ANTENNAS						
700/800 MHZ ANTENNAS (RF ONLY)						
APX 7500 SERIES		3 dB Gain Antenna, 762-870 MHz	HAF4015	700/800	762-870	Motorcycle
		Low Profile Antenna, 762-780 MHz	HAF4018	700/800	762-870	Motorcycle
GPS ANTENNAS						
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		GPS Roof Mount Antenna SMA Male connector with RG-174 17ft cable	HAG4000	GPS Only		Roof Mount
		GPS Glass Mount Antenna SMA Male connector with RG-174 17ft cable	PMAN4001	GPS Only		Glass Mount
APX 7500 SERIES		GPS Motorcycle Antenna	HAG4001	GPS Only		Motorcycle









For more information on Motorola mission critical accessories,
visit **motorolasolutions.com/apx**.

Motorola Solutions, Inc. 1301 E. Algonquin Road, Schaumburg, Illinois 60196 U.S.A. **motorolasolutions.com**

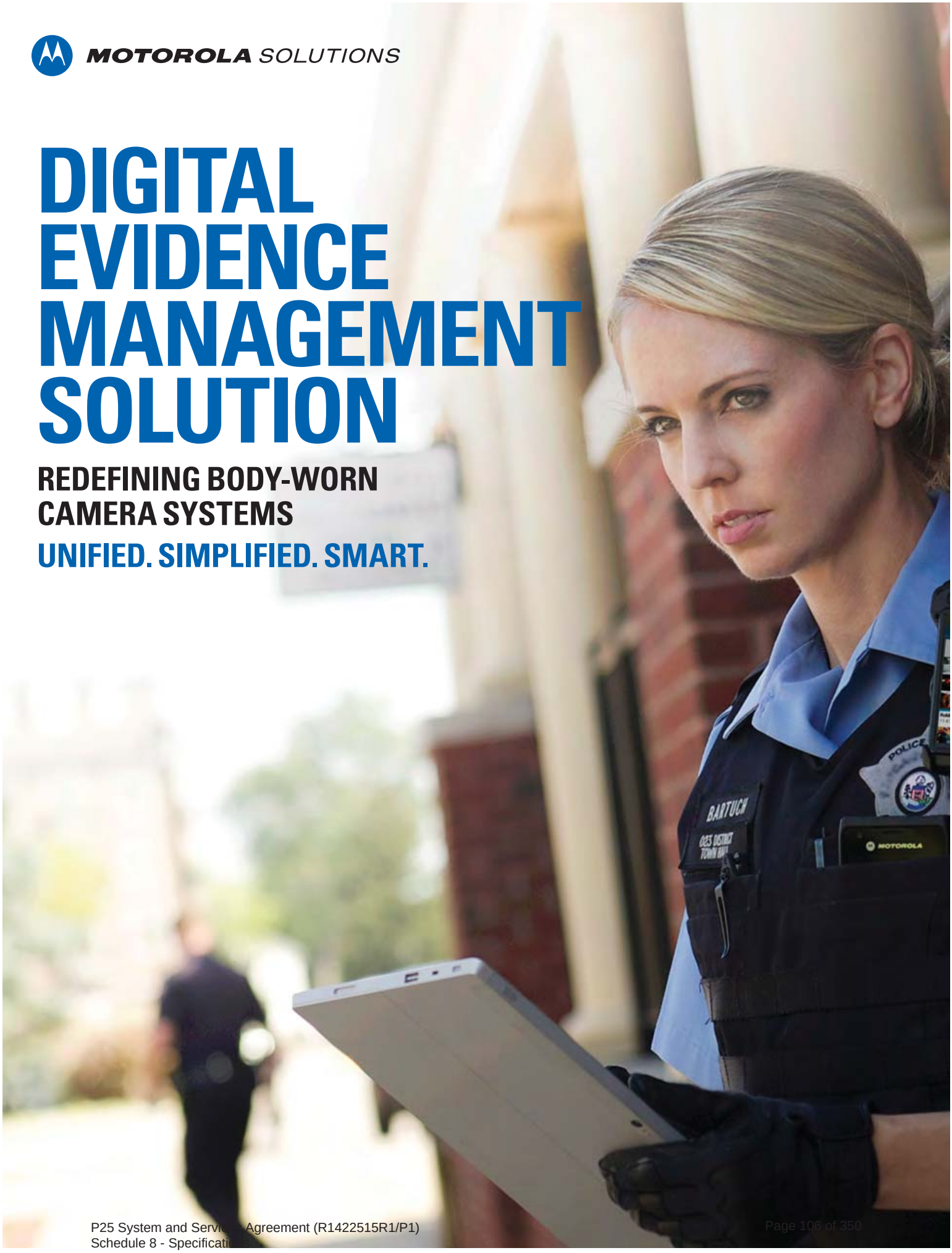
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MOTOROLA SOLUTIONS

DIGITAL EVIDENCE MANAGEMENT SOLUTION

REDEFINING BODY-WORN CAMERA SYSTEMS

UNIFIED. SIMPLIFIED. SMART.



IMPLEMENTING A BODY-WORN CAMERA PROGRAM: FINDING THE RIGHT FOCUS FOR YOUR AGENCY

Body-worn cameras are quickly becoming a predominant tool for digital evidence capture to protect officers and the citizens they serve. Body-worn cameras record the content that agencies need to build transparency and accountability with the public. Because they openly document events, body-worn cameras can elevate service while they deepen community trust. At the same time, they can help your agency enhance training, improve officer safety and implement best practices.

Police departments nationwide are benefiting from body-worn cameras – whether it's significantly decreasing litigation costs or increasing officer safety. Eighty percent of officers say they improve the quality of evidence; 58 percent report they reduced their time spent in court.[1]

Body-worn cameras go a long way toward influencing citizen and officer behavior. Almost 90 percent of departments noted a drop in the number of complaints filed against police and over 70 percent of citizens said cameras were beneficial during their encounters with officers.[2]

Given the emergence of cameras in policing and the mounting requests for multimedia evidence, what can your agency do to execute a successful, sustainable program?

58%
REPORT THEY REDUCED THEIR TIME SPENT IN COURT

ALMOST 90%
OF DEPARTMENTS NOTED A DROP IN THE NUMBER OF COMPLAINTS FILED AGAINST POLICE

OVER 70%
OF CITIZENS SAID CAMERAS WERE BENEFICIAL DURING THEIR ENCOUNTERS WITH OFFICERS



CONSIDERATION #1:
MANAGING DEVICES AND DIGITAL CONTENT

As your agency begins to capture video, you'll face a growing number of considerations – from which personnel should wear cameras to how to effectively manage content. Along with developing guidelines on who can wear them, you'll need to stipulate whether their use is required or voluntary, and in what situations. Then there's the question of where to place the camera – the head, chest, shooting side or a different area. Your agency should determine which location is best in terms of field of vision, ease of use and comfort.

One of the biggest considerations you will face is data storage. How much video needs to be retained and for how long? Agencies are discovering that given their available resources, capabilities and budgets, they gain the greatest benefit using secured, cloud storage for digital content.

CONSIDERATION #2:
CONTROLLING COSTS AND ACCESS

Costs and staffing can cripple even the best-intentioned agencies who want to adopt body-worn camera programs. Police departments who already rely on full-time officers to handle existing Freedom of Information Act (FOIA) requests say their expenses will increase dramatically as more footage and more video requests pour in.

Data storage presents another critical decision: whether to store content in-house or on a cloud service hosted by a third party. Agencies must take into account the demands on their budgets and IT resources as they scale while meeting legal and chain-of-custody requirements.

CONSIDERATION #3:
SECURING THE INTEGRITY OF DATA

When your agency chooses a body-worn camera solution, you must ensure recorded content is secured and maintains integrity from the moment of capture. Your program should meet the FBI's Criminal Justice Information Services (CJIS) requirements for securing data. Reputable and experienced CJIS-compliant providers can protect the security and integrity of your data with systems that prevent data tampering and unauthorized access.

CONSIDERATION #4:
RESPONDING TO RECORDS REQUESTS

Responding to FOIA and judicial record requests can tax resources and overload staff, yet your agency must make sure response is timely and transparent. This includes searching for and retrieving the right video; determining which portions comply with state disclosure laws for release; redacting any portions that impact the privacy of individuals; and knowing what content can be legally shared.



AGENCY WORKFLOW CONSIDERATIONS FOR VIDEO EVIDENCE MANAGEMENT

KEY AGENCY ROLES	DIVERSE VIDEO CHALLENGES
Officer	• Video uploads are time-consuming • Lack of tools to organize and review video • Difficult and time-consuming to retrieve content
Analyst/Investigator/ Command Staff	• Difficult to correlate case-related content • Lack of retention tools to properly mark content • Challenges using retention tools and adhering to agency policies • Unable to see the actions of all users
Judicial/Records Specialist	• Complex request and distribution tools • Lack of restriction controls
Citizens	• Lack of simple records requests tools • Delayed requests

MOTOROLA'S DIGITAL EVIDENCE MANAGEMENT SOLUTION



Si SERIES VIDEO SPEAKER MICROPHONE + COMMANDCENTRAL VAULT

As video evidence proliferates, agencies are looking for smarter ways to streamline the process and control costs. A holistic end-to-end solution can help to manage the expense of evidence management, enhance the safety and efficiency of officers, and improve interactions with the public.

Motorola's Digital Evidence Management Solution (DEMS) integrates it all. DEMS is a unified, simplified, smart approach that transforms the way your agency captures, stores, manages and shares multimedia content.

DEMS combines our revolutionary Si Series video speaker microphone (audio, video, radio control, and expandable applications in a single device) with CommandCentral Vault (a complete digital evidence content management solution).

Now your agency can experience a better body-worn camera solution – with streamlined deployment and advanced end-to-end content management.



UNIFIED

DEMS includes the Si Series body-worn video speaker microphone that combines voice communications, video, still images, voice recording and emergency alerting into one compact, easy-to-use device reducing hardware complexity for officers and reducing costs for agencies. Integrated with our secured, cloud-based CommandCentral Vault digital evidence management software, it delivers a powerful end-to-end solution.

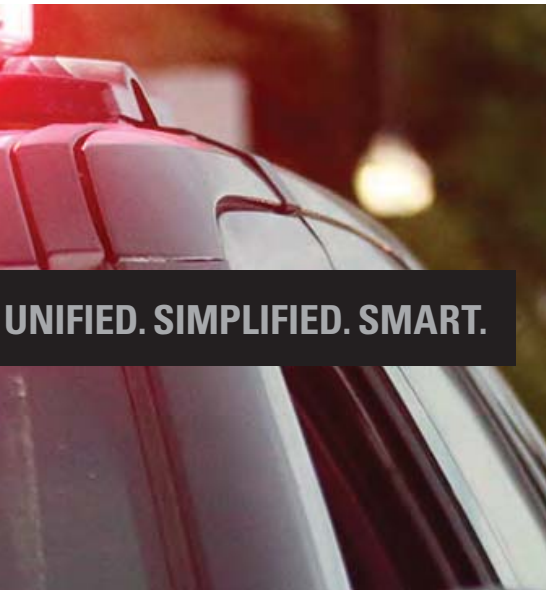
COMPLETE HARDWARE/SOFTWARE SOLUTION

Experience an integrated body-worn camera, remote speaker microphone and digital evidence management software solution in one. Instead of multiple devices, your officers wear just one video speaker microphone.

Upload video and audio from the Si Series video speaker microphone to CommandCentral Vault quickly and easily via Wi-Fi. From the moment content is securely captured and stored, to its distribution, CommandCentral Vault provides all the tools to streamline workflow. Motorola's Body-Worn Camera Service option gives your agency the flexibility to combine both as a monthly subscription service based on the number of users.

TOTAL INTEGRATION

CommandCentral Vault integrates with your CAD and RMS and across all CommandCentral applications to streamline workflows. Because it efficiently tags, redacts and secures evidence, it minimizes the time it takes to manage digital content and respond to information requests to make evidence sharing easier and more efficient.



SIMPLIFIED

Eliminate the complexity of evidence collection and management. DEMS makes documentation, administration and evidence requests simple and secure. DEMS eliminates recording errors, automatically tags and redacts content, and simplifies managing your budget with predictable pricing.

REDUCE THE NUMBER OF DEVICES

Your officers carry fewer devices in the field using the Si Series that combines a body-worn camera and Motorola APX™ quality remote speaker microphone in one, freeing them to work more safely and efficiently.

SECURITY THROUGHOUT

From the moment content is created by the Si Series video speaker microphones and uploaded to the cloud, to the moment it's shared, it is cryptographically signed. You can trust the integrity of content stored in CommandCentral Vault – and to be secure in a CJIS-capable cloud, which meets FBI requirements for secured data.

EXPEDITE CHAIN OF CUSTODY REQUESTS

Eliminate tedious frame-by-frame redacting with automatic redaction, metadata capture and content tagging that saves time and money; and accurately establishes chain of custody.

NO SURPRISE FEES

Realize greater value with predictable, subscription pricing. Because DEMS is a cloud application, you also don't have to worry about complex integration, infrastructure, or additional IT administrative overhead.

SEAMLESS CONTENT UPLOAD

Automatic uploading of content eliminates administrative time and frees your officers to spend less time managing data and more time policing.

AUTOMATIC TAGGING

Automatically tag data at the moment of capture for faster access to relevant information. Content is automatically tagged with the officer's name, incident ID and location. This metadata makes it easier to search for the exact footage you need.

ELIMINATE RECORDING ERROR

The articulating camera on the Si Series features a wide field-of-view. The 210° articulation gives your officers flexibility in how and where they place their video speaker microphone. Pre-buffering automatically records up to 60 seconds prior to an event.

SMART

DEMS is the smart way to handle digital evidence management – from the intuitive interface on the Si Series video speaker microphones to the way content is automatically and intelligently grouped with CAD and RMS evidence to reduce administrative complexities.

ACCESS INTELLIGENCE QUICKLY

The intuitive Si Series user interface enables fast access to the most relevant intelligence and tools for improved collaboration and information sharing. Customize the interface into three panels to make it easy for your officers to view.

ORGANIZE CONTENT INTELLIGENTLY

DEMS supports automatic uploads, tagging and automatic correlation of metadata to group content from multiple datasets. This saves your agency considerable time spent collecting and storing digital evidence.

AUTO-REDACTION

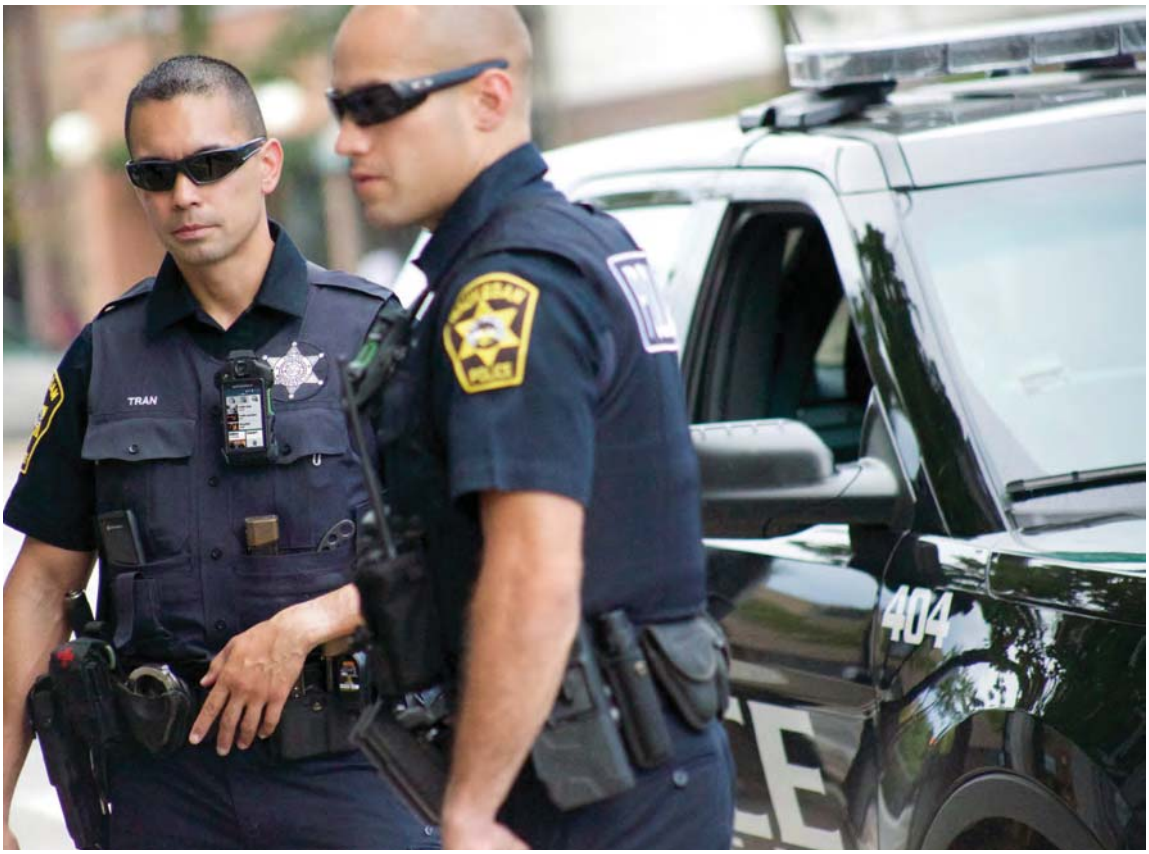
Intelligent redaction capabilities automatically blur people and objects in recorded videos to eliminate tedious frame-by-frame processes. Simply select the object or individual and CommandCentral Vault will process the request across the entire video, saving hours of time.

EMERGENCY-ACTIVATED RECORDING

The Si Series video speaker microphone automatically starts recording when the emergency button on the device is pressed. This helps improve safety in the field and reduce officer stress.



Si500 AND Si300 VIDEO SPEAKER MICROPHONES



IMPROVE TRANSPARENCY

A police officer confronts a person of interest outside a local store.

An altercation ensues and a bystander captures it on her smartphone.

The video goes viral on the Internet and many question the officer's behavior.

Because the officer recorded the encounter with his Si500, the agency quickly locates the file in CommandCentral Vault.

The video clip reveals the officer followed department rules and treated the suspect fairly.

SIGHT AND SOUND SIMPLIFIED

Capture critical events instantly and accurately with the Si500 and Si300 video speaker microphones. The Si Series combines voice communications, video, still images and emergency alerting in one compact and easy-to-use device.

CAPTURE CRITICAL EVENTS ON THE FLY

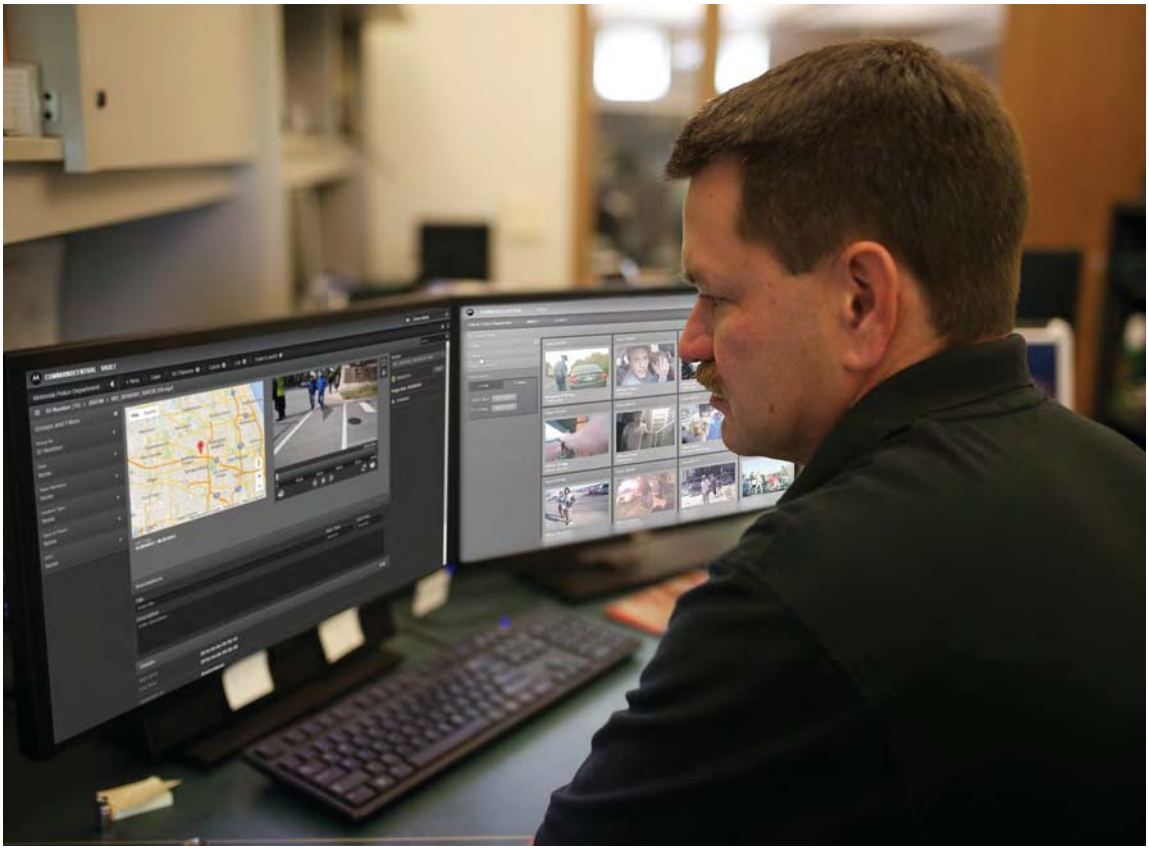
The Si500 and Si300 provide an additional layer of protection for officers and citizens by easily documenting video, voice and still images – all while continuing normal, uninterrupted radio communications. These purpose-built wearables combine intelligent recording along with the best-in-class audio and exceptional performance of our APX radios. Rugged and reliable, their adaptive audio adjusts on the fly for the loudest, clearest audio in any wearing position or environment.

EASY TO INITIATE, SECURE THROUGHOUT

A prominent video recording slider and 210° articulating camera make the Si500 and Si300 easy to wear and operate. Use the slider to manually record or push the emergency button for automatic recording. Voice and data content are secured and maintain integrity from the moment of capture through storage and sharing with CommandCentral Vault.



COMMANDCENTRAL VAULT



STREAMLINE CONTENT REVIEW AND SHARING

Two officers pursue a suspect while a bystander captures the action on her smartphone.

She uploads the video to YouTube along with a negative summary.

At the station, the content from the officers' Si500 is automatically uploaded and auto-tagged so it can be instantly searched by officer name, CAD incident ID and location and played back over a geospatial map.

The officers annotate the video to identify their actions while off-site command staff review and flag the video to adhere to retention policies.

Analysts use rapid auto-redaction to protect the privacy of bystanders, then share it with the media using the integrated FOIA module.

The new footage shows the officers acted appropriately and confirms the citizen video left out key details.

OPERATIONS SIMPLIFIED

Motorola's CommandCentral Vault is more than just storage, it's true end-to-end content management. All content is securely stored, simple to manage and easy to share with judicial personnel, citizens and media. CommandCentral Vault is cloud based and integrates seamlessly with the Si Series video speaker microphone. It aggregates evidence from a variety of multimedia sources (body-worn video, surveillance video) and stores them in a single place. Now you can capture, review, manage and share digital evidence simply and efficiently.

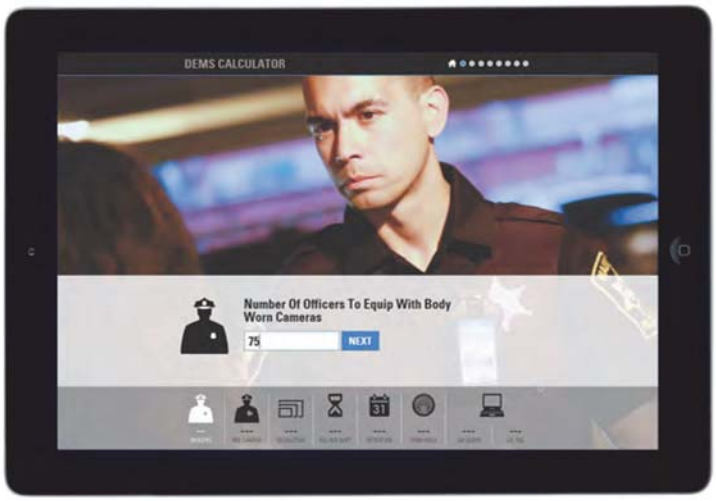
CommandCentral Vault supports automatic uploads, tags and correlation of metadata. Your agency saves valuable time collecting and storing digital evidence and can respond to information requests swiftly. With CommandCentral Vault you can reduce administrative overhead and simplify workflows while maintaining policy and compliance to help save time and enhance community support.

CommandCentral Vault features:

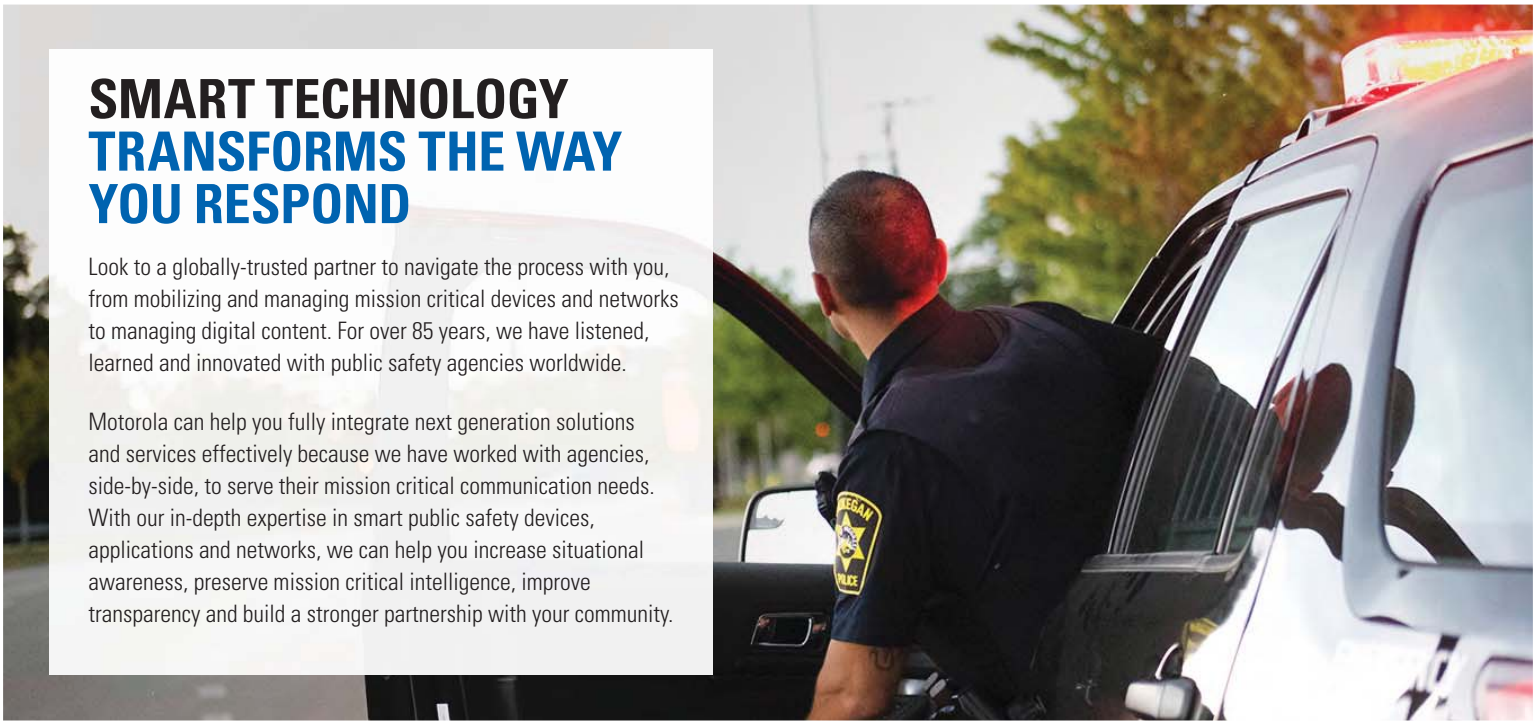
- Complete content management
- Cloud storage that meets CJIS standards
- Predictable costs with no surprise fees
- Automated redaction
- Auto correlation of metadata
- End-to-end chain of custody
- Fast, easy evidence sharing

PLANNING A BODY-WORN PROGRAM?

Leverage Motorola's expertise to help you calculate your estimated storage and program costs using our DEMS calculator.
www.motorolasolutions.com/demscalculator







SMART TECHNOLOGY TRANSFORMS THE WAY YOU RESPOND

Look to a globally-trusted partner to navigate the process with you, from mobilizing and managing mission critical devices and networks to managing digital content. For over 85 years, we have listened, learned and innovated with public safety agencies worldwide.

Motorola can help you fully integrate next generation solutions and services effectively because we have worked with agencies, side-by-side, to serve their mission critical communication needs. With our in-depth expertise in smart public safety devices, applications and networks, we can help you increase situational awareness, preserve mission critical intelligence, improve transparency and build a stronger partnership with your community.

For more information about our Digital Evidence Management Solution, contact your Motorola representative or visit motorolasolutions.com/dems

SOURCES

1, 2 Implementing a Body-Worn Camera Program, Police Executive Research Forum, 2014

Motorola Solutions, Inc. 1301 East Algonquin Road Schaumburg, Illinois 60196, U.S.A. 800-323-3982 **motorolasolutions.com**

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MOTOROLA SOLUTIONS



Si500

VIDEO SPEAKER MICROPHONE







Si500

VIDEO SPEAKER MICROPHONE

Motorola's Si500 Video Speaker Microphone (VSM) is paving the way for convergence by reducing the number of devices that weigh down officers in the field today. Both body-worn camera and remote speaker microphone, the compact Si500 is the smart interface that extends the mission critical performance of Motorola APX™ radios.

This innovative, purpose-built wearable combines intelligent recording with the best-in-class audio of APX radios. It delivers the mission critical sight, sound and security required to protect public safety personnel and citizens.

With an intuitive user interface that is easy to operate, your officers can focus on the mission, not the technology. The Si500 VSM evolves with your agency and enables a variety of future applications and capabilities.

SIGHT AND SOUND SIMPLIFIED

KEY FEATURES

- APX audio quality at 100+ phon
- 5 integrated microphones with Motorola's exclusive Adaptive Audio Engine
- 210° articulating camera with optimized field-of-view and low-light performance
- Pre-buffering to capture events prior to recording
- Automatic recording with emergency button
- Video Preview Mode used as deterrent
- Wireless and wired radio connectivity
- Standard and high-capacity removable battery options
- IP67 and MIL-STD 810G rated durability
- Covert operation mode
- Wi-Fi® connectivity
- Manage and store evidence with Motorola CommandCentral Vault





CAPTURE CRITICAL EVENTS INSTANTLY AND ACCURATELY

The Si500 provides an additional layer of protection for officers and citizens by easily documenting video, voice recording and still images without interrupting radio communications. The Si500 is equipped with a 210 degree articulating camera lens that provides optimal field-of-view and flexible wearing positions. Based on preference, users can wear the VSM with the display facing in or out. The display facing out enables an officer to utilize video preview mode to activate the camera allowing citizens to view themselves. This feature can be used as a deterrent to prevent the need to record video altogether.

- Configurable pre-buffering captures events prior to recording
- Realistic low-light recording mimics the human eye
- Prominent display notification, audible tone or vibration indicate recording
- Customized video tagging and integrated metadata (time, date, location* and device ID)
- Secured with partition encryption featuring secure boot and application white listing

*If GPS is enabled on APX Portable Radio

EXTEND THE POWER OF APX BEST-IN-CLASS PERFORMANCE

Like our industry-leading APX radios, every feature and function of the Si500 is designed with your safety in mind from best-in-class audio to purpose-built ergonomics. Using the Adaptive Audio Engine, Si500 dynamically changes the level of noise suppression, microphone gain, windporting and speaker equalization on the fly for the loudest, clearest audio in any wearing position or environment. The Si500 offers a tempered-glass display with an intuitive user interface that allows personnel to control radio channels and talkgroups, capture video and photos, tag videos and audio recordings. Integrated Wi-Fi® dramatically improves the speed of VSM configuration and feature updates with Radio Management.

- Best-in-class APX-quality audio
- 2 programmable buttons for video preview and video bookmarking
- Prominent button for fast push-to-talk
- Bright orange emergency alert button
- Easy-to-use power, volume, video and programmable buttons
- Ultra-rugged, IP67 and MIL-STD rated for harsh environments
- 5 integrated microphones with Adaptive Audio Engine

SIMPLIFIED OPERATIONS WITH COMMANDCENTRAL VAULT

Our cloud-based digital evidence management software aggregates evidence from a variety of multi-media sources (body-worn video, voice notes, surveillance video) and reduces administrative overhead. Now store, review, manage and share digital content simply and efficiently. CommandCentral Vault automatically uploads, tags and correlates metadata to save time collecting and storing digital evidence. The system ensures end-to-end security that reduces any challenge to chain of custody for agencies. It simplifies evidence storage and security through the Amazon Web Services (AWS) GovCloud to meet CJIS standards.

- End-to-end content management
- CJIS compliant secure storage
- Predictable costs
- Automated redaction
- Auto-correlates metadata
- Establishes proper chain of custody
- Secure evidence sharing (with CAD and RMS)

PURPOSE-BUILT TO PROTECT

The Si500 delivers exceptional audio/video performance combined with rugged hardware, powerful software and Wi-Fi® connectivity. Optimized to work as a part of a mission-critical ecosystem, it features industry-leading APX audio and ergonomics.











SIMPLIFY INTELLIGENCE WITH AN INTUITIVE USER INTERFACE

Empower your personnel with quick access to the most relevant intelligence and tools for better collaboration and information sharing. The Si500's simple and intuitive user interface can be customized to organize data into three panels – home, activity and conversation panels to make information easily viewable and manageable.



HOME PANEL

QUICKLY ACCESS VITAL ACTIVITIES, CONVERSATIONS AND TOOLS

Displays information in a clear and concise way for quick access.

Aggregrates data from other panels and displays only vital information.



ACTIVITY PANEL

VIEW RELEVANT VOICE NOTES, VIDEO AND STILL IMAGES ASSOCIATED WITH YOUR CURRENT TASK

Quickly tag and categorize captured multi-media files.

Assign multiple tags to the group for organization and retrieval in CommandCentral Vault.



CONVERSATION PANEL

STAY CONNECTED WITH YOUR PERSONNEL IN REAL TIME

Manage APX zone, channel and volume.

ACCESSORIES BUILT FOR THE WAY YOU WORK



SLIMLINE SHOULDER STRAP

Designed to optimize field-of-view and recording angle. Position and remove easily with the quick clip mount.



VERSATILE CARRY HOLDER

Designed to meet public safety specifications, the Si500 Carry Holder enables flexible wearing positions on a tactical vest or uniform. Purpose-built for fast attachment and removal.



3.5MM SURVEILLANCE KIT

Ideal for covert operations, this translucent tube connects to the 3.5mm audio jack on the Si500 and provides a more discrete option for receiving private messages.

Si500 SPECIFICATIONS

SIZE & WEIGHT	
Dimensions (H x W x D)	120mm x 62mm x 24mm (standard battery) 120mm x 62mm x 27mm (high capacity battery)
Weight	220g (standard battery) 250g (high capacity battery)

BATTERY	
Battery Life*	
Standard Capacity (1950 mAh)	10+ Hours
High Capacity (2925 mAh)	18+ Hours 6+ Hours (with pre-buffering enabled)
Charging Time	
Standard Capacity (1950 mAh)	~3 Hours
High Capacity (2925 mAh)	~4 Hours

AUDIO PERFORMANCE	
Noise Reduction	5 integrated microphones with Adaptive Audio. Adaptive Audio is standard on Si500.
Audio Output Power	0.5 Watt Speaker (100+ phon)

VIDEO	
Internal Memory	32 GB
Optical Performance (Field-of-View)	Diagonal 164° Horizontal 128° Vertical 68°
Recording Resolutions	1080p, 720p, 480p
Recording Speed	30 fps
Low-Light Performance	.5 Lux
Recording Format	MP4
Video Encoding Technology	H264
Audio Encoding Technology	AAC (Advanced Audio Coding)

DISPLAY	
Dimensions	3.2" Transflective
Screen Type	Gorilla Glass Impact Protection Wet finger and light glove optimized

CONNECTIVITY	
Type	Land Mobile Radio (LMR) WLAN (Wi-Fi®) 802.11 b/g/n/ac Wireless Connectivity

INTEGRATED TECHNOLOGY	
Portrait/Landscape Display Support 210° Articulating Camera	Yes
Vibration Notification	Yes
Hall Effect Sensor	Face-In/Face-Out Carry Detection

INITIAL LAUNCH APPLICATIONS	
Voice Recording	Yes
Body-Worn Video Recording & Configuration	Yes
Radio Control	Yes

DURABILITY	
MIL-STD 810G	Drop, vibration, shock and water intrusion
IP67	Fully protected against dust 1 meter water immersion for 30 minutes
Operating Temperature	-4° F to 140° F (-20° C to + 60° C)
Storage Temperature	-67° F to 185° F (-55° C to +85° C)

*Assumes 5/5/90 duty cycle, 1.5 hours video recording, 1 hour touch screen interaction

PSS System and Services Agreement (R1422515R1/P1)
Schedule 8 - Specifications


SIGHT AND
SOUND
SIMPLIFIED
POLICE
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For more information, please visit: www.motorolasolutions.com/Si500

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05-2015

MOTOROLA SOLUTIONS



Si300

VIDEO SPEAKER MICROPHONE







Si300

VIDEO SPEAKER MICROPHONE

The Si300 Video Speaker Microphone combines voice communications, video, still images and emergency alerting in one compact, easy-to-use device. Now agencies can reduce the number of devices their public safety personnel need to do their job effectively.

An extension of the high-performing Motorola APX™ radio, the Si300 is a smart interface with an integrated remote speaker microphone and body-worn camera in one. It assures the reliable voice and mission critical sight, sound and security your officers need to work more safely.

The Si300 delivers the mission critical capabilities first responders, commanders and investigators are seeking to increase situational awareness, preserve mission critical intelligence and improve agency transparency.

SIGHT AND SOUND SIMPLIFIED

KEY FEATURES

- APX audio quality at 100+ phon
- 5 integrated microphones with Motorola Adaptive Audio Engine (optional)
- Articulating camera with optimized field-of-view and low-light performance
- Pre-buffering to capture events prior to recording
- Automatic recording with emergency button
- Wired radio connectivity
- Standard and high-capacity removable battery options
- IP67 and MIL-STD 810G rated durability
- Covert operation mode
- Wi-Fi connectivity
- Manage and store evidence with Motorola CommandCentral Vault





CAPTURE CRITICAL EVENTS INSTANTLY AND ACCURATELY

The Si300 combines voice communications, video, still images and emergency alerting in one compact, easy-to-use device. The Si300 is designed to keep first responders focused on the task with a prominent video recording slider and articulating camera that make it easy to operate and wear in multiple positions. Quickly initiate recording in two ways – manually via recording slider or automatically with a push of the emergency button. Each recorded multi-media file is digitally signed and hashed, with mutual authentication to ensure secure chain of custody from capture on the device to CommandCentral Vault.

- Pre-buffering records up to 60 seconds prior to event
- Realistic low-light recording mimics the human eye
- Integrates metadata (time, date, location* and radio ID)
- Dual audio evidence streams (radio and video)

*If GPS is enabled on APX Portable Radio

EXTEND THE POWER OF APX BEST-IN-CLASS PERFORMANCE

Every feature and function of the Si300 is designed with officer safety in mind from best-in-class audio to intuitive ergonomics. APX-rugged and reliable, Si300 is built to withstand the toughest conditions. It is MIL-STD 810G rated for 4ft drop to concrete and IP67 compliant to withstand submersion in 1 meter of water for 30 minutes. Dedicated buttons are easy to access and prevent accidental activation. Integrated Wi-Fi dramatically improves the speed of over-the-air VSM configuration and feature updates with Radio Management.

- Best-in-class APX-quality audio
- Prominent button for fast push-to-talk
- Bright orange emergency alert button
- Easy-to-use power, volume, video and programmable buttons
- 5 integrated microphones with Adaptive Audio Engine (optional software)

SIMPLIFIED OPERATIONS WITH COMMANDCENTRAL VAULT

Our cloud-based digital evidence management software aggregates evidence from a variety of multi-media sources (body-worn video and surveillance video) and reduces administrative overhead. Now store, review, manage and share digital content simply and efficiently. CommandCentral Vault automatically uploads, tags and correlates metadata to save time collecting and storing digital evidence. The system ensures end-to-end security that reduces any challenge to chain of custody for agencies. It simplifies evidence storage and security through Microsoft Azure Government cloud to meet CJIS standards.

- End-to-end content management
- CJIS-compliant secure storage
- Predictable costs
- Automated redaction
- Auto-correlates metadata
- Establishes proper chain of custody
- Secure evidence sharing (with CAD and RMS)

PURPOSE-BUILT TO PROTECT

The Si300 delivers exceptional audio/video performance combined with rugged hardware and Wi-Fi connectivity for fast video upload. Optimized to work as a part of a mission-critical ecosystem, it features industry-leading APX audio and ergonomics.











ACCESSORIES MADE FOR THE WAY YOU WORK

Increase the functionality and dependability of your Si300 VSMs with Motorola accessories. A full range of accessories including batteries, carry cases, chargers and headsets help you communicate with the rest of your team.



SLIMLINE SHOULDER EPAULETTE

Designed to optimize audio performance and improve viewing angle. Position and remove easily with the quick clip mount.

MULTI-UNIT CHARGER

Designed for the most efficient charging, the Si300 Multi-Unit Charger charges six units or six spare batteries at once with LED light charging indicators.





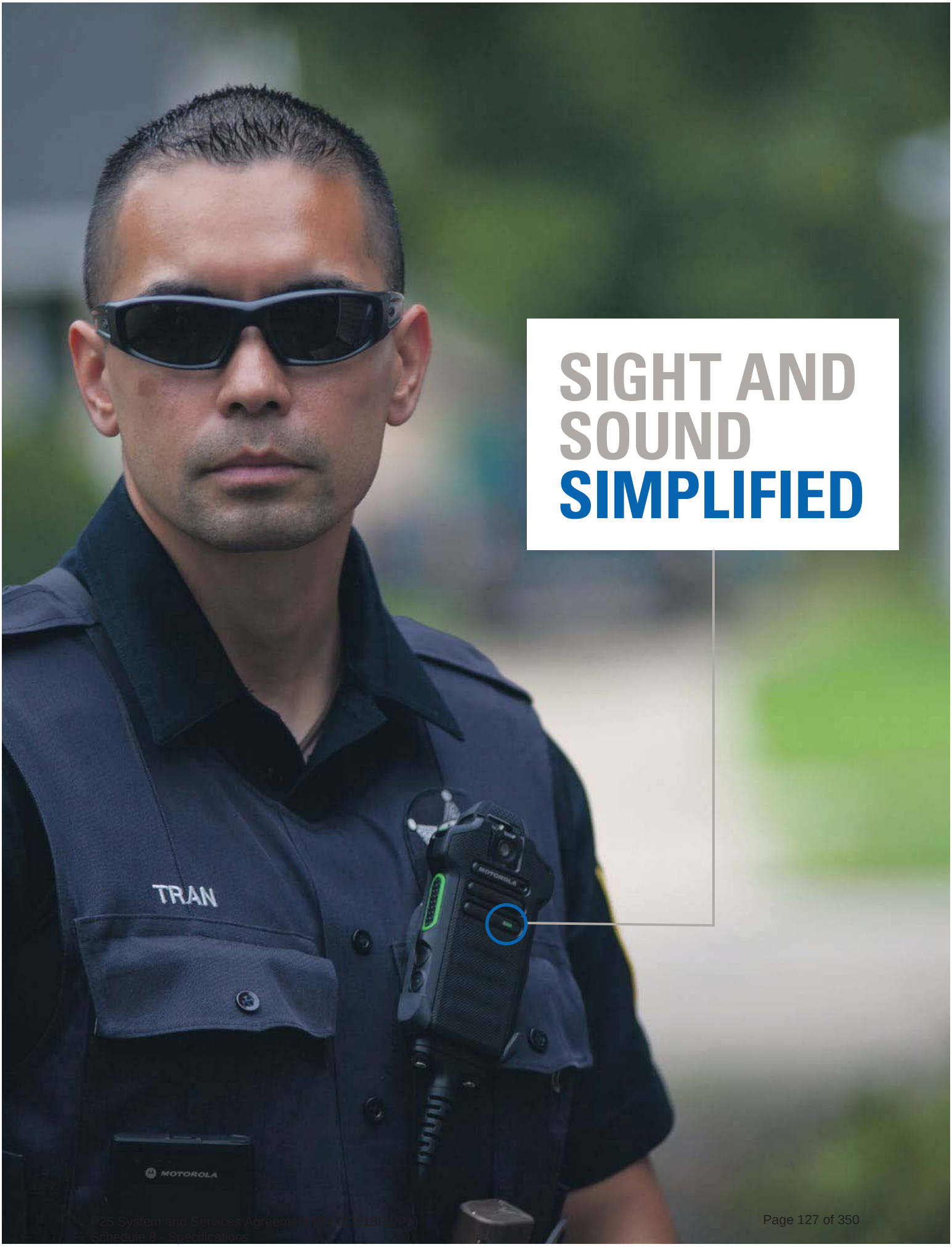
VERSATILE CARRY HOLDER

Designed to meet public safety specifications, the Si300 carry holder enables flexible wearing positions on a tactical vest or uniform. Purpose-built for fast attachment and removal.

3.5MM SURVEILLANCE KIT

Ideal for covert operations, this translucent tube connects to the 3.5mm audio jack on the Si300 and provides a more discreet option for receiving private messages.




SIGHT AND
SOUND
SIMPLIFIED
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For more information, please visit: www.motorolasolutions.com/Si300

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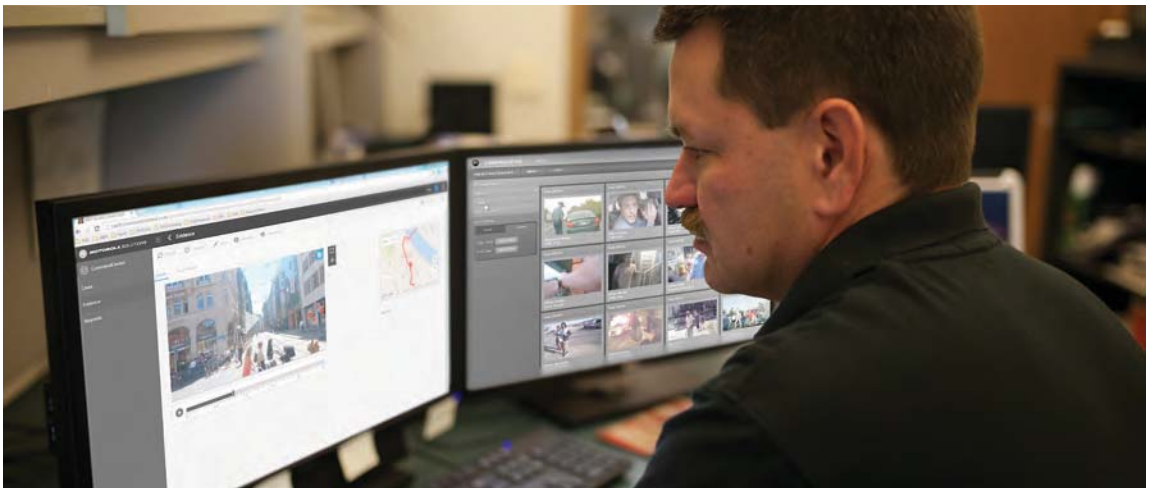
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10-2015

MOTOROLA SOLUTIONS

COMMANDCENTRAL VAULT

OPERATIONS SIMPLIFIED



You need a digital evidence management solution that securely and efficiently stores all forms of multimedia and allows your agency to easily review, manage and share content, including evidence. CommandCentral Vault provides an advanced end-to-end content management solution that is secure and feature-rich with predictable pricing designed to streamline your operations. With CommandCentral Vault you can reduce administrative overhead and simplify workflows while maintaining policy and compliance to help save time and enhance community support.

TRANSFORMING DIGITAL EVIDENCE MANAGEMENT

Motorola's CommandCentral Vault is more than just storage, it's true end-to-end content management. All content is securely stored, simple to manage and easy to share with judicial personnel, citizens and media. CommandCentral Vault provides all the tools necessary to streamline workflows. Now your agency can reduce administrative time, simplify management and provide greater transparency faster than ever.

Example: A citizen recorded altercation goes viral and the officers are accused of excessive force. After they return to the station, video is automatically uploaded without user intervention. Simplified content management allows the officers to annotate, add additional tags and mark the videos for additional review. Command staff and the public information officer are able to easily search and review the marked videos from their mobile devices and prepare them for distribution. An analyst using auto-redaction quickly edits the videos to protect the privacy of innocent individuals. Using the FOIA workflow, the agency provides the redacted video to the media within hours, showing the officers' response was warranted and legal.

KEY USERS



Officer
Upload content, then search, review, annotate, mark, tag, clip and organize efficiently.



Detective
Easily search and review content details in a geospatial view with audit and retention control.



Records Specialist
Expedite redaction through automation, create clips, control content, set policies and securely distribute content with ease.



Citizen
Request content through a web-based portal, make payments easily and get secured, restricted access to approved content.

REQUEST A DEMO:
Register online at motorolasolutions.com/spssdemo

SOLID SECURITY
Content captured in the field is digitally signed to ensure authenticity when stored in CommandCentral Vault. The original content is always preserved and every action taken on content is logged for comprehensive audit and chain of custody needs.

CommandCentral Vault is based on Microsoft's Azure Government Cloud, the only cloud service provider contractually committed to meeting CJIS security standards established by the FBI. From the moment content is created and stored to when it's shared, it is fully secured.

FEATURES

- **Secured Content:**
  Original content is never editable and digitally signed to provide a cryptographically secure method to prove authenticity and chain-of-custody with cloud storage that meets CJIS standards.
- **Automated Redaction:**
  Eliminate tedious frame-by-frame redaction. Simply select the objects or people in a video and the redaction is applied across all frames automatically.
- **Automatic Correlation:**
  When linked to your CAD system or RMS, CommandCentral Vault can automatically correlate related evidence from external systems and group them in case folders to reduce administrative overhead searching for content (requires Manage module).
- **Complete Auditing:**
  Every action taken on stored content is tracked for greater transparency and accountability.
- **Evidence Sharing:**
  Customizable, easy-to-understand forms and workflows are available to distribute content to judicial personnel as well as citizens and media (requires Judicial or FOIA module).
- **Geospatial Video Review:**
  Integrated maps with geotagged locations of recorded content allows for simplified content review.
- **CommandCentral Integration:**
  Metadata stored in CommandCentral Vault can be reused in other CommandCentral applications to increase actionable intelligence.
- **Retention Policies:**
  Flag evidence to prevent deletion and retain content for different lengths based on incident type, capture date and case association based on your agency's policies.



Search through all recordings based on keywords, location or participating parties.

AVAILABLE MODULES

Store

The Store module is the baseline package provided for CommandCentral Vault and is offered on a per user license basis. Store users can seamlessly upload content into secure cloud storage that meets CJSI standards.

It provides the following additional capabilities:

- Annotate images and video during review
- Automatic association of stored content with CAD/RMS data
- Review content and associated metadata with geospatial mapping playback
- Chain of custody controls to preserve and verify original content
- Mark content to adhere to retention policies

Manage (Optional)

In addition to Store capabilities you receive:

- Agency-wide content search for permitted users
- Enhanced review functionality with playback speed controls
- Additional administrative content restriction controls
- Automated redaction based on facial and/or object recognition

Judicial (Optional)

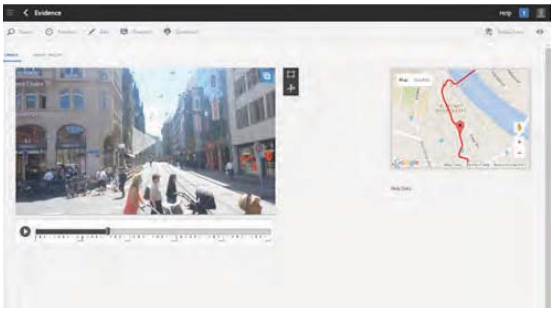
In addition to Store capabilities you receive:

- The ability to create video clips of specific evidence related to a judicial request
- The ability to restrict access based on permissions
- Secure links to requested content to maintain chain of custody
- Automated redaction based on facial and/or object recognition

FOIA (Optional)

In addition to Store capabilities you receive:

- A secure, agency-branded web portal to enable FOIA requests from the public
- The ability to collect payments for FOIA requests
- The ability to tailor customizable workflow forms to your agency needs
- Automated redaction based on facial and/or object recognition



Geospatial content review allows personnel to see exactly where officers were located throughout their recording.

PREDICTABLE COSTS
CommandCentral Vault provides your agency with simplified, predictable pricing to easily plan and budget expenses for a body-worn camera (BWC) program. As a cloud-based application, there is no complex integration or need for infrastructure and additional IT administrative overhead. Monthly subscription costs are based on the number of BWC users and role-based access is available to all agency personnel at no additional cost.

DIGITAL EVIDENCE MANAGEMENT SOLUTION
CommandCentral Vault, when combined with the Si300 or Si500 video speaker microphone, creates a complete digital evidence management solution. The combined solution features wireless upload and automatic metadata correlation to simplify content management and reduce administrative overhead. With intuitive and intelligent software automating actions for personnel in the street and back office, this end-to-end solution is paving the way for a new era in digital evidence management. Learn more at www.motorolasolutions.com/dems

For more information about CommandCentral Vault, contact your Motorola representative or visit motorolasolutions.com/commandcentralvault

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BROWARD COUNTY RFP SECTION 7: SUBSCRIBER EQUIPMENT

Pricing and Trade-in and Additional Incentives

Motorola Solutions is offering the following pricing and discounts to Broward County government agencies. Pricing for specific radio models and accessories are located in Appendix D -Pricing Workbook-For Information Only- Addendum 2.

Pricing Incentives

Motorola Solutions is offering the following pricing and discounts to Broward County government agencies. Pricing for specific radio models and accessories are located in Appendix D -Pricing Workbook-For Information Only- Addendum 2.

Standard Discount:

A. **25% discount off of any P25 configured APX radio.** This standard discount will be available for any state or local government agency in the State of Florida.

B. **23% discount off of any APX accessories.** This standard discount will be available for any state or local government agency in the State of Florida.

C. This standard discount will be available for any Florida state and local government agencies.

Broward County Migration Incentive:

A. **Total discount of 40% off of any P25 APX radio, no minimum quantity.**

B. **Total discount of 29% off of any APX accessories, no minimum quantity.**

C. This additional discount will be available for Broward County local government agencies and it will be good for 1 year from the date of RFP # R1422515P1 contract execution.

D. Motorola Solutions will entertain additional incentives for large quantity purchases.

Warranty

A. APX radios standard warrantee: 1 year depot support.

B. Accessories standard warrantee: 1 year depot support.

B1. Impress Batteries will be warranted for 18 months.

C. Extended warranty is available up to 5 years, as an option.

Motorola Solutions has included a comprehensive list of radios, configurable options and accessories. Motorola Solutions will not limit agencies to these lists. Agencies will be able to configure and select items from our entire APX product line with the same applicable discounts to meet their agencies specific needs.

APX 4000 PORTABLE RADIOS					
STANDARD RADIO BUNDLE: P25, TDMA, IV&D, GPS, BLUETOOTH, WHIP ANTENNA, 1900MAH BATTERY, 1 YEAR WARRANTY					
MODEL	**DESCRIPTION**	**QTY**	**DISC%**	**UNIT $**	**DISC $**
H51UCF9PW6 N	**APX 4000 7/800 MHZ *MODEL 2* PORTABLE**	**1**	**25%**	**$3,926.00**	**$2,944.50**
H51UCH9PW7 N	**APX 4000 7/800 MHZ *MODEL 3* PORTABLE**	**1**	**25%**	**$4,342.00**	**$3,256.50**
OPTIONS(not limited to):		**QTY**	**LIST $**	**DISC %**	**DISC $**
G996	ADD: PROGRAMMING OVER P25 (OTAP)	1	$100.00	25%	$75.00
QA01648	ADD: ADVANCED SYSTEM KEY - HARDWARE KEY	1	$5.00	25%	$3.75
QA03399	ADD: ENHANCED DATA	1	$150.00	25%	$112.50
QA04447	ADD: APX GEOFENCE	1	$150.00	25%	$112.50
H04	ADD: TACTICAL REKEY WITH MULTIKEY	1	$350.00	25%	$262.50
H869	ENH: MULTIKEY	1	$330.00	25%	$247.50
Q629	ENH: AES ENCRYPTION	1	$475.00	25%	$356.25
H885BK	ADD: 3 YEAR SERVICE FROM THE START LITE	1	$84.00	0%	$84.00
H499	ENH: SUBMERSIBLE (DELTA T)	1	$250.00	25%	$187.50
QA04934	ALT: IMPRES LI-ION 2300MAH RUGGED UL BATTERY*	1	$50.00	25%	$37.50

APX 6000 PORTABLE RADIOS					
STANDARD RADIO BUNDLE: P25, TDMA, IV&D, GPS, BLUETOOTH, WHIP ANTENNA, 2150MAH BATTERY, 1 YEAR WARRANTY					
MODEL	**DESCRIPTION**	**QTY**	**DISC%**	**LIST $**	**DISC $**
H98UCD9PW5 N	**APX6000 7/800 MHZ *MODEL 1.5* PORTABLE**	**1**	**25%**	**$4,891.00**	**$3,668.25**
H98UCF9PW6 N	**APX6000 700/800 *MODEL 2.5* PORTABLE**	**1**	**25%**	**$5,203.00**	**$3,902.25**
H98UCH9PW7 N	**APX6000 700/800 *MODEL 3.5* PORTABLE**	**1**	**25%**	**$5,619.00**	**$4,214.25**
XTREME (XE) DELTA T/UL OPTIONS(not limited to):		**QTY**	**DISC%**	**LIST $**	**DISC $**
QA02006	ENH: APX6000XE RUGGED RADIO (standard UL battery NNTN8930 comes with option)	1	25%	$800.00	$600.00
QA00781	ALT: LIION 4200MAH IMPRES DELTA-T	1	25%	$115.00	$86.25
QA05575	ALT: LIION HICAP UL TIA4950 4500MAH	1	25%	$165.00	$123.75
OPTIONS(not limited to):		**QTY**	**DISC%**	**LIST $**	**DISC $**
QA01648AA	ADD: ADVANCED SYSTEM KEY - HARDWARE KEY	1	25%	$5.00	$3.75
G996	ADD: PROGRAMMING OVER P25 (OTAP)	1	25%	$100.00	$75.00
QA01767	ADD: P25 LINK LAYER AUTHENTICATION	1	25%	$100.00	$75.00
QA00631	ADD: DVRS PSU ACTIVATION	1	25%	$100.00	$75.00
H869	ENH: MULTIKEY	1	25%	$330.00	$247.50
Q498	ENH: ASTRO 25 OTAR W/ MULTIKEY	1	25%	$740.00	$555.00
QA03399	ADD: ENHANCED DATA	1	25%	$150.00	$112.50
QA04447	ADD: APX GEOFENCE PORTABLE	1	25%	$150.00	$112.50
Q15	ADD: AES/DES-XL/DES-OFB ENCRYPTION	1	25%	$799.00	$599.25
Q629	ENH: AES ENCRYPTION	1	25%	$475.00	$363.75
H04	ADD: TACTICAL REKEY WITH MULTIKEY	1	25%	$350.00	$262.50
QA01837	ALT: LIION IMPRES IP67 2900MAH (NNTN7038)	1	25%	$100.00	$75.00
H885BK	ADD: 3 YEAR SERVICE FROM THE START LITE	1	0%	$84.00	$84.00
H64	ALT: PUBLIC SAFETY YELLOW HOUSING	1	25%	$25.00	$18.75
QA01427	ALT: IMPACT GREEN HOUSING	1	25%	$25.00	$18.75
QA WIFI	ADD: WI-FI	1	25%	$300.00	$225.00
QA AUDIO	ADD: ADVANCED AUDIO	1	25%	$150.00	$112.50

APX 8000 PORTABLE RADIOS					
STANDARD RADIO BUNDLE: P25, TDMA, IV&D, GPS, BLUETOOTH, WHIP ANTENNA, 3100MAH BATTERY, 1 YEAR WARRANTY					
MODEL	**DESCRIPTIONS**	**QTY**	**DISC%**	**LIST $**	**DISC $**
H91TGD9PW5 N	**APX 8000 *ALL BAND MODEL 1.5 PORTABLE***	**1**	**25%**	**$8,374.00**	**$6,280.50**
Q806	ADD: ASTRO DIGITAL CAI OPERATION	1	25%		
H38	ADD: SMARTZONE OPERATION	1	25%		
Q361	ADD: P25 9600 BAUD TRUNKING	1	25%		
QA00580	ADD: TDMA OPERATION	1	25%		
DUAL BAND		1	25%	$7,574.00	$5,680.50
SINGLE BAND		1	25%	$6,774.00	$5,080.50
H91TGD9PW6 N	**APX 8000 *ALL BAND MODEL 2.5* PORTABLE**	**1**	**25%**	**$8,574.00**	**$6,430.50**
DUAL BAND		1	25%	$7,774.00	$5,830.50
SINGLE BAND		1	25%	$6,974.00	$5,230.50
H91TGD9PW7 N	**APX 8000 *ALL BANDMODEL 3.5* PORTABLE**	**1**	**25%**	**$8,874.00**	**$6,655.50**
Q806	ADD: ASTRO DIGITAL CAI OPERATION	1	25%		
H38	ADD: SMARTZONE OPERATION	1	25%		
Q361	ADD: P25 9600 BAUD TRUNKING	1	25%		
QA00580	ADD: TDMA OPERATION	1	25%		
DUAL BAND		1	25%	$8,074.00	$6,055.50
SINGLE BAND		1	25%	$7,274.00	$5,455.50
XTREME (XE) DELTA T/UL OPTIONS(not limited to):		**QTY**	**DISC %**	**LIST $**	**DISC $**
QA02006	ENH: APX8000XE RUGGED RADIO (standard UL battery PMNN4504 comes with option)	1	25%	$800.00	$600.00
QA05595	ALT: LIION 4100MA TIA4950 UL	1	25%	$130.00	$97.50
OPTIONS(not limited to):		**QTY**	**DISC %**	**LIST $**	**DISC $**
Q58	ADD: 3 YEAR SERVICE FROM THE START LITE	1	0%	$102.00	$102.00
QA01648	ADD: ADVANCED SYSTEM KEY - HARDWARE KEY	1	25%	$5.00	$3.75
G996	ADD: PROGRAMMING OVER P25 (OTAP)	1	25%	$100.00	$75.00
QA01767	ADD: P25 LINK LAYER AUTHENTICATION	1	25%	$100.00	$75.00
QA00631	ADD: DVRS PSU ACTIVATION	1	25%	$100.00	$75.00
H869	ENH: MULTIKEY	1	25%	$330.00	$247.50
Q498	ENH: ASTRO 25 OTAR W/ MULTIKEY	1	25%	$740.00	$555.00
QA03399	ADD: ENHANCED DATA	1	25%	$150.00	$112.50
QA04447	ADD: APX GEOFENCE PORTABLE	1	25%	$150.00	$112.50

Q15	ADD: AES/DES-XL/DES-OFB ENCRYPTION	1	25%	$799.00	$599.25
Q629	ENH: AES ENCRYPTION	1	25%	$475.00	$363.75
H04	ADD: TACTICAL REKEY WITH MULTIKEY	1	25%	$350.00	$262.50
QA09001	ADD: WIFI CAPABILITY	1	25%	$300.00	$225.00
H64	ALT:APX 8000 HOUSING YELLOW	1	25%	$25.00	$18.75

APX 4500 MOBILE RADIOS (standard whip antennas and control head cables)

STANDARD RADIO BUNDLE: P25, TDMA, IV&D, GPS, PALM MIC, 7.5 WATT SPEAKER, 3DB LOW PROFILE ANTENNA , 1 YEAR WARRANTY (REMOTE MOUNT 17FT CABLE)

MODEL	DESCRIPTIONS	QTY	DISC%	UNIT $	DISC $
M22URS9PW1 N	**APX4500 7/800 *02 CONTROL, HEAD DASH MOUNT***	**1**	**25%**	**$4,316.00**	**$3,237.00**
M22URS9PW1 N	**APX4500 7/800 *02 CONTROL HEAD, REMOTE MOUNT***	**1**	**25%**	**$4,488.00**	**$3,366.00**
CONTROL STATION OPTIONS(not limited to):		**QTY**	**DISC%**	**UNIT $**	**DISC $**
G91	ADD: CONTROL STATION POWER SUPPLY	1	25%	$269.00	$201.75
W665	ADD: CONTROL STATION OPERATION	1	25%	$70.00	$52.50
W382	ADD: CONTROL STATION DESK GCAI MIC	1	25%	$169.00	$126.75
OPTIONS(not limited to):		**QTY**	**DISC%**	**UNIT $**	**DISC $**
QA01648	ADD: ADVANCED SYSTEM KEY - HARDWARE KEY		25%	$5.00	$3.75
GA00631	ADD: DVRS MSU ACTIVATION		25%	$250.00	$187.50
G201	ADD:IMPACT GREEN COLOR HOUSING (O2)		25%	$25.00	$18.75
G335	ADD: ANT 1/4 WAVE 762-870MHZ		25%	$14.00	$10.50
G831	ADD: SPKR 15W WATER RESISTANT		25%	$60.00	$45.00
G24	ADD: 3 YEAR SERVICE FROM THE START LITE		0%	$121.00	$121.00
G996	ENH: OVER THE AIR PROVISIONING		25%	$100.00	$75.00
G683	ADD: ONE TOUCH STATUS MESSAGING		25%	$75.00	$56.25
GA01767	ADD: APX MOBILE RADIO AUTHENTICAT		25%	$100.00	$75.00
QA03399	ADD: ENHANCED DATA		25%	$150.00	$112.50
GA00226	ADD: GPS ANTENNA		25%	$75.00	$56.25
GA01202AA	ADD: APX GEOFENCE MOBILE		25%	$150.00	$112.50
G843AH	ADD: AEX ENCRYPTION		25%	$475.00	$356.25
G298AS	ENH: ASTRO 25 OTAR W/ MULTIKEY		25%	$740.00	$518.00
W969	ADD: MULTIPLE KEY ENCRYPTION OPERATION		25%	$330.00	$247.50
G618	ADD:CBL REMOTE MOUNT 10 FEET		25%	$10.00	$7.50
G610	ADD: REMOTE MOUNT CBL 30 FEET		25%	$25.00	$18.75

APX 6500 MOBILE RADIOS (standard whip antennas and control head cables)

STANDARD RADIO BUNDLE: P25, TDMA, IV&D, GPS, PALM MIC, 7.5 WATT SPEAKER, 3DB LOW PROFILE ANTENNA , 1 YEAR WARRANTY (REMOTE MOUNT 17FT CABLE)

MODEL	DESCRIPTIONS	QTY	DISC%	UNIT $	DISC $
M25URS9PW1 N	**APX6500 7/800 MHZ MID POWER MOBILE *05 CONTROL HEAD, DASH MOUNT***	**1**	**25%**	**$5,541.00**	**$4,155.75**
M25URS9PW1 N	**APX6500 7/800 MHZ MID POWER MOBILE *05 CONTROL HEAD, REMOTE MOUNT***	**1**	**25%**	**$5,713.00**	**$4,284.75**
CONTROL STATION OPTIONS(not limited to):		**QTY**	**DISC%**	**UNIT $**	**DISC $**
G91	ADD: CONTROL STATION POWER SUPPLY	1	25%	$269.00	$201.75
W665	ADD: CONTROL STATION OPERATION	1	25%	$70.00	$52.50
W382	ADD: CONTROL STATION DESK GCAI MIC	1	25%	$169.00	$126.75
DUAL CONTROL HEAD OPTIONS(not limited to):		**QTY**	**DISC%**	**UNIT $**	**DISC $**
GA00092	ADD: DUAL-CONTRL HD HARDWARE (must add additional mic, cables & speakers)	1	25%	$570.00	$427.50
OPTIONS(not limited to):		**QTY**	**DISC%**	**UNIT $**	**DISC $**
QA01648	ADD: ADVANCED SYSTEM KEY - HARDWARE KEY	1	25%	$5.00	$3.75
QA00631	ADD: DVRS PSU ACTIVATION	1	25%	$100.00	$75.00
GA00631	ADD: DVRS MSU ACTIVATION	1	25%	$250.00	$187.50
G335	ADD: ANT 1/4 WAVE 762-870 MHZ	1	25%	$14.00	$10.50
G831	ADD: SPKR 15W WATER RESISTANT	1	25%	$60.00	$45.00
G24	ADD: 3 YEAR SERVICE FROM THE START LITE	1	0%	$121.00	$121.00
G996	ENH: OVER THE AIR PROVISIONING	1	25%	$100.00	$75.00
QA03399	ADD: ENHANCED DATA	1	25%	$150.00	$112.50
GA01202AA	ADD: APX GEOFENCE MOBILE	1	25%	$150.00	$112.50
GA01767	ADD: APX MOBILE RADIO AUTHENTICAT	1	25%	$100.00	$75.00
GA00226	ADD: GPS ANTENNA	1	25%	$75.00	$56.25
G298AS	ENH: ASTRO 25 OTAR W/ MULTIKEY	1	25%	$740.00	$555.00
W969	ADD: MULTIPLE KEY ENCRYPTION OPERATION	1	25%	$330.00	$247.50
G851	ADD: AES/DES-XL/DES-OFB ENCRYPTION	1	25%	$799.00	$599.25
G843	ADD: AES ENCRYPTION APX	1	25%	$475.00	$356.25

G618	ADD: REMOTE MOUNT CBL 10 FEET	1	25%	$10.00	$7.50
G610	ADD: REMOTE MOUNT CBL 30 FEET	1	25%	$25.00	$18.75
GA00396AB	ADD REMOTE MOUNT CBL 150 FEET	1	25%	$75.00	$56.25
GA00805AA	ADD: 07 CONTROL HEAD	1	25%	$632.00	$474.00
GA00245AA	ADD: 09 CONTROL HEAD	1	25%	$1,200.00	$900.00

APX 7500 MOBILE RADIOS (standard whip antennas and control head cables)

STANDARD RADIO BUNDLE: P25, TDMA, IV&D, GPS, PALM MIC, 7.5 WATT SPEAKER, ANTENNA (7/800 3DB LOW PROFILE, 1/4 WAVE WHIP VHF/UHF) , 1 YEAR WARRANTY (REMOTE MOUNT 17FT CABLE, CONSOLETTES DC POWER)

MODEL	DESCRIPTION	QTY	DISC %	Unit Total	EXT DISC $
M30URS9PW1 N	APX 7500 ***SINGLE BAND , 05 CONTROL HEAD, DASH MOUNT***	1	25%	$6,233.00	$4,674.75
M30URS9PW1 N	APX7500 ***SINGLE BAND , 05 CONTROL HEAD, REMOTE MOUNT***	1	25%	$6,405.00	$4,803.75
M30TSS9PW1 N	APX7500 ***DUAL BAND MID POWER, 05 CONTROL HEAD, DASH MOUNT***	1	25%	$7,246.50	$5,434.88
M30TSS9PW1 N	APX7500 ***DUAL BAND, MID POWER, 05 CONTROL HEAD, REMOTE MOUNT***	1	25%	$7,418.50	$5,563.88
M30TXS9PW1 N	APX7500 ***DUAL BAND, HIGH POWER*** 05, ***CONTROL HEAD, REMOTE MOUNT***	1	25%	$7,943.50	$5,957.63
CONTROL STATION OPTIONS(not limited to):		**QTY**	**DISC%**	**UNIT $**	**DISC $**
G91	**ADD: CONTROL STATION POWER SUPPLY**	1	25%	$269.00	$201.75
W665	**ADD: CONTROL STATION OPERATION**	1	25%	$70.00	$52.50
W382	**ADD: CONTROL STATION DESK GCAI MIC**	1	25%	$169.00	$126.75
MULTIPLE CONTROL HEAD OPTIONS(not limited to):				**UNIT $**	**DISC $**
GA00092	ADD: DUAL-CONTRL HD HARDWARE(must add additional mic, cables & speakers)	1	25%	$570.00	$427.50
GA00093	ADD: APX7500 TRI-CONTROL HARDWARE(must add additional mic,cables & speakers)	1	25%	$1,000.00	$750.00
GA00094	ADD: APX QUAD-CONTROL HARDWARE(must add additional mic, cables & speakers)	1	25%	$1,300.00	$975.00
CONSOLETTE RADIOS (no antenna, line or combiners in bundle, only radio and internal configurations):		**QTY**	**DISC%**	**UNIT $**	**DISC $**
L30URS9PW1 N	**APX7500 SINGLE BAND CONSOLETTE**	**1**	**25%**		
LIMITED FRONT PANEL		**1**	**25%**	**$7,848.00**	**$5,886.00**
FULL FP W/05/KEYPAD		**1**	**25%**	**$8,157.00**	**$6,117.75**
L30TSS9PW1 N	**APX7500 CONSOLETTE DUAL BAND CONSOLETTE**	1	25%		
LIMITED FRONT PANEL		**1**	**25%**	**$9,248.00**	**$6,936.00**
FULL FP W/05/KEYPAD		**1**	**25%**	**$9,557.00**	**$7,167.75**
CONSOLETTE OPTIONS(not limited to):		**QTY**	**DISC%**	**UNIT $**	**DISC $**
DSCOL54160	VHF OMNIMEANDER COLLINEAR DIRECTIONAL ANTENNA	1	8%	$ 1,921.00	$1,767.32
DSCOL4570	UHF OMNI COLLINEAR DIRECTIONAL ANTENNA	1	8%	$ 912.00	$839.04

DSANT790F2	7/800 OMNI COLLINEAR DIRECTIONAL TELEWAVE ANTENNA	1	8%	$ 1,012.00	$931.04
100 FT 1/2 SUPERFLEX CABLE AND CONNECTORS		1	8%	$585.90	$539.03
OPTIONS(not limited to):		**QTY**	**DISC%**	**UNIT $**	**DISC $**
QA01648	ADD: ADVANCED SYSTEM KEY - HARDWARE KEY	1	25%	$5.00	$3.75
GA01767	APX MOBILE RADIO AUTHENTICATION	1	25%	$100.00	$75.00
GA00631	ADD: DVRS MSU ACTIVATION	1	25%	$250.00	$187.50
GA00805	ADD: APX O7 CONTROL HEAD.	1	25%	$632.00	$474.00
GA00245	ADD: O9 CONTROL HEAD	1	25%	$1,200.00	$900.00
G174	ADD: ANT 3DB LOW-PROFILE 762-870	1	25%	$43.00	$32.25
W484	ALT: ANT 3DB GAIN 762-870MHZ	1	25%	$38.00	$28.50
G296	ADD: 1/4 WAVE WHIP ROOF TOP 136-144	1	25%	$13.50	$10.13
G300	ADD:1/4 WAVE ROOF TOP ANT VHF	1	25%	$13.50	$10.13
G430	ADD: ANT 5.0DB 445-470 MHZ	1	25%	$110.00	$82.50
G426	ADD: ANT 1/4 WAVE WHIP 450-470 MHZ	1	25%	$25.00	$18.75
G510	ADD: ANT LOW PROFILE 450-512 MHZ	1	25%	$50.00	$37.50
G78	ADD: 3 YEAR SERVICE FROM THE START LITE	1	0%	$158.00	$158.00
G831	ADD: SPKR 15W WATER RESISTANT	1	25%	$60.00	$45.00
W432	ADD: AUXILARY SPKR 13W (3.2OHM)	1	25%	$71.50	$53.63
G996	ENH: OVER THE AIR PROVISIONING	1	25%	$100.00	$75.00
QA03399	ADD: ENHANCED DATA	1	25%	$150.00	$112.50
GA01202	ADD: APX GEOFENCE MOBILE	1	25%	$150.00	$112.50
GA00226	ADD: GPS ANTENNA	1	25%	$75.00	$56.25
W969	ADD: MULTIPLE KEY ENCRYPTION OPERATION	1	25%	$330.00	$247.50
G298	ENH: ASTRO 25 OTAR W/ MULTIKEY	1	25%	$740.00	$555.00
G851	ADD: AES/DES-XL/DES-OFB ENCRYPTION	1	25%	$799.00	$599.25
G843	ADD: AES ENCRYPTION APX	1	25%	$475.00	$356.25
G609	ADD: REMOTE MOUNT CBL 50 FEET	1	25%	$35.00	$26.25
G607	ADD:CBL REMOTE MOUNT 75 FEET	1	25%	$45.00	$33.75
G879	ADD:REMOTE MOUNT CBL 115 FEET	1	25%	$55.00	$41.25

APX 8500 MOBILE RADIOS (standard whip antennas and control head cables)

STANDARD RADIO BUNDLE: P25, TDMA, IV&D, GPS, PALM MIC, 7.5 WATT SPEAKER, ANTENNA (7/800 3DB LOW PROFILE, 1/4 WAVE WHIP VHF/UHF, ALL BAND ANTENNA) , 1 YEAR WARRANTY (REMOTE MOUNT 17FT CABLE)

MODEL	DESCRIPTION	QTY	DISC %	Unit Total	EXT DISC $
M37TSS9PW1 N	**APX8500 *ALL BAND* , MID POWER, *05 CONTROL HEAD, DASH MOUNT* MOBILE RADIO**	**1**	**25%**	**$8,759.00**	**$6,569.25**
DUAL BAND		1	25%	$7,959.00	$5,969.25
SINGLE BAND		1	25%	$7,159.00	$5,369.25
M37TSS9PW1 N	**APX8500 *ALL BAND,* MID POWER, *05 CONTROL, HEAD REMOTE MOUNT* MOBILE RADIO**	**1**	**25%**	**$8,931.00**	**$6,698.25**
DUAL BAND		1	25%	$8,131.00	$6,098.25
SINGLE BAND		1	25%	$7,331.00	$5,498.25
CONTROL STATION OPTIONS(not limited to):		**QTY**	**DISC%**	**UNIT $**	**DISC $**
G91	**ADD: CONTROL STATION POWER SUPPLY**	1	25%	$269.00	$201.75
W665	**ADD: CONTROL STATION OPERATION**	1	25%	$70.00	$52.50
W382	**ADD: CONTROL STATION DESK GCAI MIC**	1	25%	$169.00	$126.75
MULTIPLE CONTROL HEAD OPTIONS(not limited to):		**QTY**	**DISC%**	**UNIT $**	**DISC $**
GA00092	ADD: DUAL-CONTRL HD HARDWARE(must add additional mic, cables & speakers)	1	25%	$570.00	$427.50
GA00093	ADD: APX7500 TRI-CONTROL HARDWARE(must add additional mic,cables & speakers)	1	25%	$1,000.00	$750.00
GA00094	ADD: APX QUAD-CONTROL HARDWARE(must add additional mic, cables & speakers)	1	25%	$1,300.00	$975.00
OPTIONS(not limited to):		**QTY**	**DISC%**	**UNIT $**	**DISC $**
QA01648	ADD: ADVANCED SYSTEM KEY - HARDWARE KEY	1	25%	$5.00	$3.75
GA01767	APX MOBILE RADIO AUTHENTICATION	1	25%	$100.00	$75.00
QA00631	ADD: DVRS PSU ACTIVATION	1	25%	$100.00	$75.00
GA00805	ADD: APX O7 CONTROL HEAD.	1	25%	$632.00	$474.00
GA00245	ADD: O9 CONTROL HEAD	1	25%	$1,200.00	$900.00
W432	ADD: AUXILARY SPKR 13W (3.2OHM)	1	25%	$71.50	$53.63
GA09001	ADD: WIFI	1	25%	$300.00	$225.00
G996	ENH: OVER THE AIR PROVISIONING	1	25%	$100.00	$75.00
QA03399	ADD: ENHANCED DATA	1	25%	$150.00	$112.50
GA00229	ENH: APX GPS ACTIVATION	1	25%	$150.00	$112.50
GA01202	ADD: APX GEOFENCE MOBILE	1	25%	$150.00	$112.50
W969	ADD: MULTIPLE KEY ENCRYPTION OPERATION	1	25%	$330.00	$247.50
G298	ENH: ASTRO 25 OTAR W/ MULTIKEY	1	25%	$740.00	$555.00
G851	ADD: AES/DES-XL/DES-OFB ENCRYPTION	1	25%	$799.00	$599.25
G843	ADD: AES ENCRYPTION APX	1	25%	$475.00	$356.25
G609	ADD: REMOTE MOUNT CBL 50 FEET	1	25%	$35.00	$26.25
G607	ADD:CBL REMOTE MOUNT 75 FEET	1	25%	$45.00	$33.75
G879	ADD:REMOTE MOUNT CBL 115 FEET	1	25%	$55.00	$41.25
G831	ADD: SPKR 15W WATER RESISTANT	1	25%	$60.00	$45.00
W432	ADD: AUXILARY SPKR 13W (3.2OHM)	1	25%	$71.50	$53.63
G78	ADD: 3 YEAR SERVICE FROM THE START LITE	1	0%	$158.00	$158.00
G174	ADD: ANT 3DB LOW-PROFILE 762-870		25%	$43.00	$118.50
W484	ALT: ANT 3DB GAIN 762-870MHZ		25%	$38.00	$28.50
G299	ADD: 1/4 WAVE ROOF TOP 150.8-162		25%	$19.50	$14.63
GA00506	ADD: ANT MCL 1/4 WAVE WHIP 425- 470		25%	$50.00	$37.50
GA00226	ADD: GPS WIFI ANTENNA		25%	$75.00	$56.25

ADDITIONAL EQUPMENT, ACCESSORIES AND PROGRAMMING EQUPMENT/SOFTWARE (NOT LIMITED TO)					
PORTABLE AND MOBILE ANTENNAS		**LIST $**	**DISC %**	**DISC $**	**RADIO TYPE**
NAF5085A	APX 700/800- GPS ANTENNA	$45.00	23%	$34.65	ALL PORTABLE
NAR6595A	ANT 1/4 WAVE 7/800 STUBBY	$29.00	23%	$22.33	ALL PORTABLE
NAF5085A	APX 700/800- GPS ANTENNA	$45.00	23%	$34.65	ALL PORTABLE
NAG4000	APX STUBBY ANTENNA	$18.00	23%	$13.86	ALL PORTABLE
NAR6593A	ANT,HLCL,136MHZ MIN,1.577GHZ M	$38.00	23%	$29.26	6000, 8000
PMAE4065A	UHF (380-520) GPS ANTENNA	$21.00	23%	$16.17	6000, 8000
NAR6594A	ANT VHF 7/800/GPS	$75.00	23%	$57.75	6000, 8000
PMAS4001A	UHF (380-520) /7-800 GPS	$31.00	23%	$23.87	6000, 8000
KT000026A01	KIT, ANTENNA, ALL-BAND, 20CM	$108.00	23%	$83.16	8000
DSCOL54160	VHF OMNIMEANDER COLLINEAR DIRECTIONAL ANTENNA	$ 1,921.00	8%	$ 1,767.32	ALL MOBILE
DSCOL4570	UHF OMNI COLLINEAR DIRECTIONAL ANTENNA	$ 912.00	8%	$ 839.04	ALL MOBILE
DSANT790F2	7/800 OMNI COLLINEAR DIRECTIONAL TELEWAVE ANTENNA	$ 1,012.00	8%	$ 931.04	ALL MOBILE
100 FT 1/2 SUPERFLEX COAX, CONNECTORS, RF SURGE SUPRESSOR, GROUND KITS AND MOUNTING HARDWARE		$826.00	8%	$ 759.92	ALL MOBILE
100 FT 1/2 PLENUM RATED COAX, CONNECTORS, RF SURGE SUPRESSOR, GROUND KITS AND MOUNTING HARDWARE		$791.00	8%	$ 727.72	ALL MOBILE
DSCS0496040531	4 PORT COMBINER	$2,159.00	8%	$1,986.28	ALL MOBILE
DSCS0496080531	8 PORT COMBINER	$2,421.00	8%	$2,227.32	ALL MOBILE
DSCS0496160531	12 PORT COMBINER	$5,426.00	8%	$4,991.92	ALL MOBILE
DSCS0496240531	16 PORT COMBINER	$8,427.00	8%	$7,752.84	ALL MOBILE
DSCS0496320531	32 PORT COMBINER	$10,796.00	8%	$9,932.32	ALL MOBILE
PORTABLE BATTERIES		**LIST $**	**DISC %**	**DISC $**	**RADIO TYPE**
NNTN8128BR	BATT IMP STD LI ION 1900M	$102.00	23%	$78.54	4000
PMNN4424AR	BATT IMP LI ION 2300M	$117.00	23%	$90.09	4000
PMNN4448AR	BATT IMP STD IP67 LIION 2700MAH	$127.00	23%	$97.79	4000
NNTN8560A	BATT IMPRES LIION TIA4950 UL IP67 2500T	$155.00	23%	$119.35	4000
NNTN8930	BATT IMP TIA4950 UL 2350MAH	$155.00	23%	$119.35	6000
NNTN8921	BATT IMPRES 2 LIION TIA4950 UL IP68 41OOMAH	$177.00	23%	$136.29	6000
NNTN7034B	BATT IMP RUGGEDIZED LIION 4200M	$162.00	23%	$124.74	6000, 8000
NNTN7038B	BATT IMP IP67 LIION 2900M	$142.00	23%	$109.34	6000, 8000
PMNN4403B	BATT IP67 LIION 2050M	$127.00	23%	$97.79	6000, 8000
PMNN4504	BATT IMPRES LIION UL2054 DIV2 IP68 3400MAH	$150.00	23%	$115.50	8000XE ONLY
PMNN4505	ALT: LIION 4100 MAH IMPRES TIA4950 UL DELTA-T	$179.00	23%	$137.83	8000XE ONLY
PORTABLE BATTERY CHARGERS		**LIST $**	**DISC %**	**DISC $**	**RADIO TYPE**

WPLN4232A	SINGLE-UNIT IMPRES CHARGER	$69.30	23%	$53.36	4000
NNTN8525A	TRAVEL CHARGER	$95.00	23%	$73.15	4000
WPLN4219B	IMPRES MULIT-UNIT CHARGER W/DISPLAY	$715.00	23%	$550.55	4000
NNTN7065B	IMPRES MULTI UNIT CHARGER W/O DISPLAY	$866.80	23%	$667.44	6000, 8000
NNTN7073B	IMPRES MULTI UNIT CHARGER W/DISPLAY	$1,485.00	23%	$1,143.45	6000, 8000
RLN6434A	APX TRAVEL CHARGER	$111.10	23%	$85.55	6000, 8000
WPLN7080	APX IMPRES SINGLE UNIT CHARGER	$125.00	23%	$96.25	6000, 8000
PORTABLE REMOTE SPEAKER MICROPHONES		**LIST $**	**DISC %**	**DISC $**	**RADIO TYPE**
HMN4104B	IMPRES RSM DSPLY W JACK, W CHNL	$412.50	23%	$317.63	ALL PORTABLE
PMMN4062A	APX IMPRES RSM, NOISE CANC. EMERGENCY BUTTON 3.5MM JACK IP54	$117.70	23%	$90.63	ALL PORTABLE
PMMN4065A	APX IMPRES RSM W/VOL, IP57	$106.70	23%	$82.16	ALL PORTABLE
PMMN4069A	IMPRES RSM, 3.5MM AUDIO JACK	$121.00	23%	$93.17	ALL PORTABLE
PMMN4083A	IMPRES RSM DELTA-T,	$125.00	23%	$96.25	ALL PORTABLE
PMMN4084A	PLUS RSM NC IP54 THRD 3.5MM JACK RX	$95.00	23%	$73.15	ALL PORTABLE
PMMN4099A	AUDIO ACCESSORY-REMOTE SPEAKER MICROPHONE,IMPRES WINDPORTING RSM, IP55	$132.00	23%	$101.64	ALL PORTABLE
NNTN8203ABLK XE	IMPRES XE RSM FM, BLACK	$368.50	23%	$283.75	ALL PORTABLE
NNTN8203AYLW XE	ASSEMBLY, ACCESSORY, IMPRES XE RSM, YELLOW	$368.50	23%	$283.75	ALL PORTABLE
NNTN8575A XE	AUDIO ACCESSORY-REMOTE SPEAKER MICROPHONE,IMPRES XE RSM XT CABLE GREEN	$480.00	23%	$369.60	ALL PORTABLE
NNTN8575ABLK XE	AUDIO ACCESSORY-REMOTE SPEAKER MICROPHONE,IMPRES XE RSM XT CABLE BLACK	$480.00	23%	$369.60	ALL PORTABLE
NNTN8575AYLW XE	AUDIO ACCESSORY-REMOTE SPEAKER MICROPHONE,IMPRES XE RSM XT CABLE YLW	$480.00	23%	$369.60	ALL PORTABLE
NMN6271A	IMPRES XP RSM FOR APX W/ DUAL MIC NOISE SUPPRESSION	$325.00	23%	$250.25	ALL PORTABLE
NMN6274A	IMPRES XP RSM FOR APX W/ DUAL MIC NOISE SUPPRESSION, 3.5MM THRDJACK	$368.50	23%	$283.75	ALL PORTABLE
PORTABLE PUBLIC SAFETY MICROPHONES					
PMMN4059B	PSM IP55 WITH 3.5MM JACK RX 18IN	$164.00	23%	$126.28	ALL PORTABLE
PMMN4060B	PSM IP55 WITH 3.5MM JACK RX 24IN	$180.40	23%	$138.91	ALL PORTABLE

PMMN4061B	PSM IP55 WITH 3.5MM JACK RX 30IN	$164.00	23%	$126.28	ALL PORTABLE
PMAF4002	APX PSM 700/800MHZ ANTENNA	$12.00	23%	$9.24	ALL PORTABLE
PORTABLE AND MOBILE BLUETOOTH		**LIST $**	**DISC %**	**DISC $**	**RADIO TYPE**
NTN2570C	ASSEMBLY ACCESSORY WIRELESS ACCY KIT NFP 12 CABLE	$295.00	23%	$227.15	ALL PORTABLE
RLN6554A	ACCESSORY KIT,APX WIRELESS RSM W/ DUC US/NA/JP/TW	$300.00	23%	$231.00	ALL PORTABLE
RLN6544A	MISSION CRITICAL WIRELESS RSM W/ BATTERY AND CLIP	$250.00	23%	$192.50	ALL PORTABLE
PMMN4097C	MOBILE MICROPHONE WITH BLUETOOTH GATEWAY	$215.00	23%	$165.55	MOBILE ONLY
PORTABLE HEADSETS/ETC		**LIST $**	**DISC %**	**DISC $**	**RADIO TYPE**
NNTN8295A	1-WIRE EARBUD,116CM CORD,BLACK	$40.00	23%	$30.80	ALL PORTABLE
NNTN8298A	2-WIRE EARBUD,116CM CORD,BLACK	$49.95	23%	$38.46	ALL PORTABLE
PMLN5653A	BONE CONDUCTION EAR MIC	$399.00	23%	$307.23	ALL PORTABLE
PMLN6127A	IMPRES 2 WIRE SURVEILLANCE -BLK	$105.00	23%	$80.85	ALL PORTABLE
PMLN6123A	IMPRES 3 WIRE W/ TRANS TUBE-BLK	$173.00	23%	$133.21	ALL PORTABLE
PORTABLE HOLSTERS		**LIST $**	**DISC %**	**DISC $**	**RADIO TYPE**
PMLN7182A	APX 4000 TWO-KNOB,SWIVEL,LEATHER CARRY CASE	$60.00	23%	$46.20	4000
PMLN4651A	BELT CLIP 2"	$11.00	23%	$8.47	4000
PMLN5657B	APX6000 CC 2.75 SWLBL 2900&2150MAH	$71.50	23%	$55.06	6000, 8000
PMLN5659B	APX6000 CC 2.75 SWL BL 4200MAH	$67.00	23%	$51.59	6000, 8000
PMLN5875	APX6000XE 2.75SWBL2900,2300&2150MAH	$65.00	23%	$50.05	6000XE, 8000XE
PMLN5876A	APX6000XE 3 FIXBL 2900,2300&2150MAH	$62.00	23%	$47.74	6000XE, 8000XE
PMLN5877A	APX6000XE CC 2.75 SWL BL 4200MAH	$65.00	23%	$50.05	6000XE, 8000XE
RLN6486A	ACCESSORY KIT,FIREMAN'S RADIO STRAP	$37.00	23%	$28.49	ALL PORTABLE
RLN6487A	ACCESSORY KIT,FIREMAN'S RADIO STRAP, XL	$40.00	23%	$30.80	ALL PORTABLE
RLN6488A	ACCESSORY KIT,ANTI-SWAY STRAP	$15.00	23%	$11.55	ALL PORTABLE
PORTABLE AND MOBILE PROGRAMING		**LIST $**	**DISC %**	**DISC $**	**RADIO TYPE**
RVN5224AE	APX PORTABLE & MOBILE PROGRAMING SOFTWARE (3YR SUBSCRIPTION)	$399.99	0%	$399.99	BOTH MOBILE AND PORTABLE
HKN6184C	CBL ASSY:CABLE CH, PROGRAMMING, USB	$52.00	23%	$40.04	MOBILE ONLY

PMKN4012B	PORTABLE PROGRAMMING CABLE, USB	$77.00	23%	$59.29	PORTABLE ONLY
T7914	RADIO MANAGEMENT ONLINE	$0.00	20%	$0.00	BOTH MOBILE AND PORTABLE
UA00049AA	ADD: RADIO MANAGEMENT LICENSES ONLINE	$100.00	20%	$80.00	BOTH MOBILE AND PORTABLE
KVL 4000 KEYLOADER		**LIST $**	**DISC %**	**DISC $**	
T7537B	KVL 4000 PDA SNAP-ON	$1,250.00	8%	$1,150.00	
U239AD	ADD: ASTRO 25 MODE	$250.00	8%	$230.00	
CA01598AA	ADD: AC LINE CORD US	$11.00	8%	$10.12	
CA00182AP	ADD: AES ENCRYPTION SOFTWARE	$750.00	8%	$690.00	
C543	ADD: CABLE FOR RNC, DIU, MGEG	$84.00	8%	$77.28	
C725AA	ADD: KEYLOAD CABLE FOR APX PORTABLE	$75.00	8%	$69.00	
CA02187	ADD: KEYLOADING CABLE ADAPTER (GCAI)	$41.50	8%	$38.18	
TOTAL:				$2,264.58	
OPTIONS(not limited to):		**UNIT $**	**DISC%**	**DISC $**	
QA01767AA	ADD: KVL RADIO AUTHENTICATION	$500.00	8%	$460.00	
X795AJ	ADD: ASN MODE	$600.00	8%	$552.00	
X423AF	ADD: DES/DES-XL/DES-OFB ENCRYPTION	$1,550.00	8%	$1,426.00	
CA02186	ADD: KEYLOAD CABLE FOR CRYPTR MICRO	$190.00	8%	$174.80	
DSMT9234MUCDCXR	USB MODEM BY MULTITECH - REQUIRED FOR KVL-KMF COMMUNICATION REMOTELY	$250.00	20%	$200.00	
DSPSA1U1EE	RUGGED USB CLIENT TO ETHERNET ADAPTER WITH USB CABLE BUILT IN.	$226.00	20%	$180.80	
GPS INSTRUCTURE COST		$160,000.00	15%	$136,000.00	
GPS INSFRASTRUCTURE LICENCING COST PER UNIT		$90.00	20%	$72.00	

SUBSCRIBER PROGRAMMING, INSTALL AND POST WARRANTY MAINTENANCE PRCING

RADIO MANANEMENT AND PROGRAMMING SOFTWARE AND EQUIPMENT			
DESCRPTION	**LIST $**	**DISC %**	**DISC $**
RVN5224AE APX PORTABLE & MOBILE PROGRAMING SOFTWARE (3YR SUBSCRIPTION)	$399.99	0%	$399.99
HKN6184C MOBILE PROGRAMMING CABLE, USB	$52.00	23%	$40.04
PMKN4012B MOBILE PROGRAMMING CABLE	$77.00	23%	$59.29
T7914 RADIO MANAGEMENT ONLINE	$0.00	20%	$0.00
UA00049AA ADD: RADIO MANAGEMENT LICENSES ONLINE (PER RADIO)	$100.00	20%	$80.00

DESCRIPTION	**QTY**	**PRICE**
RADIO PROGRAMMING or REFLASHING RADIO		
MOBILE PER RADIO	<51	$70.00
MOBILE PER RADIO	51-100	$54.00
MOBILE PER RADIO	>500	$46.00
PORTABLE PER RADIO	<51	$70.00
PORTABLE PER RADIO	51-100	$54.00
PORTABLE PER RADIO	>500	$46.00
BUILDING TWO WAY RADIO PROGRAMMING TEMPLATES	**QTY**	**PRICE**
250 mode template with excel template	1	$620.00
DASH MOUNT RADIOS (Standard Sedan or Light Trucks)	**QTY**	**PRICE**
INSTALLATION	1	$200.00
REMOVAL AT TIME OF NEW OR RE-INSTALLATION	1	$47.00
REMOVAL WITHOUT NEW OR RE-INSTALLATION	1	$65.00
REMOTE/ TRUNK MOUNT RADIOS (Standard Sedan or Light Trucks)	**QTY**	**PRICE**
INSTALLATION	1	$270.00
REMOVAL AT TIME OF NEW OR RE-INSTALLATION	1	$65.00
REMOVAL WITHOUT NEW OR RE-INSTALLATION	1	$80.00
DASH MOUNT RADIOS (Ambulance or Fire Truck type vehicles)	**QTY**	**PRICE**
INSTALLATION	1	$465.00
REMOVAL AT TIME OF NEW OR RE-INSTALLATION	1	$165.00
SECONDARY REMOVAL AT TIME OF NEW OR RE-INSTALLATION	1	$65.00
REMOVAL WITHOUT NEW OR RE-INSTALLATION	1	$195.00
SECONDARY REMOVAL WITHOUT NEW OR RE-INSTALLATION	1	$65.00
REMOTE MOUNT (Ambulance or Fire Truck type vehicles) CUSTOMER PRICING	**QTY**	**PRICE**
SINGLE CONTROL HEAD TYPE INSTALLATION	1	$465.00
DUAL CONTROL HEAD TYPE INSTALLATION REQUIRE SURVEY TO ENSURE CUSTOMER EXPECTATION IS PROPERLY MET	1	QUOTED
REMOVAL AT TIME OF NEW OR RE-INSTALLATION (SINGLE CONTROL HEAD)	1	$165.00

REMOVAL WITHOUT NEW OR RE-INSTALLATION (SINGLE CONTROL HEAD)	1			$270.00
REMOVAL AT TIME OF NEW OR RE-INSTALLATION (DUAL CONTROL HEAD)	1			$170.00
REMOVAL WITHOUT NEW OR RE-INSTALLATION (DUAL CONTROL HEAD) $	1			$285.00
CONTROL STATIONS	**QTY**	**PRICE**		
INSTALLATION: (Includes penetration of (1) wall 50 ft of 1/2 inch cable, installation of cable, connectors, yagi RF antenna type antenna)	1			$500.00
REMOVAL	1			$195.00
PORTABLE SUBCRIBER MAINTENANCE	**<500**	**>500**	**COMPREHENSIVE <500**	**COMPREHENSIVE >500**
APX4000	$50.40	$49.00	$98.40	$96.60
APX6000	$50.50	$49.00	$98.40	$96.60
APX8000	$70.50	$69.00	$118.00	$116.75
PORTABLE SUBCRIBER LOCAL SUPPORT	**<500**	**>500**	**COMPREHENSIVE <500**	**COMPREHENSIVE >500**
APX4000	$66.00	$64.35	$66.00	$64.35
APX6000	$66.00	$64.35	$66.00	$65.35
APX8000	$78.00	$76.05	$78.00	$76.05
MOBILE SUBSCRIBER MAINTENANCE	**<500**	**>500**	**COMPREHENSIVE <500**	**COMPREHENSIVE >500**
APX4500	$74.40	$72.45	$122.40	$120.60
APX6500	$74.40	$72.45	$122.40	$120.60
APX7500	$95.20	$92.84	$127.63	$125.08
MOBILE SUBSCRIBER LOCAL SUPPORT	**<500**	**>500**	**COMPREHENSIVE <500**	**COMPREHENSIVE >500**
APX4500	$42.00	$40.95	$42.00	$40.95
APX6500	$42.00	$40.95	$42.00	$40.95
APX7500	$54.00	$52.65	$54.00	$52.65
CONTROL STATION MAINTENANCE	**<500**	**>500**	**COMPREHENSIVE <500**	**COMPREHENSIVE >500**
APX4500	$116.40	N/A	N/A	N/A
APX6500	$116.40	N/A	N/A	N/A
APX7500	$149.20	N/A	N/A	N/A
APX8500	$149.20	N/A	N/A	N/A
CONTROL STATION LOCAL AND DEPOT SUPPORT	**<500**	**>500**	**COMPREHENSIVE <500**	**COMPREHENSIVE >500**
APX4500	N/A	N/A	N/A	N/A
APX6500	N/A	N/A	N/A	N/A
APX7500	N/A	N/A	N/A	N/A
APX8500	N/A	N/A	N/A	N/A
MOTOROLA WILL WORK WITH ANY AGENCY IF SERVICES ARE DESIRED				
CONSOLETTE MAINTENANCE	**<500**	**>500**	**COMPREHENSIVE <500**	**COMPREHENSIVE >500**
APX7500 CONSOLETTE	$95.20	$92.84	N/A	N/A
CONSOLETTE LOCAL SUPPORT	**<500**	**>500**	**COMPREHENSIVE <500**	**COMPREHENSIVE >500**
APX7500 CONSOLETTE	$54.00	$52.65	N/A	N/A

MOTOROLA WILL WORK WITH ANY AGENCY IF SERVICES ARE DESIRED				
PORTABLE PREVENTATIVE MAINTENANCE 1x ANNUAL	**<500**	**>500**		
APX4000	$50.40	$49.00		
APX6000	$50.50	$49.00		
APX8000	$70.50	$69.00		
PORTABLE PREVENTATIVE MAINTENANCE BIANNUAL	**<500**	**>500**		
APX4000	$95.75	$93.35		
APX6000	$65.75	$93.35		
APX8000	$133.95	$130.60		
PORTABLE PREVENTATIVE MAINTENANCE 1x EVERY 2 YEAR	**<500**	**>500**		
APX4000	$50.40	$49.00		
APX6000	$50.50	$49.00		
APX8000	$70.50	$69.00		
MOBILE/ CS/ Consolette PREVENTATIVE MAINTENANCE ANNUAL	**<500**	**>500**		
APX4500	$74.40	$72.45		
APX6500	$74.40	$72.45		
APX7500	$95.20	$92.84		
MOBILE/ CS/ Consolette PREVENTATIVE MAINTENANCE BIANNUAL	**<500**	**>500**		
APX4500	$148.80	$145.08		
APX6500	$148.80	$145.08		
APX7500	$190.40	$185.64		
MOBILE/ CS/ Consolette PREVENTATIVE MAINTENANCE 1x EVERY 2 YEAR	**<500**	**>500**		
APX4500	$74.40	$72.45		
APX6500	$74.40	$72.45		
APX7500	$95.20	$92.84		



HP 3800 Switch Series

Data sheet

Product overview

The HP 3800 Switch Series is a family of fully managed Gigabit Ethernet switches. There are a total of nine switch models—a 24-port switch, a 48-port switch, a 24-port PoE+ switch, a 48-port PoE+ switch with either SFP+ or 10GBASE-T uplinks, and a 24-port SFP switch with 2 SFP+ uplinks. HP 3800 Series Switches utilize the latest HP ProVision ASIC technology and combine the latest advances in hardware engineering to deliver one of the most resilient and energy-efficient switches in the industry. The 3800 series implements the HP FlexChassis Mesh technology to deliver chassis-like resiliency in a flexible stackable form factor.

Key features

- Fully managed Layer 3 stackable switch series
- Low-latency, highly resilient architecture
- SFP+, 10GBASE-T, PoE+, modular stacking
- FlexChassis Mesh allows stacking up to 10 switches
- Industry-leading lifetime warranty

Features and benefits

Quality of Service (QoS)

- **Layer 4 prioritization:** enables prioritization based on TCP/UDP port numbers
- **Class of Service (CoS):** sets the IEEE 802.1p priority tag based on IP address, IP Type of Service (ToS), Layer 3 protocol, TCP/UDP port number, source port, and DiffServ
- **Bandwidth shaping:**
  - **Port-based rate limiting:** provides per-port ingress-/egress-enforced maximum bandwidth
  - **Classifier-based rate limiting:** uses an access control list (ACL) to enforce maximum bandwidth for ingress traffic on each port
  - **Guaranteed minimum:** provides per-port, per-queue egress-based guaranteed minimum bandwidth
- **Advanced classifier-based QoS:** classifies traffic using multiple match criteria based on Layer 2, 3, and 4 information; applies QoS policies such as setting priority level and rate limit to selected traffic on a per-port or per-VLAN basis
- **Remote Intelligent Mirroring:** mirrors selected ingress/egress traffic based on ACL, port, MAC address, or VLAN to a local or remote HP 8200 zl, 6600, 6200 yl, 5400 zl, 3800, or 3500 switch anywhere on the network
- **RMON, XRMON, and sFlow v5:** provide advanced monitoring and reporting capabilities for statistics, history, alarms, and events
- **Traffic prioritization:** allows real-time traffic classification into eight priority levels mapped to eight queues

Management

- **Friendly port names:** allow assignment of descriptive names to ports
- **IEEE 802.1AB Link Layer Discovery Protocol (LLDP):** automated device discovery protocol provides easy mapping by network management applications
- **Command authorization:** leverages RADIUS to link a custom list of CLI commands to an individual network administrator's login; also provides an audit trail
- **Uni-Directional Link Detection (UDLD):** monitors cable between two switches and shuts down the ports on both ends if the cable is broken, turning the bidirectional link into a unidirectional one; this prevents network problems such as loops
- **Multiple configuration files:** can be stored to the flash image
- **Dual flash images:** provide independent primary and secondary operating system files for backup while upgrading
- **Out-of-band Ethernet management port:** for management over a separate physical management network; keeps management traffic segmented from network data traffic

Connectivity

- **Jumbo frames:** on Gigabit Ethernet and 10-Gigabit ports, they allow high-performance remote backup and disaster recovery services
- **IPv6:**
  - **IPv6 host:** enables switches to be managed and deployed at the IPv6 network's edge
  - **Dual stack (IPv4 and IPv6):** transitions from IPv4 to IPv6, supporting connectivity for both protocols
  - **MLD snooping:** forwards IPv6 multicast traffic to the appropriate interface
  - **IPv6 ACL/QoS:** supports ACL and QoS for IPv6 network traffic, preventing traffic flooding
  - **IPv6 routing:** supports static and OSPFv3 routing protocols
- **IEEE 802.3at Power Over Ethernet Plus (PoE+):** provides up to 30 W per port to IEEE 802.3 for PoE-/PoE+-powered devices such as video IP phones, IEEE 802.11n wireless access points, and advanced pan/zoom/tilt security cameras
- **Pre-standard PoE support:** detects and provides power to pre-standard PoE devices; see list of supported devices in the product FAQs at www.hp.com/networking
- **Choice of uplinks:**
  - **SFP+ uplink models:** for fiber optic (up to 70 km) or direct attach cable (DAC) connectivity
  - **10GBASE-T uplink models:** for 10 GbE speeds using standard RJ-45 connectors and standard twisted pair cabling up to 100 m
- **Auto-MDIX:** automatically adjusts for straight-through or crossover cables on all RJ-45 ports

Performance

- **Selectable queue configurations:** allow you to increase performance by selecting the number of queues and associated memory buffering that best meet the requirements of your network applications
- **Energy-efficient design:**
  - **High-efficiency power supplies:** 80 PLUS GOLD certified power supplies for increased power savings
  - **Energy-efficient Ethernet support:** IEEE 802.3az support for reduced power consumption
- **FlexChassis Mesh technology:**
  - **High-performance stacking:** up to 336 Gbps of stacking throughput; each 4-port stacking module can support up to 42 Gbps in each direction per stacking port
  - **Ring, chain, and mesh topologies:** support up to a 10-member ring or chain and 5-member fully meshed stacks; meshed topologies offer increased resiliency vs. a standard ring
  - **Virtualized switching:** when stacked, switches appear as a single chassis for simplified management
- **HP ProVision ASIC architecture:** designed with the latest HP ProVision ASIC, with very low latency, increased packet buffering, and adaptive power consumption

Resiliency and high availability

- **IEEE 802.3ad Link Aggregation Protocol (LACP) and HP port trunking:** support up to 24 trunks, each with up to 8 links (ports) per trunk
- **IEEE 802.1s Multiple Spanning Tree:** provides high link availability in multiple VLAN environments by allowing multiple spanning trees; provides legacy support for IEEE 802.1d and IEEE 802.1w
- **Virtual Router Redundancy Protocol (VRRP):** allows groups of two routers to dynamically back each other up to create highly available routed environments
- **Dual hot-swappable power supplies:**
  - **Increased resiliency:** second power supply can allow for complete switch power redundancy in case of power line or supply failure
  - **Increased PoE+ power:** second power supply can increase total available PoE+ power

Layer 2 switching

- **HP's switch meshing:** dynamically load balances across multiple active redundant links to increase available aggregate bandwidth
- **GARP VLAN Registration Protocol:** allows automatic learning and dynamic assignment of VLANs
- **IEEE 802.1ad QinQ:** increases the scalability of an Ethernet network by providing a hierarchical structure; connects multiple LANs on a high-speed campus or metro network
- **VLAN support and tagging:** supports the IEEE 802.1Q standard and 2,048 VLANs simultaneously
- **IEEE 802.1v protocol VLANs:** isolate select non-IPv4 protocols automatically into their own VLANs

Layer 3 services

- **Loopback interface address:** defines an address in Routing Information Protocol (RIP) and OSPF that can always be reachable, improving diagnostic capability
- **Route maps:** provide more control during route redistribution; allow filtering and altering of route metrics
- **User Datagram Protocol (UDP) helper function:** allows UDP broadcasts to be directed across router interfaces to specific IP unicast or subnet broadcast addresses and prevents server spoofing for UDP services such as DHCP

Layer 3 routing

- **Routing Information Protocol (RIP):** provides RIPv1 and RIPv2 routing
- **Static IP routing:** provides manually configured routing for both IPv4 and IPv6 networks
- **OSPF:** provides OSPFv2 for IPv4 routing and OSPFv3 for IPv6 routing

Security

- **Source-port filtering:** allows only specified ports to communicate with each other
- **RADIUS/TACACS+:** eases switch management security administration by using a password authentication server
- **Secure Shell:** encrypts all transmitted data for secure remote CLI access over IP networks
- **Secure Sockets Layer (SSL):** encrypts all HTTP traffic, allowing secure access to the browser-based management GUI in the switch

- **Port security:** allows access only to specified MAC addresses, which can be learned or specified by the administrator
- **MAC address lockout:** prevents particular configured MAC addresses from connecting to the network
- **Detection of malicious attacks:** monitors 10 types of network traffic and sends a warning when an anomaly that potentially can be caused by malicious attacks is detected
- **Secure FTP:** allows secure file transfer to and from the switch; protects against unwanted file downloads or unauthorized copying of a switch configuration file
- **Switch management logon security:** can require either RADIUS or TACACS+ authentication for secure switch CLI logon
- **Secure management access:** securely encrypts all access methods (CLI, GUI, or MIB) through SSHv2, SSL, and/or SNMPv3
- **ICMP throttling:** defeats ICMP denial-of-service attacks by enabling any switch port to automatically throttle ICMP traffic
- **Virus throttling:** detects traffic patterns typical of WORM-type viruses and either throttles or entirely prevents the virus from spreading across the routed VLANs or bridged interfaces without requiring external appliances
- **Identity-driven ACL:** enables implementation of a highly granular and flexible access security policy and VLAN assignment specific to each authenticated network user
- **STP BPDU port protection:** blocks Bridge Protocol Data Units (BPDUs) on ports that do not require BPDUs, preventing forged BPDU attacks
- **Dynamic IP lockdown:** works with DHCP protection to block traffic from unauthorized hosts, preventing IP source address spoofing
- **DHCP protection:** blocks DHCP packets from unauthorized DHCP servers, preventing denial-of-service attacks
- **Dynamic ARP protection:** blocks ARP broadcasts from unauthorized hosts, preventing eavesdropping or theft of network data
- **STP Root Guard:** protects the root bridge from malicious attack or configuration mistakes
- **Management Interface Wizard:** helps ensure that management interfaces such as SNMP, telnet, SSH, SSL, Web, and USB are secured at the desired level
- **Security banner:** displays a customized security policy when users log in to the switch
- **Switch CPU protection:** provides automatic protection against malicious network traffic trying to shut down the switch
- **USB Secure Autorun:** deploys, diagnoses, and updates switch using a USB flash drive; works with a secure credential to prevent tampering (requires HP PMC+)
- **Access control lists (ACLs):** provide filtering based on the IP field, source/destination IP address/subnet, and source/destination TCP/UDP port number on a per-VLAN or per-port basis
- **Multiple Authentication Methods:**
  - **IEEE 802.1X:** authentication of multiple IEEE 802.1X users per port; prevents user "piggybacking" on another user's authentication
  - **Web-based authentication:** authenticates from Web browser for clients that do not support IEEE 802.1X supplicant
  - **MAC-based authentication:** client is authenticated with the RADIUS server based on client's MAC address
  - **Concurrent authentication modes:** each switch port will accept up to 32 sessions of IEEE 802.1X, Web, and MAC authentications

Convergence

- **IP multicast snooping (data-driven IGMP):** automatically prevents flooding of IP multicast traffic
- **LLDP-MED (Media Endpoint Discovery):** is a standard extension of LLDP that stores values for parameters such as QoS and VLAN to automatically configure network devices such as IP phones
- **RADIUS VLAN for voice:** uses a standard RADIUS attribute and LLDP-MED to automatically configure a VLAN for IP phones
- **PoE allocations:** support multiple methods (automatic, IEEE 802.3af class, LLDP-MED, or user specified) to allocate PoE power for more efficient energy savings
- **IP multicast routing:** includes PIM Sparse and Dense modes to route IP multicast traffic

Warranty and support

- **Lifetime warranty:** for as long as you own the product with advance replacement and next-business-day delivery (available in most countries)*

*Hardware warranty replacement for as long as you own the product, with next business day advance replacement (available in most countries) with a five-year hardware warranty replacement for the disk drive included with HP AllianceONE Services zl Module, HP Threat Management Services zl Module, HP PCM+ Agent with AllianceONE Services zl Module, and HP E-MSM765 zl Mobility Controller. For details, refer to the HP Software License, Warranty, and Support booklet at www.hp.com/networking/warranty.

- **Electronic and telephone support:** limited electronic and telephone support is available from HP; refer to www.hp.com/networking/warranty for details on the support provided and the period during which support is available
- **Software releases:** refer to www.hp.com/networking/warranty for details on the software releases provided and the period during which software releases are available for your product(s)

Specifications

	 HP 3800-24G-PoE+-2SFP+ Switch (J9573A)	 HP 3800-48G-PoE+-4SFP+ Switch (J9574A)	 HP 3800-24G-2SFP+ Switch (J9575A)
Included accessories	1 HP 3800 Switch Fan Tray (J9582A) 1 HP X312 1000W 100-240VAC to 54VDC Power Supply (J9580A)	1 HP 3800 Switch Fan Tray (J9582A) 1 HP X312 1000W 100-240VAC to 54VDC Power Supply (J9580A)	1 HP 3800 Switch Fan Tray (J9582A) 1 HP X311 400W 100-240VAC to 12VDC Power Supply (J9581A)
Ports	24 RJ-45 autosensing 10/100/1000 PoE+ ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T, IEEE 802.3at PoE+); Duplex: 10BASE-T/100BASE-TX: half or full; 1000BASE-T: full only 2 fixed 1000/10000 SFP+ ports 1 RJ-45 serial console port 1 RJ-45 out-of-band management port 1 Stacking module slot	48 RJ-45 autosensing 10/100/1000 PoE+ ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T, IEEE 802.3at PoE+); Duplex: 10BASE-T/100BASE-TX: half or full; 1000BASE-T: full only 4 fixed 1000/10000 SFP+ ports 1 RJ-45 serial console port 1 RJ-45 out-of-band management port 1 Stacking module slot	24 RJ-45 autosensing 10/100/1000 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T); Duplex: 10BASE-T/100BASE-TX: half or full; 1000BASE-T: full only 2 fixed 1000/10000 SFP+ ports 1 RJ-45 serial console port 1 RJ-45 out-of-band management port 1 Stacking module slot
Power supplies	2 power supply slots 1 minimum power supply required includes: 1 x J9580A (HP X312 1000W 100-240VAC to 54VDC Power Supply)	2 power supply slots 1 minimum power supply required includes: 1 x J9580A (HP X312 1000W 100-240VAC to 54VDC Power Supply)	2 power supply slots 1 minimum power supply required includes: 1 x J9581A (HP X311 400W 100-240VAC to 12VDC Power Supply)
Fan tray	includes: 1 x J9582A 1 fan tray slot	includes: 1 x J9582A 1 fan tray slot	includes: 1 x J9582A 1 fan tray slot
Physical characteristics			
Dimensions	18.4(d) x 17.43(w) x 1.7(h) in. (46.74 x 44.27 x 4.32 cm) (1U height)	18.4(d) x 17.43(w) x 1.7(h) in. (46.74 x 44.27 x 4.32 cm) (1U height)	18.4(d) x 17.43(w) x 1.7(h) in. (46.74 x 44.27 x 4.32 cm) (1U height)
Weight	15.9 lb. (7.21 kg) switch chassis with 1 power supply and fan tray installed	16.84 lb. (7.64 kg) switch chassis with 1 power supply and fan tray installed	15.25 lb. (6.92 kg) switch chassis with 1 power supply and fan tray installed
Memory and processor			
Processor	HP ProVision ASIC/ARM @ 350 MHz; Freescale PowerPC @ 1200 MHz, 4 GB flash, 2 GB SDRAM; packet buffer size: 18 MB dynamic	HP ProVision ASIC/ARM @ 350 MHz; Freescale PowerPC @ 1200 MHz, 4 GB flash, 2 GB SDRAM; packet buffer size: 36 MB dynamic	HP ProVision ASIC/ARM @ 350 MHz; Freescale PowerPC @ 1200 MHz, 4 GB flash, 2 GB SDRAM; packet buffer size: 18 MB dynamic
Mounting	Mounts in an EIA-standard 19 in. telco rack or equipment cabinet (hardware included); horizontal surface mounting only	Mounts in an EIA-standard 19 in. telco rack or equipment cabinet (hardware included); horizontal surface mounting only	Mounts in an EIA-standard 19 in. telco rack or equipment cabinet (hardware included); horizontal surface mounting only
Performance			
1000 Mb Latency	< 2.8 µs (LIFO 64-byte packets)	< 2.8 µs (LIFO 64-byte packets)	< 2.8 µs (LIFO 64-byte packets)
10 Gbps Latency	< 1.9 µs (LIFO 64-byte packets)	< 1.9 µs (LIFO 64-byte packets)	< 1.9 µs (LIFO 64-byte packets)
Throughput	65.4 million pps (64-byte packets)	130.9 million pps (64-byte packets)	65.4 million pps (64-byte packets)
Switching capacity	88 Gbps	176 Gbps	88 Gbps
Routing table size	10000 entries	10000 entries	10000 entries
MAC address table size	65500 entries	65500 entries	65500 entries
Environment			
Operating temperature	32°F to 131°F (0°C to 55°C); max temperature is 45°C when transceivers are installed	32°F to 131°F (0°C to 55°C); max temperature is 45°C when transceivers are installed	32°F to 131°F (0°C to 55°C); max temperature is 45°C when transceivers are installed
Operating relative humidity	15% to 95% @ 104°F (40°C), noncondensing	15% to 95% @ 104°F (40°C), noncondensing	15% to 95% @ 104°F (40°C), noncondensing
Nonoperating/Storage temperature	-40°F to 158°F (-40°C to 70°C)	-40°F to 158°F (-40°C to 70°C)	-40°F to 158°F (-40°C to 70°C)
Nonoperating/Storage relative humidity	15% to 90% @ 149°F (65°C), noncondensing	15% to 90% @ 149°F (65°C), noncondensing	15% to 90% @ 149°F (65°C), noncondensing
Altitude	up to 10,000 ft. (3 km)	up to 10,000 ft. (3 km)	up to 10,000 ft. (3 km)
Acoustic	Power: 49 dB, Pressure: 33.7 dB	Power: 57 dB, Pressure: 41.2 dB	Power: 36 dB, Pressure: 26.4 dB
Electrical characteristics			
Maximum heat dissipation	434 BTU/hr (457.87 kJ/hr)	635 BTU/hr (669.93 kJ/hr)	434 BTU/hr (457.87 kJ/hr)
Voltage	100-120/200-240 VAC	100-120/200-240 VAC	100-127/200-240 VAC
Current	9.4/7.8 A	9.4/7.8 A	6/3 A
Idle power	70 W	97 W	66 W
Maximum power rating	127 W	186 W	127 W
PoE power	720 W	1080 W	
Frequency	50/60 Hz	50/60 Hz	50/60 Hz

Specifications (continued)

	HP 3800-24G-PoE+-2SFP+ Switch (J9573A)	HP 3800-48G-PoE+-4SFP+ Switch (J9574A)	HP 3800-24G-2SFP+ Switch (J9575A)
Notes	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated. PoE Power is the power supplied by the internal power supply, it is dependent on the type and quantity of power supplies and may be supplemented with the use of a External Power Supply (EPS). With a single power supply @ 120 V input, a maximum of 572 W of PoE power is available.	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated. PoE Power is the power supplied by the internal power supply, it is dependent on the type and quantity of power supplies and may be supplemented with the use of a External Power Supply (EPS). With a single power supply @ 120 V input, a maximum of 514 W of PoE power is available. With a single power supply @ 240 V, a maximum of 814 W of PoE power is available.	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated.
Safety	EN 60950/IEC 60950; UL 60950; CAN/CSA 22.2 No. 60950; EN 60825	EN 60950/IEC 60950; UL 60950; CAN/CSA 22.2 No. 60950; EN 60825	EN 60950/IEC 60950; UL 60950; CAN/CSA 22.2 No. 60950; EN 60825
Emissions	FCC Class A; VCCI Class A; EN 55022/CISPR 22 Class A	FCC Class A; VCCI Class A; EN 55022/CISPR 22 Class A	FCC Class A; VCCI Class A; EN 55022/CISPR 22 Class A
Immunity			
EN	EN 55024, CISPR 24	EN 55024, CISPR 24	EN 55024, CISPR 24
ESD	IEC 61000-4-2	IEC 61000-4-2	IEC 61000-4-2
Radiated	IEC 61000-4-3; 3 V/m	IEC 61000-4-3; 3 V/m	IEC 61000-4-3; 3 V/m
EFT/Burst	IEC 61000-4-4; 1.0 kV (power line), 0.5 kV (signal line)	IEC 61000-4-4; 1.0 kV (power line), 0.5 kV (signal line)	IEC 61000-4-4; 1.0 kV (power line), 0.5 kV (signal line)
Surge	IEC 61000-4-5; 1 kV/2 kV AC	IEC 61000-4-5; 1 kV/2 kV AC	IEC 61000-4-5; 1 kV/2 kV AC
Conducted	IEC 61000-4-6; 3 V	IEC 61000-4-6; 3 V	IEC 61000-4-6; 3 V
Power frequency magnetic field	IEC 61000-4-8; 1 A/m, 50 or 60 Hz	IEC 61000-4-8; 1 A/m, 50 or 60 Hz	IEC 61000-4-8; 1 A/m, 50 or 60 Hz
Voltage dips and interruptions	IEC 61000-4-11; >95% reductions, 0.5 period; 30% reduction, 25 periods	IEC 61000-4-11; >95% reductions, 0.5 period; 30% reduction, 25 periods	IEC 61000-4-11; >95% reductions, 0.5 period; 30% reduction, 25 periods
Harmonics	EN 61000-3-2, IEC 61000-3-2	EN 61000-3-2, IEC 61000-3-2	EN 61000-3-2, IEC 61000-3-2
Flicker	EN 61000-3-3, IEC 61000-3-3	EN 61000-3-3, IEC 61000-3-3	EN 61000-3-3, IEC 61000-3-3
Management	HP PCM+; HP PCM; command-line interface; Web browser; configuration menu	HP PCM+; HP PCM; command-line interface; Web browser; configuration menu	HP PCM+; HP PCM; command-line interface; Web browser; configuration menu
Services	3-year, 4-hour onsite, 13x5 coverage for hardware (HT021E)	3-year, 4-hour onsite, 13x5 coverage for hardware (HT021E)	3-year, 4-hour onsite, 13x5 coverage for hardware (HT021E)
	3-year, 4-hour onsite, 24x7 coverage for hardware (HT023E)	3-year, 4-hour onsite, 24x7 coverage for hardware (HT023E)	3-year, 4-hour onsite, 24x7 coverage for hardware (HT023E)
	3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 SW phone support and SW updates (HT028E)	3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 SW phone support and SW updates (HT028E)	3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 SW phone support and SW updates (HT028E)
	3-year, 24x7 SW phone support, software updates (HT027E)	3-year, 24x7 SW phone support, software updates (HT027E)	3-year, 24x7 SW phone support, software updates (HT027E)
	4-year, 4-hour onsite, 13x5 coverage for hardware (HT031E)	4-year, 4-hour onsite, 13x5 coverage for hardware (HT031E)	4-year, 4-hour onsite, 13x5 coverage for hardware (HT031E)
	4-year, 4-hour onsite, 24x7 coverage for hardware (HT033E)	4-year, 4-hour onsite, 24x7 coverage for hardware (HT033E)	4-year, 4-hour onsite, 24x7 coverage for hardware (HT033E)
	4-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (HT038E)	4-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (HT038E)	4-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (HT038E)
	4-year, 24x7 SW phone support, software updates (HT037E)	4-year, 24x7 SW phone support, software updates (HT037E)	4-year, 24x7 SW phone support, software updates (HT037E)
	5-year, 4-hour onsite, 13x5 coverage for hardware (HT041E)	5-year, 4-hour onsite, 13x5 coverage for hardware (HT041E)	5-year, 4-hour onsite, 13x5 coverage for hardware (HT041E)
	5-year, 4-hour onsite, 24x7 coverage for hardware (HT043E)	5-year, 4-hour onsite, 24x7 coverage for hardware (HT043E)	5-year, 4-hour onsite, 24x7 coverage for hardware (HT043E)
	5-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (HT048E)	5-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (HT048E)	5-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (HT048E)
	5-year, 24x7 SW phone support, software updates (HT047E)	5-year, 24x7 SW phone support, software updates (HT047E)	5-year, 24x7 SW phone support, software updates (HT047E)
	3 Yr 6 hr Call-to-Repair Onsite (HT025E)	3 Yr 6 hr Call-to-Repair Onsite (HT025E)	3 Yr 6 hr Call-to-Repair Onsite (HT025E)
	4 Yr 6 hr Call-to-Repair Onsite (HT035E)	4 Yr 6 hr Call-to-Repair Onsite (HT035E)	4 Yr 6 hr Call-to-Repair Onsite (HT035E)
	5 Yr 6 hr Call-to-Repair Onsite (HT045E)	5 Yr 6 hr Call-to-Repair Onsite (HT045E)	5 Yr 6 hr Call-to-Repair Onsite (HT045E)
	1-year, 4-hour onsite, 13x5 coverage for hardware (HT011E)	1-year, 4-hour onsite, 13x5 coverage for hardware (HT011E)	1-year, 4-hour onsite, 13x5 coverage for hardware (HT011E)

Specifications (continued)

	HP 3800-24G-PoE+-2SFP+ Switch (J9573A)	HP 3800-48G-PoE+-4SFP+ Switch (J9574A)	HP 3800-24G-2SFP+ Switch (J9575A)
	1-year, 4-hour onsite, 24x7 coverage for hardware (HT013E)	1-year, 4-hour onsite, 24x7 coverage for hardware (HT013E)	1-year, 4-hour onsite, 24x7 coverage for hardware (HT013E)
	1-year, 6 hour Call-To-Repair Onsite for hardware (HT015E)	1-year, 6 hour Call-To-Repair Onsite for hardware (HT015E)	1-year, 6 hour Call-To-Repair Onsite for hardware (HT015E)
	1-year, 24x7 software phone support, software updates (HT017E)	1-year, 24x7 software phone support, software updates (HT017E)	1-year, 24x7 software phone support, software updates (HT017E)
	1-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support and software updates (HT018E)	1-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support and software updates (HT018E)	1-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support and software updates (HT018E)
	1-year, 24x7 software phone support, software updates + Next Business Day Hardware Exchange (HT009E)	1-year, 24x7 software phone support, software updates + Next Business Day Hardware Exchange (HT009E)	1-year, 24x7 software phone support, software updates + Next Business Day Hardware Exchange (HT009E)
	1-year, 24x7 software phone support, software updates + 4 hour hardware exchange (HT010E)	1-year, 24x7 software phone support, software updates + 4 hour hardware exchange (HT010E)	1-year, 24x7 software phone support, software updates + 4 hour hardware exchange (HT010E)
	3-year, 24x7 software phone support, software updates + Next Business Day Hardware Exchange (HT019E)	3-year, 24x7 software phone support, software updates + Next Business Day Hardware Exchange (HT019E)	3-year, 24x7 software phone support, software updates + Next Business Day Hardware Exchange (HT019E)
	3-year, 24x7 software phone support, software updates + 4 hour Hardware Exchange (HT020E)	3-year, 24x7 software phone support, software updates + 4 hour Hardware Exchange (HT020E)	3-year, 24x7 software phone support, software updates + 4 hour Hardware Exchange (HT020E)
	4-year, 24x7 software phone support, software updates + Next Business Day Hardware Exchange (HT029E)	4-year, 24x7 software phone support, software updates + Next Business Day Hardware Exchange (HT029E)	4-year, 24x7 software phone support, software updates + Next Business Day Hardware Exchange (HT029E)
	4-year, 24x7 software phone support, software updates + 4 hour Hardware Exchange (HT030E)	4-year, 24x7 software phone support, software updates + 4 hour Hardware Exchange (HT030E)	4-year, 24x7 software phone support, software updates + 4 hour Hardware Exchange (HT030E)
	5-year, 24x7 software phone support, software updates + Next Business Day Hardware Exchange (HT039E)	5-year, 24x7 software phone support, software updates + Next Business Day Hardware Exchange (HT039E)	5-year, 24x7 software phone support, software updates + Next Business Day Hardware Exchange (HT039E)
	5-year, 24x7 software phone support, software updates + 4 hour Hardware Exchange (HT040E)	5-year, 24x7 software phone support, software updates + 4 hour Hardware Exchange (HT040E)	5-year, 24x7 software phone support, software updates + 4 hour Hardware Exchange (HT040E)
	Refer to the HP website at www.hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.	Refer to the HP website at www.hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.	Refer to the HP website at www.hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.

Specifications (continued)

	HP 3800-24G-PoE+-2SFP+ Switch (J9573A)	HP 3800-48G-PoE+-4SFP+ Switch (J9574A)	HP 3800-24G-2SFP+ Switch (J9575A)
Standards and protocols (applies to all products in series)	**Device management** RFC 1591 DNS (client) HTML and telnet management **General protocols** IEEE 802.1ad Q-in-Q IEEE 802.1D MAC Bridges IEEE 802.1p Priority IEEE 802.1Q VLANs IEEE 802.1s Multiple Spanning Trees IEEE 802.1v VLAN classification by Protocol and Port IEEE 802.1w Rapid Reconfiguration of Spanning Tree IEEE 802.3ad Link Aggregation Control Protocol (LACP) IEEE 802.3af Power over Ethernet IEEE 802.3x Flow Control RFC 768 UDP RFC 783 TFTP Protocol (revision 2) RFC 792 ICMP RFC 793 TCP RFC 826 ARP RFC 854 TELNET RFC 868 Time Protocol RFC 951 BOOTP RFC 1058 RIPv1 RFC 1350 TFTP Protocol (revision 2) RFC 1519 CIDR RFC 1542 BOOTP Extensions RFC 2030 Simple Network Time Protocol (SNTP) v4 RFC 2131 DHCP RFC 2453 RIPv2 RFC 2548 (MS-RAS-Vendor only) RFC 3046 DHCP Relay Agent Information Option RFC 3576 Ext to RADIUS (CoA only) RFC 3768 VRRP RFC 4675 RADIUS VLAN & Priority UDLD (Uni-directional Link Detection) **IP multicast** RFC 3376 IGMPv3 (host joins only) RFC 3973 Draft 2 PIM Dense Mode RFC 4601 Draft 10 PIM Sparse Mode **IPv6** RFC 1981 IPv6 Path MTU Discovery RFC 2375 IPv6 Multicast Address Assignments	RFC 2460 IPv6 Specification RFC 2464 Transmission of IPv6 over Ethernet Networks RFC 2710 Multicast Listener Discovery (MLD) for IPv6 RFC 2925 Remote Operations MIB (Ping only) RFC 3019 MLDv1 MIB RFC 3315 DHCPv6 (client only) RFC 3484 Default Address Selection for IPv6 RFC 3587 IPv6 Global Unicast Address Format RFC 3596 DNS Extension for IPv6 RFC 3810 MLDv2 (host joins only) RFC 4022 MIB for TCP RFC 4113 MIB for UDP RFC 4251 SSHv6 Architecture RFC 4252 SSHv6 Authentication RFC 4253 SSHv6 Transport Layer RFC 4254 SSHv6 Connection RFC 4291 IP Version 6 Addressing Architecture RFC 4293 MIB for IP RFC 4294 IPv6 Node Requirements RFC 4419 Key Exchange for SSH RFC 4443 ICMPv6 RFC 4541 IGMP & MLD Snooping Switch RFC 4861 IPv6 Neighbor Discovery RFC 4862 IPv6 Stateless Address Auto-configuration RFC 5095 Deprecation of Type 0 Routing Headers in IPv6 RFC 5340 OSPFv3 for IPv6 RFC 5453 Reserved IPv6 Interface Identifiers RFC 5722 Handling of Overlapping IPv6 Fragments **MIBs** RFC 1213 MIB II RFC 1493 Bridge MIB RFC 1724 RIPv2 MIB RFC 1850 OSPFv2 MIB RFC 2021 RMONv2 MIB RFC 2096 IP Forwarding Table MIB RFC 2613 SMON MIB RFC 2618 RADIUS Client MIB RFC 2620 RADIUS Accounting MIB RFC 2665 Ethernet-Like-MIB RFC 2668 802.3 MAU MIB RFC 2674 802.1p and IEEE 802.1Q Bridge MIB RFC 2737 Entity MIB (Version 2) RFC 2787 VRRP MIB RFC 2863 The Interfaces Group MIB RFC 2925 Ping MIB	**Network management** IEEE 802.1AB Link Layer Discovery Protocol (LLDP) RFC 2819 Four groups of RMON: 1 (statistics), 2 (history), 3 (alarm) and 9 (events) RFC 3176 sFlow ANSI/TIA-1057 LLDP Media Endpoint Discovery (LLDP-MED) SNMPv1/v2c/v3 XRMON **OSPF** RFC 2328 OSPFv2 RFC 3101 OSPF NSSA RFC 5340 OSPFv3 for IPv6 **QoS/CoS** RFC 2474 DiffServ Precedence, including 8 queues/port RFC 2597 DiffServ Assured Forwarding (AF) RFC 2598 DiffServ Expedited Forwarding (EF) **Security** IEEE 802.1X Port Based Network Access Control RFC 1492 TACACS+ RFC 2865 RADIUS (client only) RFC 2866 RADIUS Accounting Access Control Lists (ACLs) MAC Authentication MAC Lockdown MAC Lockout Port Security Secure Sockets Layer (SSL) SSHv1/SSHv2 Secure Shell Web Authentication

Specifications (continued)

	 HP 3800-48G-4SFP+ Switch (J9576A)	 HP 3800-24G-2XG Switch (J9585A)	 HP 3800-48G-4XG Switch (J9586A)
Included accessories	1 HP 3800 Switch Fan Tray (J9582A) 1 HP X311 400W 100-240VAC to 12VDC Power Supply (J9581A)	1 HP 3800 Switch Fan Tray (J9582A) 1 HP X311 400W 100-240VAC to 12VDC Power Supply (J9581A)	1 HP 3800 Switch Fan Tray (J9582A) 1 HP X311 400W 100-240VAC to 12VDC Power Supply (J9581A)
Ports	48 RJ-45 autosensing 10/100/1000 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T); Duplex: 10BASE-T/100BASE-TX: half or full; 1000BASE-T: full only 4 fixed 1000/10000 SFP+ ports 1 RJ-45 serial console port 1 RJ-45 out-of-band management port 1 Stacking module slot	24 RJ-45 autosensing 10/100/1000 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T); Duplex: 10BASE-T/100BASE-TX: half or full; 1000BASE-T: full only 2 RJ-45 10-GbE ports IEEE 802.3an-2006 Type 10GBASE-T; Duplex: full only 1 RJ-45 serial console port 1 RJ-45 out-of-band management port 1 Stacking module slot	48 RJ-45 autosensing 10/100/1000 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T); Duplex: 10BASE-T/100BASE-TX: half or full; 1000BASE-T: full only 4 RJ-45 10-GbE ports IEEE 802.3an-2006 Type 10GBASE-T; Duplex: full only 1 RJ-45 serial console port 1 RJ-45 out-of-band management port 1 Stacking module slot
Power supplies	2 power supply slots 1 minimum power supply required includes: 1 x J9581A (HP X311 400W 100-240VAC to 12VDC Power Supply)	2 power supply slots 1 minimum power supply required includes: 1 x J9581A (HP X311 400W 100-240VAC to 12VDC Power Supply)	2 power supply slots 1 minimum power supply required includes: 1 x J9581A (HP X311 400W 100-240VAC to 12VDC Power Supply)
Fan tray	includes: 1 x J9582A 1 fan tray slot	includes: 1 x J9582A 1 fan tray slot	includes: 1 x J9582A 1 fan tray slot
Physical characteristics			
Dimensions	18.4(d) x 17.43(w) x 1.7(h) in. (46.74 x 44.27 x 4.32 cm) (1U height)	18.4(d) x 17.43(w) x 1.7(h) in. (46.74 x 44.27 x 4.32 cm) (1U height)	18.4(d) x 17.43(w) x 1.7(h) in. (46.74 x 44.27 x 4.32 cm) (1U height)
Weight	16 lb. (7.26 kg) switch chassis with 1 power supply and fan tray installed	15.8 lb. (7.17 kg) switch chassis with 1 power supply and fan tray installed	16.35 lb. (7.42 kg) switch chassis with 1 power supply and fan tray installed
Memory and processor			
Processor	HP ProVision ASIC/ARM @ 350 MHz; Freescale PowerPC @ 1200 MHz, 4 GB flash, 2 GB SDRAM; packet buffer size: 36 MB dynamic	HP ProVision ASIC/ARM @ 350 MHz; Freescale PowerPC @ 1200 MHz, 4 GB flash, 2 GB SDRAM; packet buffer size: 18 MB dynamic	HP ProVision ASIC/ARM @ 350 MHz; Freescale PowerPC @ 1200 MHz, 4 GB flash, 2 GB SDRAM GB; packet buffer size: 36 MB dynamic
Mounting	Mounts in an EIA-standard 19 in. telco rack or equipment cabinet (hardware included); horizontal surface mounting only	Mounts in an EIA-standard 19 in. telco rack or equipment cabinet (hardware included); horizontal surface mounting only	Mounts in an EIA-standard 19 in. telco rack or equipment cabinet (hardware included); horizontal surface mounting only
Performance			
1000 Mb Latency	< 2.8 µs (LIFO 64-byte packets)	< 2.8 µs (LIFO 64-byte packets)	< 2.8 µs (LIFO 64-byte packets)
10 Gbps Latency	< 1.9 µs (LIFO 64-byte packets)	< 1.9 µs (LIFO 64-byte packets)	< 1.9 µs (LIFO 64-byte packets)
Throughput	130.9 million pps (64-byte packets)	65.4 million pps (64-byte packets)	130.9 million pps (64-byte packets)
Switching capacity	176 Gbps	88 Gbps	176 Gbps
Routing table size	10000 entries	10000 entries	10000 entries
MAC address table size	65500 entries	65500 entries	65500 entries
Environment			
Operating temperature	32°F to 131°F (0°C to 55°C); max temperature is 45°C when transceivers are installed	32°F to 131°F (0°C to 55°C)	32°F to 131°F (0°C to 55°C); max temperature is 45°C when SFP+ transceivers are installed
Operating relative humidity	15% to 95% @ 104°F (40°C), noncondensing	15% to 95% @ 104°F (40°C), noncondensing	15% to 95% @ 104°F (40°C), noncondensing
Nonoperating/Storage temperature	-40°F to 158°F (-40°C to 70°C)	-40°F to 158°F (-40°C to 70°C)	-40°F to 158°F (-40°C to 70°C)
Nonoperating/Storage relative humidity	15% to 90% @ 149°F (65°C), noncondensing	15% to 90% @ 149°F (65°C), noncondensing	15% to 90% @ 149°F (65°C), noncondensing
Altitude	up to 10,000 ft. (3 km)	up to 10,000 ft. (3 km)	up to 10,000 ft. (3 km)
Acoustic	Power: 36 dB, Pressure: 25.4 dB	Power: 39 dB, Pressure: 25.5 dB	Power: 34 dB, Pressure: 24.5 dB
Electrical characteristics			
Maximum heat dissipation	635 BTU/hr (669.93 kJ/hr)	434 BTU/hr (457.87 kJ/hr)	635 BTU/hr (669.93 kJ/hr)
Voltage	100-127/200-240 VAC	100-127/200-240 VAC	100-127/200-240 VAC
Current	6/3 A	6/3 A	6/3 A
Idle power	70 W	70 W	74 W
Maximum power rating	186 W	127 W	186 W
Frequency	50/60 Hz	50/60 Hz	50/60 Hz
Notes	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated.	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated.	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated.

Specifications (continued)

	HP 3800-48G-4SFP+ Switch (J9576A)	HP 3800-24G-2XG Switch (J9585A)	HP 3800-48G-4XG Switch (J9586A)
Safety	EN 60950/IEC 60950; UL 60950; CAN/CSA 22.2 No. 60950; EN 60825	EN 60950/IEC 60950; UL 60950; CAN/CSA 22.2 No. 60950; EN 60825	EN 60950/IEC 60950; UL 60950; CAN/CSA 22.2 No. 60950; EN 60825
Emissions	FCC Class A; VCCI Class A; EN 55022/CISPR 22 Class A	FCC Class A; VCCI Class A; EN 55022/CISPR 22 Class A	FCC Class A; VCCI Class A; EN 55022/CISPR 22 Class A
Immunity			
EN	EN 55024, CISPR 24	EN 55024, CISPR 24	EN 55024, CISPR 24
ESD	IEC 61000-4-2	IEC 61000-4-2	IEC 61000-4-2
Radiated	IEC 61000-4-3; 3 V/m	IEC 61000-4-3; 3 V/m	IEC 61000-4-3; 3 V/m
EFT/Burst	IEC 61000-4-4; 1.0 kV (power line), 0.5 kV (signal line)	IEC 61000-4-4; 1.0 kV (power line), 0.5 kV (signal line)	IEC 61000-4-4; 1.0 kV (power line), 0.5 kV (signal line)
Surge	IEC 61000-4-5; 1 kV/2 kV AC	IEC 61000-4-5; 1 kV/2 kV AC	IEC 61000-4-5; 1 kV/2 kV AC
Conducted	IEC 61000-4-6; 3 V	IEC 61000-4-6; 3 V	IEC 61000-4-6; 3 V
Power frequency magnetic field	IEC 61000-4-8; 1 A/m, 50 or 60 Hz	IEC 61000-4-8; 1 A/m, 50 or 60 Hz	IEC 61000-4-8; 1 A/m, 50 or 60 Hz
Voltage dips and interruptions	IEC 61000-4-11; >95% reductions, 0.5 period; 30% reduction, 25 periods	IEC 61000-4-11; >95% reductions, 0.5 period; 30% reduction, 25 periods	IEC 61000-4-11; >95% reductions, 0.5 period; 30% reduction, 25 periods
Harmonics	EN 61000-3-2, IEC 61000-3-2	EN 61000-3-2, IEC 61000-3-2	EN 61000-3-2, IEC 61000-3-2
Flicker	EN 61000-3-3, IEC 61000-3-3	EN 61000-3-3, IEC 61000-3-3	EN 61000-3-3, IEC 61000-3-3
Management	HP PCM+; HP PCM; command-line interface; Web browser; configuration menu	HP PCM+; HP PCM; command-line interface; Web browser; configuration menu	HP PCM+; HP PCM; command-line interface; Web browser; configuration menu
Services	3-year, 4-hour onsite, 13x5 coverage for hardware (HT021E) 3-year, 4-hour onsite, 24x7 coverage for hardware (HT023E) 3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 SW phone support and SW updates (HT028E) 3-year, 24x7 SW phone support, software updates (HT027E) 4-year, 4-hour onsite, 13x5 coverage for hardware (HT031E) 4-year, 4-hour onsite, 24x7 coverage for hardware (HT033E) 4-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (HT038E) 4-year, 24x7 SW phone support, software updates (HT037E) 5-year, 4-hour onsite, 13x5 coverage for hardware (HT041E) 5-year, 4-hour onsite, 24x7 coverage for hardware (HT043E) 5-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (HT048E) 5-year, 24x7 SW phone support, software updates (HT047E) 3 Yr 6 hr Call-to-Repair Onsite (HT025E) 4 Yr 6 hr Call-to-Repair Onsite (HT035E) 5 Yr 6 hr Call-to-Repair Onsite (HT045E) 1-year, 4-hour onsite, 13x5 coverage for hardware (HT011E) 1-year, 4-hour onsite, 24x7 coverage for hardware (HT013E) 1-year, 6 hour Call-To-Repair Onsite for hardware (HT015E) 1-year, 24x7 software phone support, software updates (HT017E) 1-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support and software updates (HT018E) 1-year, 24x7 software phone support, software updates + Next Business Day Hardware Exchange (HT009E)	Refer to the HP website at www.hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.	Refer to the HP website at www.hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.

Specifications (continued)

	HP 3800-48G-4SFP+ Switch (J9576A)	HP 3800-24G-2XG Switch (J9585A)	HP 3800-48G-4XG Switch (J9586A)
	1-year, 24x7 software phone support, software updates + 4 hour hardware exchange (HT010E) 3-year, 24x7 software phone support, software updates + Next Business Day Hardware Exchange (HT019E) 3-year, 24x7 software phone support, software updates + 4 hour Hardware Exchange (HT020E) 4-year, 24x7 software phone support, software updates + Next Business Day Hardware Exchange (HT029E) 4-year, 24x7 software phone support, software updates + 4 hour Hardware Exchange (HT030E) 5-year, 24x7 software phone support, software updates + Next Business Day Hardware Exchange (HT039E) 5-year, 24x7 software phone support, software updates + 4 hour Hardware Exchange (HT040E) Refer to the HP website at www.hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.		
Standards and protocols (applies to all products in series)	**Device management** RFC 1591 DNS (client) HTML and telnet management **General protocols** IEEE 802.1ad Q-in-Q IEEE 802.1D MAC Bridges IEEE 802.1p Priority IEEE 802.1Q VLANs IEEE 802.1s Multiple Spanning Trees IEEE 802.1v VLAN classification by Protocol and Port IEEE 802.1w Rapid Reconfiguration of Spanning Tree IEEE 802.3ad Link Aggregation Control Protocol (LACP) IEEE 802.3af Power over Ethernet IEEE 802.3x Flow Control RFC 768 UDP RFC 783 TFTP Protocol (revision 2) RFC 792 ICMP RFC 793 TCP RFC 826 ARP RFC 854 TELNET RFC 868 Time Protocol RFC 951 BOOTP RFC 1058 RIPv1 RFC 1350 TFTP Protocol (revision 2) RFC 1519 CIDR RFC 1542 BOOTP Extensions RFC 2030 Simple Network Time Protocol (SNTP) v4 RFC 2131 DHCP RFC 2453 RIPv2 RFC 2548 (MS-RAS-Vendor only) RFC 3046 DHCP Relay Agent Information Option RFC 3576 Ext to RADIUS (CoA only) RFC 3768 VRRP RFC 4675 RADIUS VLAN & Priority UDLD (Uni-directional Link Detection) **IP multicast** RFC 3376 IGMPv3 (host joins only) RFC 3973 Draft 2 PIM Dense Mode RFC 4601 Draft 10 PIM Sparse Mode **IPv6** RFC 1981 IPv6 Path MTU Discovery RFC 2375 IPv6 Multicast Address Assignments	RFC 2460 IPv6 Specification RFC 2464 Transmission of IPv6 over Ethernet Networks RFC 2710 Multicast Listener Discovery (MLD) for IPv6 RFC 2925 Remote Operations MIB (Ping only) RFC 3019 MLDv1 MIB RFC 3315 DHCPv6 (client only) RFC 3484 Default Address Selection for IPv6 RFC 3587 IPv6 Global Unicast Address Format RFC 3596 DNS Extension for IPv6 RFC 3810 MLDv2 (host joins only) RFC 4022 MIB for TCP RFC 4113 MIB for UDP RFC 4251 SSHv6 Architecture RFC 4252 SSHv6 Authentication RFC 4253 SSHv6 Transport Layer RFC 4254 SSHv6 Connection RFC 4291 IP Version 6 Addressing Architecture RFC 4293 MIB for IP RFC 4294 IPv6 Node Requirements RFC 4419 Key Exchange for SSH RFC 4443 ICMPv6 RFC 4541 IGMP & MLD Snooping Switch RFC 4861 IPv6 Neighbor Discovery RFC 4862 IPv6 Stateless Address Auto-configuration RFC 5095 Deprecation of Type 0 Routing Headers in IPv6 RFC 5340 OSPFv3 for IPv6 RFC 5453 Reserved IPv6 Interface Identifiers RFC 5722 Handling of Overlapping IPv6 Fragments **MIBs** RFC 1213 MIB II RFC 1493 Bridge MIB RFC 1724 RIPv2 MIB RFC 1850 OSPFv2 MIB RFC 2021 RMONv2 MIB RFC 2096 IP Forwarding Table MIB RFC 2613 SMON MIB RFC 2618 RADIUS Client MIB RFC 2620 RADIUS Accounting MIB RFC 2665 Ethernet-Like-MIB RFC 2668 802.3 MAU MIB RFC 2674 802.1p and IEEE 802.1Q Bridge MIB RFC 2737 Entity MIB (Version 2) RFC 2787 VRRP MIB RFC 2863 The Interfaces Group MIB RFC 2925 Ping MIB	**Network management** IEEE 802.1AB Link Layer Discovery Protocol (LLDP) RFC 2819 Four groups of RMON: 1 (statistics), 2 (history), 3 (alarm) and 9 (events) RFC 3176 sFlow ANSI/TIA-1057 LLDP Media Endpoint Discovery (LLDP-MED) SNMPv1/v2c/v3 XRMON **OSPF** RFC 2328 OSPFv2 RFC 3101 OSPF NSSA RFC 5340 OSPFv3 for IPv6 **QoS/CoS** RFC 2474 DiffServ Precedence, including 8 queues/port RFC 2597 DiffServ Assured Forwarding (AF) RFC 2598 DiffServ Expedited Forwarding (EF) **Security** IEEE 802.1X Port Based Network Access Control RFC 1492 TACACS+ RFC 2865 RADIUS (client only) RFC 2866 RADIUS Accounting Access Control Lists (ACLs) MAC Authentication MAC Lockdown MAC Lockout Port Security Secure Sockets Layer (SSL) SSHv1/SSHv2 Secure Shell Web Authentication

Specifications (continued)

	 HP 3800-24G-PoE+-2XG Switch (J9587A)	 HP 3800-48G-PoE+-4XG Switch (J9588A)	 HP 3800-24SFP-2SFP+ Switch (J9584A)
Included accessories	1 HP 3800 Switch Fan Tray (J9582A) 1 HP X312 1000W 100-240VAC to 54VDC Power Supply (J9580A)	1 HP 3800 Switch Fan Tray (J9582A) 1 HP X312 1000W 100-240VAC to 54VDC Power Supply (J9580A)	1 HP 3800 Switch Fan Tray (J9582A) 1 HP X311 400W 100-240VAC to 12VDC Power Supply (J9581A)
Ports	24 RJ-45 autosensing 10/100/1000 PoE+ ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T, IEEE 802.3at PoE+); Duplex: 10BASE-T/100BASE-TX: half or full; 1000BASE-T: full only 2 RJ-45 10-GbE ports IEEE 802.3an-2006 Type 10GBASE-T; Duplex: full only 1 RJ-45 serial console port 1 RJ-45 out-of-band management port 1 Stacking module slot	48 RJ-45 autosensing 10/100/1000 PoE+ ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T, IEEE 802.3at PoE+); Duplex: 10BASE-T/100BASE-TX: half or full; 1000BASE-T: full only 4 RJ-45 10-GbE ports IEEE 802.3an-2006 Type 10GBASE-T; Duplex: full only 1 RJ-45 serial console port 1 RJ-45 out-of-band management port 1 Stacking module slot	24 SFP 100/1000 Mbps ports (IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T); Duplex: 100BASE-TX: half or full; 1000BASE-T: full only 2 fixed 1000/10000 SFP+ ports 1 RJ-45 serial console port 1 RJ-45 out-of-band management port 1 Stacking module slot
Power supplies	2 power supply slots 1 minimum power supply required includes: 1 x J9580A (HP X312 1000W 100-240VAC to 54VDC Power Supply)	2 power supply slots 1 minimum power supply required includes: 1 x J9580A (HP X312 1000W 100-240VAC to 54VDC Power Supply)	2 power supply slots 1 minimum power supply required includes: 1 x J9581A (HP X311 400W 100-240VAC to 12VDC Power Supply)
Fan tray	includes: 1 x J9582A 1 fan tray slot	includes: 1 x J9582A 1 fan tray slot	includes: 1 x J9582A 1 fan tray slot
Physical characteristics			
Dimensions	18.4(d) x 17.43(w) x 1.7(h) in. (46.74 x 44.27 x 4.32 cm) (1U height)	18.4(d) x 17.43(w) x 1.7(h) in. (46.74 x 44.27 x 4.32 cm) (1U height)	18.4(d) x 17.43(w) x 1.7(h) in. (46.74 x 44.27 x 4.32 cm) (1U height)
Weight	16.45 lb. (7.46 kg) switch chassis with 1 power supply and fan tray installed	17.25 lb. (7.82 kg) switch chassis with 1 power supply and fan tray installed	16 lb. (7.26 kg) switch chassis with 1 power supply and fan tray installed
Memory and processor			
Processor	HP ProVision ASIC/ARM @ 350 MHz; Freescale PowerPC @ 1200 MHz, 4 GB flash, 2 GB SDRAM; packet buffer size: 18 MB dynamic	HP ProVision ASIC/ARM @ 350 MHz; Freescale PowerPC @ 1200 MHz, 4 GB flash, 2 GB SDRAM; packet buffer size: 36 MB dynamic	HP ProVision ASIC/ARM @ 350 MHz; Freescale PowerPC @ 1200 MHz, 4 GB flash, 2 GB SDRAM; packet buffer size: 18 MB dynamic
Mounting	Mounts in an EIA-standard 19 in. telco rack or equipment cabinet (hardware included); horizontal surface mounting only	Mounts in an EIA-standard 19 in. telco rack or equipment cabinet (hardware included); horizontal surface mounting only	Mounts in an EIA-standard 19 in. telco rack or equipment cabinet (hardware included); horizontal surface mounting only
Performance			
1000 Mb Latency	< 2.8 µs (LIFO 64-byte packets)	< 2.8 µs (LIFO 64-byte packets)	< 2.8 µs (LIFO 64-byte packets)
10 Gbps Latency	< 1.9 µs (LIFO 64-byte packets)	< 1.9 µs (LIFO 64-byte packets)	< 1.9 µs (LIFO 64-byte packets)
Throughput	65.4 million pps (64-byte packets)	130.9 million pps (64-byte packets)	65.4 million pps (64-byte packets)
Switching capacity	88 Gbps	176 Gbps	88 Gbps
Routing table size	10000 entries	10000 entries	10000 entries
MAC address table size	65500 entries	65500 entries	65500 entries
Environment			
Operating temperature	32°F to 131°F (0°C to 55°C)	32°F to 131°F (0°C to 55°C); max temperature is 45C when SFP+ transceivers are installed	32°F to 113°F (0°C to 45°C)
Operating relative humidity	15% to 95% @ 104°F (40°C), noncondensing	15% to 95% @ 104°F (40°C), noncondensing	15% to 95% @ 104°F (40°C), noncondensing
Nonoperating/Storage temperature	-40°F to 158°F (-40°C to 70°C)	-40°F to 158°F (-40°C to 70°C)	-40°F to 158°F (-40°C to 70°C)
Nonoperating/Storage relative humidity	15% to 90% @ 149°F (65°C), noncondensing	15% to 90% @ 149°F (65°C), noncondensing	15% to 90% @ 149°F (65°C), noncondensing
Altitude	up to 10,000 ft. (3 km)	up to 10,000 ft. (3 km)	up to 10,000 ft. (3 km)
Acoustic	Power: 48 dB, Pressure: 32.6 dB	Power: 57 dB, Pressure: 41.5 dB	Power: 36 dB, Pressure: 25 dB
Electrical characteristics			
Maximum heat dissipation	434 BTU/hr (457.87 kJ/hr)	635 BTU/hr (669.93 kJ/hr)	434 BTU/hr (457.87 kJ/hr)
Voltage	100-120/200-240 VAC	100-120/200-240 VAC	100-127/200-240 VAC
Current	9.4/7.8 A	9.4/7.8 A	6/3 A
Idle power	71 W	100 W	55 W
Maximum power rating	127 W	186 W	127 W
PoE power	720 W	1080 W	
Frequency	50/60 Hz	50/60 Hz	50/60 Hz

Specifications (continued)

	HP 3800-24G-PoE+-2XG Switch (J9587A)	HP 3800-48G-PoE+-4XG Switch (J9588A)	HP 3800-24SFP-2SFP+ Switch (J9584A)
Notes	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated. PoE Power is the power supplied by the internal power supply, it is dependent on the type and quantity of power supplies and may be supplemented with the use of a External Power Supply (EPS). With a single power supply @ 120 V input, a maximum of 572 W of PoE power is available.	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated. PoE Power is the power supplied by the internal power supply, it is dependent on the type and quantity of power supplies and may be supplemented with the use of a External Power Supply (EPS). With a single power supply @ 120 V input, a maximum of 514 W of PoE power is available. With a single power supply @ 240 V input, a maximum of 814 W of PoE power is available.	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated.
Safety	EN 60950/IEC 60950; UL 60950; CAN/CSA 22.2 No. 60950; EN 60825	EN 60950/IEC 60950; UL 60950; CAN/CSA 22.2 No. 60950; EN 60825	EN 60950/IEC 60950; UL 60950; CAN/CSA 22.2 No. 60950; EN 60825
Emissions	FCC Class A; VCCI Class A; EN 55022/CISPR 22 Class A	FCC Class A; VCCI Class A; EN 55022/CISPR 22 Class A	FCC Class A; VCCI Class A; EN 55022/CISPR 22 Class A
Immunity			
EN	EN 55024, CISPR 24	EN 55024, CISPR 24	EN 55024, CISPR 24
ESD	IEC 61000-4-2	IEC 61000-4-2	IEC 61000-4-2
Radiated	IEC 61000-4-3; 3 V/m	IEC 61000-4-3; 3 V/m	IEC 61000-4-3; 3 V/m
EFT/Burst	IEC 61000-4-4; 1.0 kV (power line), 0.5 kV (signal line)	IEC 61000-4-4; 1.0 kV (power line), 0.5 kV (signal line)	IEC 61000-4-4; 1.0 kV (power line), 0.5 kV (signal line)
Surge	IEC 61000-4-5; 1 kV/2 kV AC	IEC 61000-4-5; 1 kV/2 kV AC	IEC 61000-4-5; 1 kV/2 kV AC
Conducted	IEC 61000-4-6; 3 V	IEC 61000-4-6; 3 V	IEC 61000-4-6; 3 V
Power frequency magnetic field	IEC 61000-4-8; 1 A/m, 50 or 60 Hz	IEC 61000-4-8; 1 A/m, 50 or 60 Hz	IEC 61000-4-8; 1 A/m, 50 or 60 Hz
Voltage dips and interruptions	IEC 61000-4-11; >95% reductions, 0.5 period; 30% reduction, 25 periods	IEC 61000-4-11; >95% reductions, 0.5 period; 30% reduction, 25 periods	IEC 61000-4-11; >95% reductions, 0.5 period; 30% reduction, 25 periods
Harmonics	EN 61000-3-2, IEC 61000-3-2	EN 61000-3-2, IEC 61000-3-2	EN 61000-3-2, IEC 61000-3-2
Flicker	EN 61000-3-3, IEC 61000-3-3	EN 61000-3-3, IEC 61000-3-3	EN 61000-3-3, IEC 61000-3-3
Management	HP PCM+; HP PCM; command-line interface; Web browser; configuration menu	HP PCM+; HP PCM; command-line interface; Web browser; configuration menu	HP PCM+; HP PCM; command-line interface; Web browser; configuration menu
Services	Refer to the HP website at www.hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.	Refer to the HP website at www.hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.	Refer to the HP website at www.hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.

Specifications (continued)

	HP 3800-24G-PoE+-2XG Switch (J9587A)	HP 3800-48G-PoE+-4XG Switch (J9588A)	HP 3800-24SFP-2SFP+ Switch (J9584A)
Standards and protocols (applies to all products in series)	**Device management** RFC 1591 DNS (client) HTML and telnet management **General protocols** IEEE 802.1ad Q-in-Q IEEE 802.1D MAC Bridges IEEE 802.1p Priority IEEE 802.1Q VLANs IEEE 802.1s Multiple Spanning Trees IEEE 802.1v VLAN classification by Protocol and Port IEEE 802.1w Rapid Reconfiguration of Spanning Tree IEEE 802.3ad Link Aggregation Control Protocol (LACP) IEEE 802.3af Power over Ethernet IEEE 802.3x Flow Control RFC 768 UDP RFC 783 TFTP Protocol (revision 2) RFC 792 ICMP RFC 793 TCP RFC 826 ARP RFC 854 TELNET RFC 868 Time Protocol RFC 951 BOOTP RFC 1058 RIPv1 RFC 1350 TFTP Protocol (revision 2) RFC 1519 CIDR RFC 1542 BOOTP Extensions RFC 2030 Simple Network Time Protocol (SNTP) v4 RFC 2131 DHCP RFC 2453 RIPv2 RFC 2548 (MS-RAS-Vendor only) RFC 3046 DHCP Relay Agent Information Option RFC 3576 Ext to RADIUS (CoA only) RFC 3768 VRRP RFC 4675 RADIUS VLAN & Priority UDLD (Uni-directional Link Detection) **IP multicast** RFC 3376 IGMPv3 (host joins only) RFC 3973 Draft 2 PIM Dense Mode RFC 4601 Draft 10 PIM Sparse Mode **IPv6** RFC 1981 IPv6 Path MTU Discovery RFC 2375 IPv6 Multicast Address Assignments	RFC 2460 IPv6 Specification RFC 2464 Transmission of IPv6 over Ethernet Networks RFC 2710 Multicast Listener Discovery (MLD) for IPv6 RFC 2925 Remote Operations MIB (Ping only) RFC 3019 MLDv1 MIB RFC 3315 DHCPv6 (client only) RFC 3484 Default Address Selection for IPv6 RFC 3587 IPv6 Global Unicast Address Format RFC 3596 DNS Extension for IPv6 RFC 3810 MLDv2 (host joins only) RFC 4022 MIB for TCP RFC 4113 MIB for UDP RFC 4251 SSHv6 Architecture RFC 4252 SSHv6 Authentication RFC 4253 SSHv6 Transport Layer RFC 4254 SSHv6 Connection RFC 4291 IP Version 6 Addressing Architecture RFC 4293 MIB for IP RFC 4294 IPv6 Node Requirements RFC 4419 Key Exchange for SSH RFC 4443 ICMPv6 RFC 4541 IGMP & MLD Snooping Switch RFC 4861 IPv6 Neighbor Discovery RFC 4862 IPv6 Stateless Address Auto-configuration RFC 5095 Deprecation of Type 0 Routing Headers in IPv6 RFC 5340 OSPFv3 for IPv6 RFC 5453 Reserved IPv6 Interface Identifiers RFC 5722 Handling of Overlapping IPv6 Fragments **MIBs** RFC 1213 MIB II RFC 1493 Bridge MIB RFC 1724 RIPv2 MIB RFC 1850 OSPFv2 MIB RFC 2021 RMONv2 MIB RFC 2096 IP Forwarding Table MIB RFC 2613 SMON MIB RFC 2618 RADIUS Client MIB RFC 2620 RADIUS Accounting MIB RFC 2665 Ethernet-Like-MIB RFC 2668 802.3 MAU MIB RFC 2674 802.1p and IEEE 802.1Q Bridge MIB RFC 2737 Entity MIB (Version 2) RFC 2787 VRRP MIB RFC 2863 The Interfaces Group MIB RFC 2925 Ping MIB	**Network management** IEEE 802.1AB Link Layer Discovery Protocol (LLDP) RFC 2819 Four groups of RMON: 1 (statistics), 2 (history), 3 (alarm) and 9 (events) RFC 3176 sFlow ANSI/TIA-1057 LLDP Media Endpoint Discovery (LLDP-MED) SNMPv1/v2c/v3 XRMON **OSPF** RFC 2328 OSPFv2 RFC 3101 OSPF NSSA RFC 5340 OSPFv3 for IPv6 **QoS/CoS** RFC 2474 DiffServ Precedence, including 8 queues/port RFC 2597 DiffServ Assured Forwarding (AF) RFC 2598 DiffServ Expedited Forwarding (EF) **Security** IEEE 802.1X Port Based Network Access Control RFC 1492 TACACS+ RFC 2865 RADIUS (client only) RFC 2866 RADIUS Accounting Access Control Lists (ACLs) MAC Authentication MAC Lockdown MAC Lockout Port Security Secure Sockets Layer (SSL) SSHv1/SSHv2 Secure Shell Web Authentication

Modules

HP 3800 4-port Stacking Module (J9577A)

Cables

HP 3800 0.5m Stacking Cable (J9578A)
HP 3800 1m Stacking Cable (J9665A)
HP 3800 3m Stacking Cable (J9579A)

Fan Tray

HP 3800 Switch Fan Tray (J9582A)

Mounting Kit

HP X410 1U Universal 4-post Rack Mounting Kit (J9583A)

HP 3800-24G-PoE+-2SFP+ Switch (J9573A)

HP X121 1G SFP LC SX Transceiver (J4858C)
HP X121 1G SFP LC LX Transceiver (J4859C)
HP X121 1G SFP LC LH Transceiver (J4860C)
HP X121 1G SFP RJ45 T Transceiver (J8177C)
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HP X244 10G XFP to SFP+ 1m Direct Attach Copper Cable (J9300A)
HP X244 10G XFP to SFP+ 3m Direct Attach Copper Cable (J9301A)
HP X244 10G XFP to SFP+ 5m Direct Attach Copper Cable (J9302A)
HP X312 1000W 100-240VAC to 54VDC Power Supply (J9580A)

HP 3800-48G-PoE+-4SFP+ Switch (J9574A)

HP X121 1G SFP LC SX Transceiver (J4858C)
HP X121 1G SFP LC LX Transceiver (J4859C)
HP X121 1G SFP LC LH Transceiver (J4860C)
HP X121 1G SFP RJ45 T Transceiver (J8177C)
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HP 3800-24G-2SFP+ Switch (J9575A)

HP X121 1G SFP LC SX Transceiver (J4858C)
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HP X121 1G SFP LC LH Transceiver (J4860C)
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HP 3800-48G-4SFP+ Switch (J9576A)

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HP X121 1G SFP LC LH Transceiver (J4860C)
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HP 3800-24G-2XG Switch (J9585A)

HP X311 400W 100-240VAC to 12VDC Power Supply (J9581A)

HP 3800-48G-4XG Switch (J9586A)

HP X311 400W 100-240VAC to 12VDC Power Supply (J9581A)

HP 3800-24G-PoE+-2XG Switch (J9587A)

HP X312 1000W 100-240VAC to 54VDC Power Supply (J9580A)

HP 3800-48G-PoE+-4XG Switch (J9588A)

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HP 3800-24SFP-2SFP+ Switch (J9584A)

HP X121 1G SFP LC SX Transceiver (J4858C)
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HP X121 1G SFP LC LH Transceiver (J4860C)
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HP X132 10G SFP+ LC LR Transceiver (J9151A)
HP X132 10G SFP+ LC LRM Transceiver (J9152A)
HP X132 10G SFP+ LC ER Transceiver (J9153A)
HP X111 100M SFP LC FX Transceiver (J9054C)
HP X112 100M SFP LC BX-D Transceiver (J9099B)
HP X112 100M SFP LC BX-U Transceiver (J9100B)
HP 0.5 m Multimode OM3 LC/LC Optical Cable (AJ833A)
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To learn more, visit www.hp.com/networking

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Wilmore ELECTRONICS CO., INC.
P. O. Box 1329, Hillsborough, N. C. 27278, U.S.A.

SERIES 1720/200 WATT
DC-DC CONVERTERS

BULLETIN NO. 4051B

200-WATT DC-DC CONVERTERS
SINGLE OUTPUT



Series 1720

- **24, 48 OR 130 VDC INPUT**
- **ISOLATED, REGULATED OUTPUT**
- **HEIGHT 1.75" (1 RACK SPACE)**
- **HIGHLY EFFICIENT (90%) AND CONVECTION COOLED**

Series 1720 dc-to-dc converters provide a well-regulated dc output voltage from station batteries or other widely fluctuating dc sources. This output is galvanically isolated from the source and chassis and, therefore, may be connected either as a positive or a negative output. Applications include powering radio transceivers, telecommunications equipment, supervisory control systems and other critical electronic loads.

Designed for rack mounting, these state-of-the-art converters achieve superior electrical performance in a low profile enclosure. Conservatively rated and very efficient, Series 1720 converters will operate continuously at any load within their rating over a wide ambient temperature range with simple convection cooling. Standard options let users adapt converters to specific system requirements, including paralleling for redundancy and for additional power.

Nine single-output 200-watt models are available with different combinations of input and output voltages per the table below. Other voltage combinations are available, including single-output and dual-output versions at power levels up to 400 watts – contact our sales department for more information.

Table 1

Input Voltage Range (VDC)	Input Current[1] (ADC)	Output Voltage (VDC)	Output Current (ADC)	Model Number[2]
21-29 (24 nominal)	9.2	13.3	0-15	**1720-24-13-15**
	9.1	24	0-8	**1720-24-24-8**
	9.1	48	0-4	**1720-24-48-4**
42-58 (48 nominal)	4.6	13.3	0-15	**1720-48-13-15**
	4.5	24	0-8	**1720-48-24-8**
	4.5	48	0-4	**1720-48-48-4**
105-145 (130 nominal)	1.7	13.3	0-15	**1720-130-13-15**
	1.7	24	0-8	**1720-130-24-8**
	1.7	48	0-4	**1720-130-48-4**

[1]Typical current at full load and nominal input voltage
[2] See reverse side for complete model numbering information

SPECIFICATIONS

Input Voltage and Current
The input voltage range, nominal input voltage and nominal input current at full output load for standard models are shown in Table 1.

Output Voltage and Current
The output voltage and output current for standard models are shown in Table 1 (other voltages available-contact our sales department)

Output Voltage Regulation
Versus line: ±0.5%
Versus load: ±1%

Output Voltage Ripple
5 millivolts rms (typical)
50 millivolts peak-to-peak (typical)

Isolation and Grounding
Mutual electrical isolation is provided between the input circuit, the output circuit, and chassis ground.

Protection
Protection against overloads, short-circuits and output overvoltages is provided electronically. Recovery to normal operating conditions is automatic upon removal of the overload or short-circuit fault. Following an overvoltage shutdown, input power to the converter must be removed and reapplied to resume converter operation. Protection against accidental reversal of the dc input-voltage polarity during installation is provided by a shunt diode working in conjunction with the front-panel circuit breaker.

Ambient Temperature Range
Operating: -30°C to +60°C (convection cooling)
Storage: -40°C to +95°C

Efficiency
The efficiency reaches 90% at approximately 20% of full load and remains above 90% for most of the load range. The no-load input power is approximately 3 watts. Heat dissipation is approximately 75 BTU/hour at full load.

Front-Panel Switch and LED
A combination circuit breaker and ON/OFF switch is provided for input power. An LED indicates the presence (ON) of proper output voltage.

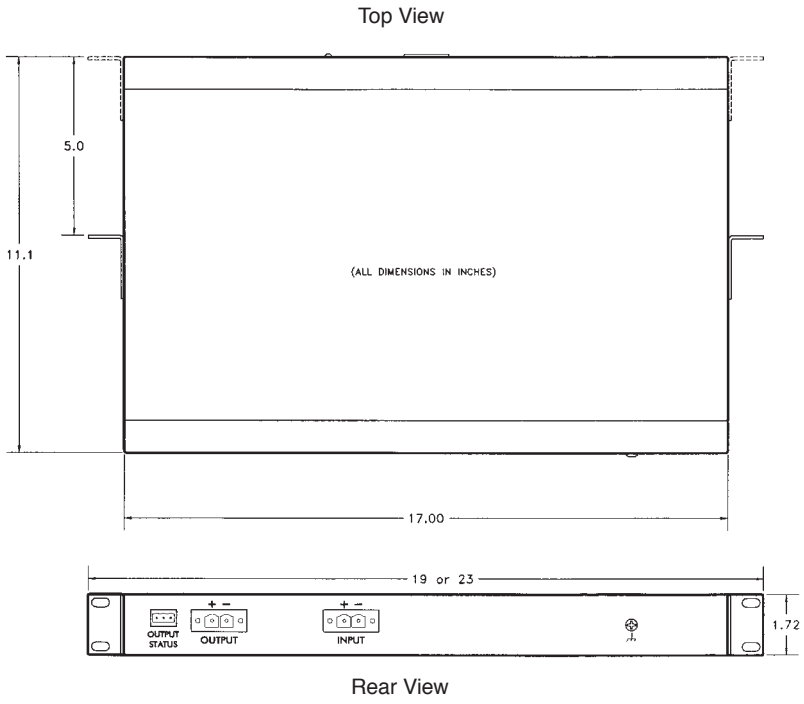


Fig. 1 Series 1720 Overall Dimensions (rear-panel connections shown with optional auxiliary contacts for indication of output status)

Physical Characteristics
Refer to Fig. 1 for overall dimensions. Weight is approximately 8 pounds. Brackets are provided for 19-inch and 23-inch rack mounting.

STANDARD OPTION FOR PARALLELING MULTIPLE CONVERTERS[3]

For applications where two or more converters will be operated in parallel to provide fault-tolerant redundancy and/or additional output power capability, a standard factory-installed option can be specified (see **MODEL NUMBERING INFORMATION**) to simplify the installation and operation of multiple-converter configurations. This option provides the following features:

- Integral output series diode to isolate an output fault in one converter from affecting others connected in parallel with it
- Auxiliary Form C contacts for remote indication of improper output (often referred to as a “converter fail alarm”)
- Integral circuitry to facilitate balanced load sharing between multiple paralleled converters

MODEL NUMBERING INFORMATION

Series 1720 converters are identified by four number groups. In sequence, these give the basic series number (**1720**) the nominal input voltage, the nominal output voltage, and the maximum load current. The standard paralleling option described in the previous section can be specified by adding the suffix **M3** to the part number. For example, **Model 1720-24-13-15-M3** is a 24-volt to 13-volt converter with a 15-ampere maximum load rating. It is provided with paralleling diode, auxiliary contacts and load sharing capability.

OTHER WILMORE PRODUCTS

For information about other Wilmore dc-to-dc converters or for information about other power-conditioning products such as switching power supplies, dc-to-ac inverters, and uninterruptible power systems, please contact our sales department.

[3] This option may affect voltage regulation, ripple, and efficiency specifications.

Information provided in this bulletin is subject to change without notice.

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SERIES 1720/400 WATT
DC-DC CONVERTERS

BULLETIN NO. 4101B

400-WATT DC-DC CONVERTERS
SINGLE OUTPUT

- **24, 48 OR 130 VDC INPUT**
- **ISOLATED, REGULATED OUTPUT**
- **HEIGHT 1.75" (1 RACK SPACE)**
- **HIGHLY EFFICIENT (90%) AND CONVECTION COOLED**



Series 1720

Series 1720 dc-to-dc converters provide a well-regulated dc output voltage from station batteries or other widely fluctuating dc sources. This output is galvanically isolated from the source and chassis and, therefore, may be connected either as a positive or a negative output. Applications include powering radio transceivers, telecommunications equipment, supervisory control systems and other critical electronic loads.

Designed for rack mounting, these state-of-the-art converters achieve superior electrical performance in a low profile enclosure. Conservatively rated and very efficient, Series 1720 converters will operate continuously at any load within their rating over a wide ambient temperature range with simple convection cooling. Standard options let users adapt converters to specific system requirements, including paralleling for redundancy and for additional power.

Nine single-output 400-watt models are available with different combinations of input and output voltages per the table below. Other combinations are available, including single-output and dual-output versions at power levels from 100 watts to 400 watts – contact our sales department or visit our Web site for more information.

Table 1

Input Voltage Range (VDC)	Input Current[1] (ADC)	Output Voltage (VDC)	Output Current (ADC)	Model Number[2]
21-29 (24 nominal)	18.4	13.3	0-30	**1720-24-13-30**
	18.2	24	0-16	**1720-24-24-16**
	18.2	48	0-8	**1720-24-48-8**
42-58 (48 nominal)	9.2	13.3	0-30	**1720-48-13-30**
	9.0	24	0-16	**1720-48-24-16**
	9.0	48	0-8	**1720-48-48-8**
105-145 (130 nominal)	3.4	13.3	0-30	**1720-130-13-30**
	3.3	24	0-16	**1720-130-24-16**
	3.3	48	0-8	**1720-130-48-8**

[1]Typical current at full load and nominal input voltage
[2] See reverse side for complete model numbering information

SPECIFICATIONS

Input Voltage and Current
The input voltage range, nominal input voltage and nominal input current at full output load for standard models are shown in Table 1.

Output Voltage and Current
The output voltage and output current for standard models are shown in Table 1 (other voltages available-contact our sales department)

Output Voltage Regulation
Versus line: ±0.5%
Versus load: ±1%

Output Voltage Ripple
5 millivolts rms (typical)
50 millivolts peak-to-peak (typical)

Isolation and Grounding
Mutual electrical isolation is provided between the input circuit, the output circuit, and chassis ground.

Protection
Protection against overloads, short-circuits and output overvoltages is provided electronically. Recovery to normal operating conditions is automatic upon removal of the overload or short-circuit fault. Following an overvoltage shutdown, input power to the converter must be removed and reapplied to resume converter operation. Protection against accidental reversal of the dc input-voltage polarity during installation is provided by a shunt diode working in conjunction with the front-panel circuit breaker.

Ambient Temperature Range
Operating: -30°C to +50°C (convection cooling)
Storage: -40°C to +95°C

Efficiency
The efficiency reaches 90% at approximately 20% of full load and remains above 90% for most of the load range. The no-load input power is approximately 5 watts. Heat dissipation is approximately 150 BTU/hour at full load.

Front-Panel Switch and LED
A combination circuit breaker and ON/OFF switch is provided for input power. An LED indicates the presence (ON) of proper output voltage.

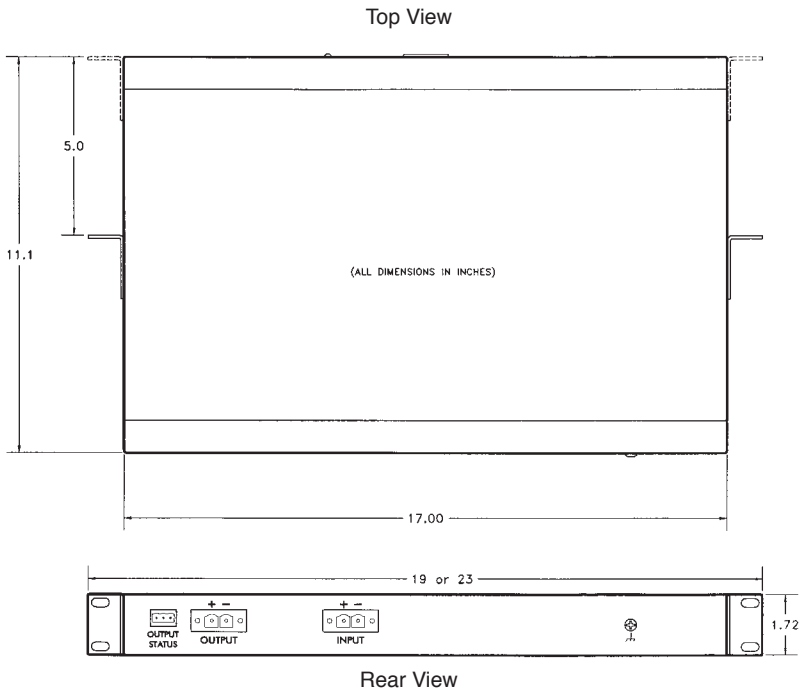


Fig. 1 Series 1720 Overall Dimensions (rear-panel connections shown with optional auxiliary contacts for indication of output status)

Physical Characteristics
Refer to Fig. 1 for overall dimensions. Weight is approximately 10 pounds. Brackets are provided for 19-inch and 23-inch rack mounting.

STANDARD OPTION FOR PARALLELING MULTIPLE CONVERTERS[3]

For applications where two or more converters will be operated in parallel to provide fault-tolerant redundancy and/or additional output power capability, a standard factory-installed option can be specified (see **MODEL NUMBERING INFORMATION**) to simplify the installation and operation of multiple-converter configurations. This option provides the following features:

- Integral output series diode to isolate an output fault in one converter from affecting others connected in parallel with it
- Auxiliary Form C contacts for remote indication of improper output (often referred to as a “converter fail alarm”)
- Integral circuitry to facilitate balanced load sharing between multiple paralleled converters

MODEL NUMBERING INFORMATION

Series 1720 converters are identified by four number groups. In sequence, these give the basic series number (**1720**) the nominal input voltage, the nominal output voltage, and the maximum load current. The standard paralleling option described in the previous section can be specified by adding the suffix **M3** to the part number. For example, **Model 1720-24-13-30-M3** is a 24-volt to 13-volt converter with a 30-ampere maximum load rating. It is provided with paralleling diode, auxiliary contacts and load sharing capability.

OTHER WILMORE PRODUCTS

For information about other Wilmore dc-to-dc converters or for information about other power-conditioning products such as switching power supplies, dc-to-ac inverters, and uninterruptible power systems, please contact our sales department.

[3] This option may affect voltage regulation, ripple, and efficiency specifications.

Information provided in this bulletin is subject to change without notice.

WILMORE ELECTRONICS COMPANY, INC.
P. O. Box 1329, Hillsborough, N. C. 27278 • Telephone (919) 732-9351 • FAX (919) 732-9359
www.wilmoreelectronics.com

ELECTRICAL SPECIFICATIONS

Frequency Range	
MWF7AM-D – 700 MHz model	762-776 MHz
MWF8AM-D – 800 MHz model	851-869 MHz
Bandwidth	
MWF7AM-D – 700 MHz model	14 MHz
MWF8AM-D – 800 MHz model	18 MHz
Insertion Loss	< 0.3 dB
Isolation at RX	> 45 dB*
Return Loss	> 19 dB
Impedance	50 Ω
Power Rating	600 W (average)

MECHANICAL SPECIFICATIONS

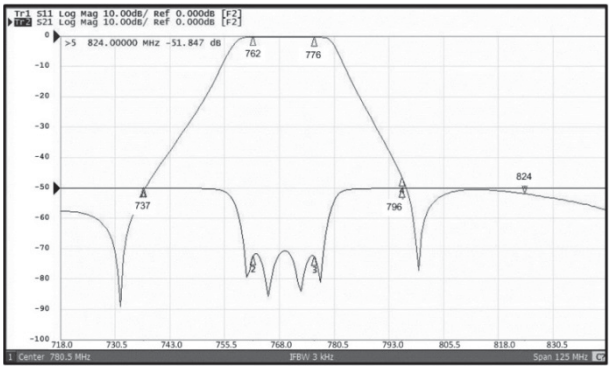
Construction/Finish	Aluminum/Black
Connectors	7/16 DIN
Mounting	EIA 19-inch Rack
Temperature Range	-30° to +60° C

DIMENSIONS

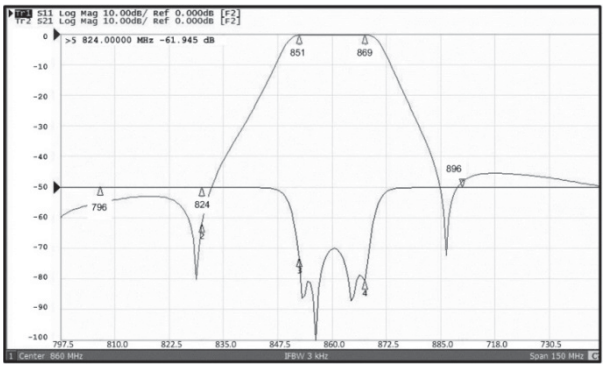
Width	19 in (482.6 mm)
Height	3.5 in (88.9 mm)
Rack Height	2 RU
Depth	10 in (254 mm)
Weight	7 lbs (3.18 kg)

***Add to isolation provided by combiners.**

SELECTIVITY CURVES



700 MHz Bandwidth



800 MHz Bandwidth



PRODUCT DESCRIPTION

These are compact, high power window filters in 700 and 800 MHz range models. Place on combiner outputs for added transmitter sideband noise reduction. The cast aluminum/machined filter design provides ultra-low insertion loss and high isolation between the combiners in a small, economical package.

FEATURES AND BENEFITS

- Low insertion loss for minimal transmitter power loss
- Provides additional TX noise attenuation – great for sites with horizontally separated antennas
- Peak instantaneous power (PIP) tested using stringent 2 kV DC / low frequency AC method to ensure handling PIP generated by today's digital systems
- Requires only 2 RU of rack space.
- Easy field installation
- May be located remotely from transmitter combiners



SUPPORTS CIRCUIT WIRELINE AND IP NETWORKS

MLC 8000 CONVENTIONAL ANALOG COMPARATOR

The MLC 8000 is a versatile product platform that allows gradual migration of analog conventional voting/simulcast systems from circuit connectivity to IP network connectivity (LAN or WAN networks). When designing a conventional system one MLC 8000 operates as a console Tone Remote Control (TRC) interface and audio voter and at least one MLC 8000 as a sub-site link converter to 4-wire analog base stations and receivers. It allows users to immediately realize the savings of IP connectivity by providing a flexible solution with a direct interface to the existing 4-wire equipment at the remote RF sites.

- Interface with existing analog TRC consoles
- Interface with existing analog 4-wire base stations and receivers
- Supports PL/DPL generation, pre-emphasis and companding for analog simulcast
- Supports analog simulcast over IP subsite links up to 64 subsites
- Supports analog conventional voting on ASTRO® 25 systems with IP subsite links
- Fully compatible with GTR 8000 stations, QUANTAR™ stations or ASTRO-TAC receivers

SUPERIOR AUDIO QUALITY

The MLC 8000 uses an advanced G.711 voice codec technology to provide transparent operation for several analog signaling standards including MDC 1200 and DTMF. The Motorola-designed audio sampling hardware and digital signal processing provide superior audio fidelity, minimizing the impact of packetization on the audio quality experienced by subscribers and console operator positions.

SPECIFICATIONS

	MLC 8000	DC POWER ADAPTER
Dimensions (H x W x D)	1.7 in (4.2cm x 8.6 in (21.8cm) x 10.4 in (26.4cm)	1.24 in (3.2cm) x 1.79 in (4.5cm) x 4.35 in (11.1cm)
Weight	5.8 lbs (2.6kg)	
Temperature	–30 °C to 60 °C (–22 °F to 140 °F) operating –40 °C to 80 °C (–40 °F to 176 °F) non-operating	–30 °C to 60 °C (–22 °F to 140 °F) operating –40 °C to 80 °C (–40 °F to 185 °F) non-operating
Humidity	5 to 95% @+50 °C (122 °F) (Non-Condensing)	5 to 95% @+50 °C (122 °F) (Non-Condensing)
Heat Dissipation	40 BTU/Hour (Maximum)	
Input Voltage Range	10.8 to 14 VDC (12v Nominal) b	90-260VAC
Input Frequency		60Hz/50Hz
Output Voltage Range		11.4V to 12.6V (12v Nominal)
Current Draw	Less than 0.6A at 12VDC	
Power Consumption	9 Watts (Maximum)	Maximum Load 2.0A
Environmental Regulatory	EU WEEE Directive EN 50419 Compliant	EU WEEE Directive EN 50419 Compliant
Safety Certifications	United States: UL60950-1 (UL Listed), Europe: EN60950-1, Canada: CSA	

INTERFACE SPECIFICATIONS

4-wire Analog Audio (Non-simulcast subsite link converter configuration)	Four RJ45 Connectors RX/TX Line Impedence: 600 Ohm	Input Audio Level: -30 to +10dBm, adjustable Output Audio Level: -30 to +10dBm, adjustable
Analog Simulcast Base Radio Port (Simulcast subsite link converter configuration)	One RJ45 Connector RX/TX Line Impedence: 600 Ohm PTT External PTT (logic output)	Output Audio Level: -10dBm output, .1dB adjustable Output Audio Delay: 0 to 300ms, 1usec adjustable Input Audio Level: -30 to +10dBm, adjustable
4-wire Analog Console Port (Analog comparator configuration)	One RJ45 Connector RX/TX Line Impedence: 600 Ohm	Input Audio Level: -30 to +10dBm, adjustable Output Audio Level: -30 to +10dBm, adjustable
V.24 Digital Audio	Four RJ45 Connectors	Synchronous RS232, 9600 baud Motorola V.24 Protocol
Ethernet	RJ45 Connector	
Analog Simulcast External Reference Input +12 VDC Input	QMA Connector (QMA-to-BNC jack adapter included) High Impedence (6.8K Ohms)	Required for analog simulcast comparator and analog simulcast subsite link converter configurations. Requires 5MHZ/1PPS composite reference from TRAK 8835-2M or TRAK 9100

SYSTEMS SPECIFICATIONS

	ANALOG NON-SIMULCAST VOTING	ANALOG SIMULCAST	MIXED-MODE NON-SIMULCAST VOTING[1]	V.24 SUBSITE LINK CONVERTER[2]
Comparator Voting Capacity	1-64 receivers	1-64 receivers	1-64 receivers	1-64 receivers
Subsite Link Converter Capacity	Up to 4 TRC stations or receivers	1 Simulcast TX/RX station[3] or 1 receiver	Up to 4 V.24/4-wire "hybrid link" stations or receivers	Up to 4 V.24 stations or receivers
Subsite Link Types	T1 channel bank, IP	IP	T1 channel bank, IP	T1 channel bank, IP
Analog IP Audio Companding	G.711 (64Kbps, PCM)	G.711 (64Kbps, PCM)	G.711 (64Kbps, PCM)	N/A
Console Interface	Tone Remote Control	Tone Remote Control	Motorola V.24	Motorola V.24
Station/Receiver Interface	Receiver: Status Tone Station: Tone Remote Control (TRC)	Receiver: Status Tone Station: External PTT and Status Tone	Motorola V.24	Motorola V.24
Voting Algorithm	Continuous Voting	Continuous Voting	Continuous Voting Vote and Hold (Analog)	Continuous Voting
Voting Control and Display	MLC 8000 configuration tool standard or MCN 8000 Server/Client (CTI Products, Inc.)	MLC 8000 configuration tool standard or MCN 8000 Server/Client (CTI Products, Inc.)	MLC 8000 configuration tool standard or MCN 8000 Server/Client (CTI Products, Inc.)	MLC 8000 configuration tool standard or MCN 8000 Server/Client (CTI Products, Inc.)

1 Requires ASTRO 25 Core and GCM 8000 Comparator
2 Requires GCM 8000 Comparator
3 Requires TRAK GPS-synchronized composite reference

Motorola Solutions, Inc. 1301 E. Algonquin Road, Schaumburg, Illinois 60196 U.S.A. **motorolasolutions.com/ASTRO25**

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Penetrator™ Antenna, 794-824, 16.4dBi, 220deg

Product Description

The novel side fed dipole design of these antennas provides 8 dBd, 10 dBd or 12 dBd omnidirectional gain with 30 MHz bandwidth. They feature constant beamtilt, heavy null fill, and have been VSWR tested. Depending upon the specific required area of coverage, horizontal patterns O, A, B, D or H are available.



BLR* Series

Features/Benefits

• High gain maximizes ERP.• Heavy null fill enhances close-in coverage.• Customized beamtilt minimizes interference to and from adjacent systems.• Various patterns available to efficiently cover target area.

Technical Specifications

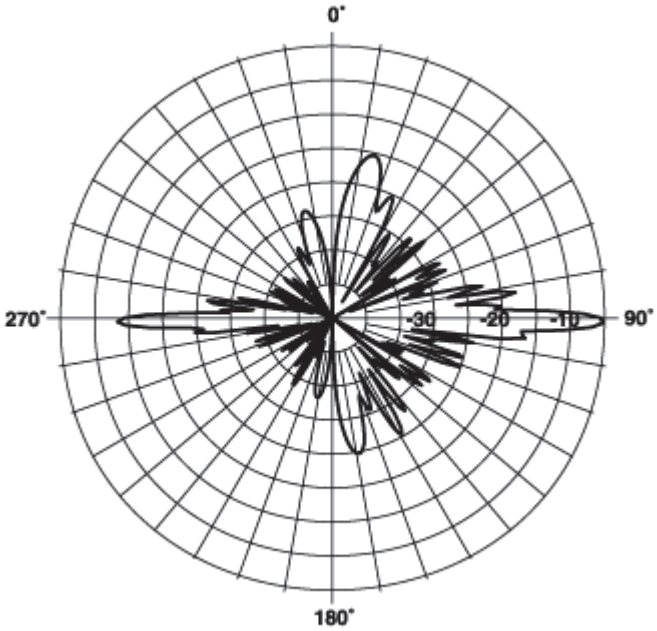
Frequency Range, MHz	794-824
Horizontal Pattern	Directional
Antenna Type	Penetrator
Horizontal Beamwidth, deg	220
Electrical Downtilt, deg	0.75
Gain, dBi (dBd)	16.4 (14.3)
Vertical Beamwidth, deg	3.5
1st Null Fill, dB	Included
Null Fill, dB	Included
Front-To-Back Ratio, dB	8
Polarization	Vertical
VSWR	< 1.5:1
Impedance, Ohms	50
Maximum Power Input, W	500
Lightning Protection	Top Rod Grounded to Base Mount
Connector Type	716 DIN Female
Connector Location	Bottom
Weight, kg (lb)	42 (92)
Weight with B1 Bracket, kg (lb)	56 (124)
Mount Type	Bracket
Mounting Hardware	B1 Bracket (included)
Rated Wind Speed, km/h (mph)	160 (100)
Overall Length, m (ft)	6.1 (20)
Diameter, mm (in)	168.3 (6.625)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Max Wind Loading Area, m² (ft²)	0.706 (7.6)
Survival Wind Speed, km/h (mph)	160 (100)
Shipping Weight, kg (lb)	61.3 (135)

Notes

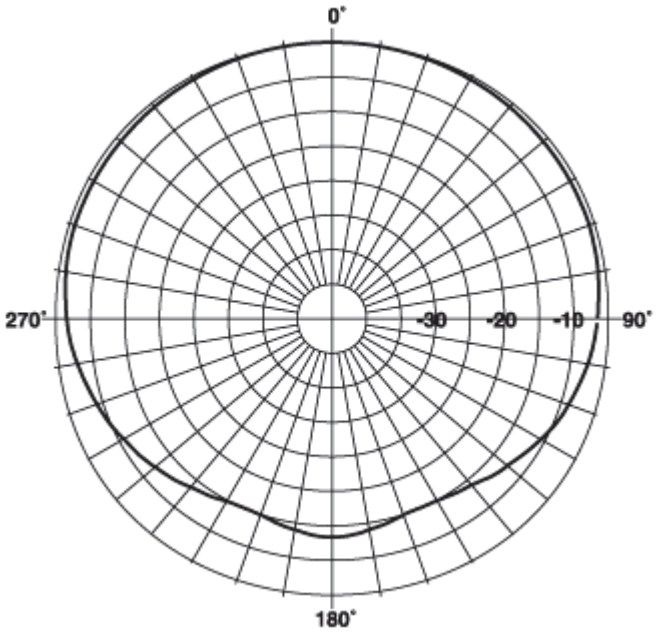
Other Documentation

All information contained in the present datasheet is subject to confirmation at time of ordering

Penetrator™ Antenna, 794-824, 16.4dBi, 220deg

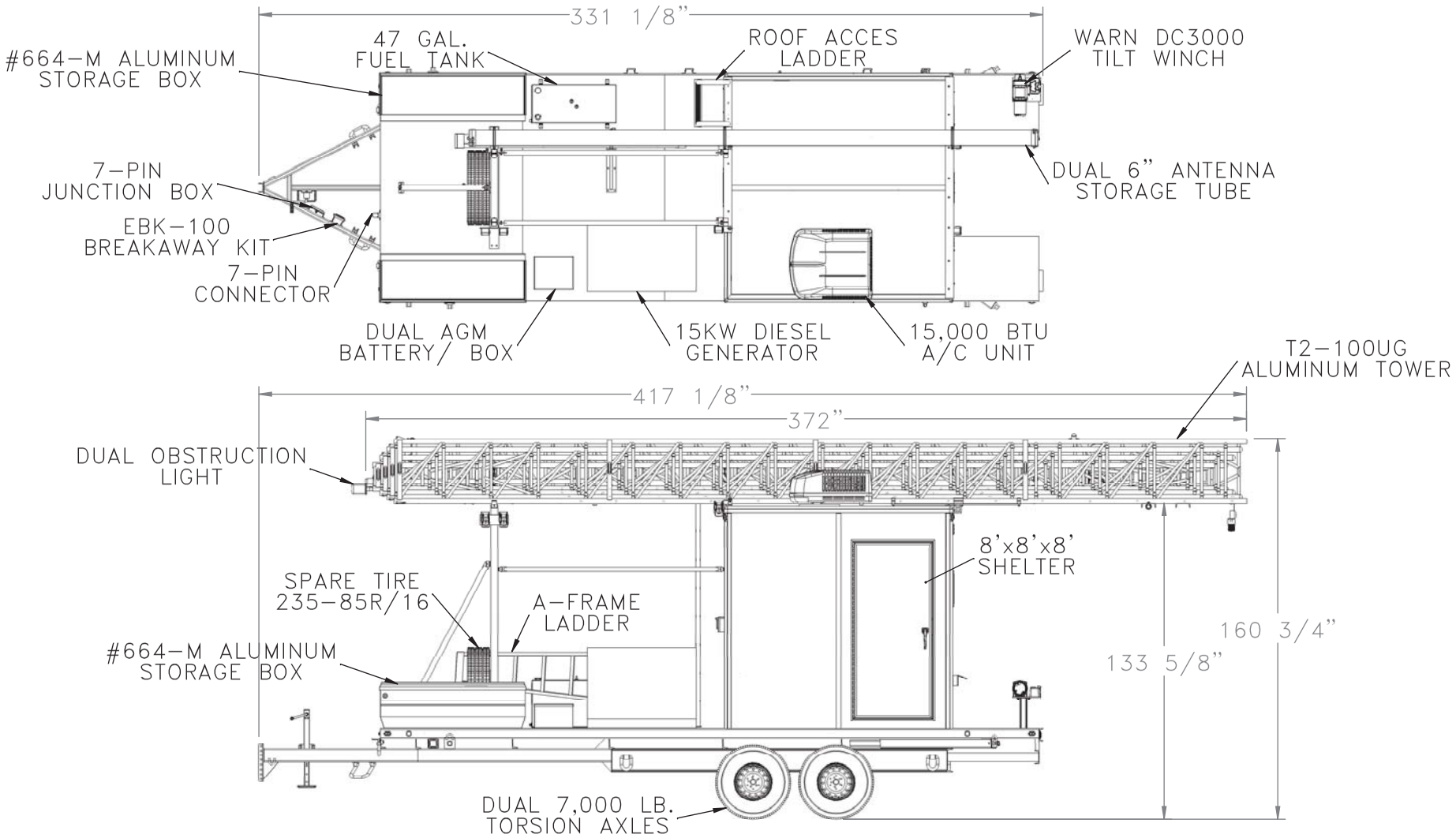


Vertical Pattern



Horizontal Pattern

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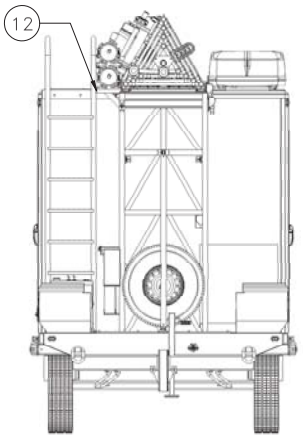
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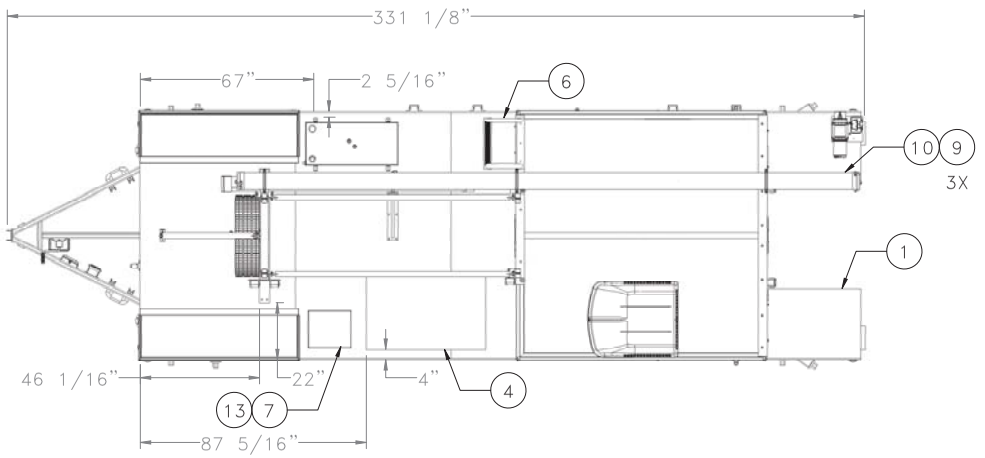
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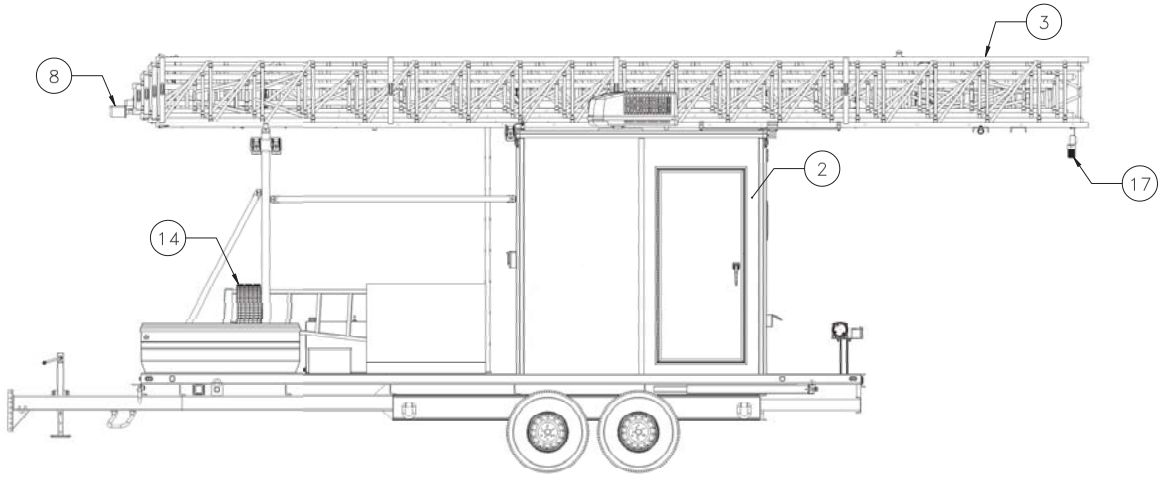
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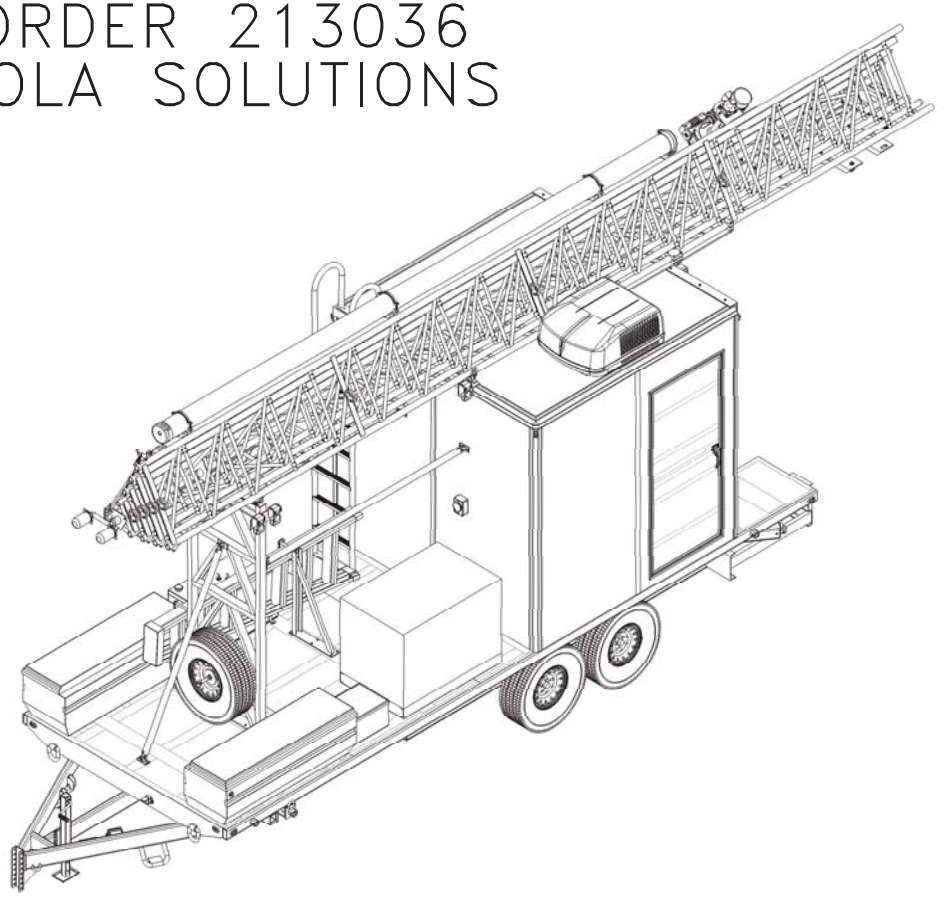
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S8 HYBRID TRAILER

SIZE	DWG. NO.	REV
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ITEM	QTY.	PART NUMBER	DESCRIPTION
1	1	OAS8H7.0-E	S8 HYBRID BASE TRAILER
2	1	S8-13036	S8 SHELTER
3	1	T2-100UG30S8	T2-100 UG ON AN S8 OR S812
4	1	ZGENALUMA15KWDSL	12KW GENERATOR
5	1	AALUMAFUELTANK47	47 GALLON FUEL TANK
6	1	AALUMAS8ROOFLDR	ROOF ACCESS LADDER FOR S8 AND S812 SHELTERS
7	1	ZBB510DUAL	S510 DUAL BATTERY BOX
8	1	ZLGDUALOBSTRLED	DUAL LED OBSTRUCTION LIGHT
9	3	AALUMADUALANTBRKT	DUAL ANTENNA TUBE BRACKET
10	1	AALUMADUALTUBE	6" DUAL ANTENNA STORAGE ASSEMBLY
11	4	AALUMAANTTUBECAP	ANTENNA TUBE CAP
12	1	SP8-001	S8 HYBRID ANTENNA TUBE MOUNTING BRACKET
13	2	ZBATT9A65	DEKA INTIMIDATOR 9A65 AGM BATTERY
14	1	ST235-85R16ASSY	ST235-85R16 TIRE AND RIM ASSEMBLY
15	1	AATIREHOLDDOWN	SPARE TIRE HOLD DOWN ASSEMBLY
16	1	HLK3KA3581	MASTERLOCK #3KA KEYED PAD LOCK (3581)
17	1	ZLGTOWERTAILLIGHT	ADDITIONAL TAIL LIGHT WITH FLASHER
18	1	TAC2S01D036HD	36" DOUBLE STAND OFF ASSEMBLY FOR HEAVY DUTY 'C' SECTION
19	1	TAE2S01S036HD	36" SINGLE STAND OFF FOR 'E2' SECTION WITH 1/8" LEGS ASSEMBLY
20	1	TAC2S01S036HD	36" SINGLE STAND OFF FOR 'C2' SECTION WITH 1/8" LEGS ASSEMBLY

S8 HYBRID
FOR ORDER 213036
MOTOROLA SOLUTIONS



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TrunkLine Antenna, Standard (FCC 101, Cat A) , Single Polarized, 6 ft

Product Description
(Only available in North America)

RFS Microwave Antennas are designed for microwave systems in all common frequency ranges from 4 GHz to 24 GHz. Different options of survival windspeeds are available. This allows the use of antennas in areas where extreme wind conditions are normal. The antennas utilise a conventional feed system and are available in three performance classes offering complete flexibility when designing a network. Standard Performance antennas are economical solutions for systems where side lobe suppression is of less importance. These antennas are required for use in networks where there is a low interference potential. Antennas are available in 2 ft (0.6m) to 12 ft (3.7m) diameters. Antennas from 4ft up to 12 ft (3.7m) can be equipped with a moulded radome to reduce wind load and to protect the feed against the accumulation of ice and snow.



Antenna

Features/Benefits

• Field-proven reliability and long life
• Support for winds up to 200 km/h (125 mph) with high-wind versions that support winds up to 252 km/h (155 mph) and an optional sway bar for added assurance in case mistakes are made during installation
• A single-piece configuration and compact packaging to reduce transportation costs
• Frequencies ranging from 4 GHz to 15 GHz with support for two wideband frequency ranges (5.725-6.875 and 7.125-8.5 GHz) to reduce antenna requirements and simplify logistics

Technical Features

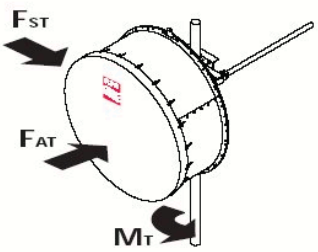
Product Type	Point to point antennas
Frequency, GHz	5.925 - 6.425
Diameter, ft (m)	6 (1.8)
Profile	TrunkLine
Reflector	1-part
Swaybar	1: (2.0 m x Ø60 mm)
optional Swaybar	1: SMA-SK-60-2000A (2.0 m x Ø60mm)
Performance	Improved Performance
Polarization	Single
Regulatory Compliance	FCC Category A
3dB beamwidth, (degrees)	1.8
Antenna Input	CPR137G
Low Band Gain, dBi	38.4
Mid Band Gain, dBi	38.7
High Band Gain, dBi	39.1
F/B Ratio, dB	55
XPD, dB	30
Max VSWR / R L, dB	1.06 (30.7)
Elevation Adjustment, degrees	± 5
Azimuth Adjustment, degrees	± 5
Polarization Adjustment, degrees	± 5
Radome	Optional
Antenna color	White RAL 9010
Mounting Pipe Diameter minimum, mm (in)	114 (4.5)
Mounting Pipe Diameter maximum, mm (in)	114 (4.5)
Approximate Weight, kg (lb)	65 (141)
Survival Windspeed, km/h (mph)	200 (125)
Operational Windspeed, km/h (mph)	190 (118)
Further Accessories	SMA-WK-6A : Wind Kit< br />SMA-SKO-UNIVERSAL-L : Universal sway bar fixation kit

All information contained in the present datasheet is subject to confirmation at time of ordering

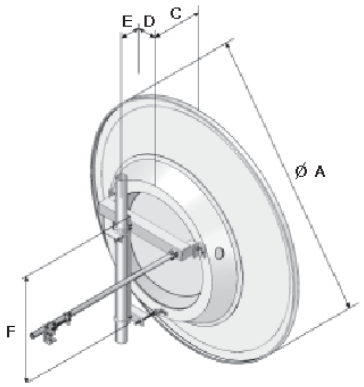
TrunkLine Antenna, Standard (FCC 101, Cat A) , Single Polarized, 6 ft

All values @ Survival Wind Speed

F_{ST} Side force max, N (lb)	2910 (651)
F_{AT} Fa Axial force max, N (lb)	9900 (2217)
M Torque max., Nm (lb*ft)	3055 (2270)



Dimensions	mm (in)
ØA	2000 (79)
B	
C	364 (14.3)
D @ Mounting pipe Ø 219 (8.5):	not applicable
D @ Mounting pipe Ø 114 (4.5):	175 (6.9)
D @ Mounting pipe Ø 89 (3.5):	not applicable
D @ Mounting pipe Ø 48 (1.9):	not applicable
E	283 (11.1)
F	590 (23.2)
G	not applicable
H	not applicable



Notes

no notes

Documentation

Complete Antenna installation

RPE (IQ-Link format)
RPE (Pathloss format)
RPE (PDF format)

All information contained in the present datasheet is subject to confirmation at time of ordering

CompactLine Easy Antenna, Ultra High Performance, Single Polarized, 3 ft

Product Description

RFS CompactLine® and CompactLine® Easy Antennas are designed for short-haul microwave systems in all common frequency ranges from 6 GHz to 80 GHz. They are typically deployed in dense urban areas, metropolitan and suburban locations, aggregation points. They are especially optimized to integrated radios to reduce costs, installation complexity and time.



Antenna

Features/Benefits

- Sizes ranging from 0.3 m (1 ft) to 1.8 m (6 ft)
- Frequencies ranging from 5.925 GHz to 80 GHz with support for three wideband frequency ranges (5.925-7.125, 7.125-8.5 and 10.0-11.7 GHz) to reduce antenna requirements and simplify logistics
- Single (SB and SC) and dual-polarized (SBX and SCX) models with the ability to upgrade from single to dual polarization and change frequencies in the field
- Low-profile design to reduce transportation requirements, wind load and antenna weight
- Simplified mounting design to accelerate installation
- CompactLine EASY models are extra light and easy to transport, deploy and upgrade
- Hardcover radomes
- Tested and validated ultra-high (ETSI EN 302 217 Class 3, FCC Class A) electrical performance
- Support for winds up to 250 km/h (155 mph) and even 320 km/h (195 mph) for SB1/SBX1
- An optional sway bar for antennas 1 m (3 ft) and larger for added assurance in case mistakes are made during installation

Technical Features

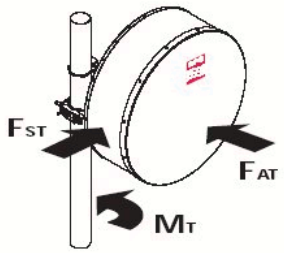
Product Type	Point to point antennas
Frequency, GHz	10 - 11.7
Diameter, ft (m)	3 (0.9)
Profile	CompactLineEasy
Reflector	1-part
Swaybar	0: (not applicable)
optional Swaybar	1: SMA-SK-3 (1.00 m x Ø33 mm)
Performance	Ultra High
Polarization	Single
Regulatory Compliance	ETSI EN 302217 Range 1 Class 3, Brazil Anatel Class 2, Canada SRSP 310.5, FCC Category A
3dB beamwidth, (degrees)	2
Antenna Input	CPR90G
Low Band Gain, dBi	37.6
Mid Band Gain, dBi	38.3
High Band Gain, dBi	39.1
F/B Ratio, dB	64
XPD, dB	30
Max VSWR / R L, dB	1.38 (16)
Elevation Adjustment, degrees	± 15
Azimuth Adjustment, degrees	± 15
Polarization Adjustment, degrees	± 5
Radome	rigid
Antenna color	White RAL 9010
Mounting Pipe Diameter minimum, mm (in)	89 (3.5)
Mounting Pipe Diameter maximum, mm (in)	114 (4.5)
Approximate Weight, kg (lb)	18 (40)
Survival Windspeed, km/h (mph)	252 (155)
Operational Windspeed, km/h (mph)	180 (112)
Further Accessories	SMA-SKO-UNIVERSAL : Universal sway bar fixation kit

All information contained in the present datasheet is subject to confirmation at time of ordering

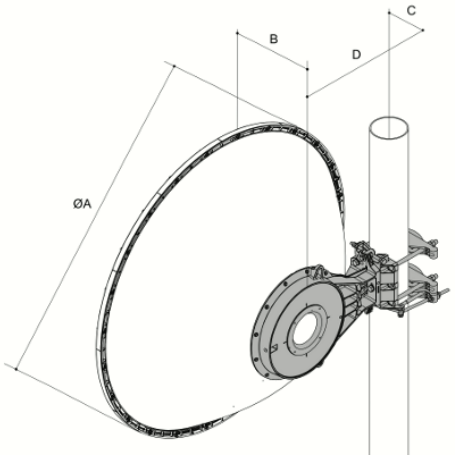
CompactLine Easy Antenna, Ultra High Performance, Single Polarized, 3 ft

All values @ Survival Wind Speed

F_{ST} Side force max, N (lb)	1451 (326)
F_{AT} Fa Axial force max, N (lb)	2930 (659)
M Torque max., Nm (lb*ft)	1213 (895)



Dimensions	mm (in)
ØA	999 (39.5)
B	375 (15)
C	56 (2.2)
D @ Mounting pipe Ø 219 (8.5):	not applicable
D @ Mounting pipe Ø 114 (4.5):	392 (15.5)
D @ Mounting pipe Ø 89 (3.5):	379.5 (14.9)
D @ Mounting pipe Ø 48 (1.9):	not applicable
E	79 (3)
F	182 (7)
G	not applicable
H	not applicable



Notes

no notes

Documentation

Reflector Installation
Feed Installation

RPE (10.55-10.68 GHz) (Pathloss format)
RPE (10.55-10.68 GHz) (PDF format)
RPE (10.0-11.7 GHz)(Pathloss Format)
RPE (10.0-11.7 GHz)(PDF Format)
RPE (10.7-11.7 GHz)(Pathloss Format)
RPE (10.7-11.7 GHz)(PDF Format)

All information contained in the present datasheet is subject to confirmation at time of ordering

CC807 Series

7/800 MHz Corporate Collinear Antennas

746-870 MHz

These industry leading PIM and PIP rated collinear arrays allow site operators to combine, with complete integrity, a large number of communications services into a single, low profile collinear antenna array.

The true corporate feed of these arrays maintains total pattern integrity over a very broad operating bandwidth, similar to that previously available only in exposed dipole configurations. This is now achieved in the preferred form factor of a fully enclosed fiberglass radome. The corporate collinears employ a unique corporate phasing system enabling precision control of the element placements ensuring phase purity resulting in exceptional bandwidth and electrical performance .

Gain is maximized and side lobes reduced dramatically. In a patent pending design approach the individual dipole elements including matching network are fabricated entirely of a flexible circuit board. The dipole elements are soldered to a brass support tube which is directly connected to the mounting tube and the lightning spike at the top of the antenna.

The result of this unique, incredibly strong design is:



- Peak Instantaneous Power rating (PIP) 25 kW
- Passive Intermodulation rating (PIM) -150 dBc
- High continuous power rating
- Extraordinary bandwidth characteristics with superior pattern control
- Field invertible (most models)

USA patent: 7,365,698

Australia patent: 2005904524



RFI
2023 Case Parkway North
Twinsburg, OH 44087
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Fax: 330 486 0705

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CC807 Series

7/800 MHz Corporate Collinear Antennas

746-870 MHz

Electrical Specifications

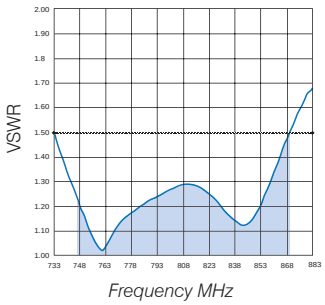
Model Number	CC807-03	CC807-06	CC807-08	CC807-11
Nominal Gain *dBd (dBi)*	3 (5.1)	6 (8.1)	8 (10.1)	10.5 (12.6)
Frequency *MHz*	746 - 870			
Tuned Bandwidth *MHz*	124			
VSWR	<1.5 :1			
Nominal Impedance Ω	50			
Downtilt	N/A	0° Std - 5° *(1)*	0° Std - 5° *(1)*	0° Std - 5° *(1)*
Vertical Beamwidth°	28	17	9	4.5
Horizontal Beamwidth	Omni +/- 0.5dB			
Input Power *Watts*	250	500	500	500
Passive IM 3rd order (2x20W) *dBc*	-150			
Peak Instantaneous Power *kW*	25			

Mechanical Specifications

Model Number		CC807-03	CC807-06	CC807-08	CC807-11
Construction		Composite fiberglass sky blue radome aluminum mounting tube			
Length *inches*		48	69	114	206
Weight lbs		9	16	27	49
Radome Diameter *inches*		3			
Shipping Weight *lbs*		18	25	40	88
Shipping Dimensions *inches*	H	6			
	W	6			
	L	56	75	119	220
Termination		7/16" DIN fixed female			
Invertible Mounting		Yes *(2)*			
Suggested Clamps (not included)		UC1143			
Projected area *ft²*	No ice	0.9	1.4	2.5	4.9
	with ice	1.2	1.7	3.1	6.2
Lateral (Thrust) @ 100mph *lbs*		22	34	62	121
Wind Gust Rating *mph*		>150			
Torque @ 100mph *ft-lbs*		15	54	205	761

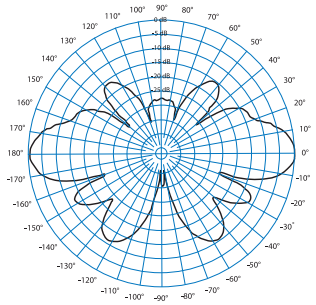
Note (1) Pre-set downtilt variations of 5 degrees are available in the following models CC807-08, CC807-11. Simply add -T5 at the end of the model being ordered. E.g. CC807-08-T5, CC807-11-T5
(2) Downtilt versions can not be field inverted.

Typical VSWR Response



Frequency MHz

Typical - E Plane



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AVIAT NETWORKS
CTR 8611 MICROWAVE ROUTER

The CTR 8611 from Aviat Networks is an integrated microwave router purpose built for microwave networks where full redundancy and protection are paramount. Designed to interoperate with any transport network, the CTR 8611 delivers industry-leading routing functionality optimized to improve the performance and manageability of microwave-based transport networks.



INTEGRATED ROUTING FOR MICROWAVE NETWORKS

To lower costs, increase capacity, and deliver new services, microwave networks serving public safety, utilities, transportation, oil and gas and others are being built on IP networking technology. These networks require routers that are not only resilient but work well with the predominant transport technology found in most data works today – microwave! The CTR 8611 router is a fully integrated microwave networking solution that enables efficient, high performance operation across microwave, routing, and management functions thus drastically simplifying backhaul networks.

HIGH RESILIENCY NETWORKING BY DESIGN

The Aviat CTR 8611 offers a versatile and scalable solution for mission critical networks with a high availability design. The interface and power feed modularity provides various configuration options. The fully redundant Switching and Control Module (SCM) enables unsurpassed carrier class reliability. Advanced quality of service (QoS) capabilities are available to support mission-critical communications such as SCADA (Supervisory Control and Data Acquisition) as well as public safety applications. This platform provides an extensive Ethernet and IP/MPLS feature set.

AVIAT'S END-END IP/MPLS SOLUTION – NOW INCLUDES CTR 8611

As a longtime leader in microwave transport solutions, Aviat now delivers an integrated IP/MPLS portfolio for microwave networks. Not only does the router layer interoperate and play nicely with transport function, the solution is managed from a single management interface. The CTR 8611 is supported by Aviat Provision INM, which is an easy to use, end-to-end network management solution. Provision INM minimizes operational and maintenance costs and scales from small networks to large networks and will support up to thirty thousand network elements.

KEY FEATURES

- Packet-based forwarding architecture with QoS awareness, enabling network optimization for voice, data and video services.
- Environmentally hardened 2RU, modular compact chassis (7 slots), supporting 10G, Gigabit and Fast Ethernet, and E1/T1 line modules that are user swappable.
- Carrier- Class Reliability for mission critical applications via the redundant Switching and Control Module (SCM):
  - Fully independent Switch fabric, Control plane, Synchronization and Management ports; separate Alarm and Power interfaces
  - MPLS fast reroute – 50 ms restoration for utility teleprotection applications
- Robust Synchronization: Multiple options include IEEE 1588v2 and adaptive timing recovery, node timing obtained from BITS, GPS source, any PDH/SONET or SynchE interface
- Extensive set of OAM capabilities to ensure network availability and maintain QoS requirements for voice, video and data.
  - Seven (7) traffic classes
  - Supports LSP Ping, LSP Traceroute, Ethernet OAM
- Network Management and Craft Interfaces including Aviat ProVision INM, SNMPv1/v2 monitoring

HARDWARE PLATFORM

CHASSIS CONFIGURATION:

- Two slots for hot swappable Switching and Control Module (SCM)
- Two slots for hot swappable power feed module
- Four slots for user changeable Line Modules (LM) – Not Hot Swappable
- Three slots for hot swappable High-speed Modules (HM)
- Management port on SCM
- External Alarm interface on SCM
- Station Clock Input (SCI) on SCM
- Station Clock Output (SCO) on SCM

MODULES – LINE (LM) AND HIGH-SPEED (HM):

- 8 x E1/T1 LM
- 8 x 10/100BASE-TX LM
- 4 x Gigabit Ethernet 10/100/1000BASE-TX HM
- 4 x Gigabit Ethernet 100/1000BASE-X HM
- 1 x 10 Gigabit Ethernet HM

ROUTER FUNCTIONALITY

FORWARDING CAPACITY

- Up to 7.5 Gbps, typical 4Gbps (packet size dependent)

FORWARDING PLANE

- IPv4 routing
- MPLS switching (LSR and LER)

FUNCTIONALITY

- IP VPN (RFC4364)
- Ethernet/VLAN, SAToP, CESoPSN, ATM and HDLC pseudowires
- Single and multi-segment pseudowires
- TDM cross connection
- ATM VP/VC switching
- ATM cell concatenation
- ATM IMA
- MC / MLPPP, PPPmux
- Y.1731 frame loss, frame delay and frame delay variation support
- IEEE802.1ag Ethernet OAM loopback, continuity check, ping and link trace
- BFD (Static routes, OSPF, ISIS, RSVP-TE)

REDUNDANCY

- Switching fabric
- Control plane
- Synchronization ports
- Management Ethernet and CLI ports
- Alarm interface ports
- Power (-48VDC)

RESILIENCY

- Ethernet Link Aggregation 802.1AX
- 1:1 RSVP-TE LSP protection
- Fast Reroute (FRR)
- IP load balancing (Equal Cost Multipath - ECMP)
- Pseudowire redundancy (ATM, TDM)

SYNCHRONIZATION

- ITU-T [G.813] SDH Timing (option 1)
- ITU-T [G.8262] Synchronous Ethernet
- Telcordia [GR-1244] Stratum-3
- SSM over Ethernet [G.8264]
- Adaptive synchronization from SAToP and CESoPSN pseudowires
- IEEE 1588v2 Precision Time Protocol

IPV4 ROUTING AND MPLS LABEL DISTRIBUTION PROTOCOLS

- OSPF-TE, ISIS-TE, BGP and MP-BGP
- LDP, RSVP-TE

TRAFFIC MANAGEMENT

- DiffServ support for up to 7 traffic classes, 7 queues per interface
- DiffServ aware MPLS Traffic Engineering (DS-TE)
- IEEE802.1P/Q mapping to IP or MPLS
- Policing and shaping
- VLAN shaping
- Access Control Lists (ACL)
- ATM service categories: CBR, rt-VBR, nrt-VBR, UBR+, UBR
- ATM VC queuing/shaping

MANAGEMENT

- CLI with SSH2, FTP with SSH2
- SNMPv1 and SNMPv2 monitoring
- Provision Intelligent Network Manager INM
- Cell site auto-configuration based on DHCP client

OPERATING ENVIRONMENT AND POWER

- Storage: ETSI EN 300 019-1-1, Class 1.1. Temperature: –5°C to 45°C / 23°F to 113°F
- Transportation: ETSI EN 300 019-1-2 Class 2.3, Temperature: –40°C to 70°C / – 40°F to 158°F
- Operating conditions: ETSI EN 300 019-1-3, Class 3.2 (non-con¬densing). Temperature: -40°C to 65°C / -40°F to 149°F. Relative humidity: 5% to 95%Minimum cold boot-up temperature: -20°C / -4°F
- Altitude: 4,500 m/15,000 ft.

MECHANICAL

- 2RU high; 441 x 88 x 300 mm / 17.38 x 3.5 x 11.875 in (W x H x D)
- Installation into standard 19-inch rack. The 23-inch and ETSI 600 mm racks supported with side adapters.

POWER AND COOLING

- User-changeable dual feed wide range (-48 VDC to +24 VDC) power module (one per element)
- Hot swappable single feed -48 VDC power module (up to 2 per element)
- Power consumption: typical 100W, maximum 160W
- Hot swappable air filter and fan module

STANDARDS

- Safety: EN 60950-1:2006, IEC60950-1:2005, and UL60950-1
- EMC: EN 300 386:2008
- RTTE Directive 1999/5/EC
- FCC 47 CFR Part 15, Subpart B, Class A
- NEBS: GR-1089-CORE, GR-63-CORE

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700-800 MHz Broadband Antennas (746-869 MHz)

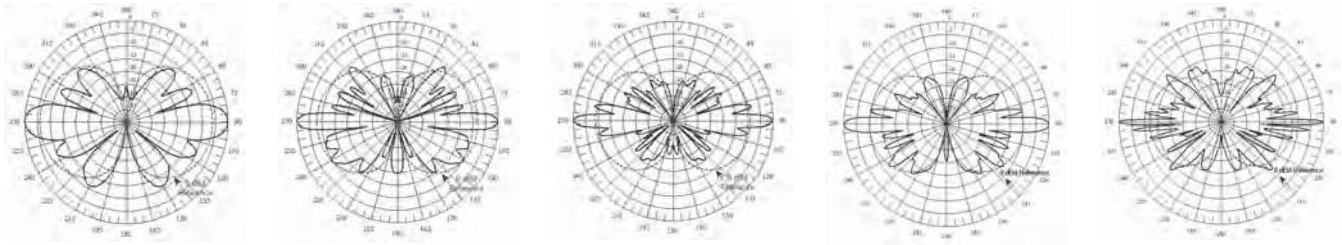
Fiberglass Omni

dbSpectra

MODEL	DS7A06F36U-N	DS7A08F36U-N	DS7C09F36U-N	DS7C10F36U-N	DS7E12F36U-N
Model with 7/16 DIN	DS7A06F36U-D	DS7A08F36U-D	DS7C09F36U-D	DS7C10F36U-D	DS7E12F36U-D
Type	Omni	Omni	Omni	Omni	Omni
ELECTRICAL SPECIFICATIONS					
Frequency Range (MHz)	746-869	746-869	764-869	764-869	794-824
Bandwidth (MHz)	123	123	105	105	30
Power (Watts)	500	500	500	500	500
Gain (dBd)	6	8	9	10	12
Horizontal Beamwidth (degrees)	360	360	360	360	360
Vertical Beamwidth (degrees)	16	6	9	6	3
Beam Tilt (degrees)	0	0	0	0	0
VSWR	1.5:1	1.5:1	1.5:1	1.5:1	1.5:1
PIM Rated Design	Yes	Yes	Yes	Yes	Yes
MECHANICAL SPECIFICATIONS					
Material/Construction	Brass/Copper	Brass/Copper	Brass/Copper	Brass/Copper	Brass/Copper
Input Connector	N(F)	N(F)	N(F)	N(F)	N(F)
Temperature Range (degrees)	-30 to +60 C	-30 to +60 C	-30 to +60 C	-30 to +60 C	-30 to +60 C
Flat Plate Area (ft^2/m^2)	1.28 / 0.12	2.5 / 0.23	2.5 / 0.23	2.5 / 0.23	3.49 / 0.32
Mounting Hardware - included	DSH2V3R	DSH3V3R	DSH3V3N	DSH3V3N	DSH3V3N
DIMENSIONS					
Length (ft/m)	7.6 / 2.3	10.9 / 3.3	14.5 / 4.4	14.5 / 4.4	24.0 / 7.3
Radome O.D. (in/cm)	3 / 7.62	3 / 7.62	3 / 7.62	3 / 7.62	3 / 7.62
Mast O.D. (in/cm)	3.2 / 8.13	3.2 / 8.13	3.2 / 8.13	3.2 / 8.13	3.2 / 8.13
Net Weight - without bracket (lb/kg)	25 / 11.3	29 / 13.2	37 / 16.8	38 / 17.24	55 / 25
Shipping Weight (lb/kg)	37 / 16.78	39 / 17.7	47 / 21.3	48 / 21.8	65 / 29.5

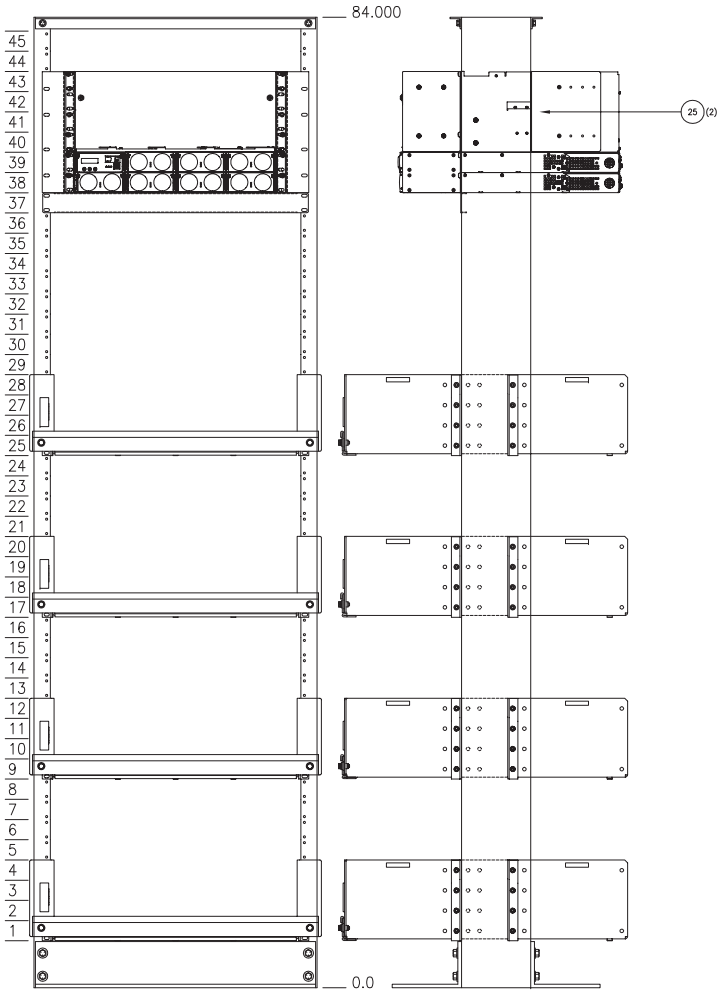
VERTICAL PATTERN

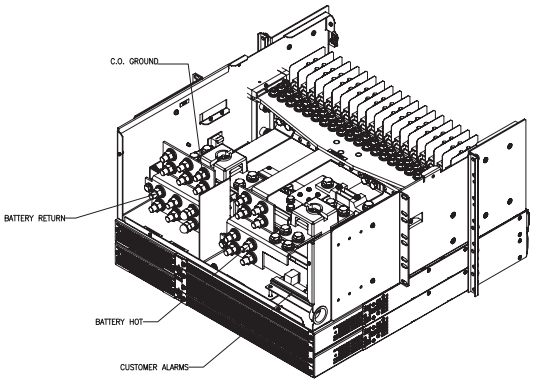
DS7A06F36U-N	DS7A08F36U-N	DS7C09F36U-N	DS7C10F36U-N	DS7E12F36U-N



Specifications are subject to change. Please visit www.dbspectra.com for the latest information on our products, including new product offerings.
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SEE BILL OF MATERIAL FOR PART DESCRIPTION	
FIND #	LABEL INFO
30	EXTENDERS
20	MAIN DIST
50	1U BLANK
60	BATT BRKR
70	BATT TRAY
60	BATT BRKR
70	BATT TRAY
60	BATT BRKR
70	BATT TRAY
60	BATT BRKR
70	BATT TRAY
10	RACK





REFER TO IM9600000000, DETAIL R-23-X-6-A, FOR RELAY RACK FOOTPRINT

NOTE: REFER TO THE PARTS LIST FOR SPECIFIC DISTRIBUTION PANEL PART NUMBER AND RECTIFIER SHELF QUANTITY. POWER SUPPLY MAY BE ORDERED SEPARATELY OR WITH DC POWER SYSTEM.

ALL INFORMATION DESIGNATED WITHIN QUOTATION MARKS REPRESENTS LABELING INFORMATION.

UNLESS OTHERWISE SPECIFIED, LOCATE THE LABELS IN THE UPPER LEFT HAND CORNER WITH FLOORSTOCK LABELS, BUS BARS WILL BE STAMPED.

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES

UNLESS OTHERWISE SPECIFIED, ALL LINEAR DIMENSIONAL TOLERANCES ARE ±

DESCRIPTION OF CHANGE PER ECO NO. 090416UD	
CHANGE BATT TRAY 1 SPACE FROM 7U TO 8U	
ENGINEER STLAUS	ENG. JAN-08-09
DRAFTER STLAUS	DRAWN 04-28-09
APPROVED	IFS
	CAD AUTOCAD
	ASSEMBLY DRAWING RACK SYSTEM FP2 -48/300 LVBD 4BT
	DRAWING ISSUE DATE
	PAGE 1 OF 1 SCALE 3/32
	DRAWING NUMBER 2054449 REV 2

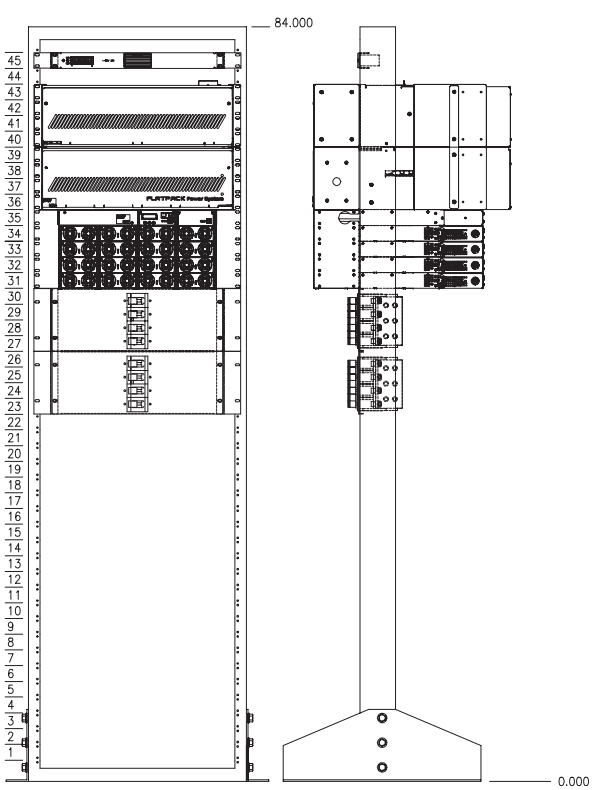
ELTEK VALERE always on

FOR SYSTEMS WITH :

- BD-800 PANEL
- GMT FUSE PANELS
- AUXILIARY DISTRIBUTION

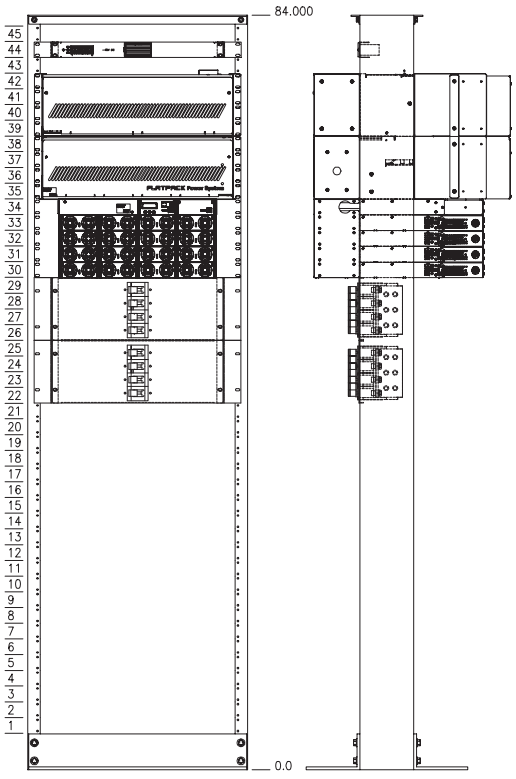
SEISMIC

SEE BILL OF MATERIAL FOR PART DESCRIPTION	
FIND #	LABEL INFO
3010	OPTIONAL
3000	OPTIONAL
10	
30	
25	
3020	OPTIONAL "1"
3020	OPTIONAL "2"
2000	



NON-SEISMIC

SEE BILL OF MATERIAL FOR PART DESCRIPTION	
FIND #	LABEL INFO
3010	OPTIONAL
3000	OPTIONAL
10	
30	
25	
3020	OPTIONAL "1"
3020	OPTIONAL "2"
2000	

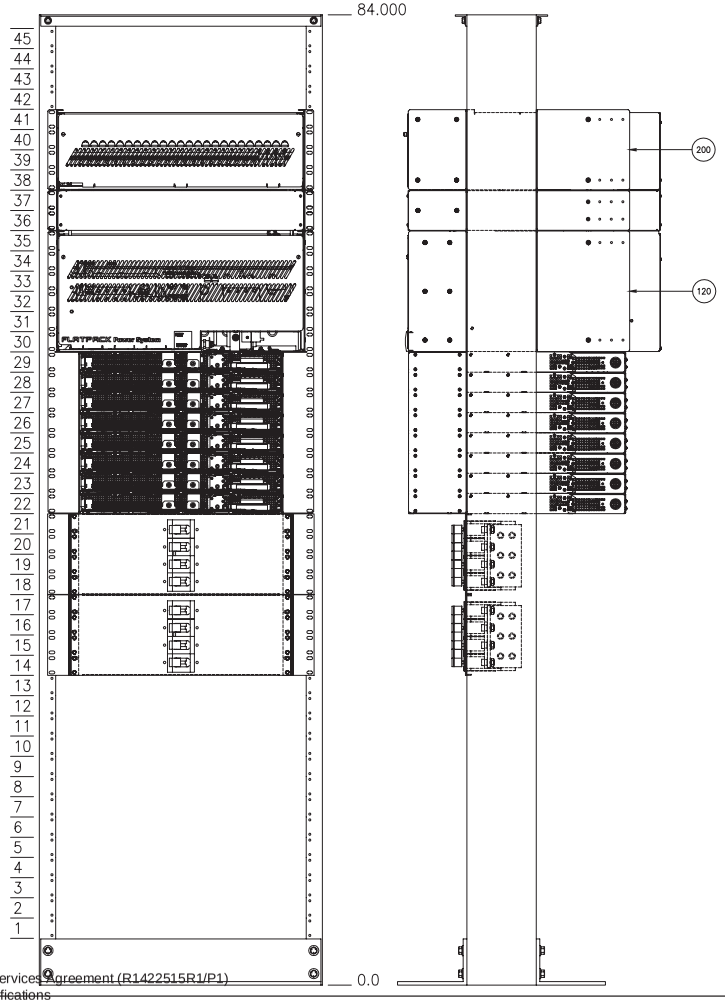


NOTE: REFER TO THE PARTS LIST FOR SPECIFIC DISTRIBUTION PANEL PART NUMBER AND RECTIFIER SHELF QUANTITY. POWER SUPPLY MAY BE ORDERED SEPARATELY OR WITH DC POWER SYSTEM.

ALL INFORMATION DESIGNATED WITHIN QUOTATION MARKS REPRESENTS LABELING INFORMATION.
UNLESS OTHERWISE SPECIFIED, LOCATE THE LABELS IN THE UPPER LEFT HAND CORNER WITH FLOORSTOCK LABELS.
BUS BARS WILL BE STAMPED.
UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES
UNLESS OTHERWISE SPECIFIED, ALL LINEAR DIMENSIONAL TOLERANCES ARE

DESCRIPTION OF CHANGE PER ECO NO.			
ENGINEER TIBUUS	ENG. 05-01-07	ELTEK VALERE always on	
DRAFTER TIBUUS	DRAWN 05-12-10		
APPROVED		CAD AUTOCAD	
		ASSEMBLY DRAWING Flatpack 2 48V 600A 7FT RACK	
		DRAWING ISSUE DATE	
		PAGE 4 OF 4 SCALE 3/32	REV 3
		DRAWING NUMBER 2029673	

SEE BILL OF MATERIAL FOR PART DESCRIPTION	
FIND #	LABEL INFO
50	AUX DIST
40	2U SPACER BOX
60	KIT AUX BUS BARS
20	POWER CORE
30	KIT LVLD
90	KIT CONTROLLER
340	KIT BD-800 "1"
340	KIT BD-800 "2"
10	



REFER TO IM9600000000, DETAIL R-23-X-6-A, FOR RELAY RACK FOOTPRINT

NOTE: REFER TO THE PARTS LIST FOR SPECIFIC DISTRIBUTION PANEL PART NUMBER AND RECTIFIER SHELF QUANTITY. POWER SUPPLY MAY BE ORDERED SEPARATELY OR WITH DC POWER SYSTEM.

ALL INFORMATION DESIGNATED WITHIN QUOTATION MARKS REPRESENTS LABELING INFORMATION.
UNLESS OTHERWISE SPECIFIED, LOCATE THE LABELS IN THE UPPER LEFT HAND CORNER WITH FLOORSTOCK LABELS, BUS BARS WILL BE STAMPED.
UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES
UNLESS OTHERWISE SPECIFIED, ALL LINEAR DIMENSIONAL TOLERANCES ARE

DESCRIPTION OF CHANGE PER ECO NO.		
ENGINEER TIBUUS	ENG. FEB-09-10	ELTEK VALERE always on
DRAFTER TIBUUS	DRAWN 02-09-10	
APPROVED	IFS	CAD AUTOCAD
		ASSEMBLY DRAWING ASSY DC SYS FP2 -48/1200A -2DIST 23IN
		DRAWING ISSUE DATE
		PAGE 1 OF 1 SCALE 3/32
		DRAWING NUMBER 2076299
		REV 1

Advanced Power Monitor

746-870MHz
Performance Monitoring of FWD and RFL Tx Power
APM Series

The DSAPM7487K1 Advanced Power Monitor (APM) monitors forward and reflected transmitted power on a channel-by-channel basis on up to 80 channels across up to four separate transmitter combining systems. Using the high coupling port directivity of its external four port coupler, a wide dynamic range of forward and reflected power can be measured. All frequencies and level thresholds are software definable. Alarm reporting is hardwire interfaced and visually notified through LEDs on the front panel of the unit. The APM can be configured via the integral webserver GUI or command line text entry.

- True channelized power and VSWR metering for digital and analog systems in multi-channel environments
- Non intrusive measurement of per channel power, VSWR, and combiner insertion loss on site or remotely
- Individual channel monitoring of up to 80 channels.
- Accommodates up to four transmitter combiners.
- Remote and on-site VSWR / FWD power alarm and logging function with optional network software for aggregating alarms
- Configuration and alarm threshold level setting via RJ45 interface port
- Supplied with one coupler, additional couplers ordered separately



FRONT VIEW



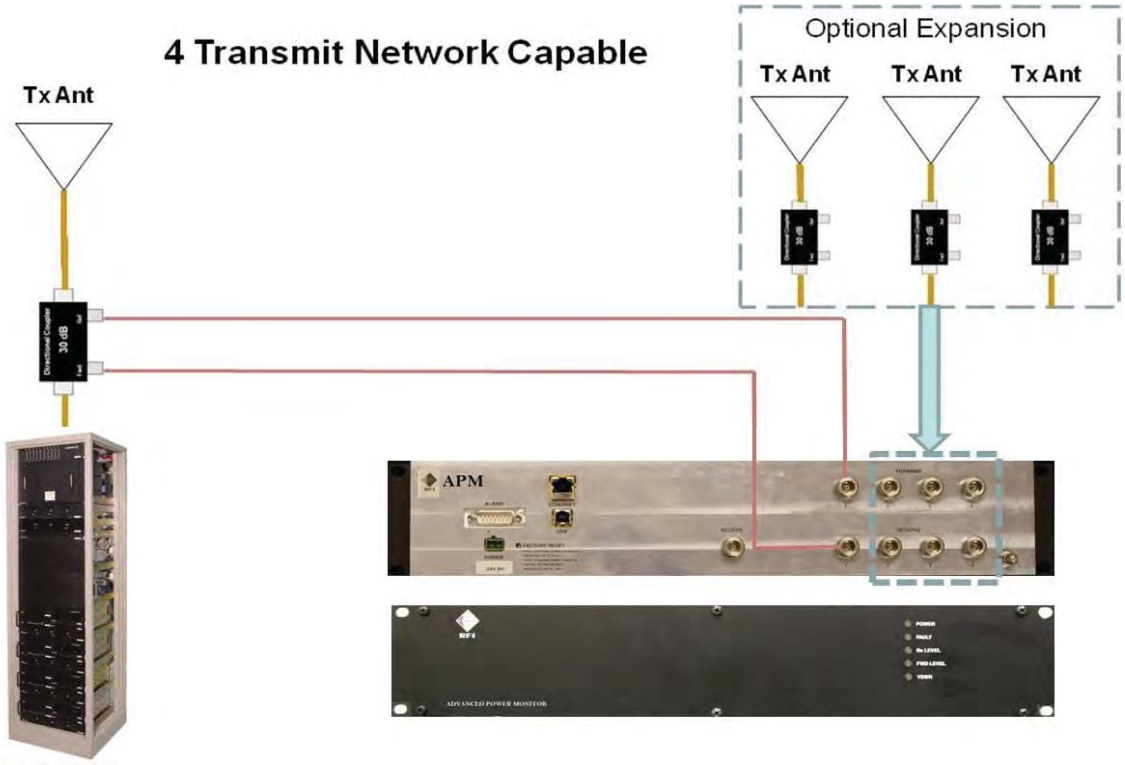
REAR VIEW

Model Number	DSAPM7487K1
Frequency range (Tx power and Rx level monitoring)	746-870 MHz
Maximum number of monitored channels	80
Maximum number of Tx Networks (Transmit Antennas)	4
Max input power into coupler - no damage	1000W (+60 dBm)
PIP Capability (Coupler)	≤40kW into coupler(s)
PIM Rating (Coupler, 2 x 43 dBm carriers)	>150 dBc
Frequency channel step size (Tx and Rx)	6.25 kHz
Channel measurement bandwidths	16 kHz (25 kHz channel), 9 kHz (12.5 kHz channel)
Max spurious or IM products level	-30 dBm
Accuracy - per channel power change (ΔdBm)	+/-0.2 dBm
RF Interface connectors on coupler	7-16 DIN F-F
Interface termination connectors	N (F)
Communication connectors/alarm connector	USB Type "B" & DB15 (F) & RJ45
Alarm connector	DB15 (F)
DC power connector	Polarized 2-pin Pheonix connector
Measurement / Monitoring capability	Forward and Reflected RF power
Alarm configuration capability	Summary Fault / Tx FWD power / VSWR
Alarm notification	via LED's (Front Panel) & Relay Contacts (DB15)
Power supply options	9-18VDC, 18-36VDC, 36-60VDC or 100-240VAC (note # 1)
Main shelf mounting	2RU 19" Rack mounting
Power Directional Coupler Mounting	2RU 19" Rack mounting
Dimensions	19x2x3.5" / 483x50x89mm (incl connectors)
Weight	< 4.4lbs / 2kgs
Operational temperature range	-10°C to +60°C / 50°F to 140°F
Altitude	15,000ft / 5,000m

Note # 1 Nominate one required operating voltage range with order. AC option provided by AC-DC plug pack

PATENT PENDING

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APPLICATION DIAGRAM

Ordering information

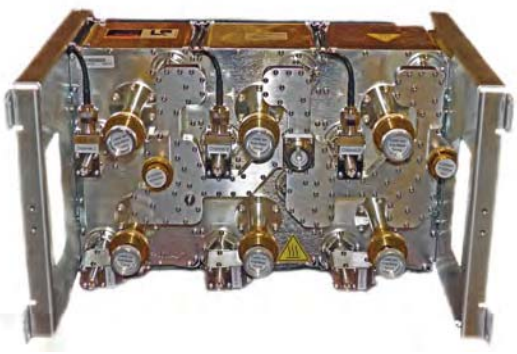
Motorola Model Number	Description
DSAPM7487K1	Advanced Power Monitor 740-870MHz 80 Ch / 4 Tx Frd / 4 Tx Refl / 1 Rx Port / 9-18V DC
DSAPM7487K124	Advanced Power Monitor 740-870MHz 80 Ch / 4 Tx Frd / 4 Tx Refl / 1 Rx Port / 18-36V DC
DSAPM7487K148	Advanced Power Monitor 740-870MHz 80 Ch / 4 Tx Frd / 4 Tx Refl / 1 Rx Port / 36-60V DC
DSAPM7487K1AC	AC Power Supply (external) 110-240V AC Input to 12V DC output with polarised 2 Pin Pheonix connector (order APM7487-K1-AC with APM7487-K1 for 110-240VAC operation)
Additional Couplers	
DSSP74962440DIN	Directional Coupler 740-960MHz 40dB 4-Port Input /Output Ports DIN (F) Coupling Ports N (F) High Directivity, PIM rated, PIP rated, 750watts average

PATENT PENDING

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PCD012 700 MHz Public Safety 4, 6, 8, 10 & 12-Channel Low Loss Combiner Kit

Filtronic Next Generation Transmit Combiners



- *Ceramic Based Design Provides much Higher "Q" Allowing Closer Spacing and Lower Loss than Traditional Combiners*
- *4, 6 , 8, 10 and 12-way Configurations Available*
- *Specified Tx-Tx Spacing Down to 150 kHz*
- *Input Isolators with High Power Loads at Each Input*
- *40% Smaller & Lower Weight than Traditional Combiners*
- *Combining Adjustments for Optimization of Output Channels*
- *KIT-000001 Included with all Rackmount Hardware (Assy Required)*

ELECTRICAL SPECIFICATIONS	PCD012-V4	PCD012-V6	PCD012-V8	PCD012-V10	PCD012-V12
Tuning Range (*MHz) Per Channel*	762 to 776	762 to 776	762 to 776	762 to 776	762 to 776
Number of Channels	4	6	8	10	12
Channel Bandwidth (*maximum)*	25 kHz	25 kHz	25 kHz	25 kHz	25 kHz
Insertion Loss @ 150 kHz Tx Spacing (*max.)*¤	4.6 dB	4.8 dB	5.0 dB	5.2 dB	5.4 dB
Insertion Loss @ 250 kHz Tx Spacing (*max.)*¤	3.8 dB	4.0 dB	4.2 dB	4.4 dB	4.6 dB
Insertion Loss @ 500 kHz Tx Spacing (*max.)*¤	3.5 dB	3.7 dB	3.9 dB	4.1 dB	4.3 dB
Tx to Tx Input Isolation (*minimum)*	30 dB	30 dB	30 dB	30 dB	30 dB
Antenna to Tx Isolation (*minimum)*	25 dB	25 dB	25 dB	25 dB	25 dB
Maximum Tx Input Power (*per channel)*					
- Average Power	100 watts	100 watts	100 watts	100 watts	100 watts
- Peak Envelope Power	240 watts	240 watts	240 watts	240 watts	240 watts
Maximum Tx Reflected Power◊	100 watts	100 watts	100 watts	100 watts	100 watts
Return Loss					
- Tx Inputs (*minimum)*	18 dB	18 dB	18 dB	18 dB	18 dB
- Antenna Output (*minimum)*	10 dB	9.5 dB	9.0 dB	8.5 dB	8.0 dB
3rd Order IMD in Rx Band (*maximum)*	-125 dBc	-125 dBc	-125 dBc	-125 dBc	-125 dBc
ENVIRONMENTAL SPECIFICATIONS					
Operating Temperature Range	-30C to +75C	-30C to +75C	-30C to +75C	-30C to +75C	-30C to +75C
Storage Temperature Range	-40C to +95C	-40C to +95C	-40C to +95C	-40C to +95C	-40C to +95C
Operating Humidity	Up to 90% Relative (continuous, non-condensing)				
Operating Altitude (*maximum)*	3 km	3 km	3 km	3 km	3 km
MECHANICAL SPECIFICATIONS					
Rack Height (*Units)*	6U	6U	12U*	12U*	12U*
Height (*mm)*	9.92" (252)	9.92" (252)	19.84" (504)*	19.84" (504)*	19.84" (504)*
Depth (*mm)*	15.1" (383.5)	15.1" (383.5)	15.1" (383.5)	15.1" (383.5)	15.1" (383.5)
Width (*mm)*	17.24" (438)	17.24" (438)	17.24" (438)	17.24" (438)	17.24" (438)
Connectors					
- Tx Inputs	N-F	N-F	N-F	N-F	N-F
- Output	7/16-F	7/16-F	7/16-F	7/16-F	7/16-F
Ground Connection	M6 Lug	M6 Lug	M6 Lug	M6 Lug	M6 Lug
Weight (*kg)*	44 lbs (20)	49 lbs (22.2)	91 lbs (41.3)†	96 lbs (43.6)†	101 (45.8)†

¤ Guaranteed maximum insertion loss under all operational environmental conditions.
◊ Reflected power rating is defined as reflected power at one channel for 5 minutes (average power). Use of a Site Tx Power Monitor is recommended. Contac MSI drop ship organization for further details.
* Two Combiners (4 or 6-channel) measure 19.84" (504 mm) top to bottom and will occupy total 12U rack height
† Two Combiners (4 or 6-channel) each weighing no more than 49 lbs (22.2 kg)

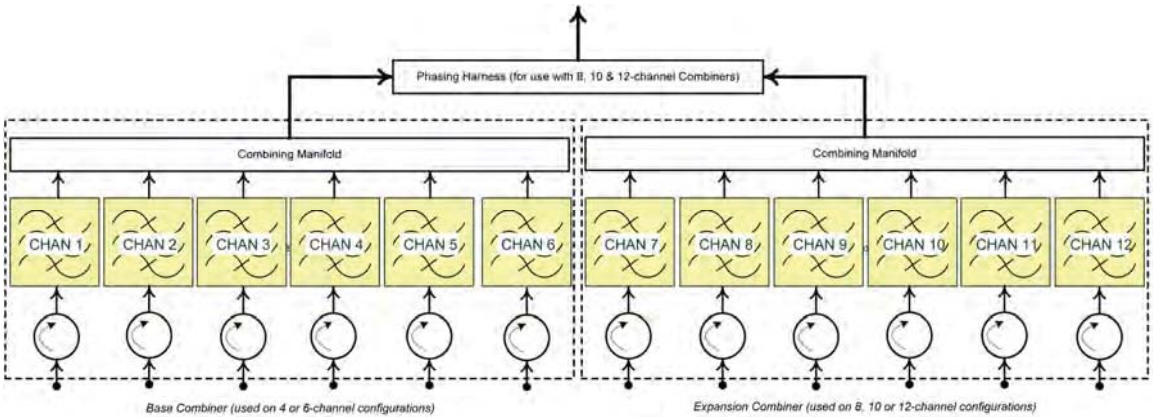
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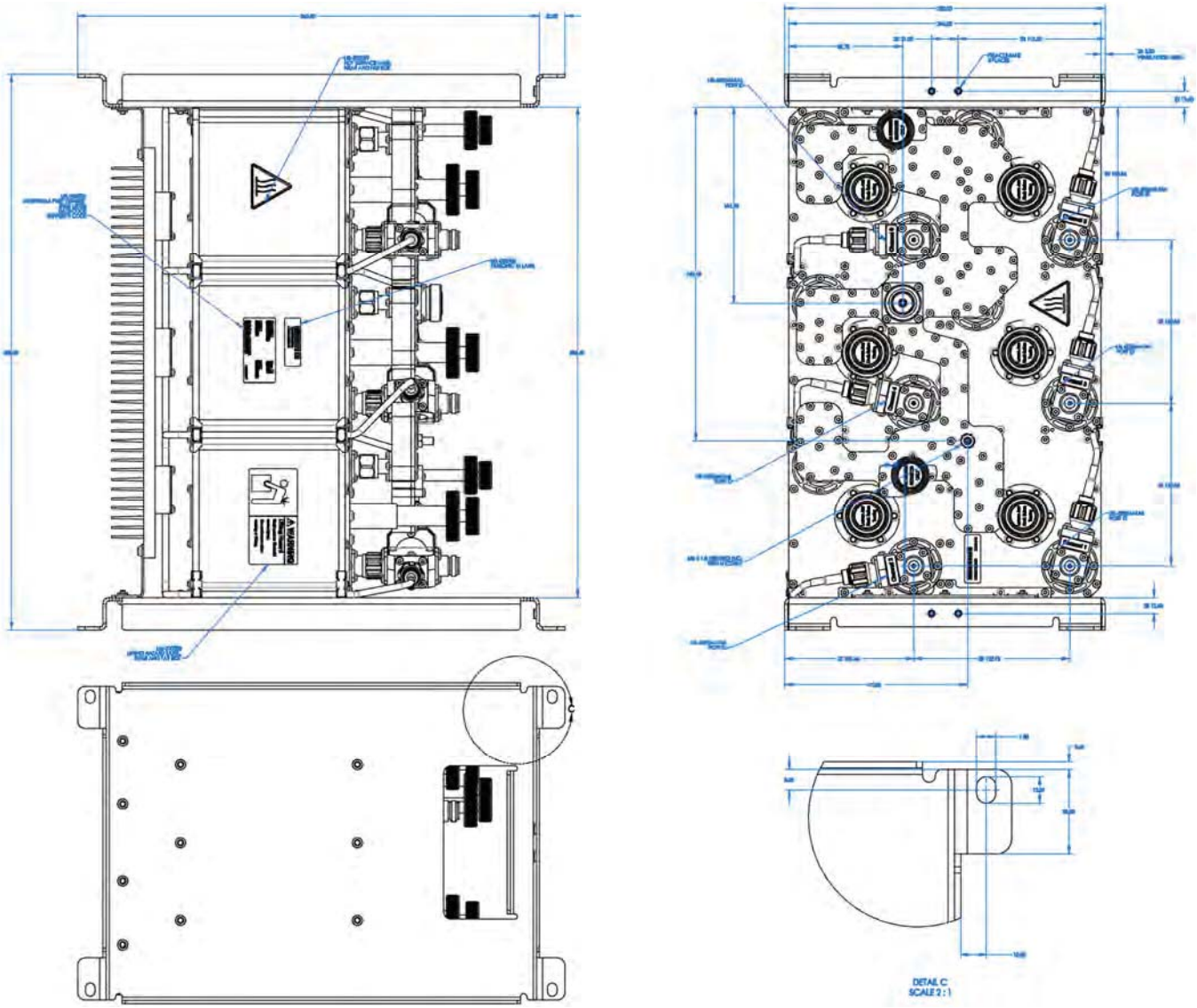
APAC
Isotek Telecommunications (Suzhou) Co. Ltd
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People's Republic of China
+86 1 386 215 1075

PCD012 700 MHz Public Safety 4, 6, 8, 10 & 12-Channel Low Loss Combiner Kit

Block Diagram



Outline (PCD012-V6 6-Channel model shown)



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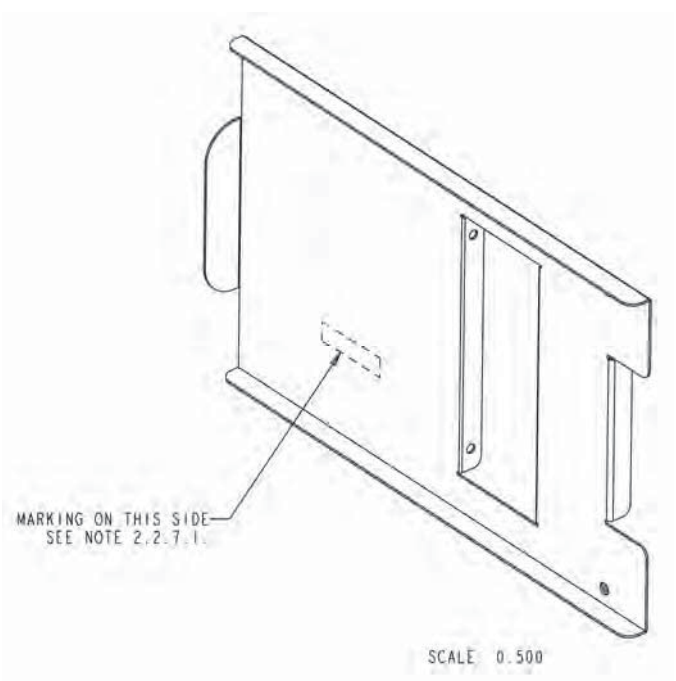
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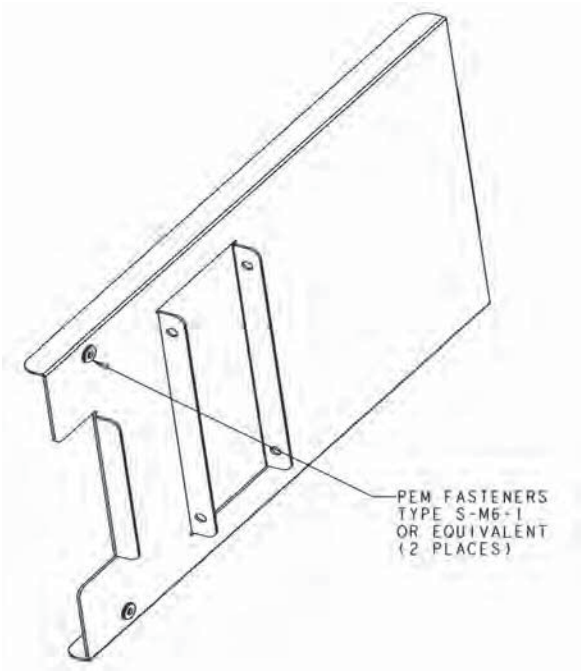
APAC
Isotek Telecommunications
(Suzhou) Co. Ltd
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Installation Kit (KIT-000001)

Each PCD012 Combiner is shipped with the KIT-000001, comprised of the following parts/quantity's for installation of each Combiner into Motorola GTR-8000 rack frame (8 through 12-way Combiners are shipped with two KIT-000001's):

P/N	Description	QTY
PCD012-Vx	**Combiner, 700 MHz (w/N-F INPUTS)**	**1**
3071488H03	CABLE, LUGGED	1
0285854Y01	NUT, M6 LOCK	1
0310909C91	SCR LCK M6x1x13	8
0784752Y02	BKT, SLIDE, OPEN RACK	2
0385855Y01	SCR, 12-24, TRD FORM	8

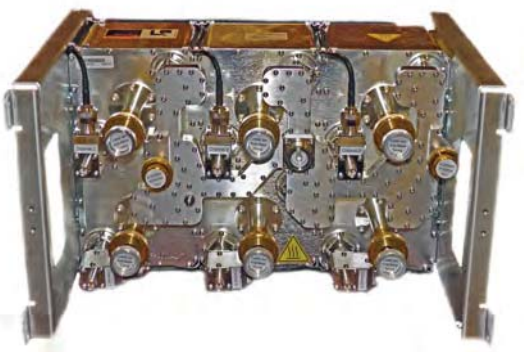




0784752Y02 Rack Bracket

PCD013 800 MHz Public Safety 4, 6, 8, 10 & 12-Channel Low Loss Combiner Kit

Filtronic Next Generation Transmit Combiners



- *Ceramic Based Design Provides much Higher "Q" Allowing Closer Spacing and Lower Loss than Traditional Combiners*
- *4, 6 , 8, 10 and 12-way Configurations Available*
- *Specified Tx-Tx Spacing Down to 150 kHz*
- *Input Isolators with High Power Loads at Each Input*
- *40% Smaller & Lower Weight than Traditional Combiners*
- *Combining Adjustments for Optimization of Output Channels*
- *KIT-000001 Included with all Rackmount Hardware (Assy Required)*

ELECTRICAL SPECIFICATIONS	PCD013-V4	PCD013-V6	PCD013-V8	PCD013-V10	PCD013-V12
Tuning Range (*MHz) Per Channel*	851 to 870	851 to 870	851 to 870	851 to 870	851 to 870
Number of Channels	4	6	8	10	12
Channel Bandwidth (*maximum)*	25 kHz	25 kHz	25 kHz	25 kHz	25 kHz
Insertion Loss @ 150 kHz Tx Spacing (*max.)*¤	4.6 dB	4.8 dB	5.0 dB	5.2 dB	5.4 dB
Insertion Loss @ 250 kHz Tx Spacing (*max.)*¤	3.8 dB	4.0 dB	4.2 dB	4.4 dB	4.6 dB
Insertion Loss @ 500 kHz Tx Spacing (*max.)*¤	3.5 dB	3.7 dB	3.9 dB	4.1 dB	4.3 dB
Tx to Tx Input Isolation (*minimum)*	30 dB	30 dB	30 dB	30 dB	30 dB
Antenna to Tx Isolation (*minimum)*	25 dB	25 dB	25 dB	25 dB	25 dB
Maximum Tx Input Power (*per channel)*					
- Average Power	100 watts	100 watts	100 watts	100 watts	100 watts
- Peak Envelope Power	240 watts	240 watts	240 watts	240 watts	240 watts
Maximum Tx Reflected Power◊	100 watts	100 watts	100 watts	100 watts	100 watts
Return Loss					
- Tx Inputs (*minimum)*	18 dB	18 dB	18 dB	18 dB	18 dB
- Antenna Output (*minimum)*	10 dB	9.5 dB	9.0 dB	8.5 dB	8.0 dB
3rd Order IMD in Rx Band (*maximum)*	-125 dBc	-125 dBc	-125 dBc	-125 dBc	-125 dBc
ENVIRONMENTAL SPECIFICATIONS					
Operating Temperature Range	-30C to +75C	-30C to +75C	-30C to +75C	-30C to +75C	-30C to +75C
Storage Temperature Range	-40C to +95C	-40C to +95C	-40C to +95C	-40C to +95C	-40C to +95C
Operating Humidity	Up to 90% Relative (continuous, non-condensing)				
Operating Altitude (*maximum)*	3 km	3 km	3 km	3 km	3 km
MECHANICAL SPECIFICATIONS					
Rack Height (*Units)*	6U	6U	12U*	12U*	12U*
Height (*mm)*	9.92" (252)	9.92" (252)	19.84" (504)*	19.84" (504)*	19.84" (504)*
Depth (*mm)*	15.1" (383.5)	15.1" (383.5)	15.1" (383.5)	15.1" (383.5)	15.1" (383.5)
Width (*mm)*	17.24" (438)	17.24" (438)	17.24" (438)	17.24" (438)	17.24" (438)
Connectors					
- Tx Inputs	N-F	N-F	N-F	N-F	N-F
- Output	7/16-F	7/16-F	7/16-F	7/16-F	7/16-F
Ground Connection	M6 Lug	M6 Lug	M6 Lug	M6 Lug	M6 Lug
Weight (*kg)*	39.5 lbs (17.9)	44.5 lbs (19.2)	82.1 lbs (37.2)†	87.1 lbs (39.5)†	92.1 lbs (41.8)†

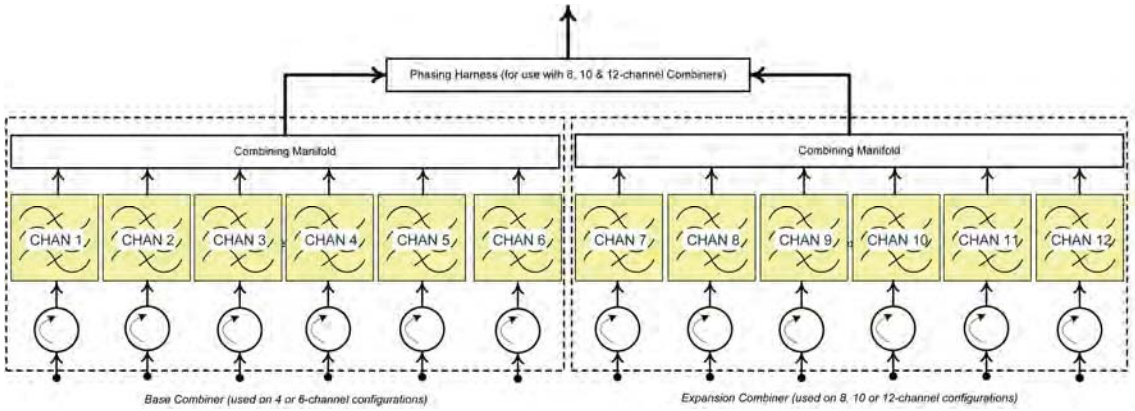
¤ Guaranteed maximum insertion loss under all operational environmental conditions.
◊ Reflected power rating is defined as reflected power at one channel for 5 minutes (average power). Use of a Site Tx Power Monitor is recommended. Contac MSI drop ship organization for further details.
* Two Combiners (4 or 6-channel) measure 19.84" (504 mm) top to bottom and will occupy total 12U rack height
† Two Combiners (4 or 6-channel) each weighing no more than 49 lbs (22.2 kg)

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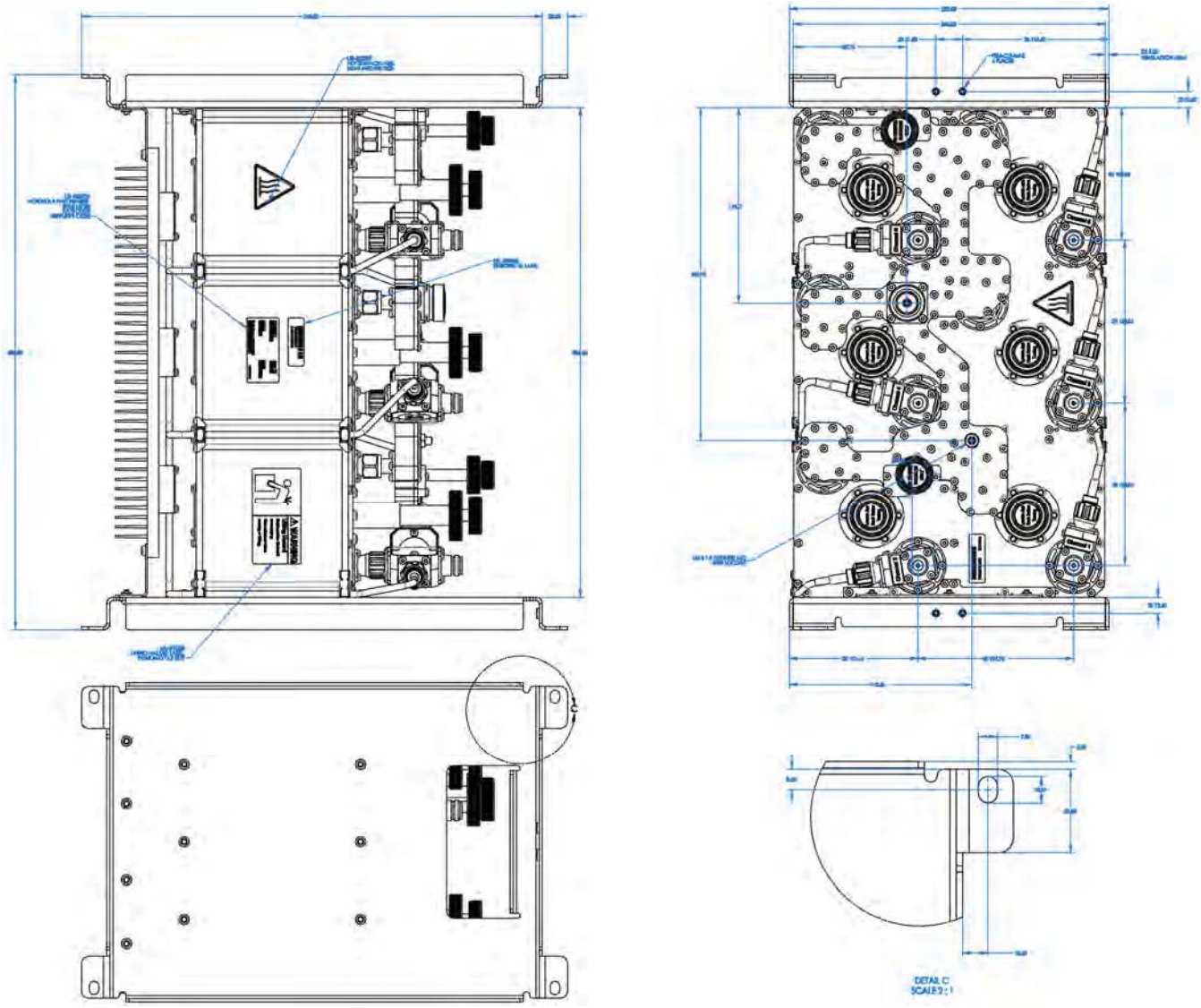
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Block Diagram



Outline (PCD013-V6 6-Channel model shown)



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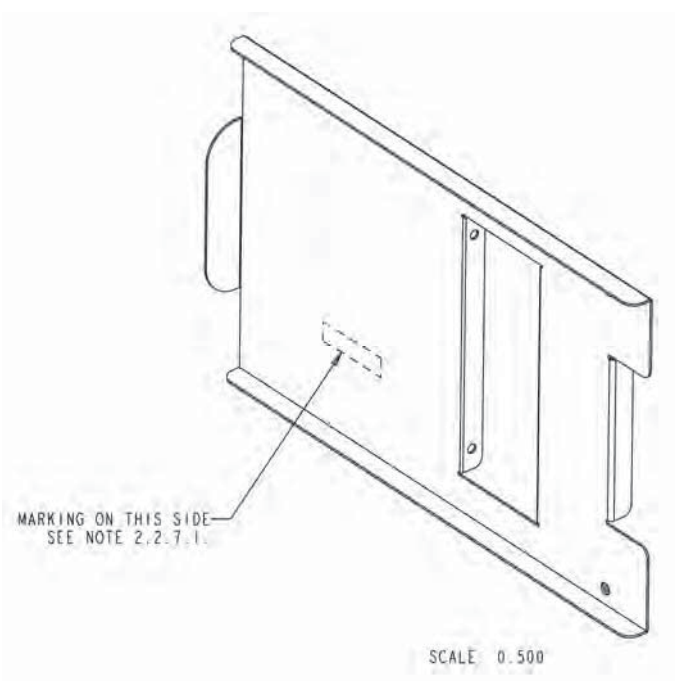
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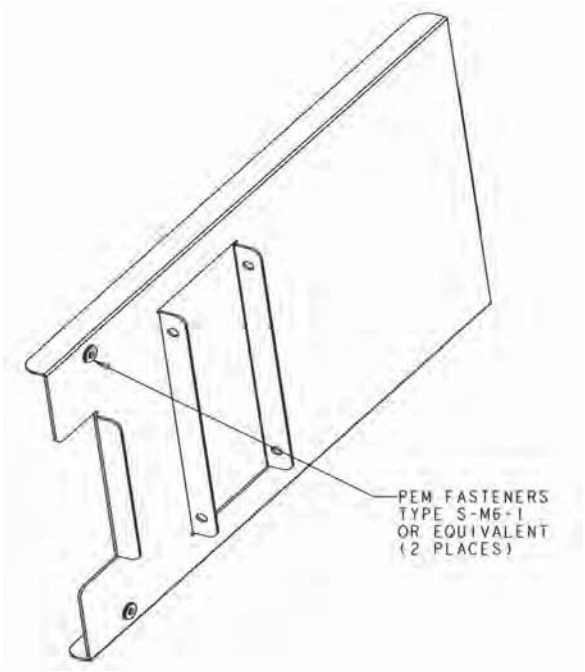
APAC
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Installation Kit (KIT-000001)

Each PCD013 Combiner is shipped with the KIT-000001, comprised of the following parts/quantity's for installation of each Combiner into Motorola GTR-8000 rack frame (8 through 12-way Combiners are shipped with two KIT-000001's):

P/N	Description	QTY
PCD013-Vx	**Combiner, 800 MHz (w/N-F INPUTS), Std Isolation**	**1**
3071488H03	CABLE, LUGGED	1
0285854Y01	NUT, M6 LOCK	1
0310909C91	SCR LCK M6x1x13	8
0784752Y02	BKT, SLIDE, OPEN RACK	2
0385855Y01	SCR, 12-24, TRD FORM	8





0784752Y02 Rack Bracket

ECLIPSE IRU 600

MISSION CRITICAL MICROWAVE



When failure is not an option, the Eclipse™ IRU 600 represents the ultimate in high performance, high reliability Mission Critical Microwave. The IRU600 is the industry's most secure radio now available with extra transmit power (+ 39 dBm or 5 times more than high power) enclosed in the compact 2RU chassis for all-indoor, protected installations for mission critical microwave deployment.

INDUSTRY'S HIGHEST POWER DIGITAL RADIO EVER

With the new Extra High Power (EHP) option, the IRU600 improves output power to +39 dBm[1], or more than five times more power than the high power IRU 600 model, making it the highest power solution on the market today. This option enables quantum improvements in increased reliable RF performance, extending path distances and/or stepping down to smaller, less expensive antennas.

In addition, the IRU 600 delivers the +39dBm Transmit output power linearly across all available modulations. This is an industry first, ensuring maximum capacity without system degradation or reduced system reliability.

The IRU 600 is designed with a powerful antenna coupling unit that features an exceptionally low-loss switch, instead of a coupler, and an expansion port for simplified expansion and protection deployments. This supports simplified connections to existing antenna systems and quick network cutover for expanding and extending your network.

INDUSTRY'S MOST SECURE AND RELIABLE MICROWAVE RADIO

The Eclipse platform is validated to FIPS 140-2 Level 2 and FIPS 197, making it the most secure microwave radio on the market for transporting sensitive data and safeguarding against unwanted and unlawful access. FIPS 140-2 Level 2 validation is the cornerstone for a complete security solution, including Secure management, Payload encryption and RADIUS authentication – especially important for mobile, public safety and government networks that need a comprehensive security solution.

The IRU 600 is built for the toughest conditions, engineered for high reliability and bulletproof redundancy. Field-proven with extremely high MTBF numbers and low MTTR, the IRU600 is also NEBS Level 3 compliant for the toughest carrier provider deployments.

DESIGNED, BUILT, SUPPORTED IN USA

The Eclipse IRU 600 is uniquely designed, built and supported all within the USA. Aviat Networks is a dedicated vendor with Corporate Headquarters, R&D center, manufacturing and comprehensive deployment services and after-sales support covering all NA time zones. Combined with our 50 year presence and expertise, you can be assured of superior products and support for all your mission critical microwave needs.

KEY FEATURES

- FCC Part 101 and Industry Canada frequencies L6/U6, 7 and 11 GHz, and unlicensed 5.8 GHz in a single platform
- +39 dBm Transmit power - with linear performance across all available modulations
- 1024QAM – ready, with Adaptive Coding & Modulation support
- FIPS 140-2 Level 2 validated; FIPS 197 validated
- RF Transmit switch reduces loss by up to 1.2 dB on Main and up to 6.1 dB on Standby compared to MHSB coupler
- Compatible over the air with Eclipse ODU 600
- 5.8 GHz and L6 in the same RFU for simple unlicensed to licensed band upgrades
- Transparent to all types of traffic, including all-IP, all-TDM, or hybrid
- High capacity transport up to 366 Mbit/s, 127xDS1 or 6xDS3 or 2xOC-3
- Indoor, ultra-compact chassis design – 2 RMS for 1+1 Protected RFU + ACU
- Built-in expansion port for simplified expansion, connection to existing radio antenna systems and network cutover for all configurations
- Support for unpaired frequencies in all frequency bands
- Expandable with link aggregation for ultra-high capacities and advanced configurations
- Optional frequency re-use with XPIC for high throughput link capacities
- Extremely low loss ACU for N+N

TM: A Certification Mark of NIST, which does not imply product endorsement by NIST, the U.S. or Canadian Governments.

[1] Typical Tx output at 6 GHz, measured at RFU. Governments. Output (including ACU losses) is +37 dBm guaranteed or +37.5 dBm typical.

ECLIPSE IRU 600

SYSTEM PARAMETERS

GENERAL										
Frequency Band options						5.8, L6, U6, 7, 11 GHz				
Capacity support						11 - 260 Mbits (40 MHz), up to 366 Mbits (60/80 MHz)				
						7 to 127 DS1; 1,3,4 or 6DS3; 1, 2xOC-3				
Modulation support			Fixed or Adaptive Coding and Modulation			QPSK, 16, 32, 64, 128, 256 QAM				
Configuration Options						Non Protected (1+0), Protected Hot Standby (1+1), Protected Space Diversity (1+1)				
SYSTEM	**5.8 GH Z**		**L6/U6 GHZ**			**7 GHZ FCC**			**11 GHZ**	
Frequency Range, GHz	5.725 - 5.850		5.925 - 6.425 6.425 - 7.125			6.875 - 7.125			10.700 - 11.700	
Standard T-R Spacings supported, MHz (Non-standard T-R options supported with spot tuned filters)	65		160, 170, 252.04, 340			150			490, 500	
Standard Frequency Assignments Supported per Regulatory Plans	FCC Part 15.407, RSS-210 Annex 8		FCC Part 101, SRSP 306.4			FCC Part 74, 101			FCC Part 101, SRSP 310.7	
ANTENNA INTERFACE										
ACU Main Port Interface	CPR-137		CPR-137			CPR-137			UG-39	
ACU Expansion Port	CPR-137		CPR-137			CPR-137			UG-39	
Top of extension kit	CPR-137G		CPR-137G			CPR-137G			CPR-90G	
RFU INTERFACE										
DC Power Connector						EHP only: 2 pin D-SUB Power Type				
IF Cable connector						SMA				
Test Point			RSSI Monitoring Point			Test Points female (test probe receptacles: signal, ground)				
			Tx Monitoring Port			SMA Female				
TRANSMITTER SPECIFICATIONS										
Transmit Power	Standard and High Power available; EHP available for L6/U6, 7 and 11* GHz, valid for all available modulations									
Manual Transmitter Power Control range						10.5 to 20 dB				
Automatic Transmitter Power Control						Configurable over full available manual attenuation range				
Transmitter Mute						> 50 dB				
Channel Selection						By software control within tuning range of RFU				
RECEIVER SPECIFICATIONS										
Frequency Stability						± 5 ppm				
Receiver Overload			BER= $1x10^{-6}$			-22 dBm				
Residual (Background) Bit Error Rate Better						Better than 10^{-13}				
STANDARDS COMPLIANCE										
Operation						EN 300 019, Class 3.1E				
Safety						UL 60950-1				
Radio Frequency			L6 to 11 GHz			FCC CFR 47, Part 101				
			5.8 GHz			FCC, CFR Part 15.407; RSS-210 Annex 8				
NEBS			SP and HP only			Level 3, compliant to GR-63-CORE and GR-1089-CORE				
EMC						Part 15, ICES-003				
Electric power substations						IEEE 1613				
SECURITY COMPLIANCE										
Security and Encryption						Optional FIPS 197 Validated 128/256-bit AES encryption				
						Optional FIPS 140-2 Level 2 Validated (Certificate #2206)				
ENVIRONMENTAL										
Operating Temperature						Guaranteed	-10° to +55° C (14° to +131° F)			
Humidity						Guaranteed	0 to 95%, non-condensing			
Altitude						Guaranteed	4,500 meters (15,000 ft)			
ELECTRICAL							**TX LEVEL**			
Power Consumption, nominal						EHP	32.5dBm	25 dBm	20 dBm	TX Muted
					1+0 (per SP/HP Unit)	n/a	63 W	55 W	48 W	45 W
					1+0 (per EHP Unit)	131 W [1]				69 W
MECHANICAL			**SIZE (HXWXD)**				**WEIGHT-SP/HP**		**WEIGHT-EHP**	
ACU + Chassis + 2RFU			2RU (88mm) x 19 in (482 mm) x 16.25 in (412 mm)				32.5 lbs (14.7 kg)		33.9 lbs (15.4 kg)	
Chassis + 2RFU			2RU (88 mm) x 19 in (482 mm) x 12 in (304 mm)				28 lbs (12.7 kg)		29.5 lbs (13.4 kg)	

EMISSION DESIGNATOR	3.75 MHZ	5 MHZ	10 MHZ	12.5 MHZ	20 MHZ	25 MHZ	30 MHZ	40 MHZ	60 MHZ*	80 MHZ*
QPSK	3M75G7W	5M00G7W	10M0G7W	12M5G7W	20M0G7W	25M0G7W	30M0G7W	40M0G7W	60M0G7W	80M0G7W
QAM	3M75D7W	5M00D7W	10M0D7W	12M5D7W	20M0D7W	25M0D7W	30M0D7W	40M0D7W	60M0D7W	80M0D7W

* Contact Aviat for availability
[1] Guaranteed at full power
All specifications are typical values unless otherwise stated, and are subject to change without notice.

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Flatpack2 +24V 600A

Flatpack2
Power Systems

Overview:

The Eltek Valere *Flatpack2* line consists of versatile, scalable, and highly-configurable systems tailored to customer requirements. Use of established components—including the efficient and reliable *Flatpack2* rectifier, the robust *Smartpack* controller, and flexible distribution units—makes for optimal system design and cost-effective deployment.

Flatpack2 Power System

The *Flatpack2* (FP2) power core features an impressive array of distribution configurations and options. Its compact design and efficient use of space complement sites with limited floor and rack space, opening room for better airflow and additional equipment. *Flatpack2* chassis are designed to mount in standard 19" or 23" telecommunications racks. Standard, fully-populated configurations accommodate four to sixteen *Flatpack2* rectifiers, yielding total power output ranges of 8kW to 32kW.

Distribution Features

- Breaker alarming
- Low-voltage disconnect (LVD) contactor options
- Horizontal load landings, vertical bulk battery landings
- Three distribution options for different power levels:
  - Small 175A, 19" wide, 1U shelf with controller slot, LVD option, up to six breaker-protected output buses, and up to two bulk battery buses
  - Three-bus, 600A, 19" wide, 4U high panel with 20 positions for plug-in circuit breakers or fuse holders, up to two LVD contactors, and rear bulk battery terminals
  - Three-bus, 600A, 23" wide, 4U or 6U high panel with 24 positions for plug-in circuit breakers or fuse holders, emergency power-off (EPO) switch, up to two LVD contactors, and rear bulk battery terminals; an additional 23" distribution panel option doubles the number of cable landings

Flatpack2 Rectifiers

- New! *Flatpack2 HE* with **96%** typical efficiency
- Input voltage range: 85 – 290 VAC
- 2000W DC output (constant power)
- 1U in height; 4.25" in width
- Hot-swap/hot-plug functionality
- Automatic active load sharing

Smartpack Controllers

- Provide comprehensive system monitoring and control in a single unit
- Local and remote interfaces
- *PowerSuite* software for computer interface
- Advanced battery-monitoring and thermal compensation
- Various models providing up to six configurable alarm inputs and output relays
- Web model for TCP/IP or SNMP communication
- Slave controller option for larger systems

Power Shelves

- Accommodate up to four rectifiers each
- 1U height (1.75"); 19" width
- Individual and dual AC feed options
- Mounting brackets for 19" and 23" racks

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Flatpack2 Power Systems
Configurations

Document
2048206 R3

Flatpack2 Systems

Standard Systems*	-48V/150A	-48V/300A	-48V/600A	+24V/600A	+24V/1200A
Image					
Output Power	8kW	14kW	32kW	16kW	32kW
Maximum Output Current (DC)	168A	294A	672A	672A	1344A
Total Height**	2RU (3.5")	6RU (10.5")	9RU (15.75")	7RU (12.25")	10RU (17.5")
Controller Slots	1	1	2	2	2
Rectifier Slots	4	7	16	8	16
Distribution Dimensions**	Height: 1RU (1.75") Width: 19" (rack) Depth: 18.75"	Height: 4RU (7.0") Width: 19" (rack) Depth: 18.75"	Height: 4RU (7.0") Width: 23" (rack) Depth: 21.75"	Height: 4RU (7.0") Width: 23" (rack) Depth: 21.75"	Height: 6RU (10.5") Width: 23" (rack) Depth: 21.75"
Configurable Load Buses	See page 3	3	3	3	3
Protected Load Landings	See page 3	Up to 20	Up to 24	Up to 24	Up to 24
Load Landing Lug Sizes	Two-hole 1/4-20 on 5/8" centers, up to #1 AWG	Two-hole 1/4-20 on 5/8" centers, up to #1 AWG	Two-hole 1/4-20 on 5/8" centers, up to #1 AWG	Two-hole 1/4-20 on 5/8" centers, up to #1 AWG	Two-hole 1/4-20 on 5/8" centers, up to #1 AWG
Bulk Battery Landings	2 (option; see page 3)	4	8	8	8
Battery Landing Lug Sizes	Two-hole 1/4-20 on 5/8" centers	Two-hole 3/8-16 on 1" centers	Two-hole 3/8-16 on 1" centers	Two-hole 3/8-16 on 1" centers	Two-hole 3/8-16 on 1" centers
LVD Contactor	Up to 1	Up to 2	Up to 2	Up to 2	Up to 2
EPO Circuit and Service Bypass Switch	No	No	Yes	Yes	Yes
Additional Distribution Panel Option	No	No	Yes	Yes	Yes

*Please consult with a sales representative for other available configurations
**Dimensions are approximate

Applicable Standards			
NEBS	Level 3 (GR-63-CORE, GR-1089-CORE)	EN 61000-4-2	Electrostatic discharge (ESD) immunity test
IEC 60950-1 UL 60950-1	Electrical safety	EN 61000-4-3	Electromagnetic field immunity test
		EN 61000-4-4	Electrical fast transient/burst immunity test
EN 55022 (CISPER 22)	Radiated disturbance at enclosure port Conducted emission at DC output ports Conducted emission at AC mains ports	EN 61000-4-5	Surge immunity test
		EN 61000-4-6	Conducted radio-frequency (RF) immunity test
		EN 61000-4-8 EN 61000-4-9	Power frequency magnetic field/pulse magnetic field
EN 61000-3-2 EN 61000-3-3 20	Harmonic current emissions	EN 61000-4-11	Voltage dips, short interruptions and voltage variations

Flatpack2 Power Systems

Distributions

Flatpack2 150A

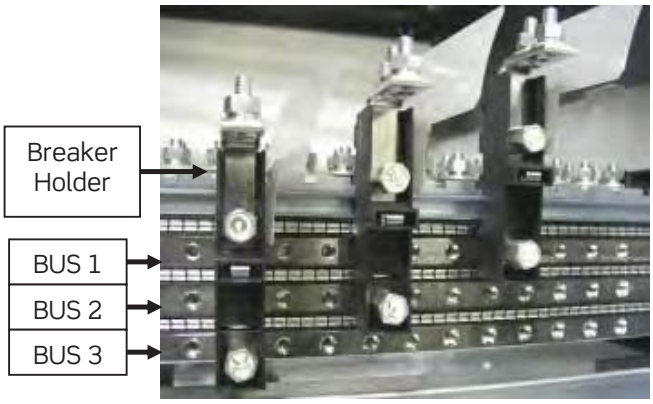
The -48V/150A system offers five standard distribution configurations that are defined by the number and types of circuit protection accommodated. Distribution consists of up to six protected buses, with each bus having its own front-access, plug-in breaker position (100A max rating) and rear-access cable landing. The buses are organized into three sets of two parallel buses, permitting each pair to be linked together by a two-pole, plug-in breaker rated up to 175A. If no front-access battery breakers are desired, an extra set of buses is installed for bulk output to batteries. A low-voltage disconnect (LVD) contactor can be ordered. A 12-position, 65A GMT fuse block is also available.

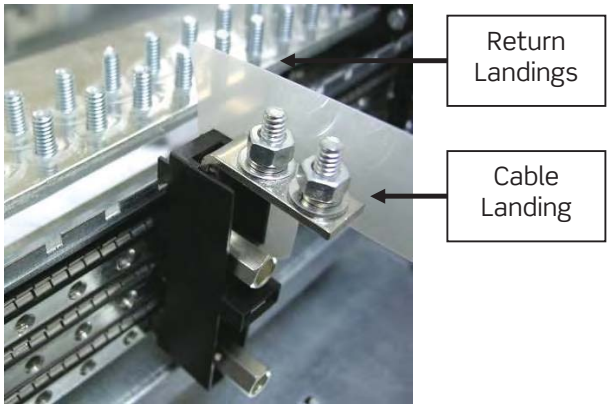
FP2 -48V/150A Configurations*	2B 2L	2B 2L GMT	2B 4L	4L GMT	6L
Battery breaker positions	2	2	2	0	0
Load breaker positions	2	2	4	4	6
Unprotected bulk battery landings	0	0	0	2	2
12-position, 65A GMT fuse block	No	Yes	No	Yes	No

*Please consult with a sales representative for other available configurations

Flatpack2 300A, 600A, and 1200A

The larger *Flatpack2* systems make use of a unique front-access distribution section that features three discrete, parallel buses. Each bus has positions for moveable breaker holders that screw into the desired bus. This arrangement facilitates a variety of convenient uses for each bus, such as protected battery connections, load-shedding, and converter output. Kits are available for double-pole and triple-pole breakers. Bulk battery cable landings are available in the rear of these distributions. There are also options for up to two LVD contactors.





Distributions*	300A	600A	1200A
Distribution Dimensions	Height: 4RU (7.0") Width: 19" (rack) Depth: 18.75"	Height: 4RU (7.0") Width: 23" (rack) Depth: 21.75"	Height: 6RU (10.5") Width: 23" (rack) Depth: 21.75"
Controller Slot(s)	One (1) in power shelf	Two (2) in dedicated shelf	Two (2) integrated in distribution
Alarm Card(s)	Integrated	Separate shelf	Integrated
Configurable Load Buses	3	3	3
Protected Load Landings	Up to 20	Up to 24	Up to 24
Load Landing Lug Sizes	Two-hole 1/4-20 on 5/8" centers, up to #1 AWG	Two-hole 1/4-20 on 5/8" centers, up to #1 AWG	Two-hole 1/4-20 on 5/8" centers, up to #1 AWG
Bulk Battery Landings	4	8	8
Battery Landing Lug Sizes	Two-hole 3/8-16 on 1" centers, up to 250 MCM	Two-hole 3/8-16 on 1" centers, up to 777 MCM	Two-hole 3/8-16 on 1" centers, up to 777 MCM
LVD Contactors	Up to 2	Up to 2	Up to 2
EPO Circuit and Service Bypass Switch	No	Yes	Yes
Optional Auxiliary Distribution Panel	No	Yes	Yes

*Please consult with a sales representative for other available configurations

Flatpack2 Power Systems
Power Modules

Document
2048206 R3

Flatpack2 HE Rectifiers

Flatpack2 HE rectifiers are available in two voltages: 48V and 24V. They are hot-swap, switched-mode power supply units.

Flatpack2 Rectifiers*	48V/2000W HE	24V/1800W HE
Module Image		
AC Input Voltage	Range: 85-300 VAC Nominal: 185-275 VAC	Range: 85-290 VAC Nominal: 176-275 VAC
Maximum AC Current	11.6 A_{rms}	11.25 A_{rms}
DC Output Voltage	43.5-57.6 VDC	21.0-29.0 VDC
Maximum DC Current	41.7A	75A
Typical Efficiency	>96%	>95%
Operating Temperature	-40°C to +75°C (-40°F to +167°F)	-40°C to +75°C (-40°F to +167°F)
Storage Temperature	-40°C to +85°C (-40°F to +185°F)	-40°C to +85°C (-40°F to +185°F)
Cooling	One fan, front-to-back airflow	One fan, front-to-back airflow
Dimensions	Height: 41.5 mm (1.63") Width: 109 mm (4.29") Depth: 327 mm (12.87")	Height: 41.5 mm (1.63") Width: 109 mm (4.29") Depth: 327 mm (12.87")
Weight	1.95 kg (4.30 lbs)	1.95 kg (4.30 lbs)

*Please consult with a sales representative for other available models, such as the non-HE rectifiers

Flatpack Converters

Flatpack DC-DC Converters can be ordered for *Flatpack2* systems. Converter shelves are delivered in sets of two or four shelves (four or eight converters, respectively). Each shelf accommodates up to two converter modules. In 300A, 600A, and 1200A distributions, converter output can be routed to one of the three parallel load buses.

Flatpack DC-DC Converters*	48V to 24V	24V to 48V
Module Image		
Input Voltage	40-60 VDC	19.8-32.0 VDC
Input Current	32A at 40 VDC	73A at 19.8 VDC
Output Voltage	24-28 VDC	55 VDC
Output Current	40A at 24 VDC	23A
Output Power	1100W at 27.5 VDC	1250W
Typical Efficiency	90%	90%
Operating Temperature	-40°C to +75°C (-40°F to +167°F) Power limiting may occur above +65°C (+149°F)	-40°C to +75°C (-40°F to +167°F) Power limiting may occur above +65°C (+149°F)
Storage Temperature	-40°C to +85°C (-40°F to +185°F)	-40°C to +85°C (-40°F to +185°F)
Dimensions	Height: 43 mm (1.69") Width: 218 mm (8.58") Depth: 240 mm (9.45")	Height: 43 mm (1.69") Width: 218 mm (8.58") Depth: 240 mm (9.45")
Weight	<3 kg (<6.6 lbs)	<3 kg (<6.6 lbs)

*Please consult with a sales representative for other available models

Flatpack2 Power Systems
Controller Modules

Smartpack Controller

Smartpack is a robust, comprehensive control and monitoring device used for Eltek Valere's *Flatpack2* systems. The controller communicates with each *Flatpack2* rectifier through a CAN bus and provides real-time monitoring and control information. The *Smartpack* controller is accompanied by the *PowerSuite* software program for PC interface. Alarm inputs and output relays can be increased by using a master/slave configuration in systems that can accommodate two controllers.



Smartpack Modules*	Web/SNMP 6+6	Slave
Module Image	 Rear View	 Front View
Input Voltage	24 – 60 VDC	24 – 60 VDC
Configurable Alarm Inputs	6	6
Form C Output Relays	6	6
Computer Interface	USB Ethernet	USB
Front Display	Yes	No
Battery Symmetry Inputs	4	8
Temperature Sense Inputs	1	2
Battery Current Monitor Input	1	2
Fuse Fail Monitor Input	1	2
LVD Control	Up to 2 contactors	Up to 2 contactors
Dimensions	Height: 44 mm (1.73") Width: 109 mm (4.29") Depth: 140 mm (5.51")	Height: 44 mm (1.73") Width: 109 mm (4.29") Depth: 140 mm (5.51")

*Please consult with a sales representative for other available models


2016 | SUPER DUTY®
BUILT FORD TOUGH



F-450 LARIAT Crew Cab 4x4. Magnetic. Available equipment.

Vehicles throughout shown may be specified with optional and aftermarket upfit equipment.

P25 System and Services Agreement (R1422515R1/P1)
Schedule 8 - Specifications

2019 SUPER DUTY®
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BUILT FORD TOUGH



STRENGTHEN YOUR TEAM WITH PROVEN WORKHORSES.

For 2016, F-Series Super Duty comes in your choice of 3 capable models: F-250, F-350, and the max. towing leader, F-450. Trim choices include: XL, XLT, LARIAT, KING RANCH,® and our top-of-the-line PLATINUM.

With the most configurations in its class,[1] there's a Super Duty just right for you. Plus, you can rest assured it's built on a foundation engineered to last. Ford F-Series has more Full-Size Pickups on the road with 250,000 or more miles than any other truck.[2]

F-250

Maximum Capabilities[3]

16,600-lb. Towing
4,040-lb. Payload
10,000-lb. GVWR
23,500-lb. GCWR

Equipment Configurations

6.2L Gas V8 or 6.7L Power Stroke® V8 Turbo Diesel
Single Rear Wheel 4x2 or 4x4
Regular Cab, SuperCab or Crew Cab; 6¾' or 8' Box

F-350

Maximum Capabilities[3]

26,500-lb. Towing
7,050-lb. Payload
14,000-lb. GVWR – UNSURPASSED
35,000-lb. GCWR

Equipment Configurations

6.2L Gas V8 or 6.7L Power Stroke V8 Turbo Diesel
Single Rear Wheel or Dual Rear Wheel; 4x2 or 4x4
Regular Cab, SuperCab or Crew Cab; 6¾' or 8' Box

F-450

Maximum Capabilities[3]

31,200-lb. Towing – BEST IN CLASS
5,300-lb. Payload
14,000-lb. GVWR – UNSURPASSED
40,400-lb. GCWR – BEST IN CLASS

Equipment Configurations

6.7L Power Stroke V8 Turbo Diesel
Dual Rear Wheel 4x4
Crew Cab with 8' Box

F-250 XL Regular Cab 4x2. Oxford White. F-350 LARIAT SuperCab 4x4. Shadow Black. F-450 LARIAT Crew Cab 4x4. White Platinum. Available equipment.

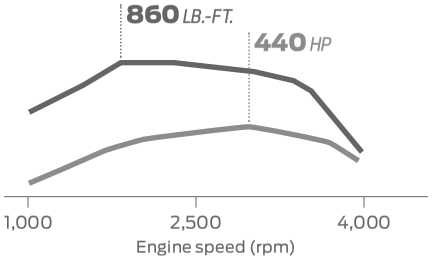
[1]Class is Full-Size Pickups over 8,500 lbs. GVWR. [2]Based on Vehicle Registration data and latest odometer readings available to Polk for 1992 and newer model year full-size pickups still on the road in the U.S. as of 12/31/14. [3]Properly equipped.

P25 System and Services Agreement (R1422515R1/P1)
Schedule 8 Specifications

BUILT FORD TOUGH

6.7L Power Stroke V8 Turbo Diesel

6,840 lbs. – Max. payload capacity[1]
31,200 lbs. – Max. towing capability[1]



DO MORE WITH THE DIESEL LEADER.

Designed, engineered and built by Ford, our 2nd-generation 6.7L Power Stroke® V8 Turbo Diesel engine[2] produces the power and torque you need to get the job done.

Best-in-class standard 860 lb.-ft. of torque and 440 hp are facilitated in part by a large turbocharger, which helps improve airflow and performance. You'll really appreciate it when towing heavy loads uphill and at high altitudes.

Best-in-class diesel fuel economy[3] is maintained with the help of high-pressure fuel injectors that achieve a clean, efficient burn.

Power upfits any time, whether the truck is in motion or at a complete stop. Our class-exclusive live-drive power takeoff (PTO) provision[2] lets you power upfits whenever the diesel engine is running. It keeps the job going with an output gear linked directly to the engine crankshaft.

Proven in over 12 million miles of cumulative testing and real-world use under extreme conditions, this B20-capable engine is the most tested Power Stroke diesel ever. From 120°F scorching heat to –40°F bone-chilling cold. Rest assured, it's Built Ford Tough.®



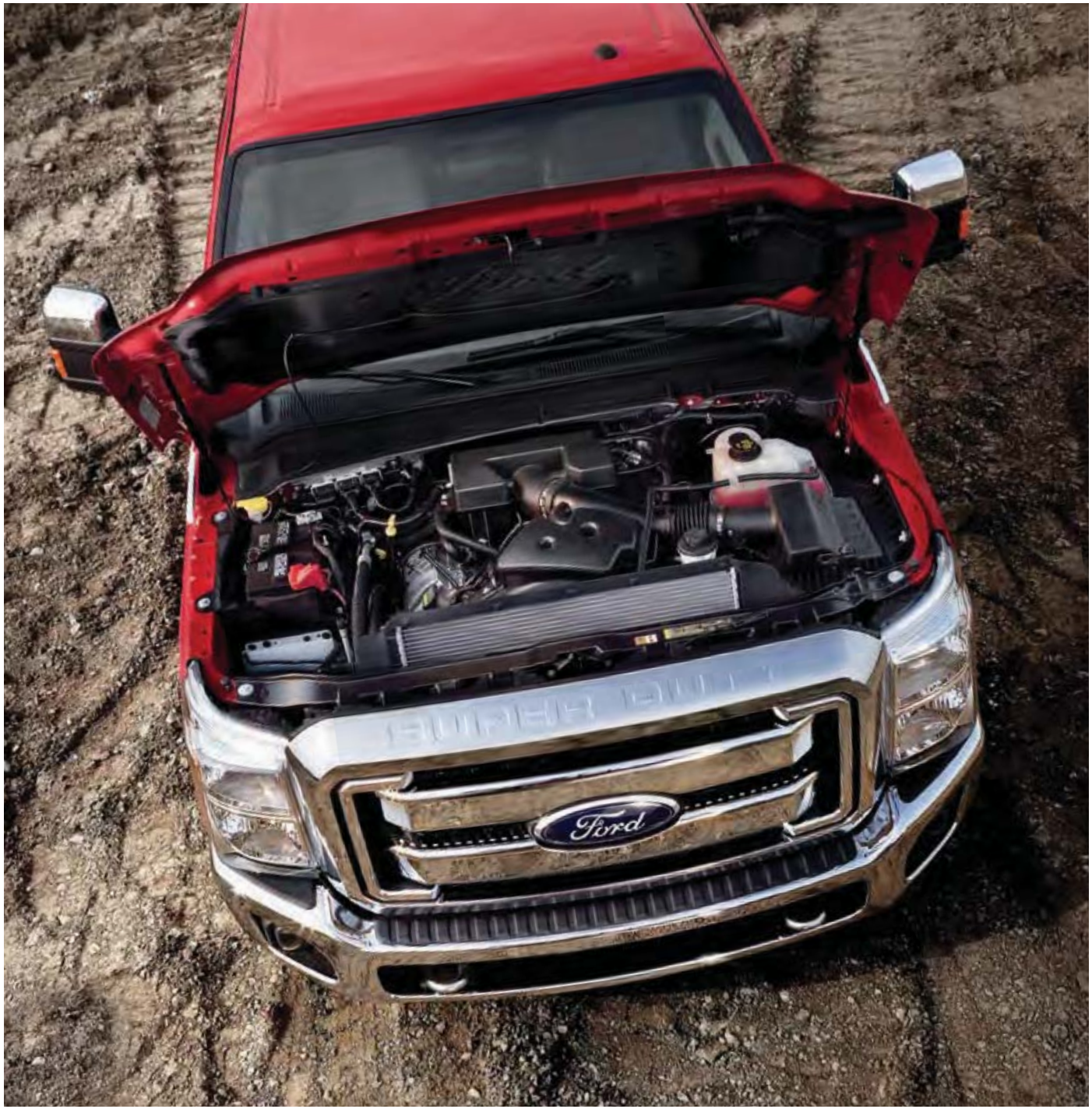
F-350 LARIAT Crew Cab 4x4. Bronze Fire/Caribou two-tone. Available equipment.

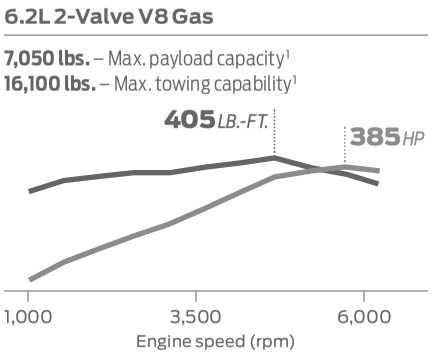
[1]When properly equipped. [2]Available feature. [3]Diesel fuel economy based on Ford simulated city-suburban drive-cycle tests of comparably equipped 2WD and 4WD F-250/F-350 and F-450/F-550 models, consistent with SAE Standard J1321.

P25 System and Services Agreement (R1422515R1/P1)
Schedule 8 - Specifications

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BUILT FORD TOUGH





RULE THE CLASS WITH 6.2L V8 GAS.

The Built Ford Tough® 6.2L 2-valve V8 gives you the most power and torque of any standard gas engine in the class: 385 hp and 405 lb.-ft. of torque. Designed, engineered, built and torture-tested by Ford, this state-of-the-art E85-capable engine is the standard powerplant on F-250 and F-350.

Ease your heavy-duty workload with lots of low-rpm torque. The gas engine's stiff SOHC valvetrain with roller-rocker shafts enables an intake- and exhaust-port layout that optimizes airflow, helping it produce plenty of torque down low.

Alternative fuel options include a CNG/Propane Gaseous Engine Prep Package that readies your truck to be upfit for compressed natural gas (CNG), propane autogas, or as a bi-fuel vehicle with the ability to seamlessly switch between CNG or propane and gasoline.

Providing flexibility and extended range, trucks upfit to a bi-fuel system include a tank for each type of fuel. Contact your local Ford Dealer for ordering details. By purchasing a Super Duty upfit for CNG or propane, you may even qualify for state incentives related to alternative-fuel use, infrastructure or vehicles. Visit www.afdc.energy.gov/afdc/laws for details.

FLEX FUEL CNG PROPANE

BUILT FORD TOUGH

2016 F-250 SUPER DUTY

F-250 XLT SuperCab 4x4. Race Red. XLT Premium Package. Available equipment.

[1]When properly equipped.

Ford Motor Company Services Agreement (R1422515R1/P1)
Schedule 8 - Specifications

PULL THE MOST – CONFIDENTLY.

Ford F-Series Super Duty is the only truck in its class offering you up to 31,200 lbs.[1] of max. towing capability.

To help you handle all that weight, Super Duty utilizes trailer sway control. The system monitors the motions of the truck to detect trailer sway and selectively brakes as needed,[2] helping you maintain control of the truck and the trailer.

When negotiating an incline, whether in Drive or Reverse, standard hill start assist helps you out by momentarily maintaining brake pressure until the engine delivers enough torque to move the truck uphill.

Less manual braking is required of drivers on diesel models thanks to engine braking performance. The diesel's turbocharger provides engine-exhaust braking power for grade descent control with less wear and tear on the wheel brakes and transmission. Engine-exhaust braking includes a manual push-button control on the instrument panel. Super Duty just keeps on helping you get it done.



CLASS-BEST MAX. TOWING 31,200 LBS.[1]

CONTROLS SWAY

HILL START ASSIST

F-450 KING RANCH® Crew Cab 4x4. Bronze Fire. Monochromatic Paint Package. Available equipment.

[1]When properly equipped. [2]Remember that even advanced technology cannot overcome the laws of physics. It's always possible to lose control of a vehicle due to inappropriate driver input for the conditions.

P25 System and Services Agreement (R1422515R1/P1)
Schedule 8 - Specifications

2013 SUPER DUTY®
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BUILT FORD TOUGH













HIT THE GROUND TOWING.

Thanks to our 5th-Wheel/Gooseneck Trailer Tow Prep Package and Ford Custom Accessories 5th-Wheel and Gooseneck Hitch Kits[1] by Reese,® your Super Duty can arrive ready to tow – right from the factory. Plus, you'll get the strength of an under-the-bed-frame crossmember[2] and the utility of a flat cargo bed floor.

New dynamic hitch assist shows your projected path based on steering angle. The black dashed line and white curved lines help you line up a trailer without a spotter more easily.

Cable Lock System by Master Lock®[2] includes a vinyl-coated cable and a locking shackle that are used to secure cargo.

For an easier towing experience overall, Super Duty offers features like an in-bed 7-pin connector[2] and PowerScope® trailer tow mirrors.[2] There's even a factory-installed, integrated trailer brake controller[2] to balance the performance of the truck's brakes and electric trailer brakes.[3] And the LCD productivity screen[2] offers a pre-towing checklist and recalls settings for different trailers. Ready, set, tow.

[1]5th-Wheel Hitch available with 8' box only. See your Ford Dealer for details. [2]Available feature. [3]Trailer brake controller verified to be compatible with electrically actuated drum brakes or hydraulic brakes. Not for use with electric-over-hydraulic brake systems. See your Ford Dealer for details.

P25 System and Services Agreement (R1422515R1/P1)
Schedule B - Specifications

BUILT FORD TOUGH



MANAGE YOUR PAYLOADS WITH EASE.

With its range of maximum payload capabilities, plus all the right tools for loading, accessing and managing your cargo, Super Duty is built to help you work smarter.

Walk up into the bed with our class-exclusive tailgate step.[1] Just open the tailgate, drop the skid-resistant step down, flip the grab bar up and go.

To help increase your confidence while hauling heavy loads, Super Duty features AdvanceTrac® with RSC® (Roll Stability Control™). It utilizes 2 gyroscopic sensors to automatically help you avoid skidding and fishtailing, and help you keep all 4 wheels firmly planted.[2] You'll find it particularly beneficial in inclement weather.

MAX. PAYLOAD **7,050 LBS.**[3] TORSION SPRING TAILGATE ASSIST ROLL STABILITY CONTROL[2]

F-350 LARIAT Crew Cab DRW 4x4. White Platinum. High-Capacity Trailer Tow Package. Available equipment.

[1]Available feature. [2]SRW models only. Engine-only traction control on DRW models. Remember that even advanced technology cannot overcome the laws of physics. It's always possible to lose control or exceed the limits with inappropriate driver input for the conditions. [3]When properly equipped. F-350 DRW Regular Cab 4x2.

P25 System and Services Agreement (R1422515R1/P1)
Schedule 8 - Specifications

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BUILT FORD TOUGH















INCREASE YOUR PRODUCTIVITY.

From electronics to cargo and beyond – Super Duty streamlines your workday.

Outside, you'll find rugged features like the industrial-grade Tough Bed® factory-installed, spray-in bedliner[1] that helps shield your investment. And a stowable bed extender,[1] made of rugged fiberglass-reinforced polypropylene, that lets you haul more with the tailgate down or secure smaller loads with it up.

Inside, lots of storage space helps keep your gear secure, yet within easy reach. A closable dash-top area houses the SYNC® with MyFord Touch®[1] media hub. There's lockable under-seat storage in the center of the 40/20/40 split front seat[1] and beneath the 60/40 split flip-up/fold-down rear bench seat[1] on certain Crew Cab models. The flow-through center console[1] holds hanging files and features a 110-volt power outlet and two 12-volt powerpoints. Power up in Super Duty.

[1]Available feature.

BUILT FORD TOUGH



CELEBRATE YOUR SUCCESS.

Especially when you choose the top-of-the-line Super Duty PLATINUM. Express your style with its premium leather-trimmed seating in your choice of Pecan or Charcoal Black, both featuring a tuxedo stripe design and exclusive "PLATINUM" embroidery.

Maintain your climate-control independence with its dual-zone electronic automatic temperature control – for your comfort and that of your front-seat passenger.

Quickly recall your personalized settings for the 10-way power driver's seat, power-adjustable brake and accelerator pedals, and even the power trailer tow mirrors, with the convenient memory feature.

Clearly convey your hardworking ethics and your drive to succeed – no matter which trim you select. For full details on every Super Duty model, please explore the Specifications section of this brochure.

HEATED/COOLED FRONT SEATS[1]

AUDIO SYSTEM FROM SONY®[1]

HEATED STEERING[1]

PLATINUM Crew Cab 4x4. Pecan Premium leather trim. Black interior. Available equipment.

[1]Available feature.

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2018 SUPER DUTY®
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BUILT FORD TOUGH

COMMAND IT WITH YOUR VOICE.

Voice-activated SYNC®[1] technology helps you keep your eyes on the road and hands on the wheel. SYNC. Say the word.

- **Hands-free calling** lets you make a call with a simple push of a button along with the sound of your voice.
- **Automatic phone book download** transfers the names and numbers in your compatible phone automatically, once paired.
- **Voice-activated music commands** let you say what music you want to hear and listen to it easily with voice-activated search, or say "Bluetooth® audio" to stream content from your phone.
- **SYNC AppLink™[2]** lets you control some of your favorite compatible mobile apps with your voice.
- **911 Assist®[3]** is a convenient no-charge feature that allows you to connect your compatible cell phone to help call 911, even if you can't.

Upgrade to SYNC with MyFord Touch.®[1,4]

- **An LCD screen** lets you easily read and control the things you want.
- **Voice-activated navigation[4]** features voice-recognition technology that lets you say commands as conversational as "find a restaurant." The system then helps guide you to your destination with audible turn-by-turn directions.
- **Voice control climate** lets you use your voice to adjust the climate, so you can stay comfortable without having to lift a finger.

SYNC



LARIAT. Charcoal Black leather trim. SYNC with MyFord Touch. Available equipment.

[1]Driving while distracted can result in loss of vehicle control. Only use SYNC/MyFord Touch/other devices, even with voice commands, when it is safe to do so. Some features may be locked out while the vehicle is in gear. Not all features are compatible with all phones. [2]Available feature. SYNC AppLink is available on select models and compatible with select smartphone platforms. SYNC AppLink is not compatible with MyFord Touch. Commands may vary by phone and AppLink software. [3]The vehicle's electrical system (including the battery), the wireless service provider's signal and a connected mobile phone must all be available and operating for 911 Assist to function properly. These systems may become damaged in a crash. The paired mobile phone must be connected to SYNC, and the 911 Assist feature enabled, in order for 911 to be dialed. When the feature is ON, 911 Assist uses your paired and connected mobile phone's location to contact emergency services by dialing 911 if your airbag deploys or, on certain vehicles, if the emergency fuel pump shut-off is activated. [4]Available feature.

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BUILT FORD TOUGH

CONNECT WITH YOUR WORLD.

SiriusXM® Satellite Radio welcomes you to the World of SiriusXM.[1] Enjoy more than 150 channels including commercial-free music, plus live sports, news and exclusive entertainment, with a 6-month trial subscription to the All Access package included with your new vehicle. You'll hear every channel available, plus you can listen online and on the SiriusXM app.[1]

Navigation[2] with SiriusXM Traffic and Travel Link® includes a 5-year complimentary SiriusXM Traffic and Travel Link[1] trial subscription. Global Positioning System (GPS) technology is combined with 3-D mapping and provides voice-guided turn-by-turn directions. With SiriusXM Traffic and Travel Link, you'll get detailed traffic information, plus current and forecasted weather, gas station locations and prices, sports scores and schedules, and movie theater locations with show listings and times.

SiriusXM



LARIAT. SYNC® with MyFord Touch.® Available equipment.

[1]SiriusXM Satellite Radio, SiriusXM Traffic and SiriusXM Travel Link subscriptions are sold separately or as a package by SiriusXM after your trial period, and are continuous until you call SiriusXM at 1-866-635-2349 to cancel. If you decide to continue service after your trial, the subscription plan you choose will automatically renew thereafter and you will be charged according to your chosen payment method at then-current rates. Fees and taxes apply. Fees and programming subject to change. See Customer Agreement for complete terms and more information at www.siriusxm.com. [2]Available feature.

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BUILT FORD TOUGH

Front Suspension
Twin-I-Beam (F-250/F-350 4x2); solid Twin-Coil Monobeam axle (F-250/F-350/F-450 4x4)
Axle (rating @ ground) – 5,250 lbs. (F-250/F-350 4x2); 5,600 lbs. (F-250/F-350 with 3.31 axle); 6,000 lbs. (F-250/F-350/F-450 4x4)
Springs – Coil
Shock absorbers – 1.38" gas type
Stabilizer bar – Standard

Rear Suspension
Solid axle
Axle (rating @ ground) – 6,200 lbs. (F-250); 7,280 lbs. (F-350 SRW); 9,650 lbs. (F-350 DRW/F-450)
Springs – Leaf
Shock absorbers – 1.38" gas type
Stabilizer bar – Standard on DRW; optional in package on SRW

Steering
Assist – Power
Overall ratio – 20.49:1 (F-250/F-350 4x2); 20.41:1 (F-250/F-350 4x4); 17.8:1 average (F-450)

Brakes
Power 4-wheel vented-disc with ABS (standard)
Rotor diameter (front/rear) – 14.29"/14.29" (F-250/F-350); 14.53"/15.35" (F-450)

Wheels
Steel or aluminum
Size – 17," 18" or 20" (F-250/F-350); 19.5" (F-450)
Number of studs – 8 (F-250/F-350); 10 (F-450)
Bolt-circle diameter – 6.69" (170-mm) SRW; 7.87" (200-mm) F-350 DRW; 8.86" (225-mm) F-450

CONQUER THE TOUGHEST TERRAIN.

Thanks in part to a heavy-duty independent Twin-I-Beam suspension on Super Duty 4x2s and a rugged twin-coil monobeam setup on 4x4s.

The highly capable F-450 has a robust rear axle, rear leaf springs, front and rear stabilizer bars and shocks, and rear driveline U-joints. It's also outfitted with durable steering gears and linkages, plus a braking system that includes large, capable brakes and precise anti-lock brake calibration.

The turn of a dial on the instrument panel is all it takes to change drive settings on Super Duty 4x4s featuring convenient electronic shift-on-the-fly operation.[1]

Get real-time feedback with our class-exclusive off-road display. Included with the LCD productivity screen[1] on SRW trucks, it monitors the truck's pitch angle, bank angle and wheel direction.

Increase your off-road confidence with Hill Descent Control,™[2] which helps maintain the truck's speed on steep declines, so you can concentrate on maneuvering. It's included in the FX4 Off-Road Package, along with transfer case and fuel tank skid plates, Rancho® shocks and box-side decals.

For maximized gripping power, our electronic-locking rear differential[1] uses a true mechanical dog-clutch mechanism to lock the rear axle shafts together so they turn at the same speed. Go further in a Super Duty 4x4.



F-350 LARIAT Crew Cab 4x4. Blue Jeans/Magnetic two-tone Chrome Package. Available equipment.

[1]Available feature. [2]Standard on F-450.

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BUILT FORD TOUGH

SUPER DUTY SPECIFICATIONS



POWERTRAINS

	6.7L Power Stroke® V8 Turbo Diesel	6.2L 2-Valve V8 Gas[1]
Configuration	OHV (32-valve)	SOHC
Fuel injection	High-pressure common-rail	Sequential electronic
Control system	Electronic	Electronic
Induction system	Single-sequential turbocharger; charged air cooler	Specially tuned
Battery	Dual 12-volt; 750-CCA/78-amp-hr	12-volt; 650-CCA/72-amp-hr
Alternator	157-amp (single 200-amp or dual combined 357-amp, optional)	157-amp (single 200-amp, optional)
Cooling system	Pressurized series flow	Pressurized series flow
Oil-life monitor	Intelligent Oil-Life Monitor®	Oil-minder system
Cylinders	8	8
Cylinder heads	Aluminum	Aluminum
Block material	Compacted graphite iron	Cast iron
Valve operation	Push rod/rocker arms	Roller-rocker shaft
Camshaft drive	Gear	Silent chain
Bore/stroke	3.90"/4.25"	4.02"/3.74"
Compression ratio	16.2:1	9.8:1
Horsepower @ rpm	440 @ 2,800	385 @ 5,500
Torque lb.-ft. @ rpm	860 @ 1,600	405 @ 4,500
Recommended fuel	Ultra-low-sulfur diesel or B20 (containing 20% or less biodiesel)	Regular unleaded or E85 Bi-fuel capable CNG or propane gas (requires upfit)

Transmission

6-speed SelectShift® automatic

Case Material

Aluminum

PTO[2]

Live-drive access on driver's side (Turbo Diesel only)

Gear Ratios

1st – 3.97:1
2nd – 2.31:1
3rd – 1.51:1
4th – 1.14:1
5th – 0.85:1
6th – 0.67:1
Reverse – 3.12:1

STANDARD FEATURES

Mechanical

- 97,500-mile tune-up interval[3] (gas engine)
- Battery saver
- Conventional spare tire/wheel/jack with underframe carrier (crank-down type)
- Engine-only traction control (EOTC) (DRW only)
- Fail-Safe Engine Cooling System (gas engine)
- Fuel tank – 26-gallon capacity (F-250/F-350 137," 142" and 156" WB with diesel engine)
- Fuel tank – 35-gallon capacity (gas engine)
- Fuel tank – 37.5-gallon capacity (F-250/F-350 158" and 172" WB with diesel engine, and F-450)
- Hill start assist
- Jack – 2-ton mechanical with SRW, 4-ton hydraulic with DRW
- Power steering
- Stabilizer bar – Front
- Stabilizer bar – Rear (DRW only)
- Stainless steel exhaust system (major components)
- Stationary elevated idle control (SEIC)[4]
- Steering damper
- Tailgate – Removable with lock and tailgate assist
- Tire Pressure Monitoring System (SRW only; excludes spare)
- Trailer hitch receiver – 12.5K (2") Built Ford Tough® (SRW with gas engine; SRW with diesel engine and 137" and 142" WB)
- Trailer hitch receiver – 14K (2.5") Built Ford Tough (SRW with diesel engine and 156," 158" and 172" WB)
- Trailer hitch receiver – 15K (2.5") Built Ford Tough (DRW with 156" and 158" WB; DRW with gas engine and 172" WB)
- Trailer hitch receiver – 19K (2.5") Built Ford Tough (F-350 DRW with diesel engine and 172" WB; F-450)
- Trailer hitch receiver – 2" sleeve reducer (vehicles with 2.5" receiver)
- Trailer sway control

Interior

- Assist and ride handles
- Coat hooks – 1 (Regular Cab); 2 in rear of cab (SuperCab and Crew Cab)
- Dome light/map lights (front and rear with Crew Cab)
- MyKey®
- Overhead console with garage door opener storage and sunglasses storage (SuperCab and Crew Cab)
- Powerpoints – 12-volt, 2 on instrument panel
- Windows – Flip-open rear quarter (SuperCab)

Exterior

- 7-/4-pin trailer tow connector
- Bumpers – Front and rear step
- Cargo box – Black box top and tailgate moldings
- Cargo box – Cargo tie-down hooks (4 in 6¾' box; 6 in 8' box)
- Cargo box – Integrated lamp with center high-mounted stop lamp
- Cargo box – Partitionable and stackable with stake pockets
- Dual-beam jewel-effect headlamps
- Intelligent 3-blink turn signal
- Roof clearance lamps (DRW)
- Underhood service lamp
- Windshield wipers – Intermittent

Safety & Security

- AdvanceTrac® with RSC® (Roll Stability Control™) (SRW only)
- Airbags[5] – Driver and right-front-passenger front
- Airbags[5] – Front-seat side
- Airbags[5] – Safety Canopy® System with roll-fold side-curtain airbags
- Belt-Minder® front safety belt reminder
- Brake/shift interlock
- Brakes – Power 4-wheel vented-disc with Anti-Lock Brake System (ABS)
- Child-safety-seat top tether anchors (Regular Cab front passenger and all rear-seat positions)
- Fuel pump inertia shutoff switch
- Headlamps-on, key-in-ignition and door ajar alert chimes
- Passenger airbag deactivation switch (Regular Cab, SuperCab)
- Safety belts – Energy-management retractors at front-outboard positions
- Safety belts – Height-adjustable at front-outboard positions
- SecuriLock® Passive Anti-Theft System
- Side-intrusion door beams
- SOS Post-Crash Alert System™
- Spare tire/wheel lock

[1]Certified to SAE J1349. [2]Available feature. [3]Under normal driving conditions with routine fluid and filter changes.
[4]Final-stage manufacturer must apply specifications. [5]Always wear your safety belt and follow airbag warning label instructions.

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BUILT FORD TOUGH

XL



F-250 XL Regular Cab 4x2. Magnetic. XL Appearance Package. Available equipment.



XL Regular Cab. Steel HD vinyl trim. XL Appearance Package. Available equipment.

Includes all standard features, plus:

Mechanical

- 6.2L SOHC 2-valve Gas V8 Flex Fuel E85-capable engine (n/a on F-450)
- 6.7L Power Stroke® V8 Turbo Diesel B20-capable engine (standard on F-450)
- TorqShift® heavy-duty 6-speed SelectShift® automatic transmission
- Alternator – 157-amp heavy-duty
- Integrated trailer brake controller (DRW)
- Manual 4-Wheel-Drive System with manual locking hubs (4x4 models only)
- Trailer brake wiring kit (in-cab, no controller, SRW only)
- 17" argent-painted steel wheels with painted center caps (F-250/F-350 SRW)
- 17" argent-painted steel wheels (F-350 DRW)
- 19.5" polished forged-aluminum wheels (F-450)
- LT245/75R17 all-season BSW tires – 5 on SRW/7 on DRW (F-250/F-350)
- 225/70R19.5 all-season BSW tires – 6 (F-450)

Seating

- 40/20/40 split front seat with armrest, cupholders and storage
- 60/40 split flip-up rear seat (SuperCab only)
- 60/40 split flip-up/fold-down rear bench seat with outboard and center head restraints (Crew Cab only)
- HD vinyl seats
- Manual lumbar support for driver's seat

Interior

- AM/FM stereo with digital clock and 2 speakers
- Air conditioning
- Climate controls – Manual
- Door locks – Manual
- Flooring – Black vinyl
- Message center – Multifunction plus trip computer includes odometer, trip odometer, engine oil monitor, engine-hour meter, engine-idle meter (gas engine only), distance to empty, average fuel economy, warning messages, system check, language selection and Ice Blue® Lighting
- Mirror – Manual day/night rearview
- Steering column – Manual tilt/telescoping
- Steering wheel – Black vinyl with 3-button message center controls
- Visors with passenger mirror
- Window – Rear, fixed-glass
- Windows – Manual

Exterior

- Bumpers – Black-painted with grained top cover
- Cab steps – 6" angular black molded (DRW only)
- Door handles – Black
- Glass – Solar-tinted
- Grille – Black
- Mirrors – Manually telescoping trailer tow with 2-way fold and manual glass
- Tow hooks – Black, 2 in front

Available Options

Mechanical

- 6.7L Power Stroke V8 Turbo Diesel B20-capable engine (standard on F-450)
- Electronic shift-on-the-fly (ESOF) 4-Wheel-Drive System with auto/manual locking hubs (4x4 models only)
- 5th-wheel hitch kit (requires 8' box; includes 18K hitch on SRW or 26.5K hitch on DRW)[1]
- Gooseneck hitch kit[1]
- Alternator – Single, 200-amp extra-heavy-duty
- Alternators – Dual, 357-amp total (diesel engine only)
- Engine block heater (standard in 15 cold-weather states)
- Engine idle shutdown (diesel engine only; restrictions apply)
- Integrated trailer brake controller (standard on DRW)
- Operator-commanded exhaust filter regeneration (diesel engine only)
- Power take-off (PTO) provision allows transmission-mounted live-drive and stationary modes (diesel engine only)
- Rear axle – Electronic-locking (F-250/F-350 SRW only)
- Rear axle – Limited-slip (F-350 DRW only; standard on F-450)
- 17" 6-spoke cast-aluminum wheels – 4 (F-250/F-350 SRW)
- 17" polished forged-aluminum wheels – 4 (F-350 DRW)
- 18" argent-painted steel wheels with painted center caps – 4 (F-350 SRW)
- Stainless steel wheel covers (F-350 DRW only; requires 17" argent-painted steel DRW wheels)[2]
- LT245/75R17 all-terrain BSW tires – 5 (F-250/F-350)
- LT265/70R17 all-terrain OWL tires – 4 (F-250/F-350 SRW)
- LT275/65R18 all-season BSW tires – 5 (F-350 SRW)
- LT275/70R18 all-terrain BSW tires – 4 (F-350 SRW 4x4)

Seating

- 40/20/40 split cloth front seat with armrest, cupholders and storage
- 40/mini-console/40 front bucket seats (HD vinyl or cloth)

Interior

- SYNC® with MyFord® voice-activated, in-vehicle connectivity system with SYNC AppLink™ (requires XL Value Package or XL Appearance Package, and steering wheel-mounted audio controls)
- Rapid-heat supplemental cab heater (requires diesel engine and alternator upgrade; standard in 15 cold-weather states when diesel engine is ordered)
- Remote Start System (requires Power Equipment Group)
- Steering wheel-mounted audio controls (requires SYNC)
- Upfitter switches located on instrument panel (4)

Exterior

- Bed mat (restrictions apply)
- Bedliner – Plastic drop-in
- Bedliner – Tough Bed® spray-in includes tailgate guard and black bed bolts
- Cab steps – 6" angular black molded (standard on DRW)
- Cable Lock System by Master Lock®[2]
- Exterior backup alarm by ECCO®[2]
- Ford Telematics™ powered by Telogis®[2] – Fleet tracking system (includes 1 year of service)
- Pickup box delete (F-250/F-350 only; requires 8' box; n/a with 20" wheels or FX4 Off-Road Package)
- Roof clearance lamps (standard on DRW)
- Skid plates – Transfer case and fuel tank (4x4 only)
- Splash guards (front and rear on F-250/F-350; rear only on F-450)
- Tailgate step includes step, tailgate assist and grab bar
- Tonneau cover – Soft-folding[2]
- Wheel-well liners (SRW only)

Available Packages

XL Appearance Package (n/a with XL Value Package) includes AM/FM stereo/single-CD player with MP3 capability, digital clock, 4 speakers, cruise control, bright hub covers and center caps (SRW only), chrome grille surround, and chrome bumpers

XL Value Package (n/a with XL Appearance Package) includes AM/FM stereo/single-CD player with MP3 capability, digital clock, 4 speakers, cruise control, bright hub covers and center caps (SRW only), and chrome bumpers

5th-Wheel/Gooseneck Trailer Tow Prep Package includes 1 under-bed-frame crossmember, 5 pickup bed 5th-wheel/gooseneck attachment points and close-out plugs, and an integrated 7-pin connector on the driver's side pickup bed wall

9,900-lb. GVWR Package (F-250; restrictions apply)

10,000-lb. GVWR Package (F-350 SRW; restrictions apply)

11,400-lb. GVWR Package (F-350 SRW 4x4 and F-350 SRW SuperCab/Crew Cab 4x2 with 8' box; requires 18" wheels and diesel engine)

Camper Package (restrictions apply) includes front springs upgrade (unless maximum springs have been computer-selected as included equipment), rear stabilizer bar (SRW), slide-in-camper certification and auxiliary rear springs on F-250

CNG/Propane Gaseous Engine Prep Package (F-250/F-350 with gas engine only) includes hardened engine intake valves and valve seats and bi-fuel manifold

FX4 Off-Road Package (4x4 only; n/a on F-450; other restrictions apply) includes transfer case and fuel tank skid plates, Hill Descent Control™ (SRW only), Rancho® shocks and FX4 Off-Road box decals

Heavy-Service Front Suspension Package (restrictions apply) includes front springs upgrade (unless maximum springs have been computer-selected as included equipment)

High-Capacity Trailer Tow Package (F-350 Crew Cab DRW 172" WB 4x4 only; requires diesel engine and 4.30 limited-slip rear axle) includes max. front springs, wide track front axle, front fender flare moldings, and increased GCWR from 31,900 lbs. to 35,000 lbs.

Power Equipment Group includes power door locks and front windows (plus rear on Crew Cab) with front one-touch-up/-down feature; manually telescoping trailer tow mirrors with 2-way fold, power/heated glass, heated manual spotter mirrors, and integrated clearance lamps and turn signal indicators; accessory delay; Remote Keyless Entry System with 2 integrated keyhead transmitter remotes; and anti-theft perimeter alarm

Snow Plow Prep Package (4x4 only; restrictions apply) includes computer-selected springs for snow plow application and extra-heavy-duty alternator with diesel engine only



Argent-Painted Steel w/Painted Center Cap
17" Standard: F-250/F-350 SRW
18" Optional: F-350 SRW



Argent-Painted Steel w/Bright Center Cap
17" Included or 18" Optional: F-250/F-350 SRW w/Value Package or Appearance Package



17" Argent-Painted Steel
Standard: F-350 DRW



17" Argent-Painted Steel w/Stainless Steel Cover
Optional: F-350 DRW



17" Polished Forged-Aluminum
Optional: F-350 DRW



17" 6-Spoke Cast-Aluminum
Optional: F-250/F-350 SRW



19.5" Polished Forged-Aluminum
Standard: F-450 DRW

[1]Requires 5th-Wheel/Gooseneck Trailer Tow Prep Package.
See your dealer for details. [2]Ford Licensed Accessory.
See your dealer for limited warranty details.

XLT



F-350 XLT Crew Cab 4x4. Ingot Silver. XLT Premium Package. Available equipment.



XLT Crew Cab. Steel cloth trim. Flow-through center console. Available equipment.

Includes all XL features, plus:

Mechanical

- Integrated trailer brake controller (SRW)
- 18" cast-aluminum wheels (SRW)
- LT275/65R18 all-season BSW tires – 5 (SRW)

Seating

- 4-way adjustable driver and right-front-passenger head restraints
- 40/20/40 split front seat with center under-seat lockable storage with 12-volt powerpoint and center armrest with cupholders and storage
- 60/40 split flip-up/fold-down rear bench seat with bag hooks, dual integrated cupholders and tray, outboard head restraints, center head restraint, and lockable under-seat partitioned storage with 12-volt powerpoint (Crew Cab only)
- Cloth seats

Interior

- AM/FM stereo/single-CD player with MP3 capability, digital clock, 4 speakers and auxiliary audio input jack
- SYNC® with MyFord® voice-activated, in-vehicle connectivity system with SYNC AppLink™
- SiriusXM® Satellite Radio with 6-month trial subscription
- Accessory delay for power features
- Cruise control
- Door locks – Power
- Flooring – Color-coordinated carpet
- Flooring – Color-coordinated carpeted floor mats
- Steering wheel – Black urethane with secondary audio, cruise and 3-button message center controls
- Visors with covered driver and passenger mirrors
- Windows – Power with front one-touch-up/-down feature

Exterior

- Anti-theft perimeter alarm
- Bumpers – Chrome with grained top cover
- Glass – Privacy (rear doors and rear window)
- Grille – Chrome
- Mirrors – Manually telescoping trailer tow with 2-way fold, power/heated glass, heated manual spotter mirrors, and integrated clearance lamps and turn signal indicators
- Remote Keyless Entry System with 2 integrated keyhead transmitter remotes

Available Options

Mechanical

- 6.7L Power Stroke® V8 Turbo Diesel B20-capable engine (standard on F-450)
- Electronic shift-on-the-fly (ESOF) 4-Wheel-Drive System with auto/manual locking hubs (4x4 models only)
- 5th-wheel hitch kit (requires 8' box; includes 18K hitch on SRW or 26.5K hitch on DRW)[1]
- Gooseneck hitch kit[1]
- Alternator – Single, 200-amp extra-heavy-duty
- Alternators – Dual, 357-amp total (diesel engine only)
- Engine block heater (standard in 15 cold-weather states)
- Engine idle shutdown (diesel engine only; restrictions apply)
- Operator-commanded exhaust filter regeneration (diesel engine only)
- Power take-off (PTO) provision allows transmission-mounted live-drive and stationary modes (diesel engine only)
- Rear axle – Electronic-locking (F-250/F-350 SRW only)
- Rear axle – Limited-slip (F-350 DRW; standard on F-450)
- 17" 6-spoke cast-aluminum wheels – 4 (F-250/F-350 SRW)
- 17" polished forged-aluminum wheels – 4 (F-350 DRW)
- Stainless steel wheel covers (requires 17" argent-painted steel DRW wheels)[2]
- LT245/75R17 all-season BSW tires – 5 (F-250/F-350 SRW)
- LT245/75R17 all-terrain BSW tires – 5 (F-350 DRW)
- LT245/75R17 all-terrain OWL tires – 4 (F-350 DRW)
- LT265/70R17 all-terrain OWL tires – 4 (F-250/F-350 SRW)
- LT275/70R18 all-terrain BSW tires – 4 (F-250/F-350 SRW 4x4)
- LT275/70R18 all-terrain OWL tires – 4 (F-250/F-350 SRW 4x4)

Seating

- 40/console/40 front bucket seats with 6-way power driver's seat and flow-through center console with lockable storage, two 12-volt powerpoints and a 110-volt power outlet (SuperCab and Crew Cab only)

Interior

- Flooring – Black all-weather floor mats (deletes carpeted floor mats)
- Rapid-heat supplemental cab heater (requires diesel engine and alternator upgrade; standard in 15 cold-weather states when diesel engine is ordered)
- Rear view camera (requires XLT Interior Package, XLT Value Package or XLT Premium Package)
- Rear View Camera and Prep Kit includes loose camera, wiring bundle, and auto-dimming rearview mirror with video display (requires pickup box delete)
- Remote Start System
- Upfitter switches located on instrument panel (4)
- Window – Rear, manual-sliding with privacy glass (Regular Cab only)
- Window – Rear, power-sliding with privacy glass and defroster (SuperCab and Crew Cab only)

Exterior

- Bed mat (restrictions apply)
- Bedliner – Plastic drop-in
- Bedliner – Tough Bed® spray-in includes tailgate guard and black bed bolts
- Body-color bodyside moldings (SRW SuperCab and Crew Cab only)
- Cab steps – 6" angular black molded (standard on DRW)
- Cab steps – 5" chrome tubular (SuperCab and Crew Cab only)
- Cable Lock System by Master Lock®[2]
- Exterior backup alarm by ECCO®[2]
- Ford Telematics™ powered by Telogis®[2] – Fleet tracking system (includes 1 year of service)
- Mirrors – PowerScope® power-telescoping/-folding trailer tow with power/heated glass, heated manual spotter mirrors, and integrated clearance lamps and turn signal indicators
- Pickup box delete (F-250/F-350 only; requires 8' box; n/a with 20" wheels or FX4 Off-Road Package)
- Reverse Sensing System (n/a with pickup box delete)
- Roof clearance lamps (standard on DRW)
- Skid plates – Transfer case and fuel tank (4x4 only)
- Splash guards (front and rear on F-250/F-350; rear only on F-450)
- Stowable bed extender (F-250/F-350 SRW only)
- Tailgate step includes step, tailgate assist and grab bar
- Tonneau cover – Soft-folding[2]
- Wheel-well liners (SRW only)

Available Packages

XLT Interior Package includes 6-way power driver's seat, power-adjustable pedals, autolamp/rainlamp, autolock/unlock and SecuriCode™ keyless entry keypad

XLT Value Package includes XLT Interior Package, 4.2" LCD productivity screen, auto-dimming rearview mirror, Reverse Sensing System and fog lamps

XLT Premium Package (requires PowerScope mirrors; SuperCab and Crew Cab only) includes XLT Interior Package, chrome exhaust tip, chrome tow hooks, unique chrome mirror caps, chrome cargo tie-down hooks, 6" chrome angular cab steps, 18" chrome-clad aluminum wheels with LT275/65R18 all-season BSW tires (on SRW only), 4.2" LCD productivity screen, auto-dimming rearview mirror, fog lamps, Reverse Sensing System, and steering wheel-mounted audio controls

5th-Wheel/Gooseneck Trailer Tow Prep Package (n/a with stowable bed extender) includes 1 under-bed-frame crossmember, 5 pickup bed 5th-wheel/gooseneck attachment points and close-out plugs, and an integrated 7-pin connector on the driver's side pickup bed wall

9,900-lb. GVWR Package (F-250; restrictions apply)

10,000-lb. GVWR Package (F-350 SRW; restrictions apply)

11,400-lb. GVWR Package (F-350 SRW 4x4 and F-350 SRW SuperCab/Crew Cab 4x2 with 8' box; requires 18" wheels and diesel engine)

Camper Package (restrictions apply) includes front springs upgrade (unless maximum springs have been computer-selected as included equipment), rear stabilizer bar (SRW), slide-in-camper certification and auxiliary rear springs on F-250

CNG/Propane Gaseous Engine Prep Package (F-250/F-350 with gas engine only) includes hardened engine intake valves and valve seats and bi-fuel manifold

FX4 Off-Road Package (4x4 only; n/a on F-450; other restrictions apply) includes transfer case and fuel tank skid plates, Hill Descent Control™ (SRW only), Rancho® shocks and FX4 Off-Road box decals

Heavy-Service Front Suspension Package (restrictions apply) includes front springs upgrade (unless maximum springs have been computer-selected as included equipment)

High-Capacity Trailer Tow Package (F-350 Crew Cab DRW 172" WB 4x4 only; requires diesel engine and 4.30 limited-slip rear axle) includes max. front springs, wide track front axle, front fender flare moldings, and increased GCWR from 31,900 lbs. to 35,000 lbs.

Snow Plow Prep Package (4x4 only; restrictions apply) includes computer-selected springs for snow plow application and extra-heavy-duty alternator with diesel engine only



17" Argent-Painted Steel
Standard: F-350 DRW



17" Argent-Painted Steel w/Stainless Steel Cover
Optional: F-350 DRW



17" Polished Forged-Aluminum
Optional: F-350 DRW



17" 6-Spoke Cast-Aluminum
Optional: F-250/F-350 SRW



18" Chrome-Clad Aluminum
Included: F-250/F-350 SRW w/Premium Package



18" Cast-Aluminum
Standard: F-250/F-350 SRW



19.5" Polished Forged-Aluminum
Standard: F-450 DRW

[1]Requires 5th-Wheel/Gooseneck Trailer Tow Prep Package.
See your dealer for details. [2]Ford Licensed Accessory.
See your dealer for limited warranty details.

LARIAT



F-450 LARIAT Crew Cab 4x4. White Platinum/Caribou two-tone. Chrome Package. Available equipment.



LARIAT Crew Cab. Charcoal Black leather trim. Available equipment.

Includes all XLT features, plus:

Mechanical

- Alternator – 200-amp extra-heavy-duty
- Electronic shift-on-the-fly (ESOF) 4-Wheel-Drive System with auto/manual locking hubs (4x4 models only)
- 17" polished forged-aluminum wheels (F-350 DRW)
- 18" bright-machined cast-aluminum wheels (SRW)
- LT275/65R18 all-season BSW tires – 5 (SRW)

Seating

- 40/console/40 front bucket seats and flow-through center console with lockable storage, two 12-volt powerpoints and a 110-volt power outlet
- 10-way power driver and front-passenger seats
- Leather-trimmed seats

Interior

- Premium Sound System includes AM/FM stereo/single-CD player with MP3 capability, digital clock and 8 speakers with subwoofer (SuperCab only)
- Premium Audio System from Sony® includes AM/FM stereo/single-CD player with MP3 capability, digital clock, and 8 speakers with subwoofer (Crew Cab only)
- SYNC® with MyFord Touch® includes an 8" color LCD touch screen in center stack; dash-top closable storage with media hub (2 USB ports, SD card reader, audio/video input jacks, and 12-volt powerpoint); and SYNC Services[1]
- SiriusXM® Satellite Radio with 6-month trial subscription
- Dual-zone electronic automatic temperature control
- Message center – Driver-configurable enhanced information center with LCD productivity screen includes gauge setup, compass, trip computer, fuel economy and towing/off-road applications, SelectShift® controls, Ice Blue® Lighting, halo lighting and daytime illumination
- Mirror – Auto-dimming rearview
- Power-adjustable pedals
- Power outlet – 110-volt on instrument panel
- Rear view camera
- Steering wheel – Color-coordinated leather-wrapped with secondary audio, cruise and 5-button message center controls
- Visors with illuminated driver and passenger mirrors
- Window – Rear, power-sliding with privacy glass and defroster
- Woodgrain-style instrument panel accents

Exterior

- Autolamp automatic on/off headlamps with rainlamp feature
- Cab steps – 5" chrome tubular (DRW)
- Door handles – Body-color
- Fog lamps
- Mirrors – PowerScope® power-telescoping/-folding trailer tow with power/heated glass, heated manual spotter mirrors, and integrated clearance lamps and turn signal indicators
- Reverse Sensing System
- SecuriCode™ keyless entry keypad

Available Options

Mechanical

- 6.7L Power Stroke® V8 Turbo Diesel B20-capable engine (standard on F-450)
- 5th-wheel hitch kit (requires 8' box; includes 18K hitch on SRW or 26.5K hitch on DRW)[2]
- Gooseneck hitch kit[2]
- Alternators – Dual, 357-amp total (diesel engine only)
- Engine block heater (standard in 15 cold-weather states)
- Power take-off (PTO) provision allows transmission-mounted live-drive and stationary modes (diesel engine only)
- Rear axle – Electronic-locking (F-250/F-350 SRW only)
- Rear axle – Limited-slip (F-350 DRW; standard on F-450)
- 20" premium cast-aluminum wheels – 4 (F-250/F-350 SRW 4x4 only)
- 20" chrome-clad aluminum wheels – 4 (requires Chrome Package; F-250/F-350 SRW 4x4 only)
- LT245/75R17 all-terrain BSW tires – 5 (F-350 DRW)
- LT245/75R17 all-terrain OWL tires – 4 (F-350 DRW)
- LT275/70R18 all-terrain BSW tires – 4 (F-250/F-350 SRW 4x4)
- LT275/70R18 all-terrain OWL tires – 4 (F-250/F-350 SRW 4x4)
- LT275/65R20 all-terrain BSW tires – 4 (F-250 4x4 only; requires FX4 Off-Road Package)
- LT275/65R20 all-terrain OWL tires – 4 (F-250/F-350 SRW 4x4)

Seating

- 40/20/40 split leather-trimmed front seats, center under-seat lockable storage with 12-volt powerpoint, and center armrest with cupholders and storage
- Heated rear outboard seats (requires LARIAT Interior Package or LARIAT Ultimate Package; Crew Cab only)

Interior

- Navigation System with Premium Sound System includes HD Radio™ Technology, AM/FM stereo/single-CD player with MP3 capability, USB port, in-dash touch screen, voice-activated controls, SiriusXM Traffic and Travel Link,® and 8 speakers with subwoofer
- Flooring – Black all-weather floor mats (deletes carpeted floor mats)
- Rapid-heat supplemental cab heater (requires diesel engine; standard in 15 cold-weather states when diesel engine is ordered)
- Remote Start System
- Universal garage door opener
- Upfitter switches located on instrument panel (4)

Exterior

- Bed mat (restrictions apply)
- Bedliner – Plastic drop-in
- Bedliner – Tough Bed® spray-in includes tailgate guard and black bed bolts
- Body-color bodyside moldings (SRW only)
- Cab steps – 5" chrome tubular (standard on DRW)
- Cable Lock System by Master Lock®[3]
- Exterior backup alarm by ECCO®[3]
- Ford Telematics™ powered by Telogis®[3] – Fleet tracking system (includes 1 year of service)
- Power-sliding moonroof (Crew Cab only)
- Roof clearance lamps (standard on DRW)
- Skid plates – Transfer case and fuel tank (4x4 only)
- Splash guards (front and rear on F-250/F-350; rear only on F-450)
- Stowable bed extender (F-250/F-350 SRW only)
- Tailgate step includes step, tailgate assist and grab bar
- Tonneau cover – Soft-folding[3]
- Two-tone lower-accent paint (includes accent-color wheel-lip moldings on SRW)
- Wheel-well liners (SRW only)

Available Packages

LARIAT Interior Package includes easy entry/exit memory, power, heated/cooled driver's seat; power, heated/cooled front-passenger seat; memory, power trailer tow mirrors; memory, power-adjustable pedals; and Remote Start System

LARIAT Ultimate Package (Crew Cab only; restrictions apply) includes easy entry/exit memory, power, heated/cooled driver's seat; power, heated/cooled front-passenger seat; memory, power trailer tow mirrors; memory, power-adjustable pedals; power moonroof; Navigation System; tailgate step; and Remote Start System

5th-Wheel/Gooseneck Trailer Tow Prep Package (n/a with stowable bed extender) includes 1 under-bed-frame crossmember, 5 pickup bed 5th-wheel/gooseneck attachment points and close-out plugs, and an integrated 7-pin connector on the driver's side pickup bed wall

9,900-lb. GVWR Package (F-250; restrictions apply)

10,000-lb. GVWR Package (F-350 SRW; restrictions apply)

11,400-lb. GVWR Package (F-350 SRW 4x4 and F-350 SRW SuperCab/Crew Cab 4x2 with 8' box; requires 18" wheels and diesel engine)

Camper Package (restrictions apply) includes front springs upgrade (unless maximum springs have been computer-selected as included equipment), rear stabilizer bar (SRW), slide-in-camper certification and auxiliary rear springs on F-250

Chrome Package includes chrome exhaust tip, chrome tow hooks, unique chrome mirror caps, chrome cargo tie-down hooks, 6" chrome angular cab steps and 18" chrome-clad aluminum wheels with LT275/65R18 all-season BSW tires (on SRW only)

CNG/Propane Gaseous Engine Prep Package (F-250/F-350 with gas engine only) includes hardened engine intake valves and valve seats and bi-fuel manifold

FX4 Off-Road Package (4x4 only; n/a on F-450; other restrictions apply) includes transfer case and fuel tank skid plates, Hill Descent Control™ (SRW only), Rancho® shocks and FX4 Off-Road box decals

Heavy-Service Front Suspension Package (restrictions apply) includes front springs upgrade (unless maximum springs have been computer-selected as included equipment)

High-Capacity Trailer Tow Package (F-350 Crew Cab DRW 172" WB 4x4 only; requires diesel engine and 4.30 limited-slip rear axle) includes max. front springs, wide track front axle, front fender flare moldings, and increased GCWR from 31,900 lbs. to 35,000 lbs.

Snow Plow Prep Package (4x4 only; restrictions apply) includes computer-selected springs for snow plow application and extra-heavy-duty alternator with diesel engine only

[1] SYNC Services varies by trim level and model year and may require a subscription. Traffic alerts and turn-by-turn directions available in select markets. Message and data rates may apply. Ford Motor Company reserves the right to change or discontinue this product service at any time without prior notification or incurring any future obligation. [2] Requires 5th-Wheel/Gooseneck Trailer Tow Prep Package. See your dealer for details. [3] Ford Licensed Accessory. See your dealer for limited warranty details.



17" Polished Forged-Aluminum
Standard: F-350 DRW



18" Bright-Machined Cast-Aluminum
Standard: F-250/F-350 SRW



18" Chrome-Clad Aluminum
Included: F-250/F-350 SRW w/Chrome Package



19.5" Polished Forged-Aluminum
Standard: F-450 DRW



20" Premium Cast-Aluminum
Optional: F-250/F-350 SRW 4x4



20" Chrome-Clad Aluminum
Optional: F-250/F-350 SRW 4x4 w/Chrome Package

KING RANCH®





F-450 KING RANCH Crew Cab 4x4. Green Gem/Caribou two-tone. Chrome Package. Available equipment.

KING RANCH Crew Cab 4x4. Antiqued Mesa Brown leather trim. Black interior. Available equipment.

Includes all LARIAT features, plus:

Seating

- Antiqued Mesa Brown leather-trimmed seats with "KING RANCH" seat back logo
- Easy entry/exit driver's seat memory feature
- Heated/cooled driver and front-passenger seats

Interior

- Navigation System with HD Radio™ Technology
- Flooring – Color-coordinated carpeted floor mats with "KING RANCH" logo
- Memory Group includes memory feature for power trailer tow mirrors, 10-way power driver's seat, and power-adjustable pedals
- Remote Start System
- Steering wheel – Antiqued Mesa Brown leather-wrapped with secondary audio, cruise and 5-button message center controls
- Unique woodgrain-style instrument panel accents
- Universal garage door opener

Exterior

- Accent-color wheel-lip moldings (SRW)
- Body-color bodyside moldings (SRW)
- Bumpers – Accent-color monochromatic
- Cab steps – Illuminated accent-color platform
- Grille – Body-color surround with chrome insert
- Mirrors – PowerScope® power-telescoping/-folding trailer tow with memory, power/heated glass, heated manual spotter mirrors, integrated clearance lamps and turn signal indicators with body-color mirror caps
- Two-tone lower-accent paint

Available Options

Mechanical

- 6.7L Power Stroke® V8 Turbo Diesel B20-capable engine (standard on F-450)
- 5th-wheel hitch kit (requires 8' box; includes 18K hitch on SRW or 26.5K hitch on DRW)[1]
- Gooseneck hitch kit[1]
- Alternators – Dual, 357-amp total (diesel engine only)
- Engine block heater (standard in 15 cold-weather states)
- Power take-off (PTO) provision allows transmission-mounted live-drive and stationary modes (diesel engine only)
- Rear axle – Electronic-locking (F-250/F-350 SRW only)
- Rear axle – Limited-slip (F-350 DRW; standard on F-450)
- 20" premium painted cast-aluminum wheels – 4 (F-250/F-350 SRW only)
- 20" chrome-clad aluminum wheels – 4 (requires Chrome Package; F-250/F-350 SRW 4x4 only)
- LT275/70R18 all-terrain BSW tires – 4 (F-250/F-350 SRW 4x4)
- LT275/70R18 all-terrain OWL tires – 4 (F-250/F-350 SRW 4x4)
- LT275/65R20 all-terrain OWL tires – 4 (F-250/F-350 SRW 4x4)
- LT245/75R17 all-terrain BSW tires – 5 (F-350 DRW)
- LT245/75R17 all-terrain OWL tires – 4 (F-350 DRW)

Seating

- Heated rear outboard seats

Interior

- Rapid-heat supplemental cab heater (requires diesel engine; standard in 15 cold-weather states when diesel engine is ordered)
- Upfitter switches located on instrument panel (4)

Exterior

- Bed mat (restrictions apply)
- Bedliner – Plastic drop-in
- Bedliner – Tough Bed® spray-in includes tailgate guard and black bed bolts
- Cable Lock System by Master Lock®[2]
- Exterior backup alarm by ECCO®[2]
- Ford Telematics™ powered by Telogis®[2] – Fleet tracking system (includes 1 year of service)
- Power-sliding moonroof
- Roof clearance lamps (standard on DRW)
- Skid plates – Transfer case and fuel tank (4x4 only)
- Splash guards (front and rear on F-250/F-350; rear only on F-450)
- Stowable bed extender (F-250/F-350 SRW only)
- Tailgate step includes step, tailgate assist and grab bar
- Tonneau cover – Soft-folding[2]
- Wheel-well liners (SRW only)

Available Packages

KING RANCH with Chrome Package includes chrome exhaust tip, chrome tow hooks, unique chrome mirror caps, chrome cargo tie-down hooks, 6" chrome angular cab steps, and 18" chrome-clad aluminum wheels with LT275/65R18 all-season BSW tires (on SRW only)

KING RANCH Monochromatic Paint Package (requires KING RANCH with Chrome Package) includes chrome front and rear bumpers, monochromatic paint, body-color bumper extenders (F-450), body-color front fender flares (DRW), and unique KING RANCH 6.7L Power Stroke diesel engine decal (replaces tape stripe)

5th-Wheel/Gooseneck Trailer Tow Prep Package (n/a with stowable bed extender) includes 1 under-bed-frame crossmember, 5 pickup bed 5th-wheel/gooseneck attachment points and close-out plugs, and an integrated 7-pin connector on the driver's side pickup bed wall

9,900-lb. GVWR Package (F-250; restrictions apply)

10,000-lb. GVWR Package (F-350 SRW; restrictions apply)

11,400-lb. GVWR Package (F-350 SRW 4x4 and F-350 SRW SuperCab/Crew Cab 4x2 with 8' box; requires 18" wheels and diesel engine)

Camper Package (restrictions apply) includes front springs upgrade (unless maximum springs have been computer-selected as included equipment), rear stabilizer bar (SRW), slide-in-camper certification and auxiliary rear springs on F-250

CNG/Propane Gaseous Engine Prep Package (F-250/F-350 with gas engine only) includes hardened engine intake valves and valve seats and bi-fuel manifold

FX4 Off-Road Package (4x4 only; n/a on F-450; other restrictions apply) includes transfer case and fuel tank skid plates, Hill Descent Control™ (SRW only), Rancho® shocks and FX4 Off-Road box decals

Heavy-Service Front Suspension Package (restrictions apply) includes front springs upgrade (unless maximum springs have been computer-selected as included equipment)

High-Capacity Trailer Tow Package (F-350 Crew Cab DRW 172" WB 4x4 only; requires diesel engine and 4.30 limited-slip rear axle) includes max. front springs, wide track front axle, front fender flare moldings, and increased GCWR from 31,900 lbs. to 35,000 lbs.

Snow Plow Prep Package (4x4 only; restrictions apply) includes computer-selected springs for snow plow application and extra-heavy-duty alternator with diesel engine only

[1]Requires 5th-Wheel/Gooseneck Trailer Tow Prep Package. See your dealer for details. [2]Ford Licensed Accessory. See your dealer for limited warranty details.



17" Polished Forged-Aluminum
Standard: F-350 DRW



18" Bright-Machined Cast-Aluminum
Standard: F-250/F-350 SRW



18" Chrome-Clad Aluminum
Included: F-250/F-350 SRW w/Chrome Package



19.5" Polished Forged-Aluminum
Standard: F-450 DRW



20" Premium Painted Cast-Aluminum
Optional: F-250/F-350 SRW 4x4



20" Chrome-Clad Aluminum
Optional: F-250/F-350 SRW 4x4 w/Chrome Package

P25 System and Services Agreement (R1422515R1/R1)
Schedule 8 Specifications

PLATINUM





F-350 PLATINUM Crew Cab 4x4. Ruby Red. Available equipment.

PLATINUM Crew Cab 4x4. Charcoal Black Premium leather trim. Available equipment.

Includes all LARIAT features, plus:

Mechanical

- 20" 7-spoke cast-aluminum wheels with black-painted pockets (SRW)
- LT275/65R20 all-terrain OWL tires (SRW)

Seating

- Premium leather-trimmed seats with tuxedo stripe design and "PLATINUM" seat back embroidery
- Easy entry/exit driver's seat memory feature
- Heated/cooled driver and front-passenger seats

Interior

- Navigation System with HD Radio™ Technology
- Memory Group includes memory feature for power trailer tow mirrors, 10-way power driver's seat, and adjustable pedals
- Remote Start System
- Steering wheel – Heated, premium leather-wrapped with genuine walnut swirl wood accent, and secondary audio, cruise and 5-button message center controls
- Unique woodgrain-style instrument panel accents
- Universal garage door opener

Exterior

- Bumpers – Body-color
- Cab steps – 6" chrome angular
- Cargo box – Chrome cargo tie-down hooks
- Chrome exhaust tip
- Door handles – Chrome with body-color bezels
- Grille – Satin-chrome surround with bright chrome insert
- Mirrors – PowerScope® power-telescoping/-folding trailer tow with memory, power/heated glass, heated manual spotter mirrors, integrated clearance lamps and turn signal indicators, and chrome mirror caps
- Raised chrome "PLATINUM" box-side lettering
- Satin-chrome tailgate appliqué
- Tailgate step includes step, tailgate assist and grab bar
- Tow hooks – Chrome, 2 in front

Available Options

Mechanical

- 6.7L Power Stroke® V8 Turbo Diesel B20-capable engine (standard on F-450)
- 5th-wheel hitch kit (requires 8' box; includes 18K hitch on SRW or 26.5K hitch on DRW)[1]
- Gooseneck hitch kit[1]
- Alternators – Dual, 357-amp total (diesel engine only)
- Engine block heater (standard in 15 cold-weather states)
- Power take-off (PTO) provision allows transmission-mounted live-drive and stationary modes (diesel engine only)
- Rear axle – Electronic-locking (F-250/F-350 SRW only)
- Rear axle – Limited-slip (F-350 DRW; standard on F-450)
- LT245/75R17 all-terrain BSW tires – 5 (F-350 DRW)
- LT245/75R17 all-terrain OWL tires – 4 (F-350 DRW)

Seating

- Heated rear outboard seats

Interior

- Rapid-heat supplemental cab heater (requires diesel engine; standard in 15 cold-weather states when diesel engine is ordered)
- Upfitter switches located on instrument panel (4)

Exterior

- Bed mat (restrictions apply)
- Bedliner – Plastic drop-in
- Bedliner – Tough Bed® spray-in includes tailgate guard and black bed bolts
- Body-color bodyside moldings (SRW)
- Cable Lock System by Master Lock®[2]
- Exterior backup alarm by ECCO®[2]
- Ford Telematics™ powered by Telogis®[2] – Fleet tracking system (includes 1 year of service)
- Power-sliding moonroof
- Roof clearance lamps (standard on DRW)
- Skid plates – Transfer case and fuel tank
- Splash guards (front and rear on F-250/F-350; rear only on F-450)
- Stowable bed extender (F-250/F-350 SRW only)
- Tonneau cover – Soft-folding[2]
- Wheel-well liners (SRW only)

Available Packages

- **5th-Wheel/Gooseneck Trailer Tow Prep Package** (n/a with stowable bed extender) includes 1 under-bed-frame crossmember, 5 pickup bed 5th-wheel/gooseneck attachment points and close-out plugs, and an integrated 7-pin connector on the driver's side pickup bed wall
- **9,900-lb. GVWR Package** (F-250; restrictions apply)
- **10,000-lb. GVWR Package** (F-350 SRW; restrictions apply)
- **11,400-lb. GVWR Package** (F-350 SRW with diesel engine)
- **Camper Package** (DRW only; restrictions apply) includes front springs upgrade (unless maximum springs have been computer-selected as included equipment) and slide-in-camper certification
- **CNG/Propane Gaseous Engine Prep Package** (F-250/F-350 with gas engine only) includes hardened engine intake valves and valve seats and bi-fuel manifold
- **FX4 Off-Road Package** (4x4 only; n/a on F-450; other restrictions apply) includes transfer case and fuel tank skid plates, Hill Descent Control™ (SRW only), Rancho® shocks and FX4 Off-Road box decals
- **Heavy-Service Front Suspension Package** (restrictions apply) includes front springs upgrade (unless maximum springs have been computer-selected as included equipment)
- **High-Capacity Trailer Tow Package** (F-350 Crew Cab DRW 172" WB 4x4 only; requires diesel engine and 4.30 limited-slip rear axle) includes max. front springs, wide track front axle, front fender flare moldings, and increased GCWR from 31,900 lbs. to 35,000 lbs.
- **Snow Plow Prep Package** (4x4 only; restrictions apply) includes computer-selected springs for snow plow application and extra-heavy-duty alternator with diesel engine only

[1]Requires 5th-Wheel/Gooseneck Trailer Tow Prep Package. See your dealer for details. [2]Ford Licensed Accessory. See your dealer for limited warranty details.



17" Polished Forged-Aluminum
Optional: F-350 DRW



19.5" Polished Forged-Aluminum
Standard: F-450 DRW



20" 7-Spoke Cast-Aluminum
w/ Black-Painted Pockets
Standard: F-250/F-350 SRW

EXTERIORS



White Platinum Metallic Tri-coat



Oxford White



Ingot Silver*



Race Red



Ruby Red Metallic Tinted Clearcoat



Bronze Fire*



Blue Jeans*



Caribou*



Magnetic*



Green Gem*



Shadow Black

INTERIORS



1 Steel HD Vinyl



2 Steel Cloth



3 Adobe Cloth



4 Adobe Leather



5 Charcoal Black Leather



6 Antiqued Mesa Brown Leather



7 Pecan Premium Leather



8 Charcoal Black Premium Leather

Exteriors	Two-Tone	Interiors								
		XL		XLT		LARIAT		KING RANCH®[1]	PLATINUM	
White Platinum Metallic Tri-coat[2]	■					4	5	6	7	8
Oxford White	■ ■	1	2	2	3	4	5	6		
Ingot Silver	■	1	2	2			5			8
Race Red[3]		1	2	2	3	4	5			
Ruby Red Metallic Tinted Clearcoat[2]	■				3	4	5	6		8
Bronze Fire	■				3	4	5	6	7	8
Blue Jeans	■ ■	1	2	2	3	4	5	6		
Caribou		1	2	2	3	4	5			
Magnetic		1	2	2			5			
Green Gem	■ ■	1	2	2	3	4	5	6		
Shadow Black[3]	■ ■	1	2	2	3	4	5	6	7	8

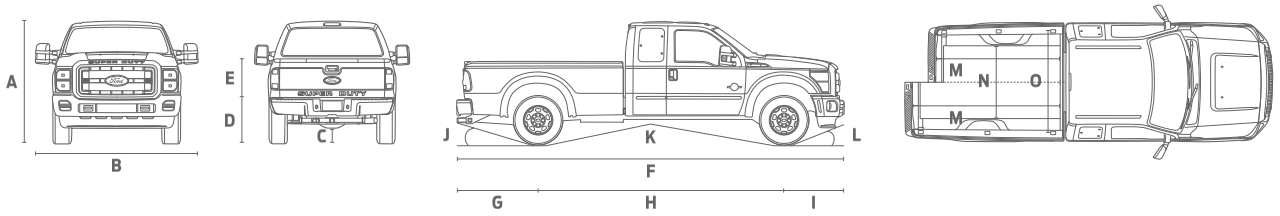
■ Caribou Two-Tone Accent exterior standard on KING RANCH, optional on LARIAT
■ Magnetic Two-Tone Accent exterior optional on LARIAT with Charcoal Black Leather interior only

[1]KING RANCH available in Black or Adobe interior environment. [2]Additional charge. [3]New for 2016.
Colors are representative only. See your dealer for actual paint/trim options.

*Metallic.

BUILT FORD TOUGH

TECHNICAL SPECIFICATIONS

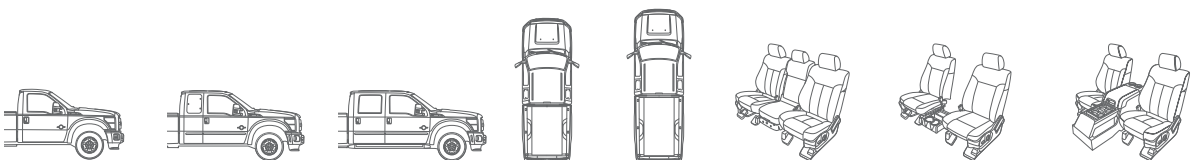


DIMENSIONS

Exterior	Regular Cab LWB 4x2/4x4	SuperCab SWB 4x2/4x4	SuperCab LWB 4x2/4x4	Crew Cab SWB 4x2/4x4	Crew Cab LWB 4x2/4x4
A. Height – F-250 SRW (w/o options)	76.6"/79.2"	77.0"/79.5"	76.9"/79.3"	77.4"/79.7"	77.3"/79.8"
A. Height – F-350 SRW (w/o options)	76.5"/80.0"	76.9"/80.4"	76.7"/80.2"	77.2"/80.8"	77.2"/80.8"
A. Height – F-350 DRW (w/o options)	76.7"/79.5"	—	76.9"/79.7"	—	77.3"/79.9"
A. Height – F-450 DRW (w/o options)	—	—	—	—	79.7"
B. Width – SRW (excl. mirrors)	79.9"	79.9"	79.9"	79.9"	79.9"
B. Width – DRW (excl. mirrors)	96.0"	—	96.0"	—	96.0"
B. Width – With mirrors	104.9"	104.9"	104.9"	104.9"	104.9"
B. Width – With mirrors extended	110.0"	110.0"	110.0"	110.0"	110.0"
C. Ground clearance – F-250 SRW	8.5"/8.2"	8.5"/8.2"	8.5"/8.1"	8.5"/8.1"	8.5"/8.1"
C. Ground clearance – F-350 SRW	8.5"/8.2"	8.5"/8.2"	8.5"/8.2"	8.5"/8.2"	8.5"/8.2"
C. Ground clearance – F-350 DRW	8.1"/8.0"	—	8.1"/8.0"	—	8.0"/8.0"
C. Ground clearance – F-450 DRW	—	—	—	—	8.0"
D. Load floor height – F-250 SRW	35.2"/36.3"	34.8"/35.6"	34.4"/35.4"	34.2"/35.1"	34.1"/35.0"
D. Load floor height – F-350 SRW	34.7"/38.5"	34.4"/37.9"	34.1"/38.0"	33.9"/37.8"	33.8"/37.7"
D. Load floor height – F-350 DRW	35.0"/36.4"	—	34.3"/35.7"	—	34.1"/35.6"
D. Load floor height – F-450 DRW	—	—	—	—	35.4"
E. Cargo box height	20.0"	20.0"	20.0"	20.0"	20.0"
F. Length	227.6"	232.4"	248.6"	246.8"	263.0"
G. Overhang – Rear	52.4"	52.4"	52.4"	52.4"	52.4"
H. Wheelbase	137.0"	141.8"	158.0"	156.2"	172.4"
I. Overhang – Front	38.1"	38.1"	38.1"	38.1"	38.1"
J. Angle of departure – F-250 SRW	17.8°/19.2°	17.4°/18.5°	17.0°/18.3°	16.7°/18.0°	16.7°/17.9°
J. Angle of departure – F-350 SRW	17.3°/21.5°	17.0°/20.9°	16.6°/21.1°	16.4°/20.8°	16.3°/20.8°
J. Angle of departure – F-350 DRW	17.6°/19.3°	—	16.9°/18.7°	—	16.7°/18.5°
J. Angle of departure – F-450 DRW	—	—	—	—	18.3°

Exterior	Regular Cab LWB 4x2/4x4	SuperCab SWB 4x2/4x4	SuperCab LWB 4x2/4x4	Crew Cab SWB 4x2/4x4	Crew Cab LWB 4x2/4x4
K. Ramp breakover angle – F-250 SRW	17.5°/20.4°	16.9°/19.8°	15.8°/18.1°	15.7°/18.1°	15.0°/17.3°
K. Ramp breakover angle – F-350 SRW	17.2°/21.5°	16.7°/20.9°	15.6°/19.2°	15.5°/19.2°	14.8°/18.2°
K. Ramp breakover angle – F-350 DRW	17.5°/20.4°	—	15.9°/18.6°	—	15.0°/17.4°
K. Ramp breakover angle – F-450 DRW	—	—	—	—	17.0°
L. Angle of approach – F-250 SRW	18.0°/19.4°	18.1°/20.1°	18.7°/20.0°	18.7°/20.0°	18.9°/20.6°
L. Angle of approach – F-350 SRW	18.1°/18.8°	18.2°/19.5°	18.8°/19.3°	18.8°/19.3°	19.0°/20.0°
L. Angle of approach – F-350 DRW	18.2°/19.2°	—	19.0°/20.6°	—	19.1°/20.3°
L. Angle of approach – F-450 DRW	—	—	—	—	19.8°
Interior					
Front head room	40.7"	40.7"	40.7"	40.7"	40.7"
Front shoulder room	68.0"	68.0"	68.0"	68.0"	68.0"
Front hip room	67.6"	67.6"	67.6"	67.6"	67.6"
Front leg room (max.)	43.3"	43.3"	43.3"	43.3"	43.3"
Rear head room	—	38.1"	38.1"	40.8"	40.8"
Rear shoulder room	—	68.1"	68.1"	68.0"	68.0"
Rear hip room	—	67.3"	67.3"	67.6"	67.6"
Rear leg room	—	31.6"	31.6"	42.1"	42.1"
Cargo Box					
Volume (cu. ft.)	77.3	64.1	77.3	64.1	77.3
M. Length at floor	98.0"	81.8"	98.0"	81.8"	98.0"
N. Width at wheelhouse	50.9"	50.9"	50.9"	50.9"	50.9"
O. Width at floor (maximum)	69.3"	69.3"	69.3"	69.3"	69.3"

SRW = single rear wheel DRW = dual rear wheel
SWB = short wheelbase (6¾' cargo box) LWB = long wheelbase (8' cargo box)



	Regular Cab	SuperCab	Crew Cab	6¾' Box Size	8' Box Size	40/20/40 split front seat	40/mini-console/40 front bucket seats	40/console/40 front bucket seats
XL	□	□	□	□	□	■	□	
XLT	□	□	□	□	□	■		□
LARIAT		□	□	□	□	□		■
KING RANCH®			■	□	□			■
PLATINUM			■	□	□			■

■ Standard □ Optional

INTERIOR STORAGE (cu. ft.)

Front 40/20/40 split seat center under-seat lockable storage – 0.36
Front flow-through center console main bin – 1.23
Rear Crew Cab 60/40 split bench under-seat lockable storage – 1.17

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Schedule 8 - Specifications

BUILT FORD TOUGH

TECHNICAL SPECIFICATIONS

MAXIMUM PAYLOAD WEIGHT RATINGS (lbs.)

	Max. GVWR	Regular Cab 137.0" WB	SuperCab 141.8" WB	SuperCab 158.0" WB	Crew Cab 156.2" WB	Crew Cab 172.4" WB
F-250 SRW 4x2	9,900	3,890	3,600	3,500	3,390	3,280
	10,000	4,040	3,700	3,600	3,490	3,380
F-250 SRW 4x4	9,900	3,480	3,200	3,100	3,000	2,880
	10,000	3,580	3,300	3,200	3,100	2,980
F-350 SRW 4x2	10,000	3,920	3,630	3,560	3,450	3,310
	10,200	—	—	3,760	3,650	—
	10,500	4,370	4,080	—	—	3,810
	10,700	—	3,650	—	4,090	—
	10,800	—	—	3,620	3,580	—
	10,900	—	—	4,410	—	—
	11,000	4,220	3,900	—	—	4,260
	11,100	—	—	—	—	3,710
	11,400	—	—	4,160	4,120	3,960
	11,500	—	—	4,260	—	4,050
F-350 SRW 4x4	10,000	3,510	3,240	3,160	3,060	2,950
	10,400	3,910	—	—	—	—
	10,500	3,950	3,740	—	—	—
	10,600	—	3,790	—	3,660	—
	10,700	—	—	3,860	—	—
	10,800	3,650	—	3,900	3,800	3,750
	11,000	3,790	—	4,070	—	3,890
	11,100	4,510[1]	4,250	—	—	—
	11,200	—	3,740	3,610	3,590	4,060
	11,300	4,760	—	3,660	4,270	3,440
	11,400	4,160	3,910	3,730	3,700	3,510
	11,500	4,260	4,000	3,820	3,800	3,610
F-350 DRW 4x2	13,500	7,050	—	—	—	—
	13,900	—	—	7,000	—	—
	14,000	6,840	—	6,340	—	6,870
F-350 DRW 4x4	13,800	6,880	—	—	—	—
	14,000	6,420	—	6,680	—	6,460
F-450 DRW 4x4	14,000	—	—	—	—	5,300

WB = wheelbase

CONVENTIONAL TOWING — MAXIMUM LOADED TRAILER WEIGHT RATINGS (lbs.)

Automatic Transmission			Regular Cab						SuperCab						Crew Cab						
Engine	Axle Ratio	GCWR	F-250 SRW 4x2	F-350 SRW 4x2	F-350 DRW 4x2	F-250 SRW 4x4	F-350 SRW 4x4	F-350 DRW 4x4	F-250 SRW 4x2	F-350 SRW 4x2	F-350 DRW 4x2	F-250 SRW 4x4	F-350 SRW 4x4	F-350 DRW 4x4	F-250 SRW 4x2	F-350 SRW 4x2	F-350 DRW 4x2	F-250 SRW 4x4	F-350 SRW 4x4	F-350 DRW 4x4	F-450 DRW 4x4
6.2L 2-valve FFV	3.73	19,200	12,500	12,500	—	12,500	12,500	—	12,500	12,500	—	12,400	12,300	—	12,500	12,500	—	12,200	12,100	—	—
		19,800	—	—	13,200	—	—	12,700	—	—	12,800	—	—	12,400	—	—	12,500	—	—	12,100	—
	4.30	22,200	12,500	12,500	—	12,500	12,500	—	12,500	12,500	—	12,500	12,500	—	12,500	12,500	—	12,500	12,500	—	—
		22,800	—	—	16,100	—	—	15,700	—	—	15,700	—	—	15,300	—	—	15,500	—	—	15,100	—
6.7L V8 Turbo Diesel	3.31	23,500	12,500	12,500	—	12,500	12,500	—	14,000	14,000	—	14,000	14,000	—	14,000	14,000	—	14,000	14,000	—	—
	3.55	23,500	12,500	12,500	—	12,500	12,500	—	14,000	14,000	—	14,000	14,000	—	14,000	14,000	—	14,000	14,000	—	—
	3.73	32,100	—	—	19,000	—	—	19,000	—	—	19,000	—	—	19,000	—	—	19,000	—	—	19,000	—
	4.30	35,000[2]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	19,000	—
		40,400	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	19,000

5TH-WHEEL/GOOSENECK TOWING — MAXIMUM LOADED TRAILER WEIGHT RATINGS (lbs.)

Automatic Transmission			Regular Cab						SuperCab						Crew Cab						
Engine	Axle Ratio	GCWR	F-250 SRW 4x2	F-350 SRW 4x2	F-350 DRW 4x2	F-250 SRW 4x4	F-350 SRW 4x4	F-350 DRW 4x4	F-250 SRW 4x2	F-350 SRW 4x2	F-350 DRW 4x2	F-250 SRW 4x4	F-350 SRW 4x4	F-350 DRW 4x4	F-250 SRW 4x2	F-350 SRW 4x2	F-350 DRW 4x2	F-250 SRW 4x4	F-350 SRW 4x4	F-350 DRW 4x4	F-450 DRW 4x4
6.2L 2-valve FFV	3.73	19,200	12,900	12,900	—	12,500	12,500	—	12,700	12,600	—	12,300	12,200	—	12,400	12,400	—	12,100	12,000	—	—
		19,800	—	—	13,100	—	—	12,600	—	—	12,700	—	—	12,200	—	—	12,400	—	—	12,000	—
	4.30	22,200	15,900	15,900	—	15,500	15,500	—	15,700	15,600	—	15,300	15,200	—	15,400	15,400	—	15,100	15,000	—	—
		22,800	—	—	16,100	—	—	15,600	—	—	15,700	—	—	15,200	—	—	15,400	—	—	15,000	—
6.7L V8 Turbo Diesel	3.31	23,500	16,600	16,500	—	16,200	16,100	—	16,300	16,200	—	15,900	15,900	—	16,100	16,000	—	15,100	15,700	—	—
	3.55	23,500	16,600	16,500	—	16,200	16,100	—	16,300	16,200	—	15,900	15,900	—	16,100	16,000	—	15,100	15,700	—	—
	3.73	32,100	—	—	24,700	—	—	24,300	—	—	24,200	—	—	23,800	—	—	24,000	—	—	23,500	—
	4.30	35,000[2]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	26,500[3]	—
		40,400	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	31,200[3]

[1]Requires Camper Package. [2]Requires High-Capacity Trailer Tow Package. [3]5th-wheel towing limited to 5th-wheel hitch rating of 26,500 lbs.

Maximum capabilities shown are for properly equipped vehicles with required equipment and a 150-lb. driver. Weight of additional options, equipment, passengers and cargo must be deducted from this weight. For additional information, see your Ford Dealer. **Conventional Towing Notes**: This information also applies to models with Pickup Box Delete option (66D). Trailer tongue load weight should be 10–15% of total loaded trailer weight. Make sure that the vehicle payload (reduced by option weight) will accommodate trailer tongue load weight and the weight of passengers and cargo added to the towing vehicle. The addition of trailer tongue load weight, and the weight of passengers and cargo, cannot cause vehicle weights to exceed the rear GAWR (Gross Axle Weight Rating) or GVWR (Gross Vehicle Weight Rating). These ratings can be found on the vehicle's Safety Compliance Certification Label. **5th-Wheel Towing Notes**: This information also applies to models with Pickup Box Delete option (66D). Trailer kingpin weight should be 15–25% of total loaded trailer weight. Make sure that the vehicle payload (reduced by option weight) will accommodate trailer kingpin weight and the weight of passengers and cargo added to the towing vehicle. The addition of trailer kingpin weight, and the weight of passengers and cargo, cannot cause vehicle weights to exceed the rear GAWR (Gross Axle Weight Rating) or GVWR (Gross Vehicle Weight Rating). These ratings can be found on the vehicle's Safety Compliance Certification Label.

P25 System and Services Agreement (R1422515R1/P1)
Schedule 8 - Specifications

BUILT FORD TOUGH











F-250 XL Crew Cab in Oxford White accessorized with 5" black step bars, fog lamps, smoked hood and side window deflectors, heavy-duty splash guards, commercial-grade tool/cargo box by Delta,®[1] and Ford Commercial Graphics by 3M Original Wraps[1]

5th-wheel hitch kits (18K, 26.5K)

All-weather floor mats

Remote Access

Wheel-well liners

Exterior

Commercial graphics[1]
Exhaust tip
Hitch-mounted bike carriers[1]
Hood protector[1]
Racks and carriers[1]
Splash guards
Sportz® tents[1]
Stainless steel wheel covers[1]
Step bars
Trailer towing accessories
Wheel lock kit

Interior

Ash cup/coin holders
Cargo organizers and protectors
In-vehicle safe[1]
Leather-trimmed interior seating[1]
Premium carpeted floor mats
Protective seat covers[1]
Tablet cradle[1]

Bed Products

Bed extender, liners and mats
Cable lock[1]
Retractable stake pocket tie-downs[1]
Tonneau covers[1]

Electronics

Ford Telematics™ powered by Telogis®[1]
Keyless entry keypad
Remote start systems
Speed control
Vehicle Security System
Warning sensor systems[1]
Wireless charging[1]

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[1]Ford Licensed Accessory.



ford.com/trucks/superduty/

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New Vehicle Limited Warranty. We want your Ford F-Series Super Duty® ownership experience to be the best it can be. Under this warranty, your new vehicle comes with 3-year/36,000-mile bumper-to-bumper coverage, 5-year/60,000-mile Powertrain Warranty coverage, 5-year/60,000-mile safety restraint coverage, and 5-year/unlimited-mile corrosion (perforation) coverage – all with no deductible. The Ford 6.7L Power Stroke® diesel engine gets 5-year/100,000-mile warranty coverage. Please ask your Ford Dealer for a copy of this limited warranty.

Roadside Assistance. Covers your vehicle for 5 years or 60,000 miles, so you have the security of knowing that help may be only a phone call away should you run out of fuel, lock yourself out of the vehicle or need towing. Your Ford Dealer can provide complete details on all of these advantages.

Ford Credit. Get the ride you want. Whether you plan to lease or finance, you'll find the choices that are right for you at Ford Credit. Ask your Ford Dealer for details or check us out at fordcredit.com.

Ford Extended Service Plan. For a purchase or lease, the Ford Extended Service Plan (ESP) gives you peace-of-mind protection designed to cover key vehicle components and protect you from the cost of unexpected repairs. Ask your dealer for a Ford ESP, the only service contract backed exclusively by Ford and honored at all Ford dealerships.

Insurance Services. Get Ford Motor Company quality in your auto insurance. Our program offers industry-leading benefits and competitive rates. Call 1-877-367-3847, or visit us at fordvip.com for a no-obligation quote. Insurance offered by American Road Services Company (in CA, American Road Insurance Agency), a licensed agency and subsidiary of Ford Motor Company.

Ford Original Accessories will be warranted for whichever provides you the greatest benefit: 24 months/unlimited mileage, or the remainder of your Bumper-to-Bumper 3-year/36,000-mile New Vehicle Limited Warranty. Ford Licensed Accessories (FLA) are warranted by the accessory manufacturer's warranty. FLA are designed and developed by the accessory manufacturer and have not been designed or tested to Ford Motor Company engineering requirements. Contact your Ford Dealer for details and/or a copy of all limited warranties.

Comparisons based on competitive models (class is Full-Size Pickups over 8,500 lbs. GVWR), publicly available information and Ford certification data at time of release. Vehicles may be shown with optional and aftermarket equipment. Features may be offered only in combination with other options or subject to additional ordering requirements/limitations. Dimensions and capacity ratings shown may vary due to optional features and/or production variability. Information is provided on an "as is" basis and could include technical, typographical or other errors. Ford makes no warranties, representations, or guarantees of any kind, express or implied, including but not limited to, accuracy, currency, or completeness, the operation of the information, materials, content, availability, and products. Ford reserves the right to change product specifications, pricing and equipment at any time without incurring obligations. Your Ford Dealer is the best source of the most up-to-date information on Ford vehicles. Body manufacturers are responsible for compliance certification of the completed vehicle. The Ford New Vehicle Limited Warranty and any government certification made by Ford shall cover only the vehicle as manufactured by Ford and shall not extend to any addition, modification or change of or to the vehicle by the Ford Authorized Pool Account.

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FortiGate® 100D Series

Integrated Security for
Small and Medium Enterprises



FortiGate 100D Series

FortiGate 100D, 140D, 140D-POE and 140D-POE-T1

In order to comply with legislation and secure the valuable data traversing networks, small and medium enterprises and remote branch offices need a security solution that integrates multiple attack recognition technologies into a single device. With limited budgets and modest remote resources, these smaller networks desire a cost effective solution that is simple to install, connect and maintain. Just as importantly, networks are ever-expanding and need a solution that leaves them with room to grow over time.

The FortiGate 100D series is an ideal security solution for small and medium enterprises or remote branch offices of larger networks. It combines firewall, IPsec and SS-VPN, application control, intrusion prevention, anti-malware, antispam, P2P security, and web filtering into a single device.

Simple, Powerful, Secure

The FortiGate 100D series installs in minutes, automatically downloading regular updates to protect against the latest viruses, network vulnerabilities, worms, spam and phishing attacks, and malicious websites with no administrator intervention. Leveraging patented FortiASIC acceleration, the FortiGate 100D series offers market-leading performance, with high port density that facilitate network growth and expansion. Onboard storage provides local archiving of data for policy compliance and/or WAN Optimization. The WAN Optimization functionality increases network performance by reducing the amount of communication and data transmitted between applications and servers across a WAN, and/or web caching.

Key Features & Benefits

Consolidated Security Architecture	Better protection and lower cost of ownership than multiple point security products.
Single Pane of Glass Management	Reduces complexity and decreases costs as all security functions can be managed through one console.
High Port Density	Up to 42x GE ports facilitate flexible deployment of network segments and promotes network expansion and high availability configurations.
Power over Ethernet	Seamless integration of peripheral devices in a secure environment.

The FortiGate 100D series is an ideal security solution for small and medium enterprises or remote branch offices of larger networks.

Meeting the Needs of Small and Medium Enterprises and Branch Offices

- High port density delivers maximum flexibility and scalability
- Application control coupled with identity-based policy enforcement provides complete content protection
- Strong authentication options for policy compliance

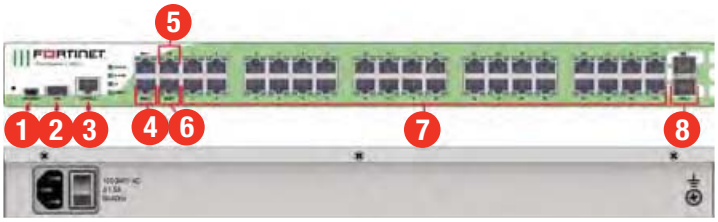
HARDWARE

FortiGate 100D



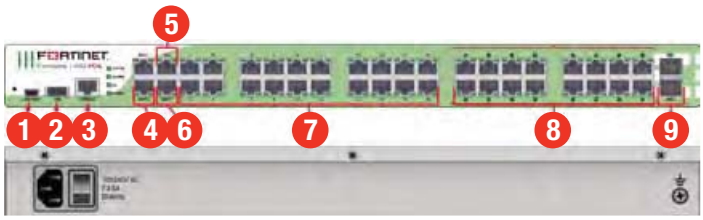
1. USB Management Port	6. 1x GE RJ45 DMZ Port
2. 2x USB Ports	7. 2x GE RJ45 HA Ports
3. Console Port	8. 14x GE RJ45 Switch Ports
4. 2x GE RJ45 WAN Ports	9. 2x GE RJ45 Shared Ports
5. 1x GE RJ45 Management Port	10. 2x GE SFP Shared Ports

FortiGate 140D



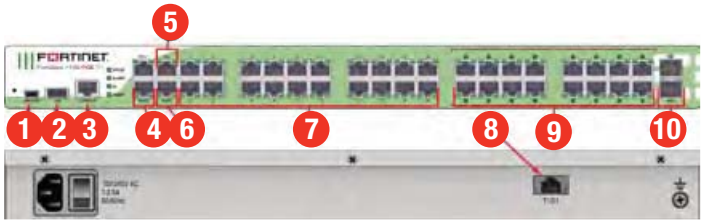
1. USB Management Port	5. 1x GE RJ45 HA Port
2. USB Port	6. 1x GE RJ45 Management Port
3. Console Port	7. 36x GE RJ45 Switch Ports
4. x GE RJ45 WAN Ports	8. 2x GE SFP DMZ Ports

FortiGate 140D-POE



1. USB Management Port	6. 1x GE RJ45 Management Port
2. USB Port	7. 20x GE RJ45 Switch Ports
3. Console Port	8. 16x GE RJ45 PoE Ports
4. 2x GE RJ45 WAN Ports	9. 2x GE SFP DMZ Ports
5. 1x GE RJ45 HA Port	

FortiGate 140D-POE-T1



1. USB Management Port	6. 1x GE RJ45 Management Port
2. USB Port	7. 20x GE RJ45 Switch Ports
3. Console Port	8. 1x T1 Port
4. 2x GE RJ45 WAN Ports	9. 16x GE RJ45 PoE Ports
5. 1x GE RJ45 HA Port	10. 2x GE SFP DMZ Ports



Powered by FortiASIC CP8

- Providing high-speed cryptography for encryption and decryption
- Accelerates signature-based content inspection services such as AV and IPS

Content Processor

The FortiASIC CP8 content processor works outside of the direct flow of traffic, off-loading critical CPU resources.

Install in Minutes with FortiExplorer

The FortiExplorer™ wizard enables you to easily and quickly set up and configure FortiGate platforms with easy-to-follow instructions. The application runs on Windows, Mac OS X desktops and laptops as well as popular mobile devices. Simply connect to the appropriate USB port on the appliance, and be fully protected in minutes.

Power up with PoE Interfaces

The FortiGate 140D-POE and FortiGate 140D-POE-T1 include PoE interfaces that allow you to plug in compatible wireless access points and IP phones out of the box, providing ease of deployment and lower TCO.

HIGHLIGHTS

FortiOS — The World's Most Advanced Security Operating System

- **Feature Select**
  Instantly fine-tunes the FortiGate based on desired deployment needs using feature presets. Simplifies user administration and configurations while providing flexibility for different deployment modes.
- **Contextual Visibility**
  Presents critical deep insights into historic or real-time network activities with data on threat details, IPs, users, devices, applications and more. Allows administrators to quickly understand threats and stop them.
- **Advanced Security**
  Multiple advanced technologies can be coordinated to look for and stop today's blended, targeted or unknown attacks. Efficient packet handling improves performance while lowering latencies and reducing network complexities.

For complete, up-to-date and detailed feature set, please refer to the Administration Handbook and FortiOS Datasheet.

Industry Validation

The FortiGate family of physical and virtual appliances has earned more certifications than any other vendor by consistently meeting rigorous third-party standards. Our industry-leading technology provides you with air-tight security which you can safely count on.

More Protection and Better ROI

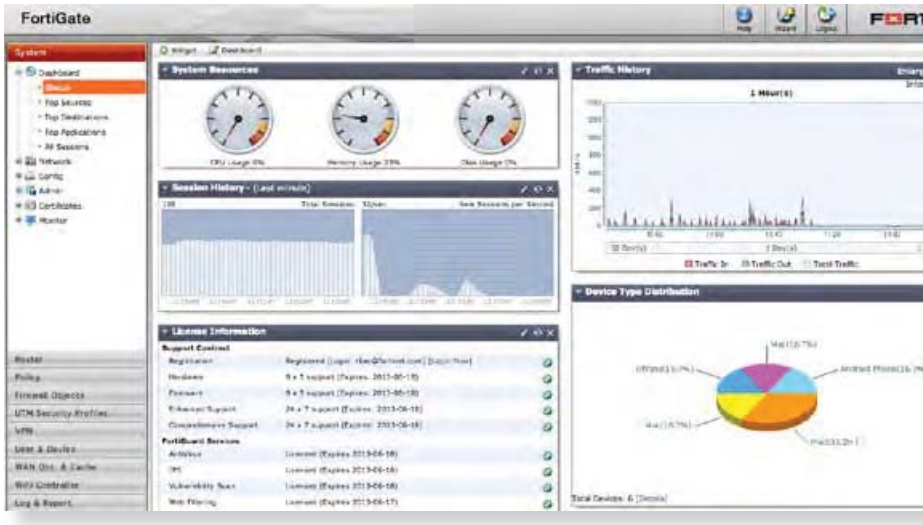
The FortiGate constantly evolves itself in its mission to provide more value for users. Extended features such as WiFi and L2 switch controller, integrated token server, endpoint control and WAN optimization add more security to organizations without incurring additional cost.

Complete and Real-time Security

Fortinet FortiGuard Subscription Services provide automated, real-time, up-to-date protection against the latest security threats. Our threat research labs are located worldwide, providing 24x7 updates when you most need it.

World-Class Technical Support and Documentation

Fortinet FortiCare support offerings provide comprehensive global support for all Fortinet products and services. You can rest assured your Fortinet security products are performing optimally and protecting your users, applications, and data around the clock.



FortiOS Dashboard — Single Pane of Glass Management

ORDER INFORMATION

Product	SKU	Description
FortiGate 100D	FG-100D	20x GE RJ45 ports (including 1x DMZ port, 1x Mgmt port, 2x HA ports, 16x internal switch ports), 2x shared media pairs (including 2x GE RJ45, 2x GE SFP slots), 32 GB onboard storage. Maximum managed FortiAPs (Total / Tunnel) 64 / 32.
FortiGate 140D	FG-140D	40x GE RJ45 (including 36x switch ports, 2x Mgmt/HA ports, 2x WAN ports), 2x GE SFP DMZ slots, 32 GB onboard storage. Maximum managed FortiAPs (Total / Tunnel) 64 / 32.
FortiGate 140D-POE	FG-140D-POE	40x GE RJ45 (including 16x PoE ports, 20x switch ports, 2x Mgmt/HA ports, 2x WAN ports), 2x GE SFP DMZ slots, 32 GB onboard storage. Maximum managed FortiAPs (Total / Tunnel) 64 / 32.
FortiGate 140D-POE-T1	FG-140D-POE-T1	40x GE RJ45 (including 16x PoE ports, 20x switch ports, 2x Mgmt/HA ports, 2x WAN ports), 2x GE SFP DMZ slots, 1x T1 port, 32 GB onboard storage (US Only). Maximum managed FortiAPs (Total / Tunnel) 64 / 32.

SPECIFICATIONS

	FORTIGATE 100D	FORTIGATE 140D	FORTIGATE 140D-POE	FORTIGATE 140D-POE-T1
Hardware Specifications				
GE RJ45 Ports	20	40	24	24
GE RJ45 PoE Ports	–	–	16	16
GE SFP or RJ45 Shared Ports	2	–	–	–
GE SFP Ports	–	2	2	2
USB Ports (Client / Server)	1 / 2	1 / 1	1 / 1	1 / 1
T1 Port	–	–	–	1
Console Port	1	1	1	1
Internal Storage	32 GB	32 GB	32 GB	32 GB
Included Transceivers	NA	0	0	0
System Performance				
Firewall Throughput (1518 / 512 / 64 byte UDP packets)	2,500 / 1,000 / 200 Mbps			
Firewall Latency (64 byte UDP packets)	37 µs	46 µs	46 µs	46 µs
Firewall Throughput (Packets Per Second)	300 Kpps			
Concurrent Sessions (TCP)	3 Million			
New Sessions/Sec (TCP)	22,000			
Firewall Policies	10,000			
IPsec VPN Throughput (512 byte packets)	450 Mbps			
Gateway-to-Gateway IPsec VPN Tunnels	2,000			
Client-to-Gateway IPsec VPN Tunnels	5,000			
SSL-VPN Throughput	300 Mbps			
Concurrent SSL-VPN Users (Recommended Maximum)	300			
IPS Throughput	950 Mbps			
Antivirus Throughput (Proxy Based / Flow Based)	300 / 650 Mbps			
CAPWAP Clear-text Throughput (HTTP)	1.50 Gbps			
Virtual Domains (Default / Maximum)	10 / 10			
Maximum Number of FortiAPs (Total / Tunnel Mode)	64 / 32			
Maximum Number of FortiTokens	1,000			
Maximum Number of Registered FortiClients	600			
High Availability Configurations	Active / Active, Active / Passive, Clustering			
Dimensions				
Height x Width x Length (inches)	1.75 x 17.01 x 11.73	1.75 x 17.01 x 12.28	1.75 x 17.01 x 12.28	1.75 x 17.01 x 12.28
Height x Width x Length (mm)	44 x 432 x 298	44 x 432 x 312	44 x 432 x 312	44 x 432 x 312
Form Factor	Rack Mount, 1 RU	Rack Mount, 1 RU	Rack Mount, 1 RU	Rack Mount, 1 RU
Weight	9.5 lbs (4.3 kg)	11.5 lbs (5.2 kg)	11.5 lbs (5.2 kg)	11.5 lbs (5.2 kg)
Environment				
Power Required	100–240V AC, 50–60 Hz			
Maximum Current	110 V / 3 A, 220 V / 1.5 A	110 V / 2 A, 220 V / 1 A	110 V / 4 A, 220 V / 2 A	110 V / 4 A, 220 V / 2 A
Total Available PoE Power Budget*	–	–	270 W	270 W
Power Consumption (Average / Maximum)	52.6 W / 63.1 W	44.8 W / 58.7 W	193.4 W / 337.1 W	193.4 W / 337.1 W
Heat Dissipation	215.3 BTU/h	200.3 BTU/h	1150.2 BTU/h	1150.2 BTU/h
Operating / Storage Temperature	32–104°F (0–40°C) / -31–158°F (-35–70°C)			
Operating Altitude	Up to 7,400 ft (2,250 m)			
Humidity	20–90% non-condensing			
Compliance				
	FCC Part 15 Class A, C-Tick, VCCI, CE, UL/cUL, CB			
Certifications				
	ICSA Labs: Firewall, IPsec, IPS, Antivirus, SSL-VPN			

Note: All performance values are "up to" and vary depending on system configuration. Antivirus performance is measured using 44 Kbyte HTTP files. IPS performance is measured using 1 Mbyte HTTP files. IPsec VPN performance is based on 512 byte UDP packets using AES-256+SHA1. For complete, up-to-date and detailed feature set, please refer to the Administration Handbook and FortiOS Datasheet.

* Maximum loading on each PoE port is 15.4 W (802.3af).

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GENERAC | INDUSTRIAL POWER

SD100

6.7L

Industrial Diesel Generator Set

EPA Certified Stationary Emergency

Standby Power Rating
100 kW 125 kVA 60 Hz

Prime Power Rating*
90 kW 113 kVA 60 Hz

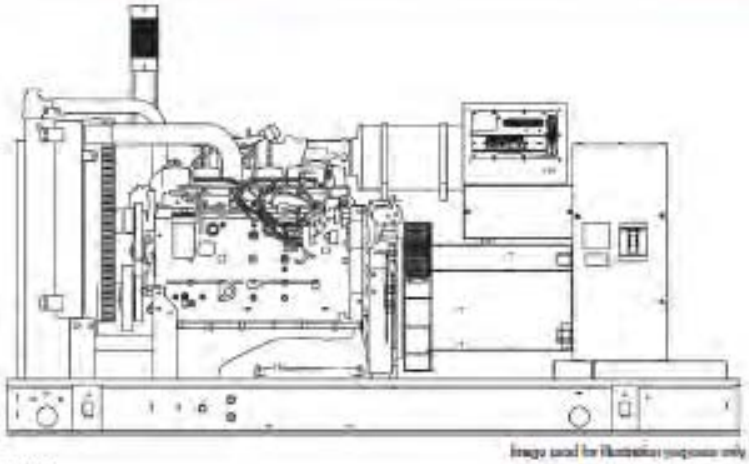


Image used for illustration purposes only

*EPA Certified Prime ratings are not available in the U.S. or its Territories

Codes and Standards

Generac products are designed to the following standards:

UL2200, UL508, UL142, UL498

NFPA70, 99, 110, 37

NEC700, 701, 702, 708

ISO9001, 8528, 3046, 7637, Pluses #2b, 4

NEMA ICS10, MG1, 250, ICS6, AB1

ANSI C62.41

IBC 2009, CBC 2010, IBC 2012, ASCE 7-05, ASCE 7-10, ICC-ES AC-156 (2012)

Powering Ahead

For over 50 years, Generac has led the industry with innovative design and superior manufacturing.

Generac ensures superior quality by designing and manufacturing most of its generator components, including alternators, enclosures and base tanks, control systems and communications software.

Generac's gensets utilize a wide variety of options, configurations and arrangements, allowing us to meet the standby power needs of practically every application.

Generac searched globally to ensure the most reliable engines power our generators. We choose only engines that have already been proven in heavy-duty industrial application under adverse conditions.

Generac is committed to ensuring our customers' service support continues after their generator purchase.

GENERAC | INDUSTRIAL POWER

SD100

Standard Features

ENGINE SYSTEM

General
- Oil Drain Extension
- Air Cleaner
- Fan Guard
- Stainless Steel flexible exhaust connection
- Critical Exhaust Silencer (enclosed only)
- Factory Filled Oil
- Radiator Duct Adapter (open set only)

Fuel System
- Fuel lockoff solenoid
- Primary fuel filter

Cooling System
- Closed Coolant Recovery System
- UV/Ozone resistant hoses
- Factory-Installed Radiator
- Radiator Drain Extension
- 50/50 Ethylene glycol antifreeze
- 120 VAC Coolant Heater

Engine Electrical System
- Battery charging alternator
- Battery cables
- Battery tray
- Solenoid activated starter motor
- Rubber-booted engine electrical connections

ALTERNATOR SYSTEM

- UL2200 GENprotect™
- 12 leads (3-phase, non 600 V)
- Class H insulation material
- Vented rotor
- 2/3 pitch
- Skewed stator
- Auxiliary voltage regulator power winding
- Amortisseur winding
- Brushless Excitation
- Sealed Bearings
- Automated manufacturing (winding, insertion, lacing, varnishing)
- Rotor dynamically spin balanced (get tolerance)
- Full load capacity alternator
- Protective thermal switch

GENERATOR SET

- Internal Genset Vibration Isolation
- Separation of circuits - high/low voltage
- Separation of circuits - multiple breakers
- Silencer Heat Shield
- Wrapped Exhaust Piping
- Silencer housed in discharge hood (enclosed only)
- Standard Factory Testing
- 2 Year Limited Warranty (Standby rated Units)
- 1 Year Limited Warranty (Prime rated units)
- Silencer mounted in the discharge hood (enclosed only)

ENCLOSURE (if selected)

- Rust-proof fasteners with nylon washers to protect finish
- High performance sound-absorbing material
- Gasketed doors
- Stamped air-intake louvers
- Air discharge hoods for radiator-upward pointing
- Stainless steel lift off door hinges
- Stainless steel lockable handles
- Rhino Coat™ - Textured polyester powder coat

TANKS (if selected)

- UL 142
- Double wall
- Vents
- Sloped top
- Sloped bottom
- Factory pressure tested (2 psi)
- Rupture basin alarm
- Fuel level
- Check valve in supply and return lines
- Rhino Coat™ - Textured polyester powder coat
- Stainless hardware

CONTROL SYSTEM



Control Panel
- Digital H Control Panel - Dual 4x20 Display
- Programmable Crank Limiter
- 7-Day Programmable Exerciser
- Special Applications Programmable PLC
- RS-232/485
- All-Phase Sensing DVR
- Full System Status
- Utility Monitoring
- Low Fuel Pressure Indication
- 2-Wire Start Compatible
- Power Output (kW)
- Power Factor
- kW Hours, Total & Last Run
- Real/Reactive/Apparent Power
- All Phase AC Voltage
- All Phase Currents
- Oil Pressure
- Coolant Temperature
- Coolant Level
- Engine Speed
- Battery Voltage
- Frequency
- Date/Time Fault History (Event Log)
- Isochronous Governor Control
- Waterproof/sealed Connectors
- Audible Alarms and Shutdowns
- Not in Auto (Flashing Light)
- Auto/Off/Manual Switch
- E-Stop (Red Mushroom-Type)
- NFPA110 Level I and II (Programmable)
- Customizable Alarms, Warnings, and Events
- Modbus protocol
- Predictive Maintenance algorithm
- Sealed Boards
- Password parameter adjustment protection
- Single point ground
- 15 channel data logging
- 0.2 msec high speed data logging
- Alarm information automatically comes up on the display

Alarms
- Oil Pressure (Pre-programmable Low Pressure Shutdown)
- Coolant Temperature (Pre-programmed High Temp Shutdown)
- Coolant Level (Pre-programmed Low Level Shutdown)
- Low Fuel Pressure Alarm
- Engine Speed (Pre-programmed Over speed Shutdown)
- Battery Voltage Warning
- Alarms & warnings time and date stamped
- Alarms & warnings for transient and steady state conditions
- Snap shots of key operation parameters during alarms & warnings
- Alarms and warnings spelled out (no alarm codes)

SD100

Configurable Options

ENGINE SYSTEM

General
- O Oil Make-Up System
- O Oil Heater
- O Industrial Exhaust Silencer

Fuel System
- O Flexible fuel lines
- O Primary fuel filter

Engine Electrical System
- O 10A UL battery charger
- O 2.5A UL battery charger
- O Battery Warmer

ALTERNATOR SYSTEM

- O Alternator Upsizing
- O Anti-Condensation Heater
- O Tropical coating
- O Permanent Magnet Excitation

CIRCUIT BREAKER OPTIONS

- O Main Line Circuit Breaker
- O 2nd Main Line Circuit Breaker
- O Shunt Trip and Auxiliary Contact
- O Electronic Trip Breakers

GENERATOR SET

- O Gen-Link Communications Software (English Only)
- O IBC Seismic Certification
- O 8 Load Position Load Center
- O 2 Year Extended Warranty
- O 5 Year Warranty
- O 5 Year Extended Warranty

ENCLOSURE

- O Weather Protected
- O Level 1 Sound Attenuation
- O Level 2 Sound Attenuation
- O Steel Enclosure
- O Aluminum Enclosure
- O 150 MPH Wind Kit
- O 12 VDC Enclosure Lighting Kit
- O 120 VAC Enclosure Lighting Kit
- O AC/DC Enclosure Lighting Kit
- O Door Alarm Switch

TANKS (Size on last page)

- O Electrical Fuel Level
- O Mechanical Fuel Level
- O 8" Vent Extension
- O 13" Vent Extension
- O 19" Vent Extension

CONTROL SYSTEM

- O 21-Light Remote Annunciator
- O Remote Relay Panel (8 or 16)
- O Oil Temperature Sender with Indication Alarm
- O Remote E-Stop (Break Glass-Type, Surface Mount)
- O Remote E-Stop (Red Mushroom-Type, Surface Mount)
- O Remote E-Stop (Red Mushroom-Type, Flush Mount)
- O Remote Communication - Modem
- O Remote Communication - Ethernet
- O 10A Run Relay
- O Ground fault indication and protection functions

Engineered Options

ENGINE SYSTEM

- O Coolant heater ball valves
- O Block Heaters
- O Fluid containment pans

CONTROL SYSTEM

- O Spare inputs (x4) / outputs (x4) - H Panel Only
- O Battery Disconnect Switch

ALTERNATOR SYSTEM

- O 3rd Breaker System

GENERATOR SET

- O Special Testing

ENCLOSURE

- O Motorized Dampers
- O Door switched for intrusion alert
- O Enclosure ambient heaters

TANKS

- O Overfill protection valve
- O UL2085 Tank
- O ULC S-601 Tank
- O Stainless Steel Tank
- O Special Fuel Tanks (MIDEQ and FL DEP/DERM, etc.)
- O Vent Extensions

Rating Definitions

Standby – Applicable for a varying emergency load for the duration of a utility power outage with no overload capability.
Prime – Applicable for supplying power to a varying load in lieu of utility for an unlimited amount of running time. A 10% overload capacity is available for 1 out of every 12 hours. The Prime Power option is only available on International applications.

Power ratings in accordance with ISO 8528-1, Second Edition dated 2005-06-01, definitions for Prime Power (PRP) and Emergency Standby Power (ESP).

GENERAC | INDUSTRIAL POWER

SD100 application and engineering data

ENGINE SPECIFICATIONS

General

Make	Generac
EPA Emissions Compliance	Stationary Emergency
EPA Emissions Reference	See Emission Data Sheet
Cylinder #	6
Type	In-Line
Displacement - L (cu in)	6.7 (408.86)
Bore - mm (in)	104 (4.09)
Stroke - mm (in)	128 (5.2)
Compression Ratio	16.5:1
Intake Air Method	Turbocharged/Aftercooled
Cylinder Head Type	2 Valve
Piston Type	Alloy Aluminum
Crankshaft Type	Forged Steel

Engine Governing

Governor	Electronic Isochronous
Frequency Regulation (Steady State)	± 0.25%

Lubrication System

Oil Pump Type	Gear
Oil Filter Type	Full Flow
Crankcase Capacity - L (qts)	17 (18)

Cooling System

Cooling System Type	Closed Recovery
Water Pump Flow	Belt Driven Centrifugal
Fan Type	Pusher
Fan Speed (rpm)	2538 rpm
Fan Diameter mm (in)	599 (23.6)
Coolant Heater Wattage	1500
Coolant Heater Standard Voltage	120 V /240 V

Fuel System

Fuel Type	Ultra Low Sulfur Diesel Fuel
Fuel Specifications	ASTM
Fuel Filtering (microns)	5
Fuel Inject Pump	Stanadyne
Fuel Pump Type	Engine Driven Gear
Injector Type	Mechanical
Fuel Supply Line - mm (in)	12.7 (0.5) NPT
Fuel Return Line - mm (in)	12.7 (0.5) NPT

Engine Electrical System

System Voltage	12 VDC
Battery Charging Alternator	Std
Battery Size	See Battery Index 0161970SBY
Battery Voltage	12 VDC
Ground Polarity	Negative

ALTERNATOR SPECIFICATIONS

Standard Model	390 mm
Poles	4
Field Type	Revolving
Insulation Class - Rotor	H
Insulation Class - Stator	H
Total Harmonic Distortion	< 3%
Telephone Interference Factor (TIF)	< 50
Standard Excitation	Synchronous Brushless
Bearings	Single Seated Cartridge
Coupling	Direct, Flexible Disc
Load Capacity - Standby	100%
Prototype Short Circuit Test	Yes

Voltage Regulator Type	Digital
Number of Sensed Phases	All
Regulation Accuracy (Steady State)	± 0.25%

SD100 operating data

POWER RATINGS

	Standby	
Single-Phase 120/240 VAC @1.0pf	100 kW	Amps: 417
Three-Phase 120/208 VAC @0.8pf	100 kW	Amps: 347
Three-Phase 120/240 VAC @0.8pf	100 kW	Amps: 301
Three-Phase 277/480 VAC @0.8pf	100 kW	Amps: 150
Three-Phase 346/600 VAC @0.8pf	100 kW	Amps: 120

STARTING CAPABILITIES (sKVA)

sKVA vs. Voltage Dip

		480 VAC						208/240 VAC					
Alternator	kW	10%	15%	20%	25%	30%	35%	10%	15%	20%	25%	30%	35%
Standard	100	79	118	157	197	236	200	59	89	118	148	177	206
Upsize 1	130	116	174	323	290	348	406	87	131	174	218	261	305
Upsize 2	150	133	199	265	332	398	464	100	149	199	249	299	348
Upsize 3	200	187	280	373	467	560	653	140	210	280	350	420	490

FUEL CONSUMPTION RATES*

Fuel Pump Lift - ft (m)
3 (1)

Total Fuel Pump Flow (Combustion + Return)
29.1 gph

Diesel - gph (lph)

Percent Load	gph (lph)
25%	2.2 (8.3)
50%	4.2 (15.9)
75%	5.9 (22.3)
100%	7.3 (27.6)

* Fuel supply installation must accommodate fuel consumption rates at 100% load.

COOLING

		Standby
Coolant Flow per Minute	gpm (lpm)	44.6 (168.8)
Coolant System Capacity	gal (L)	5.65 (21.4)
Heat Rejection to Coolant	BTU/hr	269,130
Inlet Air	cfm (m3/hr)	6360 (180)
Max. Operating Radiator Air Temp	F° (C°)	122 (50)
Max. Ambient Temperature (before derate)	F° (C°)	110 (43.3)
Maximum Radiator Backpressure	in H_2O	0.5

COMBUSTION AIR REQUIREMENTS

		Standby
Flow at Rated Power	cfm (m3/min)	325 (9.2)

ENGINE

		Standby
Rated Engine Speed	rpm	1800
Horsepower at Rated kW**	hp	152
Piston Speed	ft/min (m/min)	1559 (475)
BMEP	psi	165

** Refer to "Emissions Data Sheet" for maximum bHP for EPA and SCAQMD permitting purposes.

EXHAUST

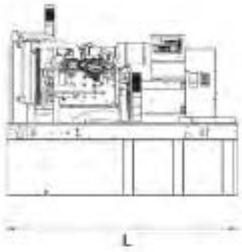
		Standby
Exhaust Flow (Rated Output)	cfm (m³/min)	885 (25)
Max. Backpressure (Post Silencer)	inHg (Kpa)	1.5 (5.1)
Exhaust Temp (Rated Output)	°F (°C)	885 (474)
Exhaust Outlet Size (Open Set)	mm (in)	101.6 (4)

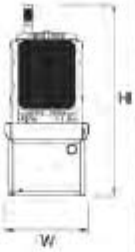
Deration – Operational characteristics consider maximum ambient conditions. Derate factors may apply under atypical site conditions. Please consult a Generac Power Systems Industrial Dealer for additional details. All performance ratings in accordance with ISO3046, BS5514, ISO8528 and DIN6271 standards.

GENERAC | INDUSTRIAL POWER

SD100

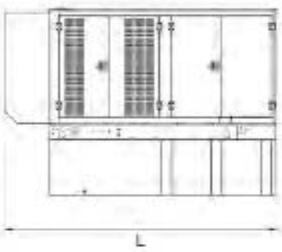
dimensions and weights*

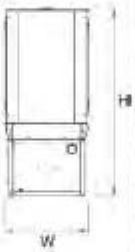




OPEN SET

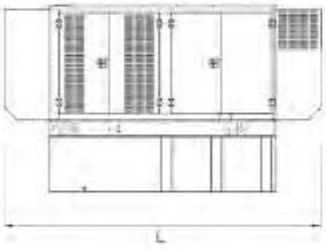
RUN TIME HOURS	USABLE CAPACITY GAL (L)	L x W x H in (mm)	WT lbs (kg) - Tank & Open Set
NO TANK	-	110 (2794) x 40 (1016) x 65 (1651)	3104 (1408)
12	90 (340.7)	110 (2794) x 40 (1016) x 77 (1955.6)	3813 (1730)
30	220 (832.8)	110 (2794) x 40 (1016) x 89 (2260.6)	4146 (1881)
48	350 (1324.9)	110 (2794) x 40 (1016) x 101 (2565.4)	4488 (2036)
70	510 (1930.6)	110 (2794) x 40 (1016) x 105 (2667)	4469 (2029)
81	589 (2229.6)	128 (3251.2) x 49 (1244.6) x 107 (2717.8)	4948 (2244)
95	693 (2623.3)	136 (3454.4) x 53 (1346.2) x 107 (2717.8)	4667 (2117)

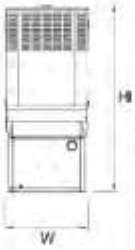




STANDARD ENCLOSURE

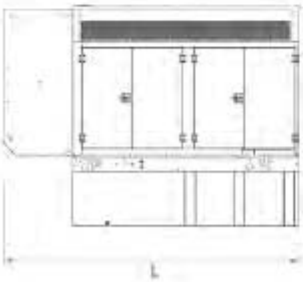
RUN TIME HOURS	USABLE CAPACITY GAL (L)	L x W x H in (mm)	WT lbs (kg) - Enclosure Only	
			Steel	Aluminum
NO TANK	-	133 (3378) x 40 (1016) x 64 (1625.6)	500 (227)	165 (75)
12	90 (340.7)	133 (3378) x 40 (1016) x 77 (1956)		
30	220 (832.8)	133 (3378) x 40 (1016) x 89 (2261)		
48	350 (1324.9)	133 (3378) x 40 (1016) x 101 (2565)		
70	510 (1930.6)	133 (3378) x 47 (1194) x 105 (2667)		
81	589 (2229.6)	133 (3378) x 49 (1125) x 107 (2718)		
95	693 (2623.3)	133 (3378) x 53 (1346) x 107 (2718)		

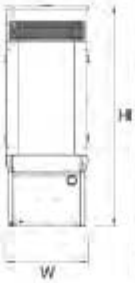




LEVEL 1 ACOUSTIC ENCLOSURE

RUN TIME HOURS	USABLE CAPACITY GAL (L)	L x W x H in (mm)	WT lbs (kg) - Enclosure Only	
			Steel	Aluminum
NO TANK	-	154 (3912) x 40 (1016) x 64 (1626)	750 (340)	250 (112)
12	90 (340.7)	154 (3912) x 40 (1016) x 77 (1956)		
30	220 (832.8)	154 (3912) x 40 (1016) x 89 (2261)		
48	350 (1324.9)	154 (3912) x 40 (1016) x 101 (2565)		
70	510 (1930.6)	154 (3912) x 47 (1194) x 105 (2667)		
81	589 (2229.6)	154 (3912) x 49 (1245) x 107 (2718)		
95	693 (2623.3)	154 (3912) x 53 (1346) x 107 (2718)		





LEVEL 2 ACOUSTIC ENCLOSURE

RUN TIME HOURS	USABLE CAPACITY GAL (L)	L x W x H in (mm)	WT lbs (kg) - Enclosure Only	
			Steel	Aluminum
NO TANK	-	145 (3683) x 40 (1016) x 81 (2057)	1000 (454)	330 (150)
12	90 (340.7)	145 (3683) x 40 (1016) x 84 (2134)		
30	220 (832.8)	145 (3683) x 40 (1016) x 106 (2692)		
48	350 (1324.9)	145 (3683) x 40 (1016) x 118 (2997)		
70	510 (1930.6)	145 (3683) x 47 (1194) x 122 (3099)		
81	589 (2229.6)	145 (3683) x 49 (1245) x 124 (3150)		
95	693 (2623.3)	145 (3683) x 53 (1346) x 124 (3150)		

*All measurements are approximate and for estimation purposes only. Sound dBA can be found on the sound data sheet. Enclosure Only weight is added to Tank & Open Set weight to determine total weight.

Specification characteristics may change without notice. Dimensions and weights are for preliminary purposes only. Please consult a Generac Power Systems Industrial Dealer for detailed installation drawings.

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GENERAC | INDUSTRIAL POWER

SD080

4.5L

Industrial Diesel Generator Set

EPA Certified Stationary Emergency

Standby Power Rating
80 kW 100 kVA 60 Hz

Prime Power Rating*
72 kW 90 kVA 60 Hz

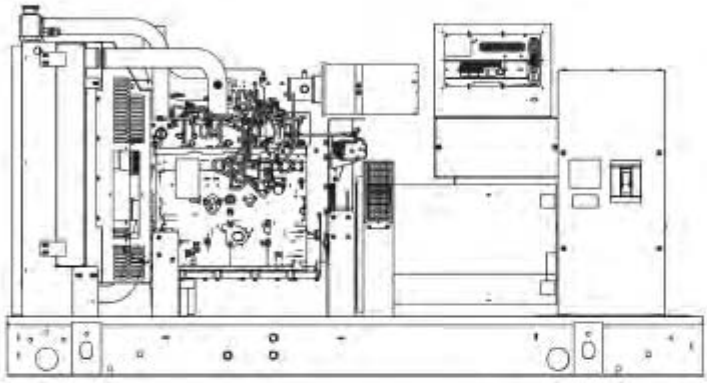


Image used for illustration purposes only

*EPA Certified Prime ratings are not available in the U.S. or its Territories

Codes and Standards

Generac products are designed to the following standards:

UL2200, UL508, UL142, UL498

NFPA70, 99, 110, 37

NEC700, 701, 702, 708

ISO9001, 8528, 3046, 7637, Pluses #2b, 4

NEMA ICS10, MG1, 250, ICS6, AB1

ANSI C62.41

American National Standards Institute

IBC 2009, CBC 2010, IBC 2012, ASCE 7-05, ASCE 7-10, ICC-ES AC-156 (2012)

Powering Ahead

For over 50 years, Generac has led the industry with innovative design and superior manufacturing.

Generac ensures superior quality by designing and manufacturing most of its generator components, including alternators, enclosures and base tanks, control systems and communications software.

Generac's gensets utilize a wide variety of options, configurations and arrangements, allowing us to meet the standby power needs of practically every application.

Generac searched globally to ensure the most reliable engines power our generators. We choose only engines that have already been proven in heavy-duty industrial application under adverse conditions.

Generac is committed to ensuring our customers' service support continues after their generator purchase.

GENERAC | INDUSTRIAL POWER

SD080

Standard Features

ENGINE SYSTEM

General
- Oil Drain Extension
- Air Cleaner
- Fan Guard
- Stainless Steel flexible exhaust connection
- Critical Exhaust Silencer (enclosed only)
- Factory Filled Oil
- Radiator Duct Adapter (open set only)

Fuel System
- Fuel lockoff solenoid
- Primary fuel filter

Cooling System
- Closed Coolant Recovery System
- UV/Ozone resistant hoses
- Factory-Installed Radiator
- Radiator Drain Extension
- 50/50 Ethylene glycol antifreeze
- 120 VAC Coolant Heater

Engine Electrical System
- Battery charging alternator
- Battery cables
- Battery tray
- Solenoid activated starter motor
- Rubber-booted engine electrical connections

ALTERNATOR SYSTEM

- UL2200 GENprotect™
- 12 leads (3-phase, non 600 V)
- Class H insulation material
- Vented rotor
- 2/3 pitch
- Skewed stator
- Auxiliary voltage regulator power winding
- Amortisseur winding
- Brushless Excitation
- Sealed Bearings
- Automated manufacturing (winding, insertion, lacing, varnishing)
- Rotor dynamically spin balanced (get tolerance)
- Full load capacity alternator
- Protective thermal switch

GENERATOR SET

- Internal Genset Vibration Isolation
- Separation of circuits - high/low voltage
- Separation of circuits - multiple breakers
- Silencer Heat Shield
- Wrapped Exhaust Piping
- Silencer housed in discharge hood (enclosed only)
- Standard Factory Testing
- 2 Year Limited Warranty (Standby rated Units)
- 1 Year Limited Warranty (Prime rated units)
- Silencer mounted in the discharge hood (enclosed only)

ENCLOSURE (if selected)

- Rust-proof fasteners with nylon washers to protect finish
- High performance sound-absorbing material
- Gasketed doors
- Stamped air-intake louvers
- Air discharge hoods for radiator-upward pointing
- Stainless steel lift off door hinges
- Stainless steel lockable handles
- Rhino Coat™ - Textured polyester powder coat

TANKS (if selected)

- UL 142
- Double wall
- Vents
- Sloped top
- Sloped bottom
- Factory pressure tested (2 psi)
- Rupture basin alarm
- Fuel level
- Check valve in supply and return lines
- Rhino Coat™ - Textured polyester powder coat
- Stainless hardware

CONTROL SYSTEM



Control Panel
- Digital H Control Panel - Dual 4x20 Display
- Programmable Crank Limiter
- 7-Day Programmable Exerciser
- Special Applications Programmable PLC
- RS-232/485
- All-Phase Sensing DVR
- Full System Status
- Utility Monitoring
- Low Fuel Pressure Indication
- 2-Wire Start Compatible
- Power Output (kW)
- Power Factor
- kW Hours, Total & Last Run
- Real/Reactive/Apparent Power
- All Phase AC Voltage
- All Phase Currents
- Oil Pressure
- Coolant Temperature
- Coolant Level
- Engine Speed
- Battery Voltage
- Frequency
- Date/Time Fault History (Event Log)
- Isochronous Governor Control
- Waterproof/sealed Connectors
- Audible Alarms and Shutdowns
- Not in Auto (Flashing Light)
- Auto/Off/Manual Switch
- E-Stop (Red Mushroom-Type)
- NFPA110 Level I and II (Programmable)
- Customizable Alarms, Warnings, and Events
- Modbus protocol
- Predictive Maintenance algorithm
- Sealed Boards
- Password parameter adjustment protection
- Single point ground
- 15 channel data logging
- 0.2 msec high speed data logging
- Alarm information automatically comes up on the display

Alarms
- Oil Pressure (Pre-programmable Low Pressure Shutdown)
- Coolant Temperature (Pre-programmed High Temp Shutdown)
- Coolant Level (Pre-programmed Low Level Shutdown)
- Low Fuel Pressure Alarm
- Engine Speed (Pre-programmed Over speed Shutdown)
- Battery Voltage Warning
- Alarms & warnings time and date stamped
- Alarms & warnings for transient and steady state conditions
- Snap shots of key operation parameters during alarms & warnings
- Alarms and warnings spelled out (no alarm codes)

SD080

Configurable Options

ENGINE SYSTEM

General
- O Oil Make-Up System
- O Oil Heater
- O Industrial Exhaust Silencer

Fuel System
- O Flexible fuel lines
- O Primary fuel filter

Engine Electrical System
- O 10A UL battery charger
- O 2.5A UL battery charger
- O Battery Warmer

ALTERNATOR SYSTEM

- O Alternator Upsizing
- O Anti-Condensation Heater
- O Tropical coating
- O Permanent Magnet Excitation

CIRCUIT BREAKER OPTIONS

- O Main Line Circuit Breaker
- O 2nd Main Line Circuit Breaker
- O Shunt Trip and Auxiliary Contact
- O Electronic Trip Breakers

GENERATOR SET

- O Gen-Link Communications Software (English Only)
- O IBC Seismic Certification
- O 8 Load Position Load Center
- O 2 Year Extended Warranty
- O 5 Year Warranty
- O 5 Year Extended Warranty

ENCLOSURE

- O Weather Protected
- O Level 1 Sound Attenuation
- O Level 2 Sound Attenuation
- O Steel Enclosure
- O Aluminum Enclosure
- O 150 MPH Wind Kit
- O 12 VDC Enclosure Lighting Kit
- O 120 VAC Enclosure Lighting Kit
- O AC/DC Enclosure Lighting Kit
- O Door Alarm Switch

TANKS (Size on last page)

- O Electrical Fuel Level
- O Mechanical Fuel Level
- O 8" Vent Extension
- O 13" Vent Extension
- O 19" Vent Extension

CONTROL SYSTEM

- O 21-Light Remote Annunciator
- O Remote Relay Panel (8 or 16)
- O Oil Temperature Sender with Indication Alarm
- O Remote E-Stop (Break Glass-Type, Surface Mount)
- O Remote E-Stop (Red Mushroom-Type, Surface Mount)
- O Remote E-Stop (Red Mushroom-Type, Flush Mount)
- O Remote Communication - Modem
- O Remote Communication - Ethernet
- O 10A Run Relay
- O Ground fault indication and protection functions

Engineered Options

ENGINE SYSTEM

- O Coolant heater ball valves
- O Block Heaters
- O Fluid containment pans

CONTROL SYSTEM

- O Spare inputs (x4) / outputs (x4) - H Panel Only
- O Battery Disconnect Switch

ALTERNATOR SYSTEM

- O 3rd Breaker System

GENERATOR SET

- O Special Testing

ENCLOSURE

- O Motorized Dampers
- O Door switched for intrusion alert
- O Enclosure ambient heaters

TANKS

- O Overfill protection valve
- O UL2085 Tank
- O ULC S-601 Tank
- O Stainless Steel Tank
- O Special Fuel Tanks (MDEQ and FL DEP/DERM, etc.)
- O Vent Extensions

Rating Definitions

Standby – Applicable for a varying emergency load for the duration of a utility power outage with no overload capability.
Prime – Applicable for supplying power to a varying load in lieu of utility for an unlimited amount of running time. A 10% overload capacity is available for 1 out of every 12 hours. The Prime Power option is only available on International applications.

Power ratings in accordance with ISO 8528-1, Second Edition dated 2005-06-01, definitions for Prime Power (PRP) and Emergency Standby Power (ESP).

GENERAC | INDUSTRIAL POWER

SD080 application and engineering data

ENGINE SPECIFICATIONS

General

Make	Generac
EPA Emissions Compliance	Stationary Emergency
EPA Emissions Reference	See Emissions Data Sheet
Cylinder #	4
Type	In-Line
Displacement - L (cu in)	4.5 (274.6)
Bore - mm (in)	105 (4.1)
Stroke - mm (in)	132 (5.2)
Compression Ratio	17.5:1
Intake Air Method	Turbocharged
Cylinder Head Type	2 Valve
Piston Type	Aluminum
Crankshaft Type	Forged Steel

Engine Governing

Governor	Electronic Isochronous
Frequency Regulation (Steady State)	± 0.25%

Lubrication System

Oil Pump Type	Gear
Oil Filter Type	Full Flow
Crankcase Capacity - L (qts)	13.6 (14.4)

Cooling System

Cooling System Type	Closed
Water Pump Flow	Belt Driven Centrifugal
Fan Type	Pusher
Fan Speed (rpm)	2538
Fan Diameter mm (in)	660.4 (26)
Coolant Heater Wattage	1500
Coolant Heater Standard Voltage	120 V /240 V

Fuel System

Fuel Type	Ultra Low Sulfur Diesel Fuel
Fuel Specifications	ASTM
Fuel Filtering (microns)	5
Fuel Inject Pump	Stanadyne
Fuel Pump Type	Engine Driven Gear
Injector Type	Mechanical
Fuel Supply Line - mm (in)	12.7 (0.5) NPT
Fuel Return Line - mm (in)	12.7 (0.5) NPT

Engine Electrical System

System Voltage	12 VDC
Battery Charging Alternator	20 A
Battery Size	See Battery Index 0161970SBY
Battery Voltage	12 VDC
Ground Polarity	Negative

ALTERNATOR SPECIFICATIONS

Standard Model	390
Poles	4
Field Type	Revolving
Insulation Class - Rotor	H
Insulation Class - Stator	H
Total Harmonic Distortion	< 3%
Telephone Interference Factor (TIF)	< 50
Standard Excitation	Synchronous Brushless
Bearings	One-Pre Lubed & Sealed
Coupling	Direct, Flexible Disc
Load Capacity - Standby	100%
Prototype Short Circuit Test	Yes

Voltage Regulator Type	Digital
Number of Sensed Phases	3
Regulation Accuracy (Steady State)	± 0.25%

SD080 operating data

POWER RATINGS

	Standby	
Single-Phase 120/240 VAC @1.0pf	80 kW	Amps: 333
Three-Phase 120/208 VAC @0.8pf	80 kW	Amps: 378
Three-Phase 120/240 VAC @0.8pf	80 kW	Amps: 241
Three-Phase 277/480 VAC @0.8pf	80 kW	Amps: 120
Three-Phase 346/600 VAC @0.8pf	80 kW	Amps: 96

STARTING CAPABILITIES (sKVA)

sKVA vs. Voltage Dip

		480 VAC						208/240 VAC					
Alternator	kW	10%	15%	20%	25%	30%	35%	10%	15%	20%	25%	30%	35%
Standard	80	59	88	117	147	176	205	44	66	88	110	132	154
Upsize 1	100	79	118	157	197	236	200	59	89	118	148	177	206
Upsize 2	125	116	174	232	293	348	406	87	131	174	218	261	305

FUEL CONSUMPTION RATES*

Fuel Pump Lift - ft (m)
3 (1)

Total Fuel Pump Flow (Combustion + Return)
13.6 gph

Diesel - gph (lph)

Percent Load	gph (lph)
25%	2.1 (7.9)
50%	3.7 (14.0)
75%	5.2 (19.7)
100%	6.3 (23.8)

* Fuel supply installation must accommodate fuel consumption rates at 100% load.

COOLING

		Standby
Coolant Flow per Minute	gpm (lpm)	32.7 (123.8)
Coolant System Capacity	gal (L)	4.5 (17.44)
Heat Rejection to Coolant	BTU/hr	232,270
Inlet Air	cfm (m3/hr)	6360 (180)
Max. Operating Radiator Air Temp	F° (C°)	122 (50)
Max. Ambient Temperature (before derate)	F° (C°)	104 (40)
Maximum Radiator Backpressure	in H_2O	0.5

COMBUSTION AIR REQUIREMENTS

		Standby
Flow at Rated Power	cfm (m3/min)	306 (8.67)

ENGINE

		Standby
Rated Engine Speed	rpm	1800
Horsepower at Rated kW**	hp	131
Piston Speed	ft/min (m/min)	1559 (475)
BMEP	psi	210

** Refer to "Emissions Data Sheet" for maximum bHP for EPA and SCAQMD permitting purposes.

EXHAUST

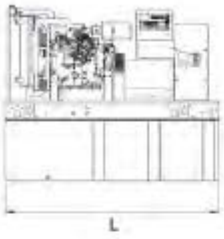
		Standby
Exhaust Flow (Rated Output)	cfm (m³/min)	790 (22.4)
Max. Backpressure (Post Silencer)	inHg (Kpa)	1.5 (5.1)
Exhaust Temp (Rated Output)	°F (°C)	887 (475)
Exhaust Outlet Size (Open Set)	mm (in)	76.2 (3.0)

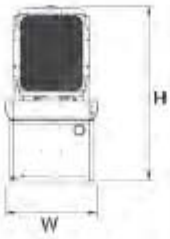
Deration – Operational characteristics consider maximum ambient conditions. Derate factors may apply under atypical site conditions. Please consult a Generac Power Systems Industrial Dealer for additional details. All performance ratings in accordance with ISO3046, BS5514, ISO8528 and DIN6271 standards.

GENERAC | INDUSTRIAL POWER

SD080

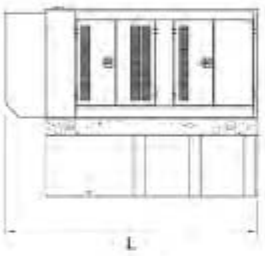
dimensions and weights*





OPEN SET

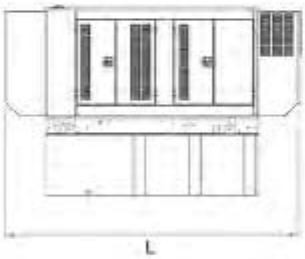
RUN TIME HOURS	USABLE CAPACITY GAL (L)	L x W x H in (mm)	WT lbs (kg) - Tank & Open Set
NO TANK	-	93 (2362.2) x 40 (1016) x 49 (1244.6)	2425 (1100)
13	79 (299)	93 (2362.2) x 40 (1016) x 62 (1574.8)	2947 (1201)
30	189 (715.4)	93 (2362.2) x 40 (1016) x 74 (1879.6)	3183 (1444)
48	300 (1135.6)	93 (2362.2) x 40 (1016) x 86 (2184.4)	3407 (1545)
56	350 (1325)	110 (2794) x 40 (1016) x 86 (2184.4)	NA
81	510 (1930.5)	117 (2971.8) x 47 (1193.8) x 86 (2184.4)	3790 (1719)
93	589 (2229.6)	128 (3251.2) x 49 (1244.6) x 86 (2184.4)	4269 (1936)





STANDARD ENCLOSURE

RUN TIME HOURS	USABLE CAPACITY GAL (L)	L x W x H in (mm)	WT lbs (kg) - Enclosure Only	
			Steel	Aluminum
NO TANK	-	112 (2844.8) x 41 (1041.4) x 56 (1422.4)	425 (193)	155 (70)
13	79 (299)	112 (2844.8) x 41 (1041.4) x 69 (1752.6)		
30	189 (715.4)	112 (2844.8) x 41 (1041.4)x 81 (2057.4)		
48	300 (1135.6)	112 (2844.8) x 41 (1041.4) x 93 (2362.2)		
56	350 (1325)	112 (2844.8) x 41 (1041.4) x 93 (2362.2)		
81	510 (1930.5)	117 (2971.8) x 47 (1193.8) x 93 (2362.2)		
93	589 (2229.6)	128 (3251.2) x 49 (1244.6) x 93 (2362.2)		

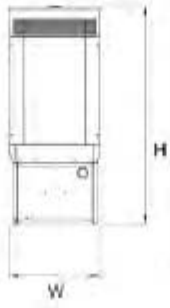




LEVEL 1 ACOUSTIC ENCLOSURE

RUN TIME HOURS	USABLE CAPACITY GAL (L)	L x W x H in (mm)	WT lbs (kg) - Enclosure Only	
			Steel	Aluminum
NO TANK	-	130 (3302) x 41 (1041.4) x 56 (1422.4)	450 (204)	285 (129)
13	79 (299)	130 (3302) x 41 (1041.4) x 69 (1752.6)		
30	189 (715.4)	130 (3302) x 41 (1041.4) x 81 (2057.4)		
48	300 (1135.6)	130 (3302) x 41 (1041.4) x 93 (2362.2)		
56	350 (1325)	130 (3302) x 41 (1041.4) x 93 (2362.2)		
81	510 (1930.5)	130 (3302) x 47 (1193.8) x 93 (2362.2)		
93	589 (2229.6)	130 (3302) x 49 (1244.6) x 93 (2362.2)		





LEVEL 2 ACOUSTIC ENCLOSURE

RUN TIME HOURS	USABLE CAPACITY GAL (L)	L x W x H in (mm)	WT lbs (kg) - Enclosure Only	
			Steel	Aluminum
NO TANK	-	112 (2844.8) x 41 (1041.4) x 69 (1752.6)	625 (284)	355 (160)
13	79 (299)	112 (2844.8) x 41 (1041.4) x 82 (2082.8)		
30	189 (715.4)	112 (2844.8) x 41 (1041.4) x 94 (2387.6)		
48	300 (1135.6)	112 (2844.8) x 41 (1041.4) x 106 (2692.4)		
56	350 (1325)	112 (2844.8) x 41 (1041.4) x 106 (2692.4)		
81	510 (1930.5)	117 (2971.8) x 47 (1193.8) x 106 (2692.4)		
93	589 (2229.6)	128 (3251.2) x 49 (1244.6) x 106 (2692.4)		

*All measurements are approximate and for estimation purposes only. Sound dBA can be found on the sound data sheet. Enclosure Only weight is added to Tank & Open Set weight to determine total weight.

Specification characteristics may change without notice. Dimensions and weights are for preliminary purposes only. Please consult a Generac Power Systems Industrial Dealer for detailed installation drawings.

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Data sheet

HP 2620 Switch Series



Product overview

The HP 2620 Switch Series consists of five switches with 10/100 connectivity. The HP 2620-24 Switch has a fan-less design for quiet operation, making it suitable for deployments in open spaces. The models 2620-24-PPoE+, 2620-24-PoE+ models, and 2620-48-PoE+ are IEEE 802.3af- and IEEE 802.3at-compliant switches that provide up to 30 W per powered port. The 2620–48 model has variable-speed fans for quiet operation.

All 2620 switches include two 10/100/1000BASE-T ports and two SFP slots for Gigabit Ethernet uplink connectivity. An optional redundant external power supply is also available to provide redundancy in the event of a power supply failure.

With IPv4/IPv6 static and RIP routing, robust security and management features, as well as free lifetime warranty and software updates, the 2620 Switch Series is a cost-effective solution for those building converged enterprise-edge networks.

A summary of the highlights of the 2620 Switch Series:

- Cost-effective access layer switches
- Lite L3 IPv4/IPv6 static and RIP routing
- 30 W PoE+ support on PoE models
- Gigabit fiber uplinks
- Enterprise-class features

Features and benefits

Quality of service (QoS)

- **L4 prioritization**
  Enables prioritization based on TCP/UDP port numbers
- **Traffic prioritization (IEEE 802.1p)**
  Allows real-time traffic classification into eight priority levels that are mapped to eight queues
- **Class of service (CoS)**
  Sets the IEEE 802.1p priority tag based on the IP address, IP type of service (ToS), L3 protocol, TCP/UDP port number, source port, and DiffServ
- **Rate limiting**
  Establishes per-port ingress-enforced maximums and per-port, per-queue minimums

Connectivity

- **Auto-MDIX**
  Provides automatic adjustments for straight-through or crossover cables on all 10/100 and 10/100/1000 ports
- **IPv6**
  - **IPv6 host**
    Allows the switches to be managed and deployed at the edge of an IPv6 network
  - **Dual stack (IPv4/IPv6)**
    Provides a transition mechanism from IPv4 to IPv6; and supports connectivity for both protocols
  - **MLD snooping**
    Forwards IPv6 multicast traffic to the appropriate interface; and helps prevent IPv6 multicast traffic from flooding the network
- **IEEE 802.3af power over Ethernet (PoE)**
  Provides up to 15.4 W per port to IEEE 802.3af-compliant PoE-powered devices such as IP phones, wireless access points, and security cameras
- **IEEE 802.3at PoE+**
  Provides up to 30 W per port to IEEE 802.3 for PoE-/PoE+-powered devices such as video IP phones, IEEE 802.11n wireless access points, and advanced pan/tilt/zoom security cameras
- **Pre-standard PoE support**
  Detects and provides power to pre-standard PoE devices (refer to the list of supported devices in the product FAQs, which can be accessed at hp.com/networking/support)
- **Single-IP-address management**
  Provides single-IP-address management for a virtual stack of up to 16 switches

Resiliency and high availability

- **External redundant power supply**
  Provides high reliability
- **IEEE 802.3ad link-aggregation-control protocol (LACP) and HP port trunking**
  Support up to 24 trunks, each with up to 8 links (ports) per trunk
- **Multiple spanning tree protocol (STP) and IEEE 802.1s**
  Offers high link availability in multiple VLAN environments by allowing multiple spanning trees; and provides legacy support for IEEE 802.1d and IEEE 802.1w
- **NEW SmartLink**
  Provides easy-to-configure link redundancy of active and standby links

Management

- **Dual flash images**
  Provides independent primary and secondary operating system files for backup while upgrading
- **Friendly port names**
  Allows assignment of descriptive names to ports
- **Multiple configuration files**
  Are easily stored with a flash image
- **Port mirroring**
  Enables traffic on a port to be simultaneously sent to a network analyzer for monitoring
- **sFlow (RFC 3176)**
  Delivers wire-speed traffic accounting and monitoring, configured by the SNMP and CLI with three terminal encrypted receivers
- **Remote monitoring (RMON)**
  Provides advanced monitoring and reporting capabilities for statistics, history, alarms, and events
- **Find, fix, and inform**
  Finds and fixes common network problems automatically, and then informs the administrator
- **NEW Comware CLI**
  - **Comware-compatible CLI**
    Bridges the experience of HP Comware CLI users who use the HP ProVision software CLI
  - **Display and fundamental Comware CLI commands**
    Are embedded in the switch CLI as native commands; display output is formatted as on Comware-based switches and fundamental commands provide a Comware-familiar initial switch setup
  - **Configuration Comware CLI commands**
    Elicit CLI help to formulate the correct ProVision software CLI command

L2 switching

- **VLANs**
  Provide support for 512 VLANs and 4,094 VLAN IDs
- **Jumbo packet support**
  Improves the performance of large data transfers; and supports frame sizes up to 9220 bytes
- **IEEE 802.1v protocol VLANs**
  Isolate select non-IPv4 protocols automatically into their own VLANs
- **NEW Per-VLAN spanning tree plus (PVST+)**
  Allows each VLAN to build a separate spanning tree, improving link bandwidth usage in network environments with multiple VLANs

L3 routing

- **Static IP routing**
  Provides manually configured routing; and includes the ECMP capability
- **Routing information protocol (RIP)**
  Provides RIPv1 and RIPv2 routing

Security

- **Access control lists (ACLs)**
  Provide IP L3 filtering, based on the source/destination IP address/subnet and source/destination TCP/UDP port number
- **Source-port filtering**
  Allows only specified ports to communicate with each other
- **RADIUS/TACACS+**
  Eases switch management security administration by using a password authentication server
- **Secure shell**
  Encrypts all transmitted data for secure remote CLI access over IP networks

- **Secure sockets layer (SSL)**
  Encrypts all HTTP traffic, enabling secure access to the browser-based management GUI in the switch
- **Port security**
  Allows access only to specified MAC addresses, which can be learned or specified by the administrator
- **MAC address lockout**
  Helps prevent certain configured MAC addresses from connecting to the network
- **Secure FTP**
  Allows secure file transfer to and from the switch; and protects against unwanted file downloads or unauthorized copying of a switch configuration file
- **Custom banner**
  Displays the security policy when users log in to the switch
- **Identity-driven ACL**
  Enables implementation of a highly granular and flexible access security policy and VLAN assignment—specific to each authenticated network user
- **STP BPDU port protection**
  Blocks bridge protocol data units (BPDUs) on ports that do not require BPDUs, mitigating forged BPDU attacks
- **STP root guard**
  Protects the root bridge from malicious attacks or configuration mistakes
- **DHCP protection**
  Blocks DHCP packets from unauthorized DHCP servers, mitigating denial-of-service attacks
- **Dynamic ARP protection**
  Blocks ARP broadcasts from unauthorized hosts, helping prevent eavesdropping or theft of network data
- **Multiple user authentication methods**
  - **IEEE 802.1X**
    Uses an IEEE 802.1X supplicant on the client, in conjunction with a RADIUS server, to authenticate in accordance with industry standards
  - **Web-based authentication**
    Provides a browser-based environment, similar to IEEE 802.1X, to authenticate clients that do not support the IEEE 802.1X supplicant
  - **MAC-based authentication**
    Authenticates the client with the RADIUS server, based on the client's MAC address
- **Authentication flexibility**
  - **Multiple IEEE 802.1X users per port**
    Enables authentication of multiple IEEE 802.1X users per port; and helps prevent a user from "piggybacking" on another user's IEEE 802.1X authentication
  - **Concurrent IEEE 802.1X, Web, and MAC authentication schemes per port**
    Allows a switch port to accept up to 32 sessions of IEEE 802.1X, Web, and MAC authentications
- **Port mirroring for network threats**
  Provides sampled port traffic, using sFlow technology, to the HP Network Immunity Manager application for network-behavior-anomaly-detection analysis—to detect and mitigate threats at the ports where the threats originate
- **Per-port broadcast throttling**
  Selectively configures broadcast control on heavy traffic port uplinks

Convergence

- **IP multicast snooping (data-driven IGMP)**
  Mitigates flooding of IP multicast traffic automatically
- **Media endpoint discovery (MED) enabled by the link-layer discovery protocol (LLDP)**
  Defines a standard extension of LLDP that stores values for parameters such as QoS and VLAN to automatically configure network devices such as IP phones
- **IEEE 802.1ab LLDP**
  Facilitates easy mapping, using network management applications with the LLDP automated device discovery protocol
- **PoE and PoE+ allocations**
  Support multiple methods—automatic, IEEE 802.3at dynamic, LLDP-MED fine grain, IEEE 802.3af device class, or user specified—to allocate and manage PoE/PoE+ power for more efficient energy use
- **LLDP-CDP compatibility**
  Receives and recognizes CDP packets from Cisco's IP phones for seamless interoperation

Monitor and diagnostics

- **Port mirroring**
  Enables traffic on a port to be simultaneously sent to a network analyzer for monitoring
- **Software updates**
  Are offered as free downloads from the Web

Flexibility

- **Quiet operation**
  - **Fan-less design (2620-24 switch)**
    Enables quiet operation for deployment in open spaces
  - **Variable-speed fans (2620-24-PPoE+, 2620-24-PoE+, 2620-48, and 2620-48-PoE+ switches)**
    Improve fan speed for the operating environment, while keeping noise and energy consumption levels to a minimum
- **Flexible mounting**
  - **Rack mountable**
    Allows the switch to be mounted on a standard 19-inch rack, with the hardware included
  - **Surface mountable**
    Allows the switch to be mounted above or below a surface (such as a desk or table), using the hardware included

Warranty and support

- **Lifetime Warranty 2.0**
  Advance hardware replacement is offered for as long as you own the product with next-business-day delivery (available in most countries)[1]
- **Electronic and telephone support (for Lifetime Warranty 2.0)**
  Limited 24x7 telephone support is provided by HP for the first three years; limited electronic and telephone support during business hours is provided by HP for the complete warranty period; to reach our support centers, visit hp.com/networking/contact-support; for details on the duration of support provided with your product purchase, visit hp.com/networking/warrantysummary
- **Software releases**
  To find software for your product, visit hp.com/networking/support; for details on the software releases available with your product purchase, visit hp.com/networking/warrantysummary

[1] HP warranty includes repair or replacement of hardware for as long as you own the product, with next-business-day advance replacement (available in most countries). The disk drives included—with the HP AllianceOne Advanced Services and Services zl Modules, HP Threat Management Services zl Module, HP AllianceOne Extended zl Module with Riverbed Steelhead, HP MSM765 zl Mobility Controller, and HP Survivable Branch Communication zl Module powered by Microsoft® Lync—each have a five-year hardware warranty. For details, refer to the software license and hardware warranty statements at hp.com/networking/warranty.

HP 2620 Switch Series

Specifications

	 HP 2620-24 Switch (J9623A)	 HP 2620-24-PPoE+ Switch (J9624A)	 HP 2620-24-PoE+ Switch (J9625A)
Ports	24 autosensing 10/100 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX); Media Type: Auto-MDIX; Duplex: half or full 1 RJ-45 serial console port 2 autosensing 10/100/1000 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T); Duplex: 10BASE-T/100BASE-TX: half or full; 1000BASE-T: full only 2 open mini-GBIC (SFP) slots	12 RJ-45 autosensing 10/100 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX); Media Type: Auto-MDIX; Duplex: half or full 12 RJ-45 autosensing 10/100 PoE+ ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3at PoE+); Duplex: half or full 1 RJ-45 serial console port 2 autosensing 10/100/1000 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T); Duplex: 10BASE-T/100BASE-TX: half or full; 1000BASE-T: full only 2 open mini-GBIC (SFP) slots	24 RJ-45 autosensing 10/100 PoE+ ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3at PoE+); Media Type: Auto-MDIX; Duplex: half or full 1 RJ-45 serial console port 2 autosensing 10/100/1000 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T); Duplex: 10BASE-T/100BASE-TX: half or full; 1000BASE-T: full only 2 open mini-GBIC (SFP) slots
Physical characteristics			
Dimensions	17.44(w) x 10(d) x 1.73(h) in (44.3 x 25.4 x 4.39 cm) (1U height)	17.44(w) x 10(d) x 1.73(h) in (44.3 x 25.4 x 4.39 cm) (1U height)	17.44(w) x 14.5(d) x 1.73(h) in (44.3 x 36.83 x 4.39 cm) (1U height)
Weight	5.71 lb (2.59 kg), Fully loaded	7.03 lb (3.19 kg)	10.67 lb (4.84 kg), Fully loaded
Memory and processor			
Processor	PowerPC FreeScale 8313 @ 400 MHz, 512 MB flash, 512 MB SDRAM, 4 MB flash ROM; packet buffer size: 1 MB	PowerPC FreeScale 8313 @ 400 MHz, 512 MB flash, 512 MB SDRAM, 4 MB flash ROM; packet buffer size: 1 MB	Power PC FreeScale 8313 @ 400 MHz, 512 MB flash, 512 MB SDRAM, 4 MB flash ROM; packet buffer size: 1 MB
Mounting	Mounts in an EIA-standard 19 in. telco rack or equipment cabinet (hardware included); horizontal surface mounting only	Mounts in an EIA-standard 19 in. telco rack or equipment cabinet (hardware included); horizontal surface mounting only	Mounts in an EIA-standard 19 in. telco rack or equipment cabinet (hardware included); horizontal surface mounting only
Performance			
	IPv6 Ready Certified	IPv6 Ready Certified	IPv6 Ready Certified
100 Mb Latency	< 8.3 µs (LIFO 64-byte packets)	< 8.3 µs (LIFO 64-byte packets)	< 8.3 µs (LIFO)
1000 Mb Latency	< 2.9 µs (LIFO 64-byte packets)	< 2.9 µs (LIFO 64-byte packets)	< 2.9 µs (LIFO)
Throughput	up to 9.5 million pps	up to 9.5 million pps	up to 9.5 million pps
Routing/Switching capacity	12.8 Gb/s	12.8 Gb/s	12.8 Gb/s
MAC address table size	16000 entries	16000 entries	16000 entries
Environment			
Operating temperature	32°F to 131°F (0°C to 55°C)	32°F to 131°F (0°C to 55°C)	32°F to 131°F (0°C to 55°C)
Operating relative humidity	15% to 95%, noncondensing	15% to 95%, noncondensing	15% to 95%, noncondensing
Nonoperating/Storage temperature	-40°F to 158°F (-40°C to 70°C)	-40°F to 158°F (-40°C to 70°C)	-40°F to 158°F (-40°C to 70°C)
Nonoperating/Storage relative humidity	15% to 90%, noncondensing	15% to 90%, noncondensing	15% to 90%, noncondensing
Altitude	up to 10,000 ft (3 km)	up to 10,000 ft (3 km)	up to 10,000 ft (3 km)
Acoustic	Power: 0 dB, Pressure: 0 dB No Fan	Power: 37.1 dB, Pressure: 25.9 dB	Power: 34.0 dB, Pressure: 29.7 dB

HP 2620 Switch Series

Specifications (Continued)

	HP 2620-24 Switch (J9623A)	HP 2620-24-PPoE+ Switch (J9624A)	HP 2620-24-PoE+ Switch (J9625A)
Electrical characteristics			
	Achieved Miercom Certified Green Award	Achieved Miercom Certified Green Award	Achieved Miercom Certified Green Award
Frequency	50/60 Hz	50/60 Hz	50/60 Hz
Maximum heat dissipation	95 BTU/hr (100.23 kJ/hr)	177 BTU/hr (186.74 kJ/hr), (switch only: 177 BTU/hr; combined switch + max. PoE devices: 679 BTU/hr)	270 BTU/hr (284.85 kJ/hr), (switch only: 270 BTU/hr; combined switch + max. PoE devices: 1751 BTU/hr)
Voltage	100-127/200-240 VAC	100-127/200-240 VAC	100-127/200-240 VAC
Maximum power rating	28 W	38.5 W	39.5 W
Idle power	13.3 W	22.0 W	22.8 W
PoE power	0 W	128 W	382 W
Notes	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated. PoE power is the power supplied by the internal power supply. It is dependent on the type and quantity of power supplies and may be supplemented with the use of an external power supply (EPS).	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated. PoE power is the power supplied by the internal power supply. It is dependent on the type and quantity of power supplies and may be supplemented with the use of an external power supply (EPS).	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated. PoE power is the power supplied by the internal power supply. It is dependent on the type and quantity of power supplies and may be supplemented with the use of an external power supply (EPS).
Safety	EN 60950/IEC 60950; CAN/CSA 22.2 No. 60950; EN 60825; UL 60950	EN 60950/IEC 60950; CAN/CSA 22.2 No. 60950; EN 60825; UL 60950	EN 60950/IEC 60950; CAN/CSA 22.2 No. 60950; EN 60825; UL 60950
Processor	PowerPC FreeScale 8313 @ 400 MHz, 512 MB flash, 512 MB SDRAM, 4 MB flash ROM; packet buffer size: 1 MB	PowerPC FreeScale 8313 @ 400 MHz, 512 MB flash, 512 MB SDRAM, 4 MB flash ROM; packet buffer size: 1 MB	Power PC FreeScale 8313 @ 400 MHz, 512 MB flash, 512 MB SDRAM, 4 MB flash ROM; packet buffer size: 1 MB
Emissions	FCC Class A; VCCI Class A; EN 55022/CISPR 22 Class A	FCC Class A; VCCI Class A; EN 55022/CISPR 22 Class A	FCC Class A; VCCI Class A; EN 55022/CISPR 22 Class A
Immunity			
EN	EN 55024, CISPR 24	EN 55024, CISPR 24	EN 55024, CISPR 24
ESD	IEC 61000-4-2	IEC 61000-4-2	IEC 61000-4-2
Radiated	IEC 61000-4-3	IEC 61000-4-3	IEC 61000-4-3
EFT/Burst	IEC 61000-4-4	IEC 61000-4-4	IEC 61000-4-4
Surge	IEC 61000-4-5	IEC 61000-4-5	IEC 61000-4-5
Conducted	IEC 61000-4-6	IEC 61000-4-6	IEC 61000-4-6
Power frequency magnetic field	IEC 61000-4-8	IEC 61000-4-8	IEC 61000-4-8
Voltage dips and interruptions	IEC 61000-4-11	IEC 61000-4-11	IEC 61000-4-11
Harmonics	EN 61000-3-2, IEC 61000-3-2	EN 61000-3-2, IEC 61000-3-2	EN 61000-3-2, IEC 61000-3-2
Flicker	EN 61000-3-3, IEC 61000-3-3	EN 61000-3-3, IEC 61000-3-3	EN 61000-3-3, IEC 61000-3-3
Management	command-line interface; Web browser	command-line interface; Web browser	command-line interface; Web browser
Services	Refer to the HP website at hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.	Refer to the HP website at hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.	Refer to the HP website at hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.

HP 2620 Switch Series

Specifications (Continued)



HP 2620-48 Switch (J9626A)



HP 2620-48-PoE+ Switch (J9627A)

	HP 2620-48 Switch (J9626A)	HP 2620-48-PoE+ Switch (J9627A)
Ports	48 autosensing 10/100 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX); Media Type: Auto-MDIX; Duplex: half or full	48 RJ-45 autosensing 10/100 PoE+ ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3at PoE+); Media Type: Auto-MDIX; Duplex: half or full
	1 RJ-45 serial console port	1 RJ-45 serial console port
	2 autosensing 10/100/1000 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T); Duplex: 10BASE-T/100BASE-TX: half or full; 1000BASE-T: full only	2 autosensing 10/100/1000 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T); Duplex: 10BASE-T/100BASE-TX: half or full; 1000BASE-T: full only
	2 open mini-GBIC (SFP) slots	2 open mini-GBIC (SFP) slots
Physical characteristics		
Dimensions	17.44(w) x 10(d) x 1.73(h) in (44.3 x 25.4 x 4.39 cm) (1U height)	17.44(w) x 14.5(d) x 1.73(h) in (44.3 x 36.83 x 4.39 cm) (1U height)
Weight	6.48 lb (2.94 kg), Fully loaded	11.53 lb (5.23 kg), Fully loaded
Memory and processor		
Processor	Power PC FreeScale 8313 @ 400 MHz, 512 MB flash, 512 MB SDRAM, 4 MB flash ROM; packet buffer size: 2 MB	PowerPC FreeScale 8313 @ 400 MHz, 512 MB flash, 512 MB SDRAM, 4 MB flash ROM; packet buffer size: 2 MB
Mounting	Mounts in an EIA-standard 19 in. telco rack or equipment cabinet (hardware included); horizontal surface mounting only	Mounts in an EIA-standard 19 in. telco rack or equipment cabinet (hardware included); horizontal surface mounting only
Performance		
	IPv6 Ready Certified	IPv6 Ready Certified
100 Mb Latency	< 8.3 µs (LIFO)	< 8.3 µs (LIFO)
1000 Mb Latency	< 2.9 µs (LIFO)	< 2.9 µs (LIFO)
Throughput	up to 13.0 million pps	up to 13.0 million pps
Routing/Switching capacity	17.6 Gb/s	17.6 Gb/s
MAC address table size	16000 entries	16000 entries
Environment		
Operating temperature	32°F to 131°F (0°C to 55°C)	32°F to 131°F (0°C to 55°C)
Operating relative humidity	15% to 95%, noncondensing	15% to 95%, noncondensing
Nonoperating/Storage temperature	-40°F to 158°F (-40°C to 70°C)	-40°F to 158°F (-40°C to 70°C)
Nonoperating/Storage relative humidity	15% to 90%, noncondensing	15% to 90%, noncondensing
Altitude	up to 10,000 ft (3 km)	up to 10,000 ft (3 km)
Acoustic	Power: 36.5 dB, Pressure: 24.5 dB	Power: 34.0 dB, Pressure: 25.3 dB

HP 2620 Switch Series

Specifications (Continued)

	HP 2620-48 Switch (J9626A)	HP 2620-48-PoE+ Switch (J9627A)
Electrical characteristics		
	Achieved Miercom Certified Green Award	Achieved Miercom Certified Green Award
Frequency	50/60 Hz	50/60 Hz
Maximum heat dissipation	148 BTU/hr (156.14 kJ/hr)	325 BTU/hr (342.88 kJ/hr), (switch only: 325 BTU/hr; combined switch + max. PoE devices: 1833 BTU/hr)
Voltage	100-127/200-240 VAC	100-127/200-240 VAC
Maximum power rating	43.5 W	54.9 W
Idle power	19.4 W	29.6 W
PoE power		382 W
Notes	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated.	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated. PoE power is the power supplied by the internal power supply. It is dependent on the type and quantity of power supplies and may be supplemented with the use of an external power supply (EPS).
Safety	EN 60950/IEC 60950; CAN/CSA 22.2 No. 60950; EN 60825; UL 60950	EN 60950/IEC 60950; CAN/CSA 22.2 No. 60950; EN 60825; UL 60950
Emissions	FCC Class A; VCCI Class A; EN 55022/CISPR 22 Class A	FCC Class A; VCCI Class A; EN 55022/CISPR 22 Class A
Immunity		
EN	EN 55024, CISPR 24	EN 55024, CISPR 24
ESD	IEC 61000-4-2	IEC 61000-4-2
Radiated	IEC 61000-4-3	IEC 61000-4-3
EFT/Burst	IEC 61000-4-4	IEC 61000-4-4
Surge	IEC 61000-4-5	IEC 61000-4-5
Conducted	IEC 61000-4-6	IEC 61000-4-6
Power frequency magnetic field	IEC 61000-4-8	IEC 61000-4-8
Voltage dips and interruptions	IEC 61000-4-11	IEC 61000-4-11
Harmonics	EN 61000-3-2, IEC 61000-3-2	EN 61000-3-2, IEC 61000-3-2
Flicker	EN 61000-3-3, IEC 61000-3-3	EN 61000-3-3, IEC 61000-3-3
Management	command-line interface; Web browser	command-line interface; Web browser
Services	Refer to the HP website at hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.	Refer to the HP website at hp.com/networking/services for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local HP sales office.

HP 2620 Switch Series

Specifications (Continued)

	HP 2620-48 Switch (J9626A)	HP 2620-48-PoE+ Switch (J9627A)

Standards and Protocols
(applies to all products in series)

Device management

RFC 1591 DNS (client)

HTML and telnet management

General protocols

IEEE 802.1D MAC Bridges

IEEE 802.1p Priority

IEEE 802.1Q VLANs

IEEE 802.1s Multiple Spanning Trees

IEEE 802.1v VLAN classification by Protocol and Port

IEEE 802.1w Rapid Reconfiguration of Spanning Tree

IEEE 802.3ad LACP

IEEE 802.3x Flow Control

RFC 768 UDP

RFC 783 TFTP Protocol (revision 2)

RFC 792 ICMP

RFC 793 TCP

RFC 826 ARP

RFC 854 TELNET

RFC 868 Time Protocol

RFC 951 BOOTP

RFC 1058 RIPv1

RFC 1350 TFTP Protocol (revision 2)

RFC 1542 BOOTP Extensions

RFC 2030 Simple Network Time Protocol (SNTP) v4

RFC 2131 DHCP

RFC 2453 RIPv2

RFC 3046 DHCP Relay Agent Information Option

IP multicast

RFC 3376 IGMPv3 (host joins only)

IPv6

RFC 1981 IPv6 Path MTU Discovery

RFC 2460 IPv6 Specification

RFC 2710 Multicast Listener Discovery (MLD) for IPv6

RFC 2925 Remote Operations MIB (Ping only)

RFC 3019 MLDv1 MIB

RFC 3315 DHCPv6 (client only)

RFC 3513 IPv6 Addressing Architecture

RFC 3596 DNS Extension for IPv6

RFC 3810 Multicast Listener Discovery Version 2 (MLDv2) for IPv6

RFC 4022 MIB for TCP

RFC 4113 MIB for UDP

RFC 4251 SSHv6 Architecture

RFC 4252 SSHv6 Authentication

RFC 4253 SSHv6 Transport Layer

RFC 4254 SSHv6 Connection

RFC 4293 MIB for IP

RFC 4419 Key Exchange for SSH

RFC 4443 ICMPv6

RFC 4541 IGMP & MLD Snooping Switch

RFC 4861 IPv6 Neighbor Discovery

MIBs

RFC 1213 MIB II

RFC 1493 Bridge MIB

RFC 1724 RIPv2 MIB

RFC 2021 RMONv2 MIB

RFC 2096 IP Forwarding Table MIB

RFC 2613 SMON MIB

RFC 2618 RADIUS Client MIB

RFC 2620 RADIUS Accounting MIB

RFC 2665 Ethernet-Like-MIB

RFC 2668 802.3 MAU MIB

RFC 2674 802.1p and IEEE 802.1Q Bridge MIB

RFC 2737 Entity MIB (Version 2)

RFC 2863 The Interfaces Group MIB

RFC 2925 Ping MIB

Network management

IEEE 802.1AB LLDP

RFC 2819 Four groups of RMON: 1 (statistics), 2 (history), 3 (alarm), and 9 (events)

RFC 3176 sFlow

ANSI/TIA-1057 LLDP-MED

SNMPv1/v2c/v3

XRMON

QoS/CoS

RFC 2474 DiffServ Precedence, including 8 queues/port

RFC 2597 DiffServ Assured Forwarding (AF)

RFC 2598 DiffServ Expedited Forwarding (EF)

Ingress Rate Limiting

Security

IEEE 802.1X Port Based Network Access Control

RFC 1492 TACACS+

RFC 2138 RADIUS Authentication

RFC 2866 RADIUS Accounting

SSL

HP 2620 Switch Series accessories

Transceivers
HP X121 1G SFP LC SX Transceiver (J4858C)
HP X121 1G SFP LC LX Transceiver (J4859C)
HP X121 1G SFP LC LH Transceiver (J4860C)
HP X121 1G SFP RJ45 T Transceiver (J8177C)
HP X111 100M SFP LC FX Transceiver (J9054C)
HP X112 100M SFP LC BX-D Transceiver (J9099B)
HP X112 100M SFP LC BX-U Transceiver (J9100B)
HP X122 1G SFP LC BX-D Transceiver (J9142B)
HP X122 1G SFP LC BX-U Transceiver (J9143B)

Cables
HP 0.5 m Multimode OM3 LC/LC Optical Cable (AJ833A)
HP 1 m Multimode OM3 LC/LC Optical Cable (AJ834A)
HP 2 m Multimode OM3 LC/LC Optical Cable (AJ835A)
HP 5 m Multimode OM3 LC/LC Optical Cable (AJ836A)
HP 15 m Multimode OM3 LC/LC Optical Cable (AJ837A)
HP 30 m Multimode OM3 LC/LC Optical Cable (AJ838A)
HP 50 m Multimode OM3 LC/LC Optical Cable (AJ839A)
HP Premier Flex LC/LC Multi-mode OM4 2 fiber 1m Cable (QK732A)
HP Premier Flex LC/LC Multi-mode OM4 2 fiber 2m Cable (QK733A)
HP Premier Flex LC/LC Multi-mode OM4 2 fiber 5m Cable (QK734A)
HP Premier Flex LC/LC Multi-mode OM4 2 fiber 15m Cable (QK735A)
HP Premier Flex LC/LC Multi-mode OM4 2 fiber 30m Cable (QK736A)
HP Premier Flex LC/LC Multi-mode OM4 2 fiber 50m Cable (QK737A)

Mounting Kit
HP X410 1U Universal 4-post Rack Mounting Kit (J9583A)

HP 2620–24 Switch (J9623A)
HP 600 Redundant and External Power Supply (J8168A)

HP 2620-24-PPoE+ Switch (J9624A)
HP 600 Redundant and External Power Supply (J8168A)

HP 2620-24-PoE+ Switch (J9625A)
HP 620 Redundant/External Power Supply (J8696A)
HP 630 Redundant and/or External Power Supply (J9443A)

HP 2620–48 Switch (J9626A)
HP 600 Redundant and External Power Supply (J8168A)

HP 2620-48-PoE+ Switch (J9627A)
HP 630 Redundant and/or External Power Supply (J9443A)
HP 620 Redundant/External Power Supply (J8696A)

Learn more at
hp.com/networking

Products within this series have achieved sufficient scores in each of the rated criteria to achieve the Miercom Certified Green distinction Award. See the Specifications section of this series for more information.

Products within this series are IPv6 Ready certified. See the Specifications section of this series for more information.

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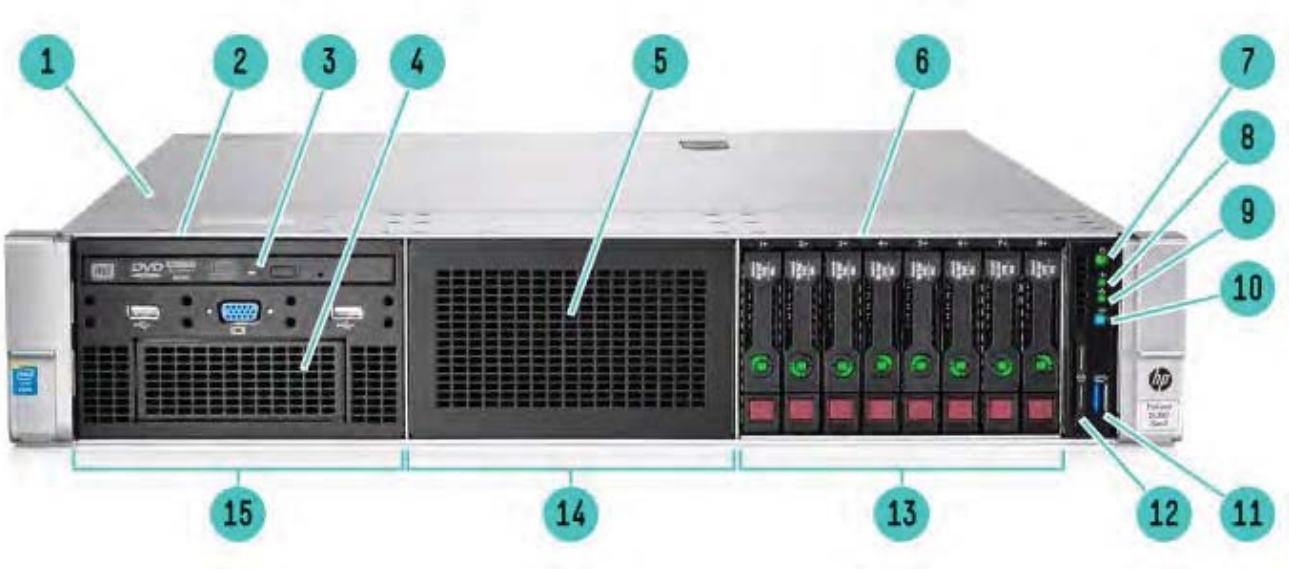
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4AA3-7117ENW, December 2013, Rev. 1

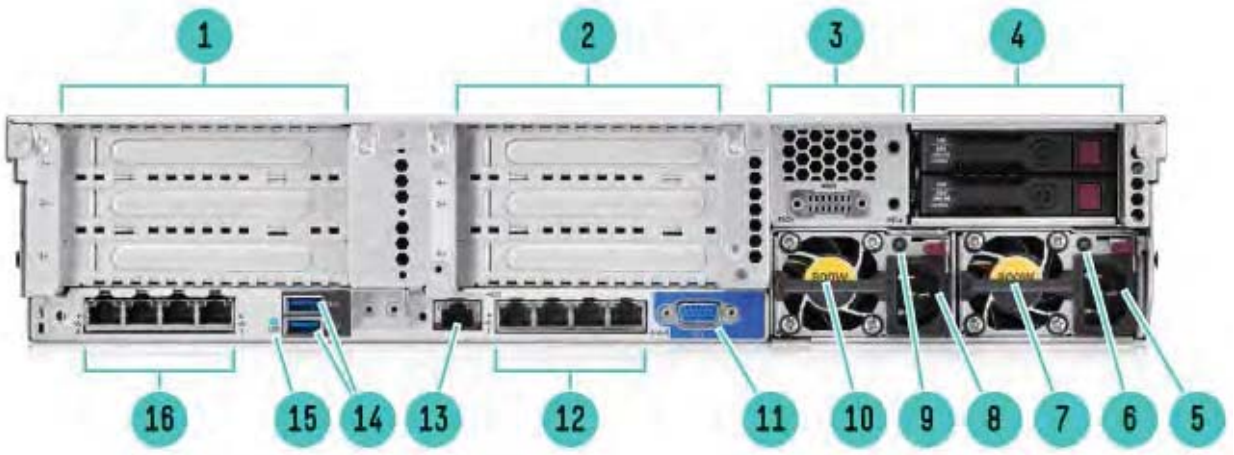
HPE ProLiant DL380 Generation9 (Gen9)

The HPE ProLiant DL380 Gen9 Server delivers the best performance and expandability in the HPE 2P rack portfolio. Reliability, serviceability and near continuous availability, backed by a comprehensive warranty, make it ideal for any environment. Deploy the data center standard.



Front View - 8SFF Chassis with Optional Universal Media Bay shown

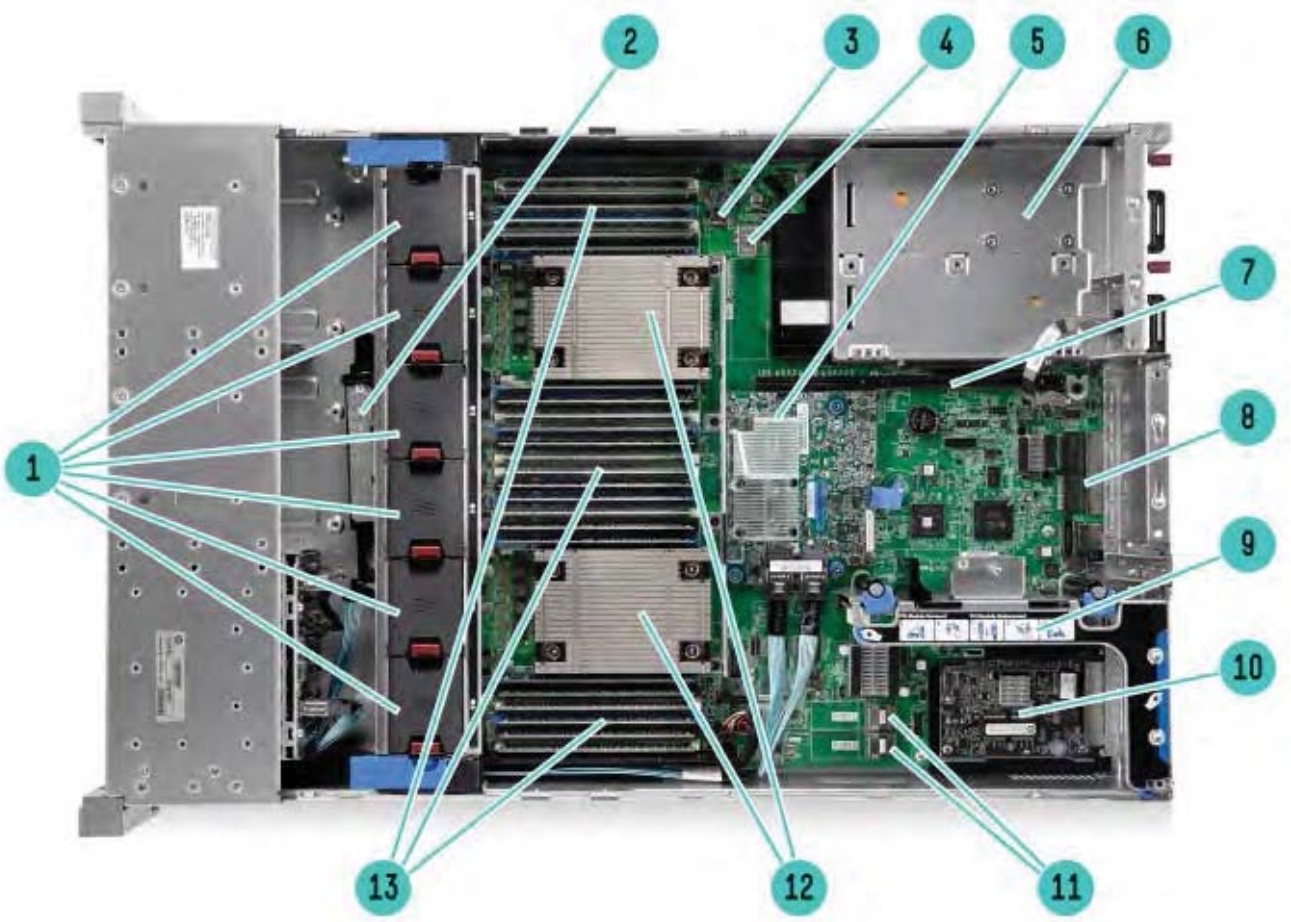
1. Quick removal access panel
2. Universal Media bay. 2 USB 2.0 and VGA standard (8SFF bay optional)
3. Optional Optical drive. Requires Universal Media bay
4. Optional 2 SFF HDD, blank shown. Requires Universal Media bay
5. Drive Bay 2. Blank shown, 8SFF or 6NVMe optional
6. 8 SFF Drive Cage Bay
7. Power On/Standby button and system power LED button
8. Health LED
9. NIC status
10. UID button
11. USB 3.0
12. Serial label pull tag
13. Bay 3
14. Bay 2
15. Bay 1



Rear view

1. PCI Slots (Slots 1-3 top to bottom, riser shipped standard)
2. PCI Slots (Slots 4-6top to bottom, requires second riser card, and second processor)
3. Optional serial port
4. Optional rear 2 SFF HDD (supported in 24 SFF or 12 LFF front end)
5. Power supply Power connection
6. Power supply Power LED
7. HPE Flexible Slot Power Supply bay 2 (800w shown)
8. Power supply Power connection
9. Power supply Power LED
10. HPE Flexible Slot Power Supply bay 1 (800w shown)

    NOTE: Optional Micro UPS option.
11. VGA connector
12. Embedded 4x1GbE Network Adapter
13. Dedicated iLO connector
14. USB 3.0 connectors (2)
15. Unit ID LED
16. Optional FlexibleLOM ports (Shown: 4x1GbE)



Internal View

1. Fan cage shown with 6 standard Hot-plug fans (High Performance fans optional)
2. Optional HPE Smart Storage Battery
3. MicroSD card slot
   NOTE: Optional Dual MicroSD.
4. Internal USB 3.0 connector
5. Optional HPE Flexible Smart Array or Smart HBA (H240ar shown)
6. (Under) Hot Plug redundant HPE Flexible Slot Power supplies
   NOTE: Optional Micro UPS option.
7. Connection for second (optional) riser (Required second CPU)
8. Embedded 4x1Gbe NIC
9. Primary PCIe riser, standard (Optional double wide GPU riser)
10. Optional Flexible LOM slot
11. X4 SATA ports (1 and 2)
12. 2 Processors, heatsink showing, with HPE Smart Socket Guide
13. DDR4 DIMM slots. Shown fully populated in 24 slots (12 per processor)

What's New

- New max capacity SFF Solid State Drives
- New Graphics option, NVIDIA M60

NOTE: For more information regarding Intel Xeon processors, please see the following **http://www.intel.com/xeon**.

Processor
Up to two of the following depending on model

Model	CPU frequency	Cores	L3 Cache	Power	QPI	DDR4 Hz
E5-2699v3	2.3GHz	18	45MB	145W	9.6GT/s	2133
E5-2698v3	2.3GHz	16	40MB	135W	9.6GT/s	2133
E5-2697v3	2.6GHz	14	35MB	145W	9.6GT/s	2133
E5-2695v3	2.3GHz	14	35MB	120W	9.6GT/s	2133
E5-2690v3	2.6GHz	12	30MB	135W	9.6GT/s	2133
E5-2687Wv3	3.1GHz	10	25MB	160W	9.6GT/s	2133
E5-2683v3	2.0GHz	14	35MB	120W	9.6GT/s	2133
E5-2680v3	2.5GHz	12	30MB	120W	9.6GT/s	2133
E5-2670v3	2.3GHz	12	30MB	120W	9.6GT/s	2133
E5-2667v3	3.2GHz	8	20MB	135W	9.6GT/s	2133
E5-2660v3	2.6GHz	10	25MB	105W	9.6GT/s	2133
E5-2650v3	2.3GHz	10	25MB	105W	9.6GT/s	2133
E5-2650Lv3	1.8GHz	12	30MB	65W	9.6GT/s	2133
E5-2643v3	3.4GHz	6	20MB	135W	9.6GT/s	2133
E5-2640v3	2.6GHz	8	20MB	90W	8.0GT/s	1866
E5-2637v3	3.5GHz	4	15MB	135W	9.6GT/s	2133
E5-2630v3	2.4Ghz	8	20MB	85W	8.0GT/s	1866
E5-2630Lv3	1.8GHz	8	20MB	55W	8.0GT/s	1866
E5-2623v3	3.0GHz	4	10MB	105W	8.0GT/s	1866
E5-2620v3	2.4GHz	6	15MB	85W	8.0GT/s	1866
E5-2609v3	1.9GHz	6	15MB	85W	6.4GT/s	1600
E5-2603v3	1.6GHz	6	15MB	85W	6.4GT/s	1600

NOTE: All processors above 120W use a high efficiency Heatsink. Doublewide PCIe cards are only supported with this Heatsink. For processors with a standard Heatsink that require double wide PCIe cards, the Graphics Enablement kit option is also required (719082-B21).

Chipset

Intel® C610 Series Chipset
Intel® E5-2600v3 Processor Family
NOTE: For more information regarding Intel chipsets, please see the following URL: **http://www.intel.com/products/server/chipsets/**

On System Management Chipset

HPE iLO (Firmware HPE iLO4 2.3) 2GB NAND
NOTE: 1GB USB user space configurable via UEFI and accessible via iLO. Read and learn more in the **HPE iLO QuickSpecs**.

Memory

Type:
HPE SmartMemory
DDR4 Registered (RDIMM) or Load Reduced (LRDIMM)

One of the following depending on model	DIMM Slots Available	24	(12 DIMM slots per processor, 4 channels per processor, 3 DIMMs per channel)
	Maximum Capacity (LRDIMM)	1.5TB	(24 x 64GB LRDIMM @2133MHz)
	Maximum Capacity (RDIMM)	768GB	(24 x 32GB RDIMM @2133MHz)

Memory Protection	Advanced ECC	Advanced ECC uses single device data correction to detect and correct single and all multibit error that occurs within a single DRAM chip.
	Online spare	Memory online spare mode detects a rank that is degrading and switches operation to the spare rank.

Expansion Slots

Primary Riser (Standard)

Expansion Slots #	Technology	Bus Width	Connector Width	Bus Number	Form Factor	Notes
1	PCIe 3.0	x8	x16	7	Full-height, half-length slot	**Proc 1**
2	PCIe 3.0	x8	x16	10	Full-height, half-length slot	**Proc 1**
3	PCIe 3.0	x8	x8	13	Half Length/Full Height	**Proc 1**

NOTE: Bus Width Indicates the number of physical electrical lanes running to the connector.
NOTE: All slots support PCIe cards to 150W or more depending on card, but an additional Power Cord Option is required (PN 669777-B21). See Option Section below for offering.
NOTE: Double wide PCIe cards are only supported in risers with the Processors leveraging the High Performance Heatsink. For Processors requiring double wide GPU support please order the GPU enablement kit (719082-B21).

Slot 2 PCIe Riser (Optional 3-slot) 719073-B21

Expansion Slots #	Technology	Bus Width	Connector Width	Bus Number	Device Number	Form Factor	Notes
4	PCIe 3.0	x16	x16	16		Full-height, full-length slot	Proc 2
5	PCIe 3.0	x16	x16	20		Full-height, full-length slot	Proc 2
6	PCIe 3.0	x8	x8	23		Full-height, half-length slot	Proc 2

NOTE: Bus Width Indicates the number of physical electrical lanes running to the connector.
NOTE: When populating the second optional riser slot, the second processor must be installed.
NOTE: All slots support PCIe cards to 150W or more depending on card but an additional Power Cord Option is required (PN 669777-B21). See Option Section below for offering.
NOTE: Double wide PCIe cards are only supported in risers with the Processors leveraging the High Performance Heatsink. For Processors requiring double wide GPU support please order the GPU enablement kit (719082-B21).

Slot 1 PCIe Riser (Optional 2-slot) 719076-B21

Expansion Slots #	Technology	Bus Width	Connector Width	Bus Number	Device Number	Form Factor	Notes
2	PCIe 3.0	x16	x16	0x05		Full-height, full-length slot	Proc 1

3	PCIe 3.0	x8	x8	0x08	Full-height, half-length slot	Proc 1

NOTE: Bus Width Indicates the number of physical electrical lanes running to the connector.

NOTE: This will replace the standard primary riser and supports double wide cards.

NOTE: All slots support PCIe cards to 150W or more depending on card, but an additional Power Cord Option is required (PN 669777-B21). See Option Section below for offering.

NOTE: Double wide PCIe cards are only supported in risers with the Processors leveraging the High Performance Heatsink. For Processors requiring double wide GPU support please order the GPU enablement kit (719082-B21).

Storage Controller One of the following depending on model	Entry Models	HPE Dynamic Smart Array B140i Controller **NOTE:** The embedded B140i controller will operate in UEFI only mode. For legacy support an additional controller will be needed, and for CTO orders please also select the Legacy mode settings part, 758959-B22. **NOTE:** The B140i defaults to AHCI off the chipset. Smart array needs to be enables on the SATA only models if required. **NOTE:** The B140i will not operate in Legacy mode.
	Base Models	HPE Dynamic Smart Array B140i Controller HPE Flexible Smart Array P440ar/2G FIO Controller HPE Flexible Smart Array P840/4G FIO Controller
	Performance Models	HPE Dynamic Smart Array B140i Controller HPE Flexible Smart Array P440ar/2GB

Internal Storage Devices One of the following depending on model	Optical Drive	Ships standard in Performance Models Optional: DVD-ROM, DVD-RW
	Hard Drives	None ship standard
	Hard Drive Bays	8 SFF with optional Universal Media bay, 8SFF bay or 6NME drive options 24 SFF plus optional 2 SFF drives rear 12 LFF plus optional 3 LFF drives rear **NOTE:** The 3 LFF rear drives will consume space for the secondary riser. **NOTE:** The 12 LFF CTO Server also supports 2 SFF rear which allows for the second riser. **NOTE:** The 6 NVMe drive option can only be leveraged in the SFF CTO Server and replaces Bay 2. 4 LFF drive bays total **NOTE:** The Universal Media Bay (724865-B21) not available with the LFF CTO Server or the 24SFF CTO Server, and can only be populated in Bay1. **NOTE:** The 8SFF can be upgraded with a drive cage to 16 or 24 SFF with field upgrades. For optimal upgrade Bay2 should be populated second, with Bay 13 the last to be populated for a field upgrade to 24 SFF. **NOTE:** The 4LFF CTO Server cannot be upgraded to 12LFF in the field. **NOTE:** All Pre-configured models come with an embedded 10-Port SATA controller. Optional HPE Flexible Smart Array and Smart SAS HBA Controllers can be added.

		CAPACITY	CONFIGURATION
Maximum Internal Storage	Hot Plug SFF SAS	52.0TB	24+2 x 2TB (with optional rear SFF drive cage)
	Hot Plug SFF SATA	52.0TB	24+2 x 2TB (with optional SFF drive cage)
	Hot Plug LFF SAS	120.0TB	12+3 x 8TB (with optional rear LFF drive cage)
	Hot Plug LFF SATA	120.0TB	12+3 x 8TB (with optional rear LFF drive cage)
	Hot Plug SFF SAS SSD	99.84TB	24+2 x 3.84TB (with optional rear SFF drive cage)
	Hot Plug LFF SATA SSD	57.6B	12+3 x 3.84TB (with optional rear LFF drive cage)
	Hot Plug SFF NVMe SSD	12TB NVMe + 36TB SFF	6x2TB NVMe plus 36TB with 18 SFF (Bay 1, bay 3 and optional rear drive support)

Power Supply

HPE 500W Flex Slot Platinum Hot Plug Power Supply
NOTE: Available in 94% efficiency.
HPE 800W Flex Slot Platinum Hot Plug Power Supply
NOTE: Available in 94% and 96% efficiency.
NOTE: Also available in -48VDC and 227VAC/380VDC power inputs.
HPE 1400W Flex Slot Platinum Plus Hot Plug Power Supply
NOTE: Available in 94% efficiency.
HPE Flexible Slot Battery Backup Unit Kits
NOTE: Flex Slot Battery Backup provides 750W output and 500W in paralleled configuration.

HPE Flexible Slot (Flex Slot) Power Supplies share a common electrical and physical design that allows for hot plug, tool-less installation into HPE ProLiant Gen9 Performance Servers. Flex Slot power supplies are certified for high-efficiency operation and offer multiple power output options, allowing users to "right-size" a power supply for specific server configurations. This flexibility helps to reduce power waste, lower overall energy costs, and avoid "trapped" power capacity in the data center.

All pre-configured servers ship with a standard 6-foot IEC C-13/C-14 jumper cord (A0K02A). This jumper cord is also included with each standard AC power supply option kit. If a different power cord is required, please check the ProLiant Power Cables web page.

To review the power requirements for your selected system, please use the HPE Power Advisor Tool located at http://www.hp.com/go/hppoweradvisor.

Power specifications and technical content for all HPE Server power supplies can be found at http://www.hp.com/go/proliant/powersupply.

		Non-redundant	Redundant
System Fans			
One of the following depending on model	2P model		6 fans

NOTE: 1P models typically ship with 4 standard fans. The second processor option kit contains 2 additional fans.
NOTE: The 12LFF and 24SFF CTO Servers ship with 6 High Performance fans as standard.
NOTE: High Performance Fan Kit is available to meet ambient temperature environments.
NOTE: High Performance Fan Kit is required for Passive GPU support.
NOTE: The 8SFF Bay1 kit (719067-B21) will ship with 6 High efficiency fans.

Interfaces	Serial	Optional
	Video	2 (1 front, optional via Universal Media Bay, 724865-B21), 1 back not active simultaneously
	FlexibleLOM Network Ports	4 x 1Gb ports shipping standard with optional FlexibleLOM
	HPE iLO Remote Management Network Port	1 Gb Dedicated
	Micro SD Slot	1 Micro SD
	NOTE: The Micro SD slot is not a hot-pluggable device. Customers should not attempt to plug an SD card into the SD slot while the server is powered.	
	USB 3.0	Up to 5 total: 1 front, 2 rear, 2 internal (secure), 2 optional USB 2.0 front via Universal Media Bay
	SID (Systems Insight Display)	Optional
	NOTE: Not shipping as standard. Available as a CTO option or as a field upgrade (768900-B21).	

Operating Systems and Virtualization Software Support for ProLiant Servers	**Microsoft Windows Server** **Canonical Ubuntu** **Red Hat Enterprise Linux (RHEL)** **SUSE Linux Enterprise Server (SLES)** **Oracle Solaris** **VMware** **Citrix XenServer** **NOTE: For more information on Hewlett Packard Enterprise Certified and Supported ProLiant Servers for OS and Virtualization Software and latest listing of software drivers available for your server, please visit our Support Matrix at: http://www.hp.com/go/ossupport and our driver download page: http://www.hp.com/support/DL380Gen9.**

Upgradeability	Upgradeable to two processors (36 Cores) **NOTE: Processor upgrade available from Intel® Xeon® Processors E5-2600v3. Please contact Hewlett Packard Enterprise Technology Sales (http://www.hp.com/support), your local HPE Re-seller.** Up to 24 DIMM slots available for higher Memory capacity FlexibleLOM connector for 1 Gigabit or 10 Gigabit networking options HPE Flexible Smart Array or Smart HBA Controllers Embedded 10-Port SATA, B140i as standard Optional 3 slot riser (x16, x16, x8), or 2 slot primary riser (x16, x8) **NOTE: To take advantage of the additional 3 PCI slot upgrade, the second processor must be installed.** Redundant Power Supply Optical Drive supported via Universal Media Bay **NOTE: The Universal Media bay provides front VGA and 2xUSB 2.0, plus ability to add 2SFF and Optical.** **NOTE: Universal Media bay is only available with 8 or 8+8SFF CTO Server & can be populated in Bay1 only.** HPE Legacy Mode (FIO only, 758959-B22) **NOTE: UEFI is the default mode for CTO and BTO SKUs. Can change default to legacy via CTO.**

Industry Standard Compliance	ACPI 2.0b Compliant PCIe 3.0 Compliant PXE Support WOL Support Microsoft® Logo certifications USB 3.0 Support USB 2.0 Support **NOTE: This support is on the optional Universal Media Bay.** Energy Star ASHRAE A3/A4 **NOTE: The DL380 Gen9 is now one of the first HPE ProLiant Gen9 Servers with Extended Ambient Support up to 45 C for data center infrastructures designed for better energy efficiency such as but not limited to fresh air cooling.** **For additional technical thermal details regarding ambient temperatures, humidity and features support please visit: http://www.hp.com/servers/ASHRAE**. UEFI (Unified Extensible Firmware Interface Forum) **NOTE: UEFI is the default for the DL380 Gen9. Legacy model can be selected in the field or as a CTO option (758959-B22).**
Graphics	Integrated Matrox G200eH2 video standard with 16MB of Video RAM • **1280 x 1024 (32 bpp)** • **1920 x 1200 (16 bpp)** HPE iLO 4 On System Management Memory • **16 MB Flash** • **256 MB DDR3 with ECC (112 MB after ECC and video)**
HPE Server UEFI/Legacy ROM	**HPE Server UEFI /Legacy ROM** Unified Extensible Firmware Interface (UEFI) is an industry standard that provides better manageability and more secured configuration while interacting with your server at boot time. HPE ProLiant Gen9 platform defaults to UEFI and can be factory or field configured for Legacy BIOS Boot Mode. **NOTE: The UEFI System Utilities function is analogous to the HPE ROM-Based Setup Utility (RBSU) of legacy BIOS. For more information, please visit http://www.hp.com/go/proliantuefi/docs.** UEFI enables numerous new capabilities specific to HPE ProLiant servers such as: • Secure Boot • Operating system specific functionality • Support for > 2.2 TB (using GPT) boot drives • USB 3.0 Stack • Embedded UEFI Shell • Mass Configuration Deployment Tool using HPE RESTful API. • PXE boot support for IPv6 networks

- Boot support for option cards that only support a UEFI option ROM

For more information please visit **http://www.hp.com/go/proliant/uefi**.
NOTE: For UEFI Boot Mode, boot environment and OS image installations should be configured properly to support UEFI.
NOTE: HPE Legacy FIO Mode Setting (758959-B22) can be selected to configure the system in Legacy mode in the factory.

Form Factor One of the following depending on model	2U Rack form factor 8 SFF & 24SFF Drive Bay Version: 3.44 x 17.54 x 26.75 in (8.73 x 44.55 x 67.94 cm) 4 LFF & 12LFF Drive Bay Version: 3.44 x 17.54 x 28.75 in (8.73 x 44.55 x 73.02 cm) **NOTE: Dimensions without bezel.**	
Embedded Management	**HPE Integrated Lights-Out (HPE iLO)**	Monitor your servers for ongoing management, service alerting, reporting and remote management with HPE iLO. Learn more at **http://www.hp.com/go/ilo**.
	UEFI	Configure and boot your servers securely with industry standard Unified Extensible Firmware Interface (UEFI). Learn more at **http://www.hp.com/go/ProLiant/uefi**.
	RESTful API	A single programmatic web interface that allows you to manage and monitor your server infrastructure using basic HTTP operations (GET, PUT, POST, DELETE and PATCH). RESTful API for iLO 4 conforms to the Redfish 1.0 DMTF standard (iLO firmware version v2.30 or higher required for Redfish conformance). For more details visit: **http://www.hp.com/go/restfulapi**.
	Intelligent Provisioning	Provision servers by discovering and deploying 1 to few servers with Intelligent Provisioning. Learn more at **http://www.hp.com/go/intelligentprovisioning**.
	Embedded Remote Support	Hewlett Packard Enterprise embedded remote support, used with Insight Online direct connect or HPE Insight Remote Support, allows HPE ProLiant servers to transmit hardware events directly to Hewlett Packard Enterprise or an HPE Authorized Partner for automated phone home support. Learn more at **http://www.hp.com/go/insightonline/info**.
Server utilities	**Smart Update**	Optimize firmware and driver updates with Smart Update solutions including Smart Update Manager (SUM) and Service Pack for ProLiant (SPP). Learn more at **http://www.hp.com/go/smartupdate**.

HPE Systems Insight Manager (HPE SIM)	HPE SIM allows you to monitor the health of your HPE ProLiant Servers and HPE Integrity Servers, and also provides you with basic support for non-HPE servers. HPE SIM also integrates with SUM to provide quick and seamless firmware updates. Learn more at **http://www.hp.com/go/sim**.
Scripting Tool Kit and Windows PowerShell	Provision 1 to many servers using your own scripts to discover and deploy them with Scripting Tool Kit for Windows and Linux or Scripting Tools for Windows PowerShell. Learn more at **http://www.hp.com/go/ProLiantSTK** or **http://www.hp.com/go/powershell**.
RESTful Interface Tool	Scripting tool to provision servers using iLO 4 RESTful API to discover and deploy servers at scale. Learn more at **http://www.hp.com/go/resttool**.
HPE iLO Mobile Application	Enables the ability to access, deploy, and manage your server anytime from anywhere from select smartphones and mobile devices. For additional information please visit: **http://www.hp.com/go/ilo/mobileapp**.
HPE Insight Online	HPE Insight Online, available at no additional cost as part of your Hewlett Packard Enterprise warranty, Care Pack or contractual support agreement with Hewlett Packard Enterprise, is a personalized dashboard for simplified tracking of IT operations and support information from anywhere, anytime. Learn more at **http://www.hp.com/go/insightonline/info**.

Security

Power-on password
Serial interface control
Administrator's password
UEFI
iLO 4 (Integrated Lights-Out 4) has 12 customizable user accounts and SSL encryption
Integrated Lights-Out can be disabled via a Global Setting
iLO Advanced supports directory services integration
TPM 1.2

Warranty

This product is covered by a global limited warranty and supported by HPE Services and a worldwide network of HPE Authorized Channel Partners resellers. Hardware diagnostic support and repair is available for three years from date of purchase. Support for software and initial setup is available for 90 days from date of purchase. Enhancements to warranty services are available through HPE Care Pack services or customized service agreements. Hard drives have either a one year or three year warranty; refer to the specific hard drive QuickSpecs for details.

NOTE: Server Warranty includes 3-Year Parts, 3-Year Labor, 3-Year Onsite support with next business day response. Warranty repairs may be accomplished through the use of Customer Self Repair (CSR) parts. These parts fall into two categories: 1) Mandatory CSR parts are designed for easy replacement. A travel and labor charge will result when customers decline to replace a Mandatory CSR part; 2) Optional CSR parts are also designed for easy replacement but may

involve added complexity. Customers may choose to have HPE replace Optional CSR parts at no charge. Additional information regarding worldwide limited warranty and technical support is available at: **http://h18004.www1.hp.com/products/servers/platforms/warranty/index.html**.

Embedded Management	**iLO Advanced**	HPE iLO Advanced licenses offer smart remote functionality without compromise, for all HPE ProLiant servers. The license includes the full integrated remote console, virtual keyboard, video, and mouse (KVM), multi-user collaboration, console record and replay, and GUI-based and scripted virtual media and virtual folders. You can also activate the enhanced security and power management functionality. Learn more about HPE iLO Advanced at **http://www.hp.com/go/iloadvanced**.
Server Management	**HPE Insight Control**	HPE Insight Control, lets you deploy, migrate, monitor, remote control, and optimize your IT infrastructure through a single, simple management console. For more information, see **http://www.hp.com/go/insightcontrol**.
	HPE OneView	Powerful converged management of servers, storage, and network for IT service automation and infrastructure simplicity, see **http://www.hp.com/go/oneview**
	HPE Insight Cluster Management Utility (CMU)	HPE Insight Cluster Management Utility is a hyperscale-optimized management framework that includes software for the provisioning, control, performance management and monitoring of groups of nodes and infrastructure. Learn more at **http://www.hp.com/go/cmu**.
Rack and Power Infrastructure	HPE Rack and Power Infrastructure products and services create highly efficient and intelligent solutions for existing or new IT data centers. HPE Rack and Power infrastructure solutions – rack infrastructure, power protection and management, performance optimized data centers (PODs) – are the foundation you are looking for to help secure your long-term IT success. These products are designed to help you react to changes in the industry. They deliver efficient, easy-to-use capabilities to manage, monitor, deploy and provision infrastructure from entry to enterprise. As an industry leader, Hewlett Packard Enterprise is uniquely positioned to address the key concerns of power, cooling, cable management and system access. Learn more at **HPE Rack and Power Infrastructure**.	
High Performance Clusters	HPE Cluster Platforms are specifically engineered, factory-integrated large-scale ProLiant clusters optimized for High Performance Computing, with a choice of servers, networks and software. Operating system options include specially priced offerings for Red Hat Enterprise Linux and SUSE Linux Enterprise Server, as well as Microsoft Windows HPEC Server. A Cluster Platform Configurator simplifies ordering. **http://www.hp.com/go/clusters**. **NOTE: High Performance Computing (HPC) interconnect technologies are available for this server as part of the HPE Cluster Platform portfolio. These high-speed InfiniBand and Gigabit interconnects are fully supported by Hewlett Packard Enterprise when integrated within a Hewlett Packard Enterprise cluster. Flexible, validated solutions can be defined with the help of configuration tools. http://www.hp.com/techservers/clusters/ucp/index.html**.	
HPC Interconnects	**NOTE: High Performance Computing (HPC) interconnect technologies are available for this server under the HPE Cluster Platform product portfolio. These high-speed interconnects are fully supported by Hewlett Packard Enterprise when they are part of these configure to order clusters. Solutions can be defined with a lot of flexibility with the help of configuration tools. Please visit the**	

following URL to configure HPEC Clusters with InfiniBand Interconnects: **http://www.hp.com/techservers/clusters/ucp/index.html**.

Storage Software

Whether you need to solve a specific data protection, archiving, or storage command and control challenge, or deliver on strategic consolidation, compliance, or continuity initiatives, look no further than Hewlett Packard Enterprise storage software. Our storage software helps you reduce costs, simplify storage infrastructure, protect vital assets and respond faster to business opportunities.
Storage software that gets the job done:

- **Data Protection and Recovery Software**
  Whether you're a large enterprise or a smaller business, Hewlett Packard Enterprise data protection and recovery software will cost-effectively protect you against disaster and ensure business continuity.
- **Data Archive and Migration Software**
  Hewlett Packard Enterprise storage software enables you to comply with data retention and retrieval requirements, improve application performance, and reduce costs by efficiently migrating infrequently accessed or less valuable data to lower cost storage.
- **Storage Resource Management Software (SRM)**
  Hewlett Packard Enterprise storage resource management software reduces operational costs and provides the command and control foundation you need to efficiently manage and visualize your physical and virtual environments.
- **Data Replication Software**
  Hewlett Packard Enterprise offers array-based and host-based replication software for use in disaster recovery, testing, application development and reporting.
- **Storage Device Management Software**
  Maximize your investment in Hewlett Packard Enterprise storage and networking with software that enables hardware-specific configuration, performance tuning and connectivity management.
- **HPE StoreVirtual VSA**
  With HPE StoreVirtual VSA you can use the power of virtualization to create a virtual array within your host server. Manage it as a single pool of shared storage capacity, and scale it to match your evolving needs. HPE ProLiant Gen9 servers include a 3-year limited license for HPE StoreVirtual VSA software with 1TB of capacity at no extra cost. Simply select to install HPE StoreVirtual VSA software during server setup within Intelligent Provisioning. More information, instructional videos, and free console management software are available at **http://www.hp.com/go/vsa1TB**.

NOTE: For more information about Storage Software including QuickSpecs, please see: http://www.hp.com/go/storage/software.

One Config Simple (SCE)

SCE is a guided self-service tool to help sales and non-technical people provide customers with initial configurations in 3 to 5 minutes. You may then send the configuration on for configuration help, or use in your existing ordering processes. If you require "custom" rack configuration or configuration for products not available in SCE, please contact Hewlett Packard Enterprise Customer Business Center or an Authorized Partner for assistance. **https://h22174.www2.hp.com/SimplifiedConfig/Index**.

Service and Support	**HPE Technology Services for Industry Standard Servers** HPE Technology Services delivers confidence, reduces risk and helps customers realize agility and stability. Connect to Hewlett Packard Enterprise to help prevent problems and solve issues faster. Our support technology lets you to tap into the knowledge of millions of devices and thousands of experts to stay informed and in control, anywhere, any time. **Protect your business beyond warranty with HPE Care Pack Services** HPE Care Pack Services enable you to order the right service level, length of coverage and response time as you purchase your new server, giving you full entitlement for the selected support.
Optimized Care	**Supports maintaining servers at optimum performance availability** **HPE Proactive Care with 24x7 coverage, three year Care Pack Service** HPE Proactive Care helps prevent problems and stabilize IT by utilizing secure, real-time, predictive analytics and proactive consultations when your products are connected to HPE. This Care Pack Service combines three years' proactive reporting and advice with our 24x7 coverage and enhanced escalation management, four hour hardware response time and two hour call back for software questions on leading industry standard software running on your HPE ProLiant server. **http://h20195.www2.hp.com/v2/GetPDF.aspx/4AA3-8855ENW.pdf**
Standard Care Package	**Supports maintaining high level of server availability** **HPE Proactive Care with 6 hour call-to-repair commitment, three year Care Pack Service** HPE Proactive Care helps prevent problems and maintains IT stability by utilizing personalized proactive reports with recommendations and advice when your products are connected to HPE. This Service combines three years' proactive reporting and advice with our highest level reactive coverage - Hewlett Packard Enterprise's 24x7, six hour hardware call-to-repair. Hewlett Packard Enterprise is the only leading manufacturer who makes this level of coverage available as a standard service offering for your most valuable servers. Service includes collaborative software support for Independent Software Vendors software (Red Hat, VMWare, Microsoft, etc.) running on your HPE ProLiant/Apollo server. **http://h20195.www2.hp.com/v2/GetPDF.aspx/4AA3-8855ENW.pdf**
Related Services	**HPE Server Hardware Installation** Provides for the basic hardware installation of HPE branded servers, storage devices and networking options to assist you in bringing your new hardware into operation in a timely and professional manner. **http://h20195.www2.hp.com/V2/GetPDF.aspx/5981-9356EN.pdf** **Data Privacy –** protect your data through better media management. HPE Data privacy services help manage and protect sensitive data to reduce the risk of unauthorized access to private information and help meet compliance requirements. Our retention services allow you to keep drives and other devices upon failure, our removal services provide convenient data sanitization and our recovery services allow you to safely retire IT assets and capture any remaining value from the hardware. **http://www.hp.com/services/dataprivacy** **Factory Express for Servers and storage –**

	HPE Factory Express offers configuration, customization, integration and deployment services for HPE servers and storage products. Customers can choose how their factory solutions are built, tested, integrated, shipped and deployed. Factory Express offers service packages for simple configuration, racking, installation, complex configuration and design services as well as individual factory services, such as image loading, asset tagging, and custom packaging. Hewlett Packard Enterprise products supported through Factory Express include a wide array of servers and storage: HPE Integrity, HPE ProLiant, HPE Apollo, HPE ProLiant Server Blades, HPE BladeSystem, HPE 9000 servers as well as the MSAxxxx3PAR suite, XP, rackable tape libraries and configurable network switches. For more information on Factory Express services for your specific server model please contact your sales representative or go to: **http://www.hp.com/go/factory-express**. Additional HPE Care Pack services can be found at: **http://www.hp.com/go/cpc**
Connect your devices to HPE	Unlock all of the benefits of your technology investment by connecting your products to HPE. Achieve up to 77% reduction in down time, near 100% diagnostic accuracy and a single consolidated view of your environment. By connecting, you will receive 24x7monitoring, pre-failure alerts, automatic call logging, and automatic parts dispatch. HPE Proactive Care Service and HPE Datacenter Care Service customers will also benefit from proactive activities to help prevent issues and increase optimization. All of these benefits are already available to you with your server storage and networking products, securely connected to Hewlett Packard Enterprise support.
HPE Support Center	Personalized online support portal with access to information, tools and experts to support Hewlett Packard Enterprise business products. Submit support cases online, chat with Hewlett Packard Enterprise experts, access support resources or collaborate with peers. Learn more **http://www.hp.com/go/hpsc** Hewlett Packard Enterprise's Support Center Mobile App** allows you to resolve issues yourself or quickly connect to an agent for live support. Now, you can get access to personalized IT support anywhere, anytime. HPE Insight Remote Support and HPE Support Center are available at no additional cost with a Hewlett Packard Enterprise warranty, HPE Care Pack or Hewlett Packard Enterprise contractual support agreement. **** HPE Support Center Mobile App is subject to local availability**
Parts and Materials	Hewlett Packard Enterprise will provide HPE-supported replacement parts and materials necessary to maintain the covered hardware product in operating condition, including parts and materials for available and recommended engineering improvements. Parts and components that have reached their maximum supported lifetime and/or the maximum usage limitations as set forth in the manufacturer's operating manual, product quick-specs, or the technical product data sheet will not be provided, repaired, or replaced as part of these services. The defective media retention service feature option applies only to Disk or eligible SSD/Flash Drives replaced by Hewlett Packard Enterprise due to malfunction.

For more information To learn more on HPE ProLiant servers, please contact your Hewlett Packard Enterprise sales representative or Hewlett Packard Enterprise Authorized Channel Partner or visit: **http://www.hp.com/services/proliant**

	Entry Models		Base Models	
[SKU Number]	766342-B21	752686-B21	752688-B21	752687-B21
Model Name	HP ProLiant DL380 Gen9 E5-2609v3 1P 8GB-R B140i 4LFF SATA 500W PS Entry Server	HP ProLiant DL380 Gen9 E5-2609v3 1P 8GB-R B140i 8SFF SATA 500W PS Entry Server	HP ProLiant DL380 Gen9 E5-2620v3 2.4GHz 6-core 1P 16GB-R P840/4GB 12LFF 2x800W PS Base Server	HP ProLiant DL380 Gen9 E5-2620v3 1P 16GB-R P440ar 8SFF 500W PS Base Server
Processor	Intel® Xeon® E5-2609v3		Intel® Xeon® E5-2620v3	
Number of Processors	One			
Memory	8GB (1x8GB Registered DIMMs, 2133 MHz) **NOTE: With the E5-2609v3 this memory DIMM will only operate at 1600MHz.**		16GB (1x16GB Registered DIMMs, 2133 MHz) **NOTE: with the E5-2620v3 this memory DIMM will only operate at 1866MHz**	
Network Controller	HPE Embedded 1Gb Ethernet 4-port 331i Adapter			
Storage Controller	HPE Dynamic Smart Array B140i **NOTE: Default is AHCI off chipset, Smart Array needs to be enabled on SATA model.**		HPE Flexible Smart Array P840/4G Controller	HPE Flexible Smart Array P440ar/2GB
Hard Drive	None ship standard		None ship standard; includes 10 LFF hard drive blanks	None ship standard
Internal Storage	4 LFF HDD Bays	8 SFF HDD Bays	12 LFF HDD Bays	8 SFF HDD Bays
Optical Drive Bay	Not Available	Optional Universal Media Bay (724865-B21)	Not Available	Optional Universal Media Bay (724865-B21)
Optical Drive	Optional via HPE Mobile USB DVDRW Drive (701498-B21)	Optional DVD-ROM (726536-B21) or DVD-RW (726537-B21) via the Universal Media Bay (724865-B21)	Optional via HPE Mobile USB DVDRW Drive (701498-B21)	Optional DVD-ROM (726536-B21) or DVD-RW (726537-B21) via the Universal Media Bay (724865-B21)
PCI-Express Slots	3 PCIe slots (+3 PCI slots available with upgrade option, second processor required)			
Power Supply	(1) HPE 500W Flex Slot Platinum Power Supply		(2) HPE 800W Flex Slot Platinum Power Supply	(1) HPE 500W Flex Slot Platinum Power Supply
Fans	4 hot plug fans, redundant		6 hot plug high performance fans, redundant	4 hot plug fans, redundant
Management	iLO Management (standard), Intelligent Provisioning (standard), iLO Advanced (optional), Insight Control (optional), HPE OneView (optional)			
Form Factor	Rack (2U), HPE Easy Install Rails		Rack (2U), HPE Easy Install Rails with CMA	
Warranty	Server Warranty includes 3-Year Parts, 3-Year Labor, 3-Year Onsite support with next business day response			

	Performance Models	High Performance Models	
[SKU Number]	752689-B21	803860-B21	803861-B21
Model Name	HP ProLiant DL380 Gen9 E5-2650v3 2P 32GB-R P440ar 8SFF 2x10Gb 2x800W Perf Server	HP ProLiant DL380 Gen9 E5-2690v3 2P 32GB P440ar 8SFF 2x10Gb 2x800W High Perf Server	HP ProLiant DL380 Gen9 E5-2690v3 2P 32GB-R P440ar 8SFF 2x10Gb 2x800W OneView Server
Processor	Intel® Xeon® E5-2650v3	Intel® Xeon® E5-2690v3	
Number of Processors	Two		
Memory	32GB (2x16GB Registered DIMMs, 2133 MHz)		
Network Controller	HPE Embedded 4x1Gb, plus 2x10Gb-T Flexible LOM		
Storage Controller	HPE Flexible Smart Array P440ar/2GB		
Hard Drive	None ship standard		
Internal Storage	8 SFF HDD Bays		
Optical Drive Bay	Optional Universal Media Bay (724865-B21)		
Optical Drive	HPE Half-Height SATA DVD-RW Optical Drive		
PCI-Express Slots	6 PCIe slots (includes second riser slot upgrade option)		
Power Supply	(2) HPE 800W Flex Slot Platinum Power Supply		
Fans	6 hot plug fans, redundant	6 hot plug high performance fans, redundant	
Management	iLO Management (standard), Intelligent Provisioning (standard), iLO Advanced (standard), HPE OneView (optional)		iLO Management (standard), Intelligent Provisioning (standard), iLO Advanced (standard), HPE OneView Advanced (Standard)
Energy Star	Meets Energy Star requirements		
Form Factor	Rack (2U), HPE Easy Install Rails with CMA		
Warranty	Server Warranty includes 3-Year Parts, 3-Year Labor, 3-Year Onsite support with next business day response		

NOTE: UEFI is the standard default for all Predefined models.

[SKU Number]	777336-S01	777337-S01	800073-S01	777338-S01
Model Name	HP DL380 Gen9 E5-2609v3 US Svr/S-Buy	HP DL380 Gen9 E5-2620v3 US Svr/S-Buy	HP DL380 Gen9 E5-2620v3 SFF Svr/S-Buy	HP DL380 Gen9 E5-2640v3 US Svr/S-Buy
Processor	Intel® Xeon® E5-2609v3	Intel® Xeon® E5-2620v3		Intel® Xeon® E5-2640v3
Number of Processors	One			Two
Memory	8GB (1x8GB Registered DIMMs, 2133 MHz) **NOTE: the DIMM will operate at 1600MHz with this processor.**	16GB (1x16GB Registered DIMMs, 2133 MHz) **NOTE: the DIMM will only operate at 1866MHz with this processor**		16GB (2x8GB Registered DIMMs, 2133 MHz) **NOTE: the DIMM will only operate at 1866MHz with this processor**
Network Controller	HPE Embedded 1Gb Ethernet 4-port 331i Adapter			
Storage Controller	HPE H240ar Smart Host Bus Adapter		HPE Flexible Smart Array P440ar/2GB + Smart Storage Battery	
Hard Drive	None ship standard			
Internal Storage	8 SFF HDD Bays			
Optical Drive Bay	None Included: Optional DVD-ROM (726536-B21) or DVD-RW (726537-B21) via the Universal Media Bay (724865-B21)			
PCI-Express Slots	3 PCIe slots (+3 PCI slots available with upgrade option, second processor required)			
Power Supply	(1) HPE 500W Flex Slot Platinum Power Supply			(2) HPE 500W Flex Slot Platinum Power Supply
Fans	4 hot plug fans, redundant			6 hot plug fans, redundant
Management	Standard: iLO Management Optional: iLO Advanced, Insight Control, HPE OneView			
Form Factor	Rack (2U), HPE Easy Install Rails			
Warranty	3-Year Parts, 3-Year Labor, 3-Year Onsite support with next business day response			

[SKU Number]	800075-S01	800076-S01	800077-S01	784655-S01
Model Name	HP DL380 Gen9 E5-2643v3 SFF Svr/S-Buy	HP DL380 Gen9 E5-2667v3 SFF Svr/S-Buy	HP DL380 Gen9 E5-2690v3 2P SFF Svr/S-Buy	HP DL380 Gen9 E5-2670v3 Perf Svr/S-Buy
Processor	Intel® Xeon® E5-2643v3	Intel® Xeon® E5-2667v3	Intel® Xeon® E5-2690v3	Intel® Xeon® E5-2670v3
Number of Processors	One		Two	
Memory	32GB (2x16GB Registered DIMMs, 2133 MHz)		64GB (4x16GB Registered DIMMs, 2133 MHz)	
Network Controller	HPE Embedded 1Gb Ethernet 4-port 331i Adapter			HPE Embedded 1Gb Ethernet 4-port 331i Adapter plus HP FlexFabric 10Gb 2-port 556FLR-SFP+ Adapter
Storage Controller	HPE Flexible Smart Array P440ar/2GB + Smart Storage Battery			
Hard Drive	None ship standard			
Internal Storage	8 SFF HDD Bays			
Optical Drive Bay	None Included: Optional DVD-ROM (726536-B21) or DVD-RW (726537-B21) via the Universal Media Bay (724865-B21)			
PCI-Express Slots	3 PCIe slots (+3 PCI slots available with upgrade option, second processor required)			6 PCIe slots
Power Supply	(1) HPE 500W Flex Slot Platinum Power Supply	(2) HPE 500W Flex Slot Platinum Power Supply	(2) HPE 800W Flex Slot Platinum Power Supply	
Fans	4 hot plug fans, redundant		6 hot plug fans, redundant	
Management	Standard: iLO Management Optional: iLO Advanced, Insight Control, HPE OneView			Standard: iLO Advanced Optional: Insight Control, HPE OneView
Form Factor	Rack (2U), HPE Easy Install Rails			
Warranty	3-Year Parts, 3-Year Labor, 3-Year Onsite support with next business day response			

[SKU Number]	800078-S01	779559-S01	777339-S01	792468-S01
Model Name	HP DL380 Gen9 E5-2697v3 2P SFF Svr/S-Buy	HP DL380 Gen9 E5-2620v3 12LFF Svr/S-Buy	HP DL380 Gen9 E5-2640v3 24SFF Svr/S-Buy	HP DL380 Gen9 E5-2650v3 25SFF Svr/S-Buy
Processor	Intel® Xeon® E5-2697v3	Intel® Xeon® E5-2620v3	Intel® Xeon® E5-2640v3	Intel® Xeon® E5-2650v3
Number of Processors	Two	One		Two
Memory	64GB (4x16GB Registered DIMMs, 2133 MHz)	16GB (1x16GB Registered DIMMs, 2133 MHz) **NOTE: the DIMM will only operate at 1866MHz with this processor**	32GB (2x16GB Registered DIMMs, 2133 MHz) **NOTE: the DIMM will only operate at 1866MHz with this processor**	32GB (4x8GB Registered DIMMs, 2133 MHz)
Network Controller	HPE Embedded 1Gb Ethernet 4-port 331i Adapter			
Storage Controller	HPE Flexible Smart Array P440ar/2GB + Smart Storage Battery	HPE Smart Array P840/4GB + Smart Storage Battery	HPE Flexible Smart Array P440ar/2GB + Smart Storage Battery + SAS Expander	
Hard Drive	None ship standard			2x 300GB 10k SAS 4x 600GB 10k SAS
Internal Storage	8 SFF HDD Bays	12LFF HDD Bays	24 SFF HDD Bays	
Optical Drive Bay	None Included: Optional DVD-ROM (726536-B21) or DVD-RW (726537-B21) via the Universal Media Bay (724865-B21)	Not Available		
PCI-Express Slots	3 PCIe slots (+3 PCI slots available with upgrade option, second processor required)			
Power Supply	(2) HPE 800W Flex Slot Platinum Power Supply			
Fans	6 hot plug fans, redundant	4 hot plug fans, redundant		6 hot plug fans, redundant
Management	Standard: iLO Management Optional: iLO Advanced, Insight Control, HPE OneView			Standard: iLO Advanced Optional: Insight Control, HPE OneView
Form Factor	Rack (2U), HPE Easy Install Rails			
Warranty	3-Year Parts, 3-Year Labor, 3-Year Onsite support with next business day response			

This section lists some of the steps required to configure a Factory Integrated Model. To ensure only valid configurations are ordered, Hewlett Packard Enterprise recommends the use of an HPE approved configurator. Contact your local sales representative for information on configurable product offerings and requirements.
1. Factory Integrated Models must start with a CTO Server.
2. FIO indicates that this option is only available as a factory installable option.
3. All Factory Integrated Models will be populated with sufficient hard drive blanks based on the number of initial hard drives ordered with the server.
4. Some options may not be integrated at the factory. Contact your local sales representative for additional information.

Step 1: Base Configuration (choose one of the following configurable models)

CTO Server	HP ProLiant DL380 Gen9 8SFF Configure-to-order Server	HP ProLiant DL380 Gen9 NVMe 6 Solid State Drive Express Bay Configure-to-order Server	HP ProLiant DL380 Gen9 24SFF Configure-to-order Server	HP ProLiant DL380 Gen9 4LFF Configure-to-order Server	HP ProLiant DL380 Gen9 12LFF Configure-to-order Server
SKU Number	719064-B21	810393-B21	767032-B21	767033-B21	719061-B21
Processor	2 (optional) x HPE Smart Socket Guide				
DIMM Slots	24 DIMM slots for RDIMM, LRDIMM DDR4 Memory				
Storage Controller	HPE Dynamic Smart Array B140i, plus optional HPE Flexible Smart Array or Smart HBA controller				
PCIe	3 PCIe slots (+3 PCI slots available with upgrade option, second processor required)				
Drive Cage	8SFF Hot Plug (+8SFF and Universal Media Bay Optional)	8SFF + 6NMVe Hot Plug (+8SFF or Universal Media Bay Optional)	24SFF Hot Plug	4LFF Hot Plug	12LFF Hot Plug
Network Controller	HPE Embedded 1Gb Ethernet 4-port 331i Adapter, plus optional HPE Flexible LOM or stand up card	HPE Embedded 1Gb Ethernet 4-port 331i Adapter	HPE Embedded 1Gb Ethernet 4-port 331i Adapter, plus optional HPE Flexible LOM or stand up card		
Fans	4 hot plug fans, redundant	6 hot plug high performance fans, redundant		4 hot plug fans, redundant	6 hot plug high performance fans, redundant
Management	iLO Management (standard), Intelligent Provisioning (standard), iLO Advanced (optional), Insight Control (optional), HPE OneView (optional)				
USB	1 front, 2 internal, 2 rear	1 front, 1 internal, 2 rear	1 front, 2 internal, 2 rear	No front USB support	
Ears	HPE Quick Release Ears				

NOTE: With the NVMe CTO Server (810393-B21) there are limitations on GPU support.

Step 2: Choose Required Options (only one of the following from each list unless otherwise noted)

HPE Processors	**Entry Processors- E5-2600v3 series Processors**	
	HP DL380 Gen9 Intel® Xeon® E5-2603v3 (1.6GHz/6-core/15MB/85W) FIO Processor Kit	719053-L21
	HP DL380 Gen9 Intel® Xeon® E5-2609v3 (1.9GHz/6-core/15MB/85W) FIO Processor Kit	719052-L21
	Base Processors- E5-2600v3 series Processors	
	HP DL380 Gen9 Intel® Xeon® E5-2620v3 (2.4GHz/6-core/15MB/85W) FIO Processor Kit	719051-L21
	HP DL380 Gen9 Intel® Xeon® E5-2623v3 (3GHz/4-core/10MB/105W) FIO Processor Kit	779556-L21
	HP DL380 Gen9 Intel® Xeon® E5-2630v3 (2.4GHz/8-core/20MB/85W) FIO Processor Kit	719050-L21
	HP DL380 Gen9 Intel® Xeon® E5-2630Lv3 (1.8GHz/8-core/20MB/55W) FIO Processor Kit	719060-L21
	HP DL380 Gen9 Intel® Xeon® E5-2637v3 (3.5GHz/4-core/15MB/135W) FIO Processor Kit **NOTE:** Ships with a High Performance Heatsink	719058-L21
	HP DL380 Gen9 Intel® Xeon® E5-2640v3 (2.6GHz/8-core/20MB/90W) FIO Processor Kit	719049-L21
	Performance Processors- E5-2600v3 series Processors	
	HP DL380 Gen9 Intel® Xeon® E5-2643v3 (3.4GHz/6-core/20MB/135W) FIO Processor Kit **NOTE:** Ships with a High Performance Heatsink	719057-L21
	HP DL380 Gen9 Intel® Xeon® E5-2650v3 (2.3GHz/10-core/25MB/105W) FIO Processor Kit	719048-L21
	HP DL380 Gen9 Intel® Xeon® E5-2650Lv3 (1.8GHz/12-core/30MB/65W) FIO Processor Kit	719059-L21
	HP DL380 Gen9 Intel® Xeon® E5-2660v3 (2.6GHz/10-core/25MB/105W) FIO Processor Kit	762764-L21
	HP DL380 Gen9 Intel® Xeon® E5-2667v3 (3.2GHz/8-core/20MB/135W) FIO Processor Kit **NOTE:** Ships with a High Performance Heatsink	719056-L21
	HP DL380 Gen9 Intel® Xeon® E5-2670v3 (2.3GHz/12-core/30MB/120W) FIO Processor Kit **NOTE:** Ships with a High Performance Heatsink	719046-L21
	HP DL380 Gen9 Intel® Xeon® E5-2680v3 (2.5GHz/12-core/30MB/120W) FIO Processor Kit **NOTE:** Ships with a High Performance Heatsink	762766-L21
	HP DL380 Gen9 Intel® Xeon® E5-2683v3 (2GHz/14-core/35MB/120W) FIO Processor Kit **NOTE:** Ships with a High Performance Heatsink	719055-L21
	HP DL380 Gen9 Intel® Xeon® E5-2690v3 (2.6GHz/12-core/30MB/135W) FIO Processor Kit **NOTE:** Ships with a High Performance Heatsink	719044-L21
	HP DL380 Gen9 Intel® Xeon® E5-2695v3 (2.3GHz/14-core/35MB/120W) FIO Processor Kit **NOTE:** Ships with a High Performance Heatsink	762760-L21
	HP DL380 Gen9 Intel® Xeon® E5-2697v3 (2.6GHz/14-core/35MB/145W) FIO Processor Kit **NOTE:** Ships with a High Performance Heatsink	719054-L21
	HP DL380 Gen9 Intel® Xeon® E5-2698v3 (2.3GHz/16-core/40MB/135W) FIO Processor Kit **NOTE:** Ships with a High Performance Heatsink	781913-L21
	HP DL380 Gen9 Intel® Xeon® E5-2699v3 (2.3GHz/18-core/45MB/145W) FIO Processor Kit **NOTE:** Ships with a High Performance Heatsink	781915-L21
	HP DL380 Gen9 Intel® Xeon® E5-2687Wv3 (3.1GHz/10-core/25MB/160W) FIO Processor Kit	762768-L21
	NOTE: 2SFF rear drives are not supported with this processor in a 12LFF model.	
	NOTE: If two processors are desired, select one xxxxxx-L21 and one corresponding xxxxxx-B21.	

NOTE: Up to two processors supported. Mixing different processor models is not supported.

NOTE: DDR4 speed is the maximum memor speed of the processor. Actual memory speed may depend on the quantity and type of DIMMs installed.

NOTE: For the Intel® C600 Chipset E5-2600 Series, the letter preceding the model number indicates the Product Line (E3, E5, E7); 2600x v#, 2 = number of CPUs in a Node, 6 is socket/segment designation, 00 = Processor SKU, x = L for low power SKUs and v# (not yet designated) = version number

HPE Memory

NOTE: Select one or more memory from below

NOTE: LRDIMM and RDIMM are all distinct memory technologies and cannot be mixed within a server. The majority of ProLiant Gen9 servers support LRDIMM and RDIMM.

NOTE: HPE memory from previous generation servers are not qualified or warranted with this HPE ProLiant server. HP SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen9

NOTE: If only only processor is installed only half of the total DIMM slots are available. When populating with two processors all DIMM slots are available.

NOTE: Kits described as LP include Low Power DIMMs. For more information on ProLiant Energy Efficient Features, see: **http://www.hp.com/go/proliant-energy-efficient**.

NOTE: Depending on the memory configuration and processor model, the memory speed may run at 2133MHz, 1866MHz, 1600MHz, or 1333MHz. Please see Memory Population Table or Online Memory Configuration Tool at: **http://www.hp.com/go/ddr4config**.

Registered DIMMs (RDIMMs) for E5-2600v3 Series

HP 4GB (1x4GB) Single Rank x8 DDR4-2133 CAS-15-15-15 Registered Memory Kit	726717-B21
HP 8GB (1x8GB) Single Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit	726718-B21
HP 8GB (1x8GB) Dual Rank x8 DDR4-2133 CAS-15-15-15 Registered Memory Kit	759934-B21
HP 16GB (1x16GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit	726719-B21
HP 32GB (1x32GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit	728629-B21

Load Reduced DIMMs (LRDIMMs) for E5-2600v3 Series

HP 64GB (1x64GB) Quad Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit	726724-B21
HP 32GB (1x32GB) Quad Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit	726722-B21
HP 16GB (1x16GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit	726720-B21

HPE Power Supplies

NOTE: Mixing of power supplies in the same server is not supported. All power supplies must be of the same input voltage, output rating, and efficiency rating. If non-matching power supplies are installed, you may receive an error message and/or experience operational issues with your server.

NOTE: Prior to selecting a power supply option, it is highly recommended that you review your server configuration in the HPE Power Advisor tool to determine the right size power supply for your server configuration. The HPE Power Advisor is located at: **http://www.hp.com/go/hppoweradvisor**.

HPE Flex Slot Platinum Hot-Plug Power Supplies

HP 500W Flex Slot Platinum Hot Plug Power Supply Kit	720478-B21
HP 800W Flex Slot Platinum Hot Plug Power Supply Kit	720479-B21
HP 800W Flex Slot Titanium Hot Plug Power Supply Kit	720482-B21

NOTE: Flex Slot Titanium power supplies support power efficiency of up to 96% and include a standard C-14 power inlet connector.

HP 800W Flex Slot Universal Hot Plug Power Supply Kit 720484-B21

NOTE: Flex Slot universal power supplies support power efficiency of up to 94% and support both 277VAC/380VDC power inputs.

HP 800W Flex Slot -48VDC Hot Plug Power Supply Kit 720480-B21

NOTE: Flex Slot -48VDC power supplies support power efficiency of up to 94%.

HP 1400W Flex Slot Platinum Plus Hot Plug Power Supply Kit 720620-B21

HP 750W Flex Slot Hot Plug Battery Backup Module 738024-B21

NOTE: Flex Slot Battery Backup provides 750W output and 500W in paralleled configuration.

NOTE: Only 1 Battery Backup module per server, and a Flex Slot Power Supply needed in parallel.

NOTE: The above power supply options are all 80Plus Platinum-certified with an efficiency rating of up to 94%. Support for HPE Power Discovery Services is included with the 1400W Flex Slot option. Power specifications and technical content for all HPE Server power supplies can be found at: **http://www.hp.com/go/proliant/powersupply**

Step 3: Choose Additional Factory Integratable Options (only one of the following from each list unless otherwise noted)

HPE Storage Controllers

NOTE: The embedded B140i controller will be used as the primary controller if no controller is selected from the list below. Embedded SATA controller can support up to 8 SATA hard drives. Cable Kit may be required.

HPE Flexible Smart Array Controllers

HP Smart Array P440ar/2GB FBWC 12Gb 2-ports Int FIO SAS Controller 749974-B21

NOTE: Provides support for up to 8 internal SAS/SATA drives without using a PCIe slot.

NOTE: Includes the HP Smart Storage Battery.

HPE Smart Array Controllers

HP Smart Array P440/4GB FBWC 12Gb 1-port Int FIO SAS Controller 761872-B21

NOTE: Provides support for up to 8 internal SAS/SATA drives without using a PCIe slot.

NOTE: Includes the HP Smart Storage Battery.

HP Smart Array P840/4GB FBWC 12Gb 2-ports Int FIO SAS Controller 761874-B21

NOTE: Includes the HP Smart Storage Battery.

HPE Smart Host Bus Adapters

HP H240ar 12Gb 2-ports Int FIO Smart Host Bus Adapter 749976-B21

NOTE: Provides support for up to 8 internal SAS/SATA drives without using a PCIe slot.

HPE Cable Options

HP DL380 Gen9 12LFF Rear 2SFF or 3LFF P840/440 SAS Cable Kit 783007-B21

HP DL380 Gen9 2SFF Front SAS x4 Cable Kit 783008-B21

NOTE: Required for front mount 2SFF to H240/P440ar, H240 or embedded B140i SATA controller

	HP DL380 Gen9 8SFF SAS Cable Kit **NOTE: Required for 8/16/24 SFF models for use with P840/440 controllers**	783009-B21
	HP DL380 Gen9 2SFF x8 Front Cable Kit **NOTE: Required for front/rear mount 2SFF to P440/840 PCIe controller**	785989-B21
	HP DL380 Gen9 12LFF SAS Cable Kit **NOTE: Required for 12LFF models with P440/840 PCIe controllers**	785991-B21
	HP DL380 Gen9 8SFF H240 Cable Kit **NOTE: Required for 8/16/24 SFF models for use with H240/P440ar, H240 PCIe or embedded B140i SATA controller.**	786092-B21
	HP DL380 Gen9 12LFF H240 SAS Cable Kit **NOTE: Required for 12LFF models with H240/P440ar, H240 or embedded B140i SATA controller**	786215-B21
BIOS Mode	HP Legacy FIO Mode Setting **NOTE: If selected, then B140i will not be supported and can no longer be a primary controller, therefore SAS internal controller must be selected to be the primary controller.**	758959-B22
Controller State	HP FIO Enable B140i Setting **NOTE: Must be selected when B140i is used as primary controller and RAID is desired.**	784308-B21
	HP Mfg FIO Enable HBA Mode Setting **NOTE: When selected if H240ar/H240 are used as the primary controller then RAID is not allowed.**	792962-B21
HPE Unique Options	HP 2SFF Front SPEC Perf FIO Mount **NOTE: May only be selected with 8SFF CTO Server and optical media cage kit and 2SFF Drive cage option. When this option is selected, a primary controlleris not required for the 8SFF CTO Server.**	787945-B21
HPE Insight Software	**HPE Insight Control**	
	HP Insight Control including 1yr 24x7 Support ProLiant ML/DL/BL-bundle Single Server FIO License	C6N36A
	HP Insight Control including 1yr 24x7 Support ProLiant ML/DL/BL-bundle Single Server FIO E-LTU	C6N36ABE
HPE Converged Infrastructure Management Software	**HPE OneView Advanced (with iLO Advanced)**	
	HP OneView for ProLiant DL Server incl 3 yr 24x7 Supp FIO Bundle Physical 1 Svr Lic	E5Y43A
	HPE OneView Advanced (without HPE iLO Advanced)	
	HP OneView w/o iLO including 3yr 24x7 Support FIO 1 Server LTU	P8B31A

Step 4: Choose Additional Options for Factory Integration from Core and Additional Options sections below

CAUTION: Hewlett Packard Enterprise recommends that a minimum of two people are required for all Rack Server installations. Please refer to your installation instructions for proper tools and number of people to use for any installation.

NOTE: Some options may not be integrated at the factory. To ensure only valid configurations are ordered, Hewlett Packard Enterprise recommends the use of an HPE approved configurator. Contact your local sales representative for additional information.

HPE Unique Options	HP DL380 Gen9 NVMe 6 Solid State Drive Express Bay Enablement Kit **NOTE:** This option provides support for up to 6NVMe drives, and can only be populated in BAY2 in SFF CTO Server only, can be used with Bay1 and Bay 3 populated. **NOTE:** The HPE DL380 Gen9 High Performance Fan Kit is required for NVMe support (719079-B21). **NOTE:** The PCIe card in this enablement kit can only be populated in slot2 (primary) or slot 5 (secondary). **NOTE:** For true x16 support with this option a secondary riser (719073-B21) is needed (second processor required). **NOTE:** Kit includes Mylar film for Universal Media Bay (724865-B21) support to ensure optimal airflow. **NOTE:** There are limitations on GPU support with the NVMe bay installed.	774741-B21
	HP DL380 Gen9 Universal Media Bay Kit **NOTE:** The HPE DL380 Gen9 Universal Media bay provides front VGA and 2xUSB 2.0; plus support for 2xSFF front drives (724864-B21) and ODD support (No included); and can only be located in Bay1 in either a 8SFF or 8+8SFF CTO Server.	724865-B21
	HP DL380 Gen9 Graphics Enablement Kit **NOTE:** This kit includes alternative 2 heatsinks plus6 cables to enable GPU support. Other limitations apply, see Graphic section for more details. **NOTE:** We support up to 2 Double wide and 3 single wide Graphics cards, limitations apply. **NOTE:** Double Wide GPUs will occupy slots 2 and 5 and will leave only 2 slots left open. **NOTE:** There are limitations on GPU support with the NVMe bay installed.	719082-B21
	HP DL380 Gen9 High Performance Fan Kit **NOTE:** This kit is required for specific Ambient temperature environments, more details here: **http://www.hp.com/servers/Ashrae**. **NOTE:** This kit is also required to support Passive GPUs. **NOTE:** This kit provides max cooling for your Server.	719079-B21
	HP DL380 Gen9 2SFF Front/Rear SAS/SATA Kit **NOTE:** For 2SFF front the Universal Media Bay (724865-B21) is required. **NOTE:** 2SFF in the rear is only supported with a 24SFF (CTO Server or field upgraded) or 12LFF (719061-B21) CTO Server. **NOTE:** 2SFF Rear drives are not supported with 160W Processors.	724864-B21
	HP DL380 Gen9 3LFF Rear SAS/SATA Kit **NOTE:** This is only supported in the 12LFF CTO Server (719061-B21). **NOTE:** 3LFF rear drives will consume the 2nd riser expansion slot. **NOTE:** 3LFF Rear drives are not supported with 160W Processors.	768856-B21

	HP DL380 Gen9 Primary 2 Slot GPU Ready Riser Kit **Slot1: 1x Gen3 x16 FH/FL, 1xGen3 x8 FH/HL.** **NOTE: This replaces the standard Primary riser in slot1.**	719076-B21
	HP DL380 Gen9 Secondary 3 Slot GPU Ready Riser Kit **Slot2: 2xGen3 x16 FH/FL, 1xGen3 x8 FH/HL.**	719073-B21
	HP DL380 Gen9 8SFF Bay1 Cage/Backplane Kit **NOTE: To add an additional 8SFF drive cage in Bay1.** **NOTE: To get to 16SFF total please populate bay 2 with 768857-B21 (from an 8SFF starting point).** **NOTE: This ships with 6 High Efficiency Fans.** **NOTE: Selecting this option does not allow you to select the Universal Media Bay.**	719067-B21
	HP DL380 Gen9 Additional 8SFF Bay2 Cage/Backplane Kit **NOTE: To add an additional 8SFF drive cage in Bay 2. This is the optimal solution to upgrade to 16SFF total and allows the flexibility to add the Universal Media Bay (724865-B21) for 2 additional SFF or Optical.**	768857-B21
	HP 12Gb SAS Expander Card with Cables for DL380 Gen9 **NOTE: SAS expander to enable 24SFF field upgrade.**	727250-B21
	HP DL380 Gen9 Systems Insight Display Kit **NOTE: The Systems Insight Display no longer ships as standard but is available as a Factory Integrated or field upgrade option.**	768900-B21
	HP DL380 Gen9 Rear Serial Port and Enablement Kit	768896-B21
HPE Processors	**Entry Processors - E5-2600v3 series Processors**	
	HP DL380 Gen9 Intel® Xeon® E5-2609v3 (1.9GHz/6-core/15MB/85W) Processor Kit	719052-B21
	HP DL380 Gen9 Intel® Xeon® E5-2603v3 (1.6GHz/6-core/15MB/85W) Processor Kit	719053-B21
	Base Processors - E5-2600v3 series Processors	
	HP DL380 Gen9 Intel® Xeon® E5-2640v3 (2.6GHz/8-core/20MB/90W) Processor Kit	719049-B21
	HP DL380 Gen9 Intel® Xeon® E5-2630v3 (2.4GHz/8-core/20MB/85W) Processor Kit	719050-B21
	HP DL380 Gen9 Intel® Xeon® E5-2620v3 (2.4GHz/6-core/15MB/85W) Processor Kit	719051-B21
	HP DL380 Gen9 Intel® Xeon® E5-2637v3 (3.5GHz/4-core/15MB/135W) Processor Kit	719058-B21
	HP DL380 Gen9 Intel® Xeon® E5-2630Lv3 (1.8GHz/8-core/20MB/55W) Processor Kit	719060-B21
	HP DL380 Gen9 Intel® Xeon® E5-2623v3 (3GHz/4-core/10MB/105W) Processor Kit	779556-B21
	Performance Processors - E5-2600v3 series Processors	
	HP DL380 Gen9 Intel® Xeon® E5-2690v3 (2.6GHz/12-core/30MB/135W) Processor Kit	719044-B21

HP DL380 Gen9 Intel® Xeon® E5-2670v3 (2.3GHz/12-core/30MB/120W) Processor Kit	719046-B21
HP DL380 Gen9 Intel® Xeon® E5-2650v3 (2.3GHz/10-core/25MB/105W) Processor Kit	719048-B21
HP DL380 Gen9 Intel® Xeon® E5-2697v3 (2.6GHz/14-core/35MB/145W) Processor Kit	719054-B21
HP DL380 Gen9 Intel® Xeon® E5-2683v3 (2GHz/14-core/35MB/120W) Processor Kit	719055-B21
HP DL380 Gen9 Intel® Xeon® E5-2667v3 (3.2GHz/8-core/20MB/135W) Processor Kit	719056-B21
HP DL380 Gen9 Intel® Xeon® E5-2643v3 (3.4GHz/6-core/20MB/135W) Processor Kit	719057-B21
HP DL380 Gen9 Intel® Xeon® E5-2650Lv3 (1.8GHz/12-core/30MB/65W) Processor Kit	719059-B21
HP DL380 Gen9 Intel® Xeon® E5-2695v3 (2.3GHz/14-core/35MB/120W) Processor Kit	762760-B21
HP DL380 Gen9 Intel® Xeon® E5-2660v3 (2.6GHz/10-core/25MB/105W) Processor Kit	762764-B21
HP DL380 Gen9 Intel® Xeon® E5-2680v3 (2.5GHz/12-core/30MB/120W) Processor Kit	762766-B21
HP DL380 Gen9 Intel® Xeon® E5-2687Wv3 (3.1GHz/10-core/25MB/160W) Processor Kit	762768-B21
HP DL380 Gen9 Intel® Xeon® E5-2698v3 (2.3GHz/16-core/40MB/135W) Processor Kit	781913-B21
HP DL380 Gen9 Intel® Xeon® E5-2699v3 (2.3GHz/18-core/45MB/145W) Processor Kit	781915-B21

NOTE: Up to 2 processors supported. Performance and Energy Star Model configurations include two processors.

NOTE: HT indicates that the processor model supports Intel® Hyper-Threading Technology.

NOTE: Turbo2: Intel® Turbo Boost Technology 2.0 provides more computing power when you need it with performance that adapts to spikes in your workload and delivers more performance upside than then previous generation turbo technology.

NOTE: DDR4 speed is the maximum memory speed of the processor. Actual memory speed may depend on the quantity and type of DIMMs installed.

NOTE: processor option kits ship with 2 additional FANs for factory of field installation.

NOTE: Double wide PCIe cards are only supported in risers with the Processors leveraging the High Performance Heatsink. For Processors requiring double wide GPU support please order the GPU enablement kit (719082-B21).

HPE Memory

Registered DIMMs (RDIMMs) for E5-2600v3 Series

NOTE: The following memory is supported by the E5-2600v3 series Processors.

HP 4GB (1x4GB) Single Rank x8 DDR4-2133 CAS-15-15-15 Registered Memory Kit	726717-B21
HP 8GB (1x8GB) Single Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit	726718-B21
HP 8GB (1x8GB) Dual Rank x8 DDR4-2133 CAS-15-15-15 Registered Memory Kit	759934-B21
HP 16GB (1x16GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit	726719-B21

	HP 32GB (1x32GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit	728629-B21
	NOTE: Depending on Processor selected this memory will run at 1600, 1866 or 2133MHz.	
	Load Reduced DIMMs (LRDIMMs) for E5-2600v3 Series	
	NOTE: The following memory is supported by the E5-2600v3 series Processors.	
	HP 64GB (1x64GB) Quad Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit	726724-B21
	HP 32GB (1x32GB) Quad Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit	726722-B21
	HP 16GB (1x16GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit	726720-B21
	NOTE: Depending on Processor selected this memory will run at 1600, 1866 or 2133MHz.	
HPE Optical Drives	HP 9.5mm SATA DVD-ROM JackBlack Gen9 Optical Drive	726536-B21
	NOTE: The Universal Media Bay (724865-B21) is required for this option.	
	HP 9.5mm SATA DVD-RW JackBlack G9 Optical Drive	726537-B21
	NOTE: The Universal Media Bay (724865-B21) is required for this option.	
	HP Mobile USB Non Leaded System DVD RW Drive	701498-B21
	NOTE: This is only supported on USB 3.0 ports.	
HPE Drives	**SAS Hot Plug SFF (2.5-inch) Enterprise (ENT) Drives**	
	HP 1.8TB 12G SAS 10K rpm SFF (2.5-inch) SC Enterprise 512e 3yr Warranty Hard Drive	791034-B21
	HP 1.2TB 12G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	781518-B21
	HP 1.2TB 6G SAS 10K rpm SFF (2.5-inch) SC Dual Port Enterprise 3yr Warranty Hard Drive	718162-B21
	HP 900GB 12G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	785069-B21
	HP 900GB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652589-B21
	HP 600GB 12G SAS 15K rpm SFF (2.5-inch) SC 512e Enterprise 3yr Warranty Hard Drive	748387-B21
	HP 600GB 12G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	759212-B21
	HP 600GB 12G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	781516-B21
	HP 600GB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652583-B21
	HP 450GB 12G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	759210-B21
	HP 450GB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652572-B21
	HP 300GB 12G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	759208-B21
	HP 300GB 12G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	785067-B21
	HP 300GB 6G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652611-B21
	HP 300GB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652564-B21
	HP 146GB 6G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652605-B21
	SAS Hot Plug SFF (2.5-inch) Midline (MDL) Drives	

HP 2TB 12G SAS 7.2K rpm SFF (2.5-inch) SC 512e 1yr Warranty Hard Drive	765466-B21
HP 1TB 12G SAS 7.2K rpm SFF (2.5-inch) SC 512e 1yr Warranty Hard Drive	765464-B21
HPE 1TB 12G SAS 7.2K rpm SFF (2.5in) SC Midline 1yr Warranty Hard Drive	832514-B21
HP 1TB 6G SAS 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive	652749-B21
HP 500GB 6G SAS 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive	652745-B21
SAS Hot Plug LFF (3.5-inch) Enterprise (ENT) Drives	
HP 600GB 12G SAS 15K rpm LFF (3.5-inch) SC Converter Enterprise 3yr Warranty Hard Drive	765424-B21
HP 450GB 12G SAS 15K rpm LFF (3.5-inch) SC Converter Enterprise 3yr Warranty Hard Drive	737394-B21
HP 300GB 12G SAS 15K rpm LFF (3.5-inch) SC Converter Enterprise 3yr Warranty Hard Drive	737261-B21
SAS Hot Plug LFF (3.5-inch) Midline (MDL) Drives	
HP 8TB 12G SAS 7.2K rpm LFF (3.5-inch) SC 512e Helium 1yr Warranty Hard Drive	793703-B21
HP 6TB 12G SAS 7.2K rpm LFF (3.5-inch) SC 512e Helium 1yr Warranty Hard Drive	793699-B21
HP 6TB 12G SAS 7.2K rpm LFF (3.5-inch) SC Midline 512e 1yr Warranty Hard Drive	765259-B21
HP 6TB 6G SAS 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	761477-B21
HP 6TB 12G SAS 7.2K rpm LFF (3.5-inch) SC 512e Performance 1yr Warranty Hard Drive	793671-B21
HP 4TB 12G SAS 7.2K rpm LFF (3.5-inch) SC Midline 512e 1yr Warranty Hard Drive	765257-B21
HPE 4TB 12G SAS 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	818367-B21
HP 4TB 6G SAS 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	695510-B21
HP 4TB 12G SAS 7.2K rpm LFF (3.5-inch) SC 512e Performance 1yr Warranty Hard Drive	793669-B21
HP 3TB 6G SAS 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	652766-B21
HPE 2TB 12G SAS 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	818365-B21
HP 2TB 6G SAS 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	652757-B21
HP 1TB 6G SAS 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	652753-B21
SATA Hot Plug SFF (2.5-inch) Midline (MDL) Drives	
HP 2TB 6G SATA 7.2K rpm SFF (2.5-inch) SC 512e 1yr Warranty Hard Drive	765455-B21
HP 1TB 6G SATA 7.2K rpm SFF (2.5-inch) SC 512e 1yr Warranty Hard Drive	765453-B21
HP 1TB 6G SATA 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive	655710-B21
HP 500GB 6G SATA 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive	655708-B21
SATA Hot Plug LFF (3.5-inch) Midline (MDL) Drives	
HP 8TB 6G SATA 7.2K rpm LFF (3.5-inch) SC 512e Helium 1yr Warranty Hard Drive	793695-B21
HP 6TB 6G SATA 7.2K rpm LFF (3.5-inch) SC 512e Helium 1yr Warranty Hard Drive	793683-B21
HP 6TB 6G SATA 7.2K rpm LFF (3.5-inch) SC Midline 512e 1yr Warranty Hard Drive	765255-B21
HP 6TB 6G SATA 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	753874-B21

HP 6TB 6G SATA 7.2K rpm LFF (3.5-inch) SC 512e Performance 1yr Warranty Hard Drive	793667-B21
HP 4TB 6G SATA 7.2K rpm LFF (3.5-inch) SC Midline 512e 1yr Warranty Hard Drive	765253-B21
HP 4TB 6G SATA 7.2k rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	693687-B21
HP 4TB 6G SATA 7.2K rpm LFF (3.5-inch) SC 512e Performance 1yr Warranty Hard Drives	793665-B21
HP 3TB 6G SATA 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	628061-B21
HP 2TB 6G SATA 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	658079-B21
HP 1TB 6G SATA 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	657750-B21
HP 500GB 6G SATA 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	658071-B21
12G SAS Mixed Use Hot Plug SFF (2.5-inch) Solid State Drives	
HPE 3.2TB 12G SAS Mixed Use-3 SFF 2.5-in SC 3yr Wty Solid State Drive	822567-B21
HPE 1.6TB 12G SAS Mixed Use-3 SFF 2.5-in SC 3yr Wty Solid State Drive	822563-B21
HPE 800GB 12G SAS Mixed Use-3 SFF 2.5-in SC 3yr Wty Solid State Drive	822559-B21
HPE 400GB 12G SAS Mixed Use-3 SFF 2.5-in SC 3yr Wty Solid State Drive	822555-B21
12G SAS Read Intensive Hot Plug SFF (2.5-inch) Solid State Drives	
HPE 3.84TB 12G SAS Read Intensive-3 SFF 2.5-in SC 3yr Wty Solid State Drive	816576-B21
HPE 1.92TB 12G SAS Read Intensive-3 SFF 2.5-in SC 3yr Wty Solid State Drive	816572-B21
HPE 960GB 12G SAS Read Intensive-3 SFF 2.5-in SC 3yr Wty Solid State Drive	816568-B21
HPE 480GB 12G SAS Read Intensive-3 SFF 2.5-in SC 3yr Wty Solid State Drive	816562-B21
12G SAS Hot Plug SFF (2.5-inch) Enterprise Mainstream Solid State Drives	
HP 1.92TB 12G SAS Read Intensive SFF 2.5-in SC 3yr Wty Solid State Drive	802891-B21
HP 1.6TB 12G SAS Mainstream Endurance SFF 2.5-in ENT Mainstream SC 3yr Wty H2 Solid State Drive	779176-B21
HP 800GB 12G SAS Write Intensive SFF 2.5-in SC 3yr Wty Solid State Drive	802586-B21
HP 800GB 12G SAS Mainstream Endurance SFF 2.5-in ENT Mainstream SC 3yr Wty H2 Solid State Drive	779172-B21
HP 400GB 12G SAS Mainstream Endurance SFF 2.5-in ENT Mainstream SC 3yr Wty H2 Solid State Drive	779168-B21
HP 200GB 12G SAS Mainstream Endurance SFF 2.5-in ENT Mainstream SC 3yr Wty H2 Solid State Drive	779164-B21
HP 200GB 12G SAS Write Intensive SFF 2.5-in SC 3yr Wty Solid State Drive	802578-B21
HP 400GB 12G SAS Write Intensive SFF 2.5-in SC 3yr Wty Solid State Drive	802582-B21
12G SAS Hot Plug SFF (2.5-inch) Enterprise Value Solid State Drives	
HP 1.6TB 12G SAS Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	762263-B21
HP 800GB 12G SAS Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	762261-B21
12G SAS Hot Plug LFF (3.5-inch) Enterprise Value Solid State Drives	
HP 1.6TB 12G SAS Value Endurance LFF 3.5-in SC Enterprise Value 3yr Wty Solid State Drive	762272-B21

HP 800GB 12G SAS Value Endurance LFF 3.5-in SC Enterprise Value 3yr Wty Solid State Drive	762270-B21
6G SATA Hot Plug SFF (2.5-inch) Enterprise Value Solid State Drives	
HP 1.6TB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	757339-B21
HP 800GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	717973-B21
HP 600GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	739898-B21
HP 480GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	717971-B21
HP 300GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	739888-B21
HP 240GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	717969-B21
6G SATA Hot Plug SFF Value Endurance (2.5-inch) Enterprise Value G1 Solid State Drives	
HP 480GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty G1 Solid State Drive	756657-B21
6G SATA Hot Plug SFF Value Endurance (2.5-inch) Enterprise Value M1 Solid State Drives	
HP 800GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty M1 Solid State Drive	764929-B21
HP 480GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty M1 Solid State Drive	764927-B21
HP 240GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty M1 Solid State Drive	764925-B21
HP 120GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty M1 Solid State Drive	764923-B21
6G SATA Hot Plug SFF (2.5-inch) Enterprise Boot Solid State Drives	
HP 120GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Boot 3yr Wty Solid State Drive	717965-B21
HP 80GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Boot 3yr Wty Solid State Drive	734360-B21
6G SATA Hot Plug SFF (2.5-inch) SC Read Intensive Solid State Drives	
HP 3.84TB 6G SATA Read Intensive-3 LFF 3.5-in SC Converter 3yr Wty Solid State Drive	816933-B21
HP 3.84TB 6G SATA Read Intensive-3 SFF 2.5-in SC 3yr Wty Solid State Drive	816929-B21
HP 1.92TB 6G SATA Read Intensive-3 LFF 3.5-in SC Converter 3yr Wty Solid State Drive	816923-B21
HP 1.92TB 6G SATA Read Intensive-3 SFF 2.5-in SC 3yr Wty Solid State Drive	816919-B21
HP 1.6TB 6G SATA Read Intensive-2 SFF 2.5-in SC 3yr Wty Solid State Drive	804605-B21
HP 960GB 6G SATA Read Intensive-3 LFF 3.5-in SC Converter 3yr Wty Solid State Drive	816913-B21

HP 960GB 6G SATA Read Intensive-3 SFF 2.5-in SC 3yr Wty Solid State Drive	816909-B21
HP 800GB 6G SATA Read Intensive-2 SFF 2.5-in SC 3yr Wty Solid State Drive	804599-B21
HP 480GB 6G SATA Read Intensive SFF 2.5-in SC 3yr Wty Solid State Drive	789145-B21
HP 480GB 6G SATA Read Intensive-2 SFF 2.5-in SC 3yr Wty Solid State Drive	804593-B21
HP 480GB 6G SATA Read Intensive-3 LFF 3.5-in SC Converter 3yr Wty Solid State Drive	816903-B21
HP 480GB 6G SATA Read Intensive-3 SFF 2.5-in SC 3yr Wty Solid State Drive	816899-B21
HP 240GB 6G SATA Read Intensive-3 LFF 3.5-in SC Converter 3yr Wty Solid State Drive	816893-B21
HP 240GB 6G SATA Read Intensive-3 SFF 2.5-in SC 3yr Wty Solid State Drive	816889-B21
HP 240GB 6G SATA Read Intensive-2 SFF 2.5-in SC 3yr Wty Solid State Drive	804587-B21
HP 120GB 6G SATA Read Intensive-3 LFF 3.5-in SC Converter 3yr Wty Solid State Drive	816883-B21
HP 120GB 6G SATA Read Intensive-3 SFF 2.5-in SC 3yr Wty Solid State Drive	816879-B21
HP 120GB 6G SATA Read Intensive-2 SFF 2.5-in SC 3yr Wty Solid State Drive	804581-B21
HP 80GB 6G SATA Read Intensive-2 SFF 2.5-in SC 3yr Wty Solid State Drive	804575-B21
6G SATA Hot Plug SFF (2.5-inch) SC Write Intensive Solid State Drives	
HP 1.2TB 6G SATA Write Intensive-2 SFF 2.5-in SC 3yr Wty Solid State Drive	804677-B21
HP 800GB 6G SATA Write Intensive-2 SFF 2.5-in SC 3yr Wty Solid State Drive	804671-B21
HP 400GB 6G SATA Write Intensive-2 SFF 2.5-in SC 3yr Wty Solid State Drive	804665-B21
HP 200GB 6G SATA Write Intensive-2 SFF 2.5-in SC 3yr Wty Solid State Drive	804639-B21
6G SATA Hot Plug SFF (2.5-inch) SC Mixed Use Solid State Drives	
HP 1.92TB 6G SATA Mixed Use-3 LFF 3.5-in SC Converter 3yr Wty Solid State Drive	817015-B21
HP 1.92TB 6G SATA Mixed Use-3 SFF 2.5-in SC 3yr Wty Solid State Drive	817011-B21
HP 1.6TB 6G SATA Mixed Use-2 SFF 2.5-in SC 3yr Wty Solid State Drive	804631-B21
HP 960GB 6G SATA Mixed Use-3 SFF 2.5-in SC 3yr Wty Solid State Drive	816995-B21
HP 960GB 6G SATA Mixed Use-3 LFF 3.5-in SC Converter 3yr Wty Solid State Drive	816999-B21
HP 800GB 6G SATA Mixed Use-2 SFF 2.5-in SC 3yr Wty Solid State Drive	804625-B21
HP 480GB 6G SATA Mixed Use-2 SFF 2.5-in SC 3yr Wty Solid State Drive	832414-B21
HP 480GB 6G SATA Mixed Use-3 LFF 3.5-in SC Converter 3yr Wty Solid State Drive	816989-B21
HP 480GB 6G SATA Mixed Use-3 SFF 2.5-in SC 3yr Wty Solid State Drive	816985-B21
HP 240GB 6G SATA Mixed Use-3 LFF 3.5-in SC Converter 3yr Wty Solid State Drive	816979-B21
HP 240GB 6G SATA Mixed Use-3 SFF 2.5-in SC 3yr Wty Solid State Drive	816975-B21
HP 200GB 6G SATA Mixed Use-2 SFF 2.5-in SC 3yr Wty Solid State Drive	804613-B21
HP 120GB 6G SATA Mixed Use-3 SFF 2.5-in SC 3yr Wty Solid State Drive	816965-B21
HP 120GB 6G SATA Mixed Use-3 LFF 3.5-in SC Converter 3yr Wty Solid State Drive	816969-B21

6G SATA Hot Plug LFF Value Endurance (3.5-inch) Converter Enterprise Value G1 Solid State Drives	
HP 480GB 6G SATA Value Endurance LFF 3.5-in SC Converter ENT Value 3yr Wty G1 Solid State Drive	756660-B21
6G SATA Hot Plug LFF Value Endurance (3.5-inch) Converter Enterprise Value M1 Solid State Drives	
HP 800GB 6G SATA Value Endurance LFF 3.5-in SC Converter ENT Value 3yr Wty M1 Solid State Drive	764945-B21
HP 480GB 6G SATA Value Endurance LFF 3.5-in SC Converter ENT Value 3yr Wty M1 Solid State Drive	764943-B21
HP 240GB 6G SATA Value Endurance LFF 3.5-in SC Converter ENT Value 3yr Wty M1 Solid State Drive	764941-B21
HP 120GB 6G SATA Value Endurance LFF 3.5-in SC Converter ENT Value 3yr Wty M1 Solid State Drive	764939-B21
6G SATA Hot Plug LFF (3.5-inch) Enterprise Value Solid State Drives	
HP 1.6TB 6G SATA Value Endurance LFF 3.5-in SC Converter Enterprise Value 3yr Wty Solid State Drive	757342-B21
HP 800GB 6G SATA Value Endurance LFF 3.5-in SC Enterprise Value 3yr Wty Solid State Drive	718189-B21
HP 600GB 6G SATA Value Endurance LFF 3.5-in SC Conveter Enterprise Value 3yr Wty Solid State Drive	739900-B21
HP 480GB 6G SATA Value Endurance LFF 3.5-in SC Enterprise Value 3yr Wty Solid State Drive	718183-B21
HP 300GB 6G SATA Value Endurance LFF 3.5-in SC Converter Enterprise Value 3yr Wty Solid State Drive	739890-B21
HP 240GB 6G SATA Value Endurance LFF 3.5-in SC Enterprise Value 3yr Wty Solid State Drive	718177-B21
6G SATA Hot Plug LFF (3.5-inch) Enterprise Boot Solid State Drives	
HP 120GB 6G SATA Value Endurance LFF 3.5-in SC Enterprise Boot 3yr Wty Solid State Drive	718171-B21
HP 80GB 6G SATA Value Endurance LFF 3.5-in SC Enterprise Boot 3yr Wty Solid State Drive	734362-B21
6G SATA Hot Plug LFF (3.5-inch) SC Read Intensive Solid State Drives	
HP 1.6TB 6G SATA Read Intensive-2 LFF 3.5-in SCC 3yr Wty Solid State Drive	804608-B21
HP 800GB 6G SATA Read Intensive-2 LFF 3.5-in SCC 3yr Wty Solid State Drive	804602-B21
HP 480GB 6G SATA Read Intensive-2 LFF 3.5-in SCC 3yr Wty Solid State Drive	804596-B21
HP 480GB 6G SATA Read Intensive LFF 3.5-in SC Converter 3yr Wty Solid State Drive	789147-B21
HP 240GB 6G SATA Read Intensive-2 LFF 3.5-in SCC 3yr Wty Solid State Drive	804590-B21
HP 120GB 6G SATA Read Intensive-2 LFF 3.5-in SCC 3yr Wty Solid State Drive	804584-B21
HP 80GB 6G SATA Read Intensive-2 LFF 3.5-in SCC 3yr Wty Solid State Drive	804578-B21
6G SATA Hot Plug LFF (3.5-inch) SC Write Intensive Solid State Drives	
HP 1.2TB 6G SATA Write Intensive-2 LFF 3.5-in SCC 3yr Wty Solid State Drive	804680-B21
HP 800GB 6G SATA Write Intensive-2 LFF 3.5-in SCC 3yr Wty Solid State Drive	804674-B21

HP 400GB 6G SATA Write Intensive-2 LFF 3.5-in SCC 3yr Wty Solid State Drive	804668-B21
HP 200GB 6G SATA Write Intensive-2 LFF 3.5-in SCC 3yr Wty Solid State Drive	804642-B21

6G SATA Hot Plug LFF (3.5-inch) SC Mixed Use Solid State Drives

HP 1.6TB 6G SATA Mixed Use-2 LFF 3.5-in SCC 3yr Wty Solid State Drive	804634-B21
HP 800GB 6G SATA Mixed Use-2 LFF 3.5-in SCC 3yr Wty Solid State Drive	804628-B21
HP 480GB 6G SATA Mixed Use-2 LFF 3.5-in SCC 3yr Wty Solid State Drive	832417-B21
HP 200GB 6G SATA Mixed Use-2 LFF 3.5-in SCC 3yr Wty Solid State Drive	804616-B21

HPE NVMe PCIe Read Intensive SFF (2.5-inch) Solid State Drives

HP 2TB NVMe PCIe Read Intensive SFF 2.5-in SC2 3yr Wty Solid State Drive	764908-B21
HP 1.2TB NVMe PCIe Read Intensive SFF 2.5-in SC2 3yr Wty Solid State Drive	764906-B21
HP 400GB NVMe PCIe Read Intensive SFF 2.5-in SC2 3yr Wty Solid State Drive	764904-B21

HPE NVMe PCIe Mixed Use SFF (2.5-inch) Solid State Drives

HP 2TB NVMe PCIe Mixed Use SFF 2.5-in SC2 3yr Wty Solid State Drive	765044-B21
HP 1.6TB NVMe PCIe Mixed Use SFF 2.5-in SC2 3yr Wty Solid State Drive	765038-B21
HP 800GB NVMe PCIe Mixed Use SFF 2.5-in SC2 3yr Wty Solid State Drive	765036-B21
HP 400GB NVMe PCIe Mixed Use SFF 2.5-in SC2 3yr Wty Solid State Drive	765034-B21

HPE NVMe PCIe Write Intensive SFF (2.5-inch) Solid State Drives

HP 2TB NVMe PCIe Write Intensive SFF 2.5-in SC2 3yr Wty Solid State Drive	764894-B21
HP 1.6TB NVMe PCIe Write Intensive SFF 2.5-in SC2 3yr Wty Solid State Drive	764892-B21
HP 800GB NVMe PCIe Write Intensive SFF 2.5-in SC2 3yr Wty Solid State Drive	736939-B21
HP 400GB NVMe PCIe Write Intensive SFF 2.5-in SC2 3yr Wty Solid State Drive	736936-B21

NOTE: The NVMe CTO Server (810393-B21) or the NVMe Express Bay Enablement kit (774741-B21) are required to support these drives.

NOTE: HPE has qualified the NVMe drive portfolio using the Operating System inbox drivers, full detail on the HPE Solid State Drive QuickSpecs.

M.2 SSD

HPE Dual 340GB Read Intensive-2 Solid State M.2 Enablement Kit for ProLiant ML/DL Servers	835565-B21
HPE 340GB Read Intensive-2 Solid State M.2 Enablement Kit for ProLiant ML/DL Servers	835563-B21
HP Dual 120GB Value Endurance Solid State M.2 Enablement Kit for ProLiant ML/DL Servers	777894-B21
HP 120GB Value Endurance Solid State M.2 Enablement Kit for ProLiant ML/DL Servers	788028-B21

NOTE: M.2 drives go in PCIe slots and use B140i SATA controller only.

NOTE: M.2 supports Software RAID only.

NOTE: No HPE Flexible Smart Array supported.

Hard Drive Blank Kits

HP Large Form Factor Hard Drive Blank Kit	666986-B21
HP Small Form Factor Hard Drive Blank Kit	666987-B21

Hard Drive Kits

HP DL380 Gen9 NVMe 6 Solid State Drive Express Bay Enablement Kit	774741-B21

NOTE: This option provides support for up to 6NVMe drives, and can only be populated in BAY2 in SFF chassis only, can be used with Bay1 and Bay 3 populated.
NOTE: The HPE DL380 Gen9 High Performance Fan Kit is required for NVMe support (719079-B21).
NOTE: The PCIe card in this enablement kit can only be populated in slot2 (primary) or slot 5 (secondary).
NOTE: For true x16 support with this option a secondary riser (719073-B21) is needed (second processor required).
NOTE: Kit includes Mylar film for Universal Media Bay (724865-B21) support to ensure optimal airflow.

HP DL380 Gen9 8SFF Bay1 Cage/Backplane Kit	719067-B21
HP DL380 Gen9 Additional 8SFF Bay2 Cage/Backplane Kit	768857-B21
HP DL380 Gen9 2SFF Front/Rear SAS/SATA Kit	724864-B21
HP DL380 Gen9 3LFF Rear SAS/SATA Kit	768856-B21

NOTE: For a complete list of the drive, controller and cable options please check the compatibility matrix:
http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=4AA5-4154ENW&cc=us&lc=en.

Media Bay Kits

HP DL380 Gen9 Universal Media Bay Kit	724865-B21

NOTE: The Universal Media Bay offers front VGA and 2xUSB 2.0, plus ability to add optional Optical drive, and 2SFF.
NOTE: This is only compatible with the 8SFF or 8+8 SFF configurations and can only be populated in Bay1.

HPE Networking

1 Gigabit Ethernet adapters

HP Ethernet 1Gb 4-port 331T Adapter	647594-B21
HP Ethernet 1Gb 2-port 332T Adapter	615732-B21
HP Ethernet 1Gb 2-port 361T Adapter	652497-B21
HP Ethernet 1Gb 4-port 366T Adapter	811546-B21

10 Gigabit Ethernet adapters

HP Ethernet 10Gb 2-port 530SFP Adapter	652503-B21
HP Ethernet 10Gb 2-port 530T Adapter	656596-B21
HP Ethernet 10Gb 2-port 546SFP+ Adapter	779793-B21
HP Ethernet 10Gb 2-port 557SFP+ Adapter	788995-B21
HP Ethernet 10Gb 2-port 560SFP+ Adapter	665249-B21
HP Ethernet 10Gb 2-port 561T Adapter	716591-B21

NOTE: The DL380 Gen9 server ships with 4x1Gb Embedded.
NOTE: A minimum of two Gigabytes (2 GB) of server memory is required per each adapter.
NOTE: Direct Attach Cable (DAC) for copper environments or fiber transceivers and cables for fiber-optic environments must be purchased separately. Please see the related NIC QuickSpecs for Technical Specifications and additional information: **http://www.hp.com/go/ProLiantNICs**.

FlexibleLOM Adapters

HP Ethernet 1Gb 4-port 331FLR Adapter	629135-B22

	HP Ethernet 1Gb 4-port 366FLR Adapter	665240-B21
	HP FlexFabric 10Gb 2-port 533FLR-T Adapter	700759-B21
	HP Ethernet 10Gb 2-port 560FLR-SFP+ Adapter	665243-B21
	HP Ethernet 10Gb 2-port 561FLR-T Adapter	700699-B21
	HP FlexFabric 10Gb 2-port 534FLR-SFP+ Adapter	700751-B21
	HP Ethernet 10Gb 2-port 546FLR-SFP+ Adapter	779799-B21
	HP FlexFabric 10Gb 2-port 556FLR-SFP+ Adapter	727060-B21
	NOTE: The DL380 Gen9 server ships with 4x1Gb Embedded.	
	NOTE: Only one FlexibleLOM can be added to the server. These options are upgradeable and can be changed from the original configuration after the server is shipped.	
	NOTE: Direct Attach Cable (DAC) for copper environments or fiber transceivers and cables for fiber-optic environments must be purchased separately. Please see the related NIC QuickSpecs for Technical Specifications and additional information: http://www.hp.com/go/ProLiantNICs.	
HPE InfiniBand	HP InfiniBand FDR 2-port 545QSFP Adapter	702211-B21
	NOTE: The RHEL6.5 driver is not part of SPP, but may be downloaded here: http://downloads.linux.hp.com/SDR/downloads/MLNX_OFED/.	
	HP InfiniBand FDR/Ethernet 10Gb/40Gb 2-port 544+QSFP Adapter	764284-B21
	HP InfiniBand FDR/Ethernet 10Gb/40Gb 2-port 544+FLR-QSFP Adapter	764285-B21
	HP InfiniBand QDR/Ethernet 10Gb 2-port 544+FLR-QSFP Adapter	764286-B21
	QLogic InfiniBand 4X QDR PCI-E G2 Dual Port HCA	583211-B21
HPE I/O Expansion Options	HP DL380 Gen9 Primary 2 Slot GPU Ready Riser Kit	719076-B21
	NOTE: This is for slot 1 and supports double wide GPGPUs.	
	NOTE: For Graphics cards please also order the DL380 Gen9 Graphics Enablement kit, 719082-B21	
	Slot1: 1xGen3 x16 FH/FL, 1xGen3 x8 FH/HL.	
	NOTE: Double wide PCIe cards are only supported in risers with the Processors leveraging the High Performance Heatsink. For Processors requiring double wide GPU support please order the GPU enablement kit (719082-B21).	
	HP DL380 Gen9 Secondary 3 Slot GPU Ready Riser Kit	719073-B21
	NOTE: This is for slot 2 and supports double wide GPGPUs.	
	NOTE: For Graphics cards please also order the DL380 Gen9 Graphics Enablement kit, 719082-B21	
	Slot2: 2xGen3 x16 FH/FL, 1xGen3 x8 FH/HL.	
	NOTE: Double wide PCIe cards are only supported in risers with the Processors leveraging the High Performance Heatsink. For Processors requiring double wide GPU support please order the GPU enablement kit (719082-B21).	
HPE Power Supplies	**HPE Flex Slot Platinum Hot-plug Power supplies**	
	HP 500W Flex Slot Platinum Hot Plug Power Supply Kit	720478-B21

	NOTE: Flex Slot Platinum power supplies support power efficiency of up to 94% and include a standard C-14 power inlet connector.	
	HP 800W Flex Slot Titanium Hot Plug Power Supply Kit **NOTE:** Flex Slot Titanium power supplies support power efficiency of up to 96% and include a standard C-14 power inlet connector.	720482-B21
	HP 800W Flex Slot Platinum Hot Plug Power Supply Kit **NOTE:** Flex Slot Platinum power supplies support power efficiency of up to 94% and include a standard C-14 power inlet connector.	720479-B21
	HP 800W Flex Slot Universal Hot Plug Power Supply Kit **NOTE:** Flex Slot universal power supplies support power efficiency of up to 94% and support both 277VAC/380VDC power inputs.	720484-B21
	HP 800W Flex Slot -48VDC Hot Plug Power Supply Kit **NOTE:** Flex Slot -48VDC power supplies support power efficiency of up to 94%.	720480-B21
	HP 1400W Flex Slot Platinum Plus Hot Plug Power Supply Kit **NOTE:** Flex Slot Platinum Plus power supplies support power efficiency of up to 94% and include a C-14 power inlet connector that can support HPE Power Discovery Services (blue connector).	720620-B21
	HP 750W Flex Slot Hot Plug Battery Backup Module **NOTE:** Flex Slot Battery Backup provides 750W output and 500W in paralleled configuration. **NOTE:** Only 1 Battery Backup module per server, and a Flex Slot Power Supply needed in parallel.	738024-B21
	NOTE: All power supplies must be of the same input voltage, output rating, and efficiency rating. If non-matching power supplies are installed, you may receive an error message and/or experience operational issues with your server. **NOTE:** Mixing different power supplies in the same server may limit or disable some power supply features including support for power redundancy. To ensure access to all available features, all power supplies within the same server should have the same output and efficiency ratings **NOTE:** Prior to selecting a power supply option, it is highly recommended that you review your server configuration in the HPE Power Advisor tool to determine the right size power supply for your server configuration. The HPE Power Advisor is located at: **http://www.hp.com/go/hppoweradvisor**. **NOTE:** Support for HPE Power Discovery Services is included with the 1400W Flex Slot option. Power specifications and technical content for all HPE Server power supplies can be found at **http://www.hp.com/go/proliant/powersupply**. **NOTE:** Maximum of 2 Flex Slot PS per platform.	
HPE Computation and Graphics Accelerators	HP DL380 Gen9 Graphics Enablement Kit **NOTE:** This GPU enablement kit includes 2 Heatsinks and 8 cables to enable double wide GPUs to be supported. **NOTE:** For doublewide GPU support you are required to have at least 1x1400W Power Supply (720620-B21), per card. **NOTE:** There are limitations on the server and processor supported when adding Graphics accelerators. **NOTE:** Passive cards will require the addition of the High Performance Fan Kit (719079-B21).	719082-B21

NOTE: We support up to 2 Double wide and 3 single wide Graphics cards, limitations apply.

NOTE: This kit support up to 2 double wide Graphics cards.

NOTE: Double Wide GPUs will occupy slots 2 and 5 and will leave only 2 slots left open.

NOTE: There are limitations on GPU support with the NVMe bay installed.

HP NVIDIA GRID K1 Quad GPU PCIe Graphics Accelerator J0G94A

NOTE: For doublewide GPU support you are required to have at least 1x1400W Power Supply (720620-B21), per card.

NOTE: This card only runs at PCIeGen2 speeds.

NOTE: The Primary GPU riser (719076-B21) is required to support this in slot1.

NOTE: The secondary GPU riser (719073-B21) is required to support this in slot2 (2nd processor required).

NOTE: There are limitations on the server and processor supported when adding Graphics accelerators.

NOTE: This card will require the addition of the High Performance Fan Kit (719079-B21).

NVIDIA GRID K2 Reverse Air Flow Dual GPU PCIe Graphics Accelerator 753958-B21

NOTE: For doublewide GPU support you are required to have at least 1x1400W Power Supply (720620-B21), per card.

NOTE: This card only runs at PCIeGen2 speeds.

NOTE: The Primary GPU riser (719076-B21) is required to support this in slot1.

NOTE: The secondary GPU riser (719073-B21) is required to support this in slot2 (2nd processor required).

NOTE: This card will require the addition of the High Performance Fan Kit (719079-B21).

NOTE: Max cooling setting required to support in RSBU.

NOTE: 12LFF support is restricted to 25C Server Ambient only.

NVIDIA Tesla K40C 12GB Computational Accelerator 753960-B21

NOTE: This is supported in all servers.

NOTE: The Primary GPU riser (719076-B21) is required to support this in slot1.

NOTE: The secondary GPU riser (719073-B21) is required to support this in slot2 (2nd processor required).

NOTE: For doublewide GPU support you are required to have at least 1x1400W Power Supply (720620-B21), per card.

HP NVIDIA Tesla K80 Dual GPU PCIe Computational Accelerator J0G95A

NOTE: For doublewide GPU support you are required to have at least 1x1400W Power Supply (720620-B21), per card.

NOTE: This card only runs at PCIeGen2 speeds.

NOTE: The Primary GPU riser (719076-B21) is required to support this in slot1.

NOTE: The secondary GPU riser (719073-B21) is required to support this in slot2 (2nd processor required).

NOTE: PCIe accelerators are not supported in conjunction with this card.

NOTE: This card will require the addition of the High Performance Fan Kit (719079-B21).

NOTE: Max cooling setting required to support in RSBU.

NOTE: No support in combination with the 24SFF or 12LFF servers.

HP NVIDIA Quadro K2200 Graphics Accelerator	J0G89A

NOTE: This is supported in all servers.

NOTE: This card only runs at PCIeGen2 speeds.

NOTE: The Primary GPU riser (719076-B21) is required to support this in slot1.

NOTE: The secondary GPU riser (719073-B21) is required to support this in slot2 (2nd processor required).

NOTE: For doublewide GPU support you are required to have at least 1x1400W Power Supply (720620-B21), per card.

HP NVIDIA Quadro K4200 Graphics Accelerator	J0G90A

NOTE: This is supported in all servers.

NOTE: This card only runs at PCIeGen2 speeds.

NOTE: The Primary GPU riser (719076-B21) is required to support this in slot1.

NOTE: The secondary GPU riser (719073-B21) is required to support this in slot2 (2nd processor required).

NOTE: For doublewide GPU support you are required to have at least 1x1400W Power Supply (720620-B21), per card.

HP NVIDIA Quadro K5200 GPU Graphics Accelerator	J0G91A

NOTE: This is supported in all servers.

NOTE: The Primary GPU riser (719076-B21) is required to support this in slot1.

NOTE: The secondary GPU riser (719073-B21) is required to support this in slot2 (2nd processor required).

NVIDIA Quadro K6000 PCI-E Graphics Adapter	730874-B21

NOTE: This is supported in all servers.

NOTE: The Primary GPU riser (719076-B21) is required to support this in slot1.

NOTE: The secondary GPU riser (719073-B21) is required to support this in slot2 (2nd processor required).

NOTE: For doublewide GPU support you are required to have at least 1x1400W Power Supply (720620-B21), per card.

HPE NVIDIA Tesla M60 Reverse Air Flow Dual GPU PCIe Graphics Accelerator	M3X67A

NOTE: This is supported in the 728543-B21 riser in the secondary position (second processor required) or in the 752803-B21, primary position. Maximum 2 supported with both risers, support for 2 cards requires the 1400W Power Supply (720620-B21) to be selected.

NOTE: This card only runs at PCIeGen2 speeds.

NOTE: This card is limited to Processors running with under 140W power consumption.

HP NVIDIA Quadro M6000 Graphics Accelerator	J0G92A

NOTE: This is supported in the 728543-B21 riser in the secondary position (second processor required) or in the 752803-B21, primary position. Maximum 2 supported with both risers, support for 2 cards requires the 1400W Power Supply (720620-B21) to be selected.

NOTE: This card only runs at PCIeGen2 speeds.

Intel® Xeon® Phi 5110P Coprocessor Kit	C1P87A

NOTE: This card only runs at PCIeGen2 speeds.

NOTE: This is supported in the 728543-B21 riser in the secondary position (second processor required) or in the 752803-B21, primary position. Maximum 2 supported with both risers, support for 2 cards requires the 1400W Power Supply (720620-B21) to be selected.

NOTE: Max cooling setting required to support in RSBU.

NOTE: 12LFF support is restricted to 30C Server Ambient only.

Intel® Xeon® Phi 7120P (16GB/300W) Coprocessor Kit E2M34A

NOTE: This card only runs at PCIeGen2 speeds.

NOTE: This is supported in the 728543-B21 riser in the secondary position (second processor required) or in the 752803-B21, primary position. Maximum 2 supported with both risers, support for 2 cards requires the 1400W Power Supply (720620-B21) to be selected.

NOTE: This card will require the addition of the High Performance Fan Kit (719079-B21).

NOTE: This is supported in an 8SFF server only.

NOTE: Max cooling setting required to support in RSBU.

HP AMD FirePro W7100 Accelerator Kit J0H10A

NOTE: This is supported in all servers.

NOTE: The secondary GPU riser (719073-B21) is required to support this in slot2 (2nd processor required).

NOTE: Up to 3 of these single wide cards are supported.

HP AMD FirePro S9150 Accelerator Kit J0H11A

NOTE: For doublewide GPU support you are required to have at least 1x1400W Power Supply (720620-B21), per card.

NOTE: The Primary GPU riser (719076-B21) is required to support this in slot1.

NOTE: The secondary GPU riser (719073-B21) is required to support this in slot2 (2nd processor required).

NOTE: There are limitations on the server and processor supported when adding Graphics accelerators.

NOTE: This card will require the addition of the High Performance Fan Kit (719079-B21).

NOTE: 12LFF support is restricted to 30C Server Ambient only.

HP 150W PCI-E Power Cable Kit 669777-B21

NOTE: This cable is required for the K1, K4200, K5200, M5000 and W7100 cards.

NOTE: Each DL380 Gen9 server will accommodate up to three single-width or two double width PCIe cards for Computational Graphics support. Note that 11.25" is the max length for a card to also allow for cabling. This applies to primary slots 1 & 2 or secondary slots 4 & 5.

NOTE: The NVIDIA Tesla, GRID and Quadro modules are supported only on 64-bit versions of Linux and Windows operating systems as well as on Virtual Machine client operating systems. The supported bare metal operating systems are RHEL6, SLES 11 and Windows Server 2012 R2.

NOTE: There are limitations on fan types, setting, and server support by card.

NOTE: Mixing of GPUs is not supported.

NOTE: NVIDIA limits configurations to having 1TB memory or less installed.

NOTE: Double Wide GPUs will occupy slots 2 and 5 and will leave only 2 slots left open.

NOTE: There are limitations on GPU support with the NVMe bay installed.

HPE Cooling Options	HP DL380 Gen9 High Performance Fan Kit **NOTE:** High Performance Fan kit consists of 6 fans, these will need to replace all the standard Fans in the unit, and fill all 6-Fan cages. **NOTE:** The 12LFF and 24SFF servers (including field upgrades to 24SFF) will already include 6 High Performance Fan kits. **NOTE:** The High Performance Fan Kit is needed to support certain Passive GPGPU (Graphics cards) configurations; or ASHRAE operating environments. **NOTE:** For elevated ambient temperature support please see: **http://www.hp.com/servers/ASHRAE**.	719079-B21

NOTE: Some options may not be integrated at the factory. To ensure only valid configurations are ordered, Hewlett Packard Enterprise recommends the use of an HPE approved configurator. Contact your local sales representative for additional information.

HPE Insight Software	**HPE Insight Control**	
	HP Insight Control including 1yr 24x7 Technical Support and Updates Single Server License	C6N27A
	HP Insight Control including 1yr 24x7 Technical Support and Updates Electronic License	C6N28ABE
	HP Insight Control Server Provisioning Media Kit	BD883A
	HP Insight Management Media Kit	C6N31A
	NOTE: Electronic and Flexible-Quantity licenses can be used to purchase multiple licenses with a single activation key. **NOTE:** Customer will receive a license entitlement certificate. The license entitlement certificate must be redeemed online or via fax in order to obtain the license activation key(s). Includes one year of 24 x 7 HPE Software Technical Support and Update Service. **NOTE:** Licenses ship without media. The HPE Insight Control Media Kit can be ordered separately, or can be downloaded at: **http://www.hp.com/go/insightupdates**. **NOTE:** For additional license options please see the **HPE Insight Control QuickSpecs**.	
Embedded Management	**HPE iLO Advanced**	
	HP iLO Advanced including 1yr 24x7 Technical Support and Updates Single Server License	512485-B21
	HP iLO Advanced 1 Server License with 3yr 24x7 Tech Support and Updates	BD505A
	HP iLO Advanced including 1yr 24x7 Technical Support and Updates E-LTU	E6U59ABE
	HP iLO Advanced including 3yr 24x7 Technical Support and Updates E-LTU	E6U64ABE
HPE Converged Infrastructure Management Software	**HPE OneView Advanced (with HPE iLO Advanced)**	
	HP OneView incl 3yr 24x7 Supp Phys 1 Svr Lic	E5Y34A
	HP OneView incl 3yr 24x7 Supp Flex Qty E-LTU	E5Y35AAE
	HPE OneView Advanced (without HPE iLO Advanced)	
	HP OneView w/o iLO including 3yr 24x7 Support 1 Server LTU	P8B24A
	HP OneView w/o iLO including 3yr 24x7 Support Flex Quantity E-LTU	P8B26AAE
	HP OneView Media Kit Phys No Lic	E5Y37A
	HP Operations Analytics for HP OneView LTU	K8G29A
	HP Operations Analytics for HP OneView E-LTU	K8G29AAE
	NOTE: Full licenses of HPE OneView Advanced also provide the right-to-use HPE Insight Control without additional charge. **NOTE:** Server provisioning (via 'HPE Insight Control server provisioning') is licensed as part of HPE OneView Advanced and provides multi-server OS and driver provisioning. Media kit #BD883A can be ordered for a physical copy of this software (USB flash drive).	

	NOTE: Licenses ship without media. The HPE OneView Media Kit can be ordered separately, or can be downloaded at: **http://www.hp.com/go/oneview**. **NOTE:** Electronic and Flexible-Quantity licenses can be used to purchase multiple licenses with a single activation key.	
High Performance Clusters	**HPE Cluster Management Utility**	
	HP Insight Cluster Management Utility 1yr 24x7 Flexible License	QL803B
	HP Insight Cluster Management Utility 3yr 24x7 Flexible License	BD476A
	NOTE: These part numbers can be used to purchase one certificate for multiple licenses and support with a single activation key. Each license is for one node (server). Customer will receive a printed end user license agreement and license entitlement certificate via physical shipment. The license entitlement certificate must be redeemed online in order to obtain a license key. Customer also will receive a support agreement.	
	HP Insight Cluster Management Utility Media	BD477A
	NOTE: For additional license kits please see the **HPE Insight Cluster Management Utility QuickSpecs**	
HPE PCIe Workload Accelerator Options	**Value Endurance (VE) PCIe Workload Accelerators**	
	HP 6.4TB FH/HL Value Endurance (VE) PCIe Workload Accelerator	763840-B21
	HP 3.2TB HH/HL Value Endurance (VE) PCIe Workload Accelerator	763838-B21
	HP 1.6TB HH/HL Value Endurance (VE) PCIe Workload Accelerator	763836-B21
	HP 1.3TB HH/HL Value Endurance (VE) PCIe Workload Accelerator	763834-B21
	Light Endurance (LE) PCIe Workload Accelerators	
	HP 5.2TB FH/HL Light Endurance (LE) PCIe Workload Accelerator	775672-B21
	HP 2.6TB HH/HL Light Endurance (LE) PCIe Workload Accelerator	775670-B21
	HP 1.3TB HH/HL Light Endurance (LE) PCIe Workload Accelerator	775668-B21
	HP 1.0TB HH/HL Light Endurance (LE) PCIe Workload Accelerator	775666-B21
	NVME PCIe Workload Accelerators	
	HPE 6.4TB Read Intensive-2 FH/HL PCIe Workload Accelerator	831739-B21
	HPE 3.2TB Read Intensive-2 HH/HL PCIe Workload Accelerator	831737-B21
	HP 2.0TB NVMe Mixed Use HH/HL PCIe Workload Accelerator	803204-B21
	HPE 1.6TB Read Intensive-2 HH/HL PCIe Workload Accelerator	831735-B21
	HP 1.6TB NVMe Write Intensive HH/HL PCIe Workload Accelerator	803197-B21
	HP 1.6TB NVMe Mixed Use HH/HL PCIe Workload Accelerator	803202-B21
	HPE 1.3TB Read Intensive-2 HH/HL PCIe Workload Accelerator	831733-B21
	HP 800GB NVMe Write Intensive HH/HL PCIe Workload Accelerator	803195-B21
	HP 800GB NVMe Mixed Use HH/HL PCIe Workload Accelerator	803200-B21
HPE Security	HP 2U Security Bezel Kit	666988-B21
	HP Trusted Platform Module Option	488069-B21
HPE Storage Controllers	**SAS Controllers**	
	HPE Flexible Smart Array Controllers	

HP Smart Array P440ar/2GB FBWC 12Gb 2-ports Int SAS Controller	726736-B21
NOTE: Provides support for up to 8 internal SAS/SATA drives without using a PCIe slot.	
NOTE: Includes the HPE Smart Storage Battery.	
HPE Smart Array Controllers	
HP Smart Array P440/4GB FBWC 12Gb 1-port Int SAS Controller	726821-B21
NOTE: Provides support for up to 8 internal SAS/SATA drives.	
HP Smart Array P840/4GB FBWC 12Gb 2-ports Int SAS Controller	726897-B21
HP Smart Array P841/4GB FBWC 12Gb 4-ports Ext SAS Controller	726903-B21
HP Smart Array P441/4GB FBWC 12Gb 2-ports Ext SAS Controller	726825-B21
HPE Smart Host Bus Adapters	
HP H241 12Gb 2-ports Ext Smart Host Bus Adapter	726911-B21
HP H240 12Gb 2-ports Int Smart Host Bus Adapter	726907-B21
HP H240ar 12Gb 2-ports Int Smart Host Bus Adapter	726757-B21
NOTE: Provides support for up to 8 internal SAS/SATA drives without using a PCIe slot.	
HPE Cable Options	
HP DL380 Gen9 12LFF Rear 2SFF or 3LFF P840/440 SAS Cable Kit	783007-B21
NOTE: 12LFF port 3 to 2SFF or 3LFF to P440/840 PCIe.	
HP DL380 Gen9 2SFF Front SAS x4 Cable Kit	783008-B21
NOTE: For front mount 2SFF to H240/P440ar, H240 or embedded B140i SATA.	
HP DL380 Gen9 8SFF SAS Cable Kit	783009-B21
NOTE: 8/16/24 SFF to P840/440 bay 3.	
HP DL380 Gen9 2SFF x8 Front Cable Kit	785989-B21
NOTE: For front/rear mount 2SFF to P440/840 PCIe).	
HP DL380 Gen9 12LFF SAS Cable Kit	785991-B21
NOTE: For 12LFF to P440/840 PCIe cables- ports 1/2/3.	
HP DL380 Gen9 8SFF H240 Cable Kit	786092-B21
NOTE: 8/16/24SFF to 240/440ar, H240 PCIe or embedded B140i SATA.	
HP DL380 Gen9 12LFF Smart HBA H240 SAS Cable Kit	786215-B21
NOTE: For 12LFF ports 1&2 to H240/P440ar, H240 or embedded B140i SATA.	
NOTE: For details on cabling options, additional information available here: Cabling Matrix.	
Optional Software	
HP SmartCache No Media 24x7 Technical Support 1 Svr License	D7S26A
HP SmartCache No Media 24x7 Technical Support Flexible License	D7S27A
HP SmartCache No Media 24x7 Technical Support Electronic License	D7S27AAE
NOTE: HPE SmartCache is supported when one of the supported Smart Array Controllers is installed in the server.	
NOTE: HPE SmartCache comes standard (no licensing is required) if the HPE Smart Array P840 Controller is installed in the server.	
Optional Upgrades	
HP 96W Smart Storage Battery with 145mm Cable for DL/ML/SL Servers	727258-B21
NOTE: Provides backup power for multiple HPE Smart Array controllers or other devices (up to 16).	

NOTE: Ships as standard with some HPE Flexible Smart Array Controllers.

HP 12Gb SAS Expander Card with Cables for DL380 Gen9	727250-B21

HPE Tape Backup

NOTE: For the complete range of tape drives, autoloaders, libraries and media see: **http://www.hp.com/go/tape**. For hardware and software compatibility of Hewlett Packard Enterprise tape backup products see: **http://www.hp.com/storage/SPOCK** and **http://www.hp.com/go/ebs**.

Tape Drives

HPE StoreEver LTO-7 Ultrium 15000 External Tape Drive	BB874A
HPE StoreEver LTO-7 Ultrium 15000 Internal Tape Drive	BB873A
HP StoreEver LTO-6 Ultrium 6650 SAS External Tape Drive	EH964A
HP StoreEver 1/8 G2 LTO-6 Ultrium 6250 FC Tape Autoloader	C0H19A
HP StoreEver LTO-6 Ultrium 6250 Tape Drive in 1U Rack-mount Kit	C0L99A
HP StoreEver LTO-6 Ultrium 6250 External Tape Drive	EH970A
HP StoreEver LTO-5 Ultrium 3000 SAS Tape Drive in 1U Rack-mount	EJ014B
HP StoreEver LTO-5 Ultrium 3000 SAS External Tape Drive	EH958B
HP StoreEver LTO-5 Ultrium 3280 SAS External Tape Drive	EH900B
HP StoreEver LTO-4 Ultrium 1760 SAS (1) in 1U Rack-mount Kit	EH946C
HP StoreEver LTO-4 Ultrium 1760 SAS External Tape Drive	EH920B
HP StoreEver LTO-3 Ultrium 920 SAS External Tape Drive	EH848B
HP StoreEver 1U SAS Rack-mount Kit	AE459B
HP Mini SAS High Density to 4-lane Mini SAS External Fanout 2 Meter Cable	K2R09A
HP Mini SAS High Density to 4-lane Mini SAS External Fanout 4 Meter Cable	K2R10A

HPE Tape Storage Systems

HPE StoreEver MSL6480

HP StoreEver MSL6480 Scaleable Expansion Module	QU626A

NOTE: Please see the **HPE StoreEver MSL6480 Tape Library QuickSpecs** for Technical Specifications and additional information).

HP StoreEver MSL6480 Scalable Base Module	QU625A
HP MSL2024 0-Drive Tape Library	AK379A
HP MSL4048 0-Drive Tape Library	AK381A

HPE Disk Backup

HPE RDX Removable Disk Backup System

HP RDX+ 1TB External Backup System	B7B69B
HP RDX+ 500GB External Backup System	B7B66B
HP RDX 2TB USB3.0 External Disk Backup System	E7X53B
HP D3700 Enclosure	QW967A
HP D3600 Enclosure	QW968A
HP RDX+ External Docking System	C8S07B

NOTE: For the complete range of RDX drives and media see: **http://www.hp.com/go/rdx**. For hardware and software compatibility of Hewlett Packard Enterprise disk backup products see: **http://www.hp.com/storage/SPOCK**.

HPE Storage Options	**NOTE:** For the complete listing of Fibre Channel Host Bus Adapters for Windows 2000, Windows Server 2003 and Linux, please see: **http://h18006.www1.hp.com/storage/saninfrastructure/hba.html**.	
	Emulex Fibre Channel HBAs	
	HP 81E 8Gb 1-port PCIe Fibre Channel Host Bus Adapter	AJ762B
	HP 82E 8Gb 2-port PCIe Fibre Channel Host Bus Adapter	AJ763B
	HP StoreFabric SN1100E 16Gb Single Port Fibre Channel Host Bus Adapter	C8R38A
	HP StoreFabric SN1100E 16Gb Dual Port Fibre Channel Host Bus Adapter	C8R39A
	QLogic Fibre Channel HBAs	
	HP 81Q 8Gb 1-port PCIe Fibre Channel Host Bus Adapter	AK344A
	HP 82Q 8Gb 2-port PCIe Fibre Channel Host Bus Adapter	AJ764A
	HP StoreFabric SN1000Q 16GB 1-port PCIe Fibre Channel Host Bus Adapter	QW971A
	HP StoreFabric SN1000Q 16GB 2-port PCIe Fibre Channel Host Bus Adapter	QW972A
	Converged Network Adapter	
	HP StoreFabric CN1100R Dual Port Converged Network Adapter	QW990A
	HP StoreFabric CN1200E 10Gb Converged Network Adapter	E7Y06A
HPE Disk Storage Systems	**Disk Enclosures**	
	HP D6000 Dual I/O Module Disk Enclosure	QQ695A
	HP D6000 w/35 4TB 6G SAS 7.2K LFF Dual Port MDL HDD 140TB Bundle	E7W30A
	HP D6000 w/70 4TB 6G SAS 7.2K LFF Dual Port MDL HDD 280TB Bundle	E7W31A
	HP D6000 w/35 2TB 6G SAS 7.2K LFF Dual port MDL HDD 70TB Bundle	QQ697A
	HP D6000 w/70 2TB 6G SAS 7.2K LFF Dual port MDL HDD 140TB Bundle	QQ698A
	HP D6000 w/35 3TB 6G SAS 7.2K LFF Dual port MDL HDD 105TB Bundle	QQ699A
	HP D6000 w/70 3TB 6G SAS 7.2K LFF Dual port MDL HDD 210TB Bundle	QQ700A
	HP D2600 w/12 4TB 6G SAS 7.2K LFF Dual Port MDL HDD 48TB Bundle	E7W32A
	HP D6000 w/70 8TB 12G SAS 7.2K LFF (3.5in) Dual Port MDL HDD 560TB Bundle	M0T59A
	HP D6000 w/70 6TB 12G SAS 7.2K LFF (3.5in) Dual Port MDL HDD 420TB Bundle	M0T57A
	HP D6000 w/35 8TB 12G SAS 7.2K LFF (3.5in) Dual Port MDL HDD 280TB Bundle	M0T58A
HPE Data Center Racks	**HPE Advanced Series Racks**	
	HPE 11648 1075mm Pallet Universal Rack	H6J87A
	HPE 11648 1075mm Shock Universal Rack	H6J88A
	HPE 11642 1075mm Pallet Universal Rack	H6J65A
	HPE 11642 1075mm Shock Universal Rack	H6J66A
	HPE 11642 1200mm Pallet Universal Rack	H6J67A
	HPE 11642 1200mm Shock Universal Rack	H6J68A
	HPE 11636 1075mm Pallet Universal Rack	H6J77A
	HPE 11636 1075mm Shock Universal Rack	H6J78A
	HPE 11622 G2 1075mm Pallet Universal Rack	H6J83A
	HPE 11622 G2 1075mm Shock Universal Rack	H6J84A
	HPE 11614 1075mm Shock Universal Rack	H6J82A

NOTE: Please see the **HPE Advanced Series Racks QuickSpecs** for information on additional racks options and rack specifications.

HPE Enterprise Series Racks

HPE 647 1075mm Pallet Intelligent Series Rack	BW911A
HPE 647 1075mm Shock Intelligent Series Rack	BW912A
HPE 647 1200mm Pallet Intelligent Series Rack	BW913A
HPE 647 1200mm Shock Intelligent Series Rack	BW914A
HPE 642 1075mm Pallet Intelligent Series Rack	BW903A
HPE 642 1075mm Shock Intelligent Series Rack	BW904A
HPE 642 1200mm Pallet Intelligent Series Rack	BW907A
HPE 642 1200mm Shock Intelligent Series Rack	BW908A
HPE 636 1075mm Pallet Intelligent Series Rack	BW895A
HPE 636 1075mm Shock Intelligent Series Rack	BW896A
HPE 842 1075mm Pallet Intelligent Series Rack	BW917A
HPE 842 1075mm Shock Intelligent Series Rack	BW918A

NOTE: Please see the **HPE Enterprise Series Racks QuickSpecs** for information on additional racks options and rack specifications.

HPE Value Series Rack

HPE V142 1075mm deep Pallet 100 series Rack	AF046A

NOTE: Please see the **HPE Standard Series Racks QuickSpecs** for information on additional racks options and rack specifications.

HPE Power Distribution Units (PDUs)

HPE Basic Power Distribution Units (PDU)

HP 1.9kVA 120 Volt L5-20 Input (12xNEMA 5-20R) NA/JP Basic PDU	H5M54A
HP 3.6kVA 200-240 Volt Detachable C20 Input (12xC13) WW Basic PDU	H5M56A
HP 2.8kVA 120 Volt L5-30 Input (18xNEMA 5-20R) NA/JP Basic PDU	H5M55A
HP 3.6kVA 200-240 Volt Detachable C20 Input (18xC13) WW Basic PDU	H5M57A
HP 4.9kVA 208 Volt L6-30 Input (20xC13) NA/JP Basic PDU	H5M58A
HP 8.6kVA 208 Volt L15-30 3-Phase Input (18xC13) NA/JP Basic PDU	H5M61A
HP 4.9kVA 208 Volt L6-30 Input (24xC13/6xC19) NA/JP Basic PDU	H5M59A
HP 8.3kVA 208 Volt CS8265C Input (30xC13/6xC19) NA/JP Basic PDU	H5M60A
HP Hardwired 200-240 Volt Input (30xC13/6xC19) WW Basic PDU	H5M75A
HP 5.7kVA 208 Volt L21-20 3-Phase Input (24xC13/3xNEMA 5-20R) NA/JP Basic PDU	H5M63A
HP 8.6kVA 208 Volt L21-30 3-Phase Input (24xC13/3xC19/3xNEMA 5-20R) NA/JP Basic PDU	H5M64A
HP 8.6kVA 208 Volt L15-30 3-Phase Input (24xC13/6xC19) NA/JP Basic PDU	H5M62A
HP 11kVA 400 Volt IEC309 30A 3-Phase Input (36xC13/6xC19) NA Basic PDU	H5M67A
HP 2.8kVA 24A Low Voltage NA/JP Modular Power Distribution Unit	252663-D71
HP 4.9kVA 24A High Voltage NA/JP Core Modular Power Distribution Unit	252663-D74
HP 8.3kVA 40A High Voltage NA/JP Core Modular Power Distribution Unit	252663-D75
HP 8.6kVA 24A Three Phase NA/JP Modular Power Distribution Unit	AF512A
HP 14.4kVA 40A Three Phase NA/JP Modular Power Distribution Unit	AF519A
HP 17.3kVA 48A Three Phase NA/JP Modular Power Distribution Unit	AF511A
HP 800VA - 277V Input / 230V Output NA Rack Mount Transformer	H3X09A

NOTE: Please see the **HPE Basic Power Distribution Units (PDU) QuickSpecs** for information on additional options and product specifications.

HPE Metered Power Distribution Units (PDU)

HP 2.8kVA 120 Volt L5-30 Input (12xNEMA 5-20R)NA/JP Monitored PDU	D9N43A
HP 3.6kVA 200-240 Volt Detachable C20 Input (12xC13) WW Monitored PDU	D9N46A
HP 4.9kVA 208 Volt L6-30 Input (12xC13) NA/JP Monitored PDU	D9N44A
HP 3.6kVA 200-240 Volt Detachable C20 Input (16xC13) WW Monitored PDU	D9N45A
HP 4.9kVA 208 Volt L6-30 Input (12xC13) NA/JP Monitored PDU	G9Z05A
HP 4.9kVA 208 Volt L6-30 Input (20xC13/4xC19) NA/JP Monitored PDU	D9N47A
HP 8.6kVA 208 Volt L15-30 3-Phase Input (18xC13/3xC19) NA/JP Monitored PDU	D9N51A
HP 5.7kVA 208 Volt L21-20 3-Phase Input (18xC13/3xNEMA 5-20R) NA/JP Monitored PDU	D9N52A
HP 8.6kVA 208 Volt L21-30 3-Phase Input (20xC13/3xC19/3xNEMA 5-20R) NA/JP Monitored PDU	D9N53A
HP 8.3kVA 208 Volt CS8265C Input (30xC13/3xC19) NA Monitored PDU	D9N49A
HP 14.4kVA 208 Volt CS8365C 3-Phase Input (12xC13/12xC19)NA Monitored PDU	D9N58A
HP 16.6kVA 400 Volt IEC309 30A 3-Phase Input (30xC13/3xC19) NA Monitored PDU	D9N61A
HP 16.6kVA 400 Volt IEC309 30A 3-Phase Input (12xC13/12xC19) NA Monitored PDU	D9N62A
HP 17.3kVA 208 Volt IEC309 60A 3-Phase Input (24xC13/3xC19) NA/JP Monitored PDU	D9N54A
HP 17.3kVA 208 Volt IEC309 60A 3-Phase Input (12xC13/12xC19) NA/JP Monitored PDU	D9N59A
HP 17.3kVA 208 Volt IEC309 60A 3-Phase Watertight Input (12xC13/12xC19) NA/JP Monitored PDU	G9Z07A
HP 19.9kVA 480 Volt 3-Phase (30 Outlet) NA Monitored PDU	D9N63A
HP Environmental Sensor for Remote Monitored and Managed PDUs	E2D53A

NOTE: Please see the **HPE Metered Power Distribution Units (PDU) QuickSpecs** for information on additional options and product specifications.

HPE Intelligent Power Distribution Unit (PDU)

HP 4.9kVA 24A Single Phase NA/JP Core Intelligent Modular Power Distribution Unit	AF520A
HP 8.3kVA 40A Single Phase NA/JP Core Intelligent Modular Power Distribution Unit	AF521A
HP 8.6kVA 24A Three Phase NA/JP Core Intelligent Modular Power Distribution Unit	AF522A
HP 17.3kVA 48A Three Phase NA/JP Core Intelligent Modular Power Distribution Unit	AF523A
HP 11.4kVA 16A 415V Three Phase L22-20 NA Core Intelligent Power Distribution Unit	AF900A
HP 17.3kVA 24A 415V Three Phase IEC309 NA Core Intelligent Power Distribution Unit	AF901A
HP 17.3kVA 48A 208V Three Phase 12 Outlet Core NA/JP Intelligent Power Distribution Unit	AF535A

HP 17.3kVA 24A 415V Three Phase 12 Outlet Core NA/JP Intelligent Power Distribution Unit	AF537A
HP 4.9kVA 24A Single Phase NA/JP Intelligent Modular Power Distribution Kit	AF531A
HP 8.6kVA 24A Three Phase NA/JP Intelligent Modular Power Distribution Kit	AF532A
HP 14.4kVA 40A Three Phase NA/JP Intelligent Modular Power Distribution Unit	AF533A
HP 5xC13 Intelligent PDU Extension Bar G2 Kit	AF547A
HP 5xC13 Outlets Power and UID LEDs Pair Standard Extension Bar	AF528A

NOTE: Please see the **HPE Intelligent Power Distribution Unit (PDU) QuickSpecs** for information on additional options and product specifications.

HPE Metered and Switched Power Distribution Units (PDU)

HP 2.8kVA 120 Volt L5-30 Input (24x NEMA 5-20) NA/JP Managed PDU	H8B48A
HP 3.6kVA 200-240 Volt Detachable C20 Input (7xC13/1xC19) WW Managed PDU	H8B49A
HP 4.9kVA 208 Volt L6-30 Input (20xC13/4xC19) NA/JP Managed PDU	H8B50A
HP 8.6kVA 208 Volt L15-30 3 Phase Input (18xC13/6xC19) NA/JP Managed PDU	H8B52A
HP 8.6kVA 208 Volt L21-30 3 Phase Input (20xC13/3xC19/1x NEMA 5-20) NA/JP Managed PDU	H8B53A
HP 14.4kVA 208V CS8365C 3 Phase Input (12xC13/12xC19) NA/JP Managed PDU	H8B55A
HP 17.3kVA 208V IEC309 60A 3 Phase Input (12xC13/12xC19) NA/JP Managed PDU	H8B56A

NOTE: Please see the **HPE Metered and Switched Power Distribution Units (PDU) QuickSpecs** for information on additional options and product specifications.

NOTE: To learn more, please visit the **HPE Uninterruptible Power Systems (UPS) web page**.

HPE Rack Mount Consoles, KVM Switches, and Keyboards

HPE Location Discovery Services

HP 36U Location Discovery Kit	BW945A
HP 42U Location Discovery Kit	BW946A
HP 47U Location Discovery Kit	BW947A
HP DL380 Gen9 Location Discovery Services Ear Kit	768884-B21
HP Location Discovery Services LCD8500 Kit	TL052A

NOTE: Please see the **HPE Location Discovery Services QuickSpecs** for information on additional options and product specifications.

HPE Rack Mount Consoles

HP LCD8500 1U US Rackmount Console Kit	AF630A
HP LCD8500 1U US TAA Rackmount Console Kit	AF645A

HPE KVM Switches

HP 0x1x8 G3 KVM Console Switch	AF651A
HP 0x2x16 G3 KVM Console Switch	AF652A
HP TAA 0x2x16 G3 KVM Console Switch	AF653A
HP USB Remote Access Key for G3 KVM Console Switches	AF650A
HP KVM Console USB Interface Adapter	AF628A
HP 0x2x16 KVM Server Console Switch G2 with Virtual Media CAC Software	AF618A
HP 0x2x32 KVM Server Console Switch G2 with Virtual Media CAC Software	AF619A
HP KVM Console USB 2.0 Virtual Media CAC Interface Adapter	AF629A
HP 1x4 USB/PS2 KVM Console Switch	AF611A
HP 1x1Ex8 KVM IP Console Switch G2 with Virtual Media CAC Software	AF620A

HP 2x1Ex16 KVM IP Console Switch G2 with Virtual Media CAC Software	AF621A
HP 4x1Ex32 KVM IP Console Switch G2 with Virtual Media CAC Software	AF622A

NOTE: To learn more, please visit the HPE KVM Switches web page.

HPE USB Keyboard and Mouse

HP USB BFR with PVC Free US Keyboard/Mouse Kit	631341-B21

Rail Kits

NOTE: Gen9 rail kits have changed significantly from prior generation rail kits. Please take a moment to review the installation documentation that comes with the server to help you with the installation of your Gen9 server.

NOTE: Rail kits are optional for DL380 Gen9 and are no longer included standard with the server. Customers have the option to purchase their server without a rail kit.

NOTE: Ball bearing and Easy Install rail kits contain telescoping rails which allow for in-rack serviceability.

NOTE: To assist in the installation of the server into the rack an optional installation tool is available by contacting your local services representative (p/n 695539-001).

CAUTION: Hewlett Packard Enterprise recommends that a minimum of two people are required for all Rack Server installations. Please refer to your installation instructions for proper tools and number of people to use for any installation.

HP 2U Small Form Factor Easy Install Rail Kit	733660-B21
NOTE: Does not include CMA (733664-B21).	
HP 2U Large Form Factor Easy Install Rail Kit	733662-B21
NOTE: Does not include CMA (733664-B21).	
HP 2U Cable Management Arm for Easy Install Rail Kit	733664-B21
HP 2U Small Form Factor Ball Bearing Rail Kit	720863-B21
NOTE: Does not include CMA (720865-B21).	
HP 2U Large Form Factor Ball Bearing Rail Kit	720864-B21
NOTE: Does not include CMA (720865-B21).	
HP 2U Cable Management Arm for Ball Bearing Rail Kit	720865-B21

HPE Other Options

HP Rack LED Light Kit	BW939A
HP Kit LCD 1.83m Latch Display Port Cable	G7T29A
HP Advanced Power Manager Kit	741192-B21

HPE Uninterruptible Power Systems (UPS)

HPE DirectFlow Three Phase UPS

Power Unit (1U UPS)

HP R12000 DirectFlow - 1U Rackmount Uninterruptible Power System	G9Y75A
HP R12000 DirectFlow - POD 1U Rackmount Uninterruptible Power System	AF478A

Input/Output Module Options for 1U UPS

HP 30A 400-415 Volt Three Phase NA R10000 DirectFlow UPS IEC309 Input/Output Module	AF489A
HP 30A 480 Volt Three Phase NA R12000 DirectFlow UPS L22-30 Input/Output Module	AF491A
HP 30A 480 Volt Three Phase NA R12000 DirectFlow UPS IEC309 Input/Output Module	AF492A
HP 30A 400-415 Volt Three Phase NA R12000 DirectFlow UPS IEC309 Input/Output Module	G9Y76A

HP DirectFlow UPS Management Card	AF493A
Power Unit (2U UPS)	
HP R18000 DirectFlow - 2U Rackmount Uninterruptible Power System	AF479A
Input/Output Module Options for 2U UPS	
HP 30A 480 Volt Three Phase NA R18000 DirectFlow UPS IEC309 Input/Output Module	AF486A
HP 30A 480 Volt Three Phase NA R18000 DirectFlow UPS IEC309 Input/Output Module	AF487A
HP 30A 400 Volt Three Phase NA R18000 DirectFlow UPS IEC309 Input/Output Module	D9Q02A
HP 30A 400-415V Three Phase NA R18000 DirectFlow UPS 1:1 IEC309 Input/Output Module	AF484A

NOTE: All Input/Output Modules support dual output outlets except the AF484A.

Battery Pack Options	
HP DirectFlow UPS - 1U Rackmount Lithium-ion Battery Pack	AF480A
HP DirectFlow UPS - 3U Rackmount VRLA Battery Pack	AF482A
HP WW DirectFlow Secondary Battery Cable	AF497A

NOTE: Please see the **HPE DirectFlow Three Phase Uninterruptible Power System QuickSpecs** for information on additional options and product specifications.

HPE Tower UPS

HPE T750 G4 UPS Models	
HP T750 G4 NA/JP Uninterruptible Power System	J2P85A
HPE T1000 G4 UPS Models	
HP T1000 G4 NA/JP Uninterruptible Power System	J2P86A
HPE T1500 G4 UPS Models	
HP T1500 G4 NA/JP Uninterruptible Power System	J2P87A

HPE Rack-mountable UPS

HPE R/T2200 G4 UPS Models	
HP R/T2200 G4 NA/JP Uninterruptible Power System	J2R00A
HPE R/T3000 G4 UPS Models	
HP R/T3000 G4 Low Voltage NA/JP Uninterruptible Power System	J2R01A
HP R/T3000 G4 High Voltage NA/JP Uninterruptible Power System	J2R02A
R1500 G4 Models	
HP R1500 G4 NA Uninterruptible Power System	J2Q99A
R7000 Uninterruptible Power System (UPS)	
HP R7000 4U 50A High Voltage NA/JP Uninterruptible Power System	AF462A
R5000 Uninterruptible Power System (UPS)	
HP R5000 3U L630 High Voltage NA/JP Uninterruptible Power System	AF460A

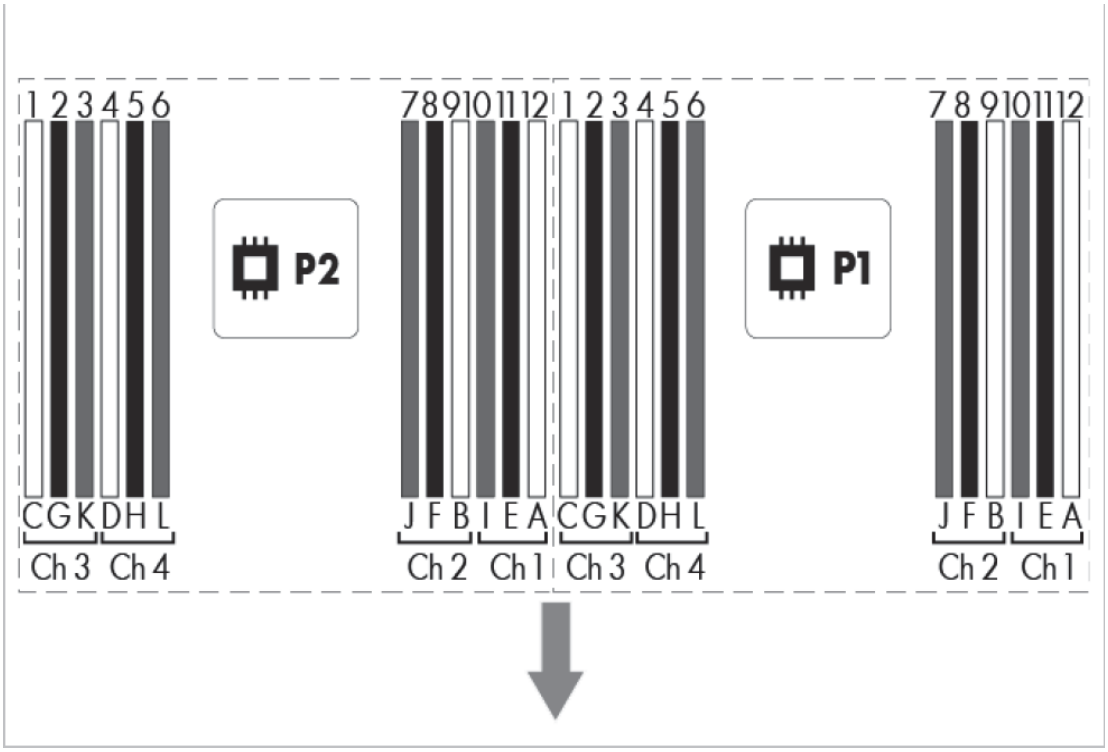
NOTE: Please see the **HPE Line Interactive Single Phase UPS QuickSpecs** for information on additional options and product specifications.

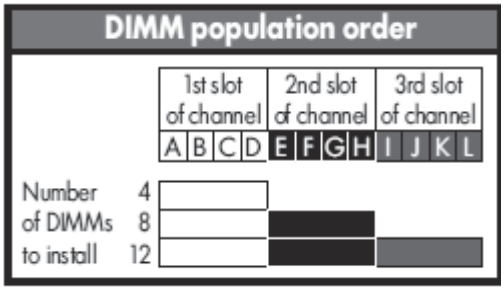
HPE UPS Options	
HP R/T2200 G4 Extended Runtime Module	J2R09A
HP R/T3000 G4 Extended Runtime Module	J2R10A
HP 2U Rack/Tower UPS Shipping Kit	L4Q11A

NOTE: To learn more, please visit the **HPE Uninterruptible Power Systems (UPS) web page**.

HPE USB and SD Options	**HPE Enterprise Mainstream Flash Media Kits for Memory Cards**	
	HP 32GB microSD Enterprise Mainstream Flash Media Kit	700139-B21
	HP 32GB SD Enterprise Mainstream Flash Media Kit	700136-B21
	HP 8GB microSD Enterprise Mainstream Flash Media Kit	726116-B21
	HP 8GB USB Enterprise Mainstream Flash Media Drive Key Kit	737953-B21
	HP Dual 8GB microSD Enterprise Midline USB Kit	741279-B21
HPE Care Pack Services	**Installation & Start-up Services**	
	HPE Install ProLiant DL38x(p) Service	U4554E
	HPE Installation and Startup DL38x(p) Service	U4555E
	Proactive Care	
	HPE 3 year Proactive Care 24x7 DL380 Gen9 w/IC Service	U5HW1E
	HPE 3 year Proactive Care 24x7 with DMR DL380 Gen9 w/IC Service	U5HW2E
	HPE 3 year Proactive Care 24x7 with CDMR DL380 Gen9 w/IC Service	U5HW3E
	HPE 3 year Proactive Care Call to Repair DL380 Gen9 w/IC Service	U5HX0E
	HPE 3 year Proactive Care Call to Repair 24x7 with DMR DL380 Gen9 w/IC Service	U5HX1E
	HPE 3 year Proactive Care Call to Repair with CDMR DL380 Gen9 w/IC Service	U5HX2E
	HPE 3 year Proactive Care 24x7 DL380 Gen9 Service	U7AE8E
	HPE 3 year Proactive Care 24x7 with DMR DL380 Gen9 Service	U7AE9E
	HPE 3 year Proactive Care 24x7 with CDMR DL380 Gen9 Service	U7AF0E
	HPE 3 year Proactive Care Call to Repair DL380 Gen9 Service	U7AF4E
	HPE 3 year Proactive Care Call to Repair 24x7 with DMR DL380 Gen9 Service	U7AF5E
	HPE 3 year Proactive Care Call to Repair with CDMR DL380 Gen9 Service	U7AF6E

Memory Population guidelines





General Memory Population Rules and Guidelines:

- White DIMM slots denote the first slot of a channel. For 1 DPC (DIMM per channel) populate white slots only.
- A minimum of one DIMM is required per server.
- Install DIMMs only if the corresponding processor is installed.
- If only one processor is installed in a two processor system, only half of the DIMM slots are available.
- To maximize performance, it is recommended to balance the total memory capacity between all installed processors and to load the channels similarly whenever possible.
- When two processors are installed, balance the DIMMs across the two processors.
- Populate DIMMs from heaviest load (quad-rank) to lightest load (single-rank) within a channel. Heaviest load (DIMM with most ranks) within a channel goes furthest from the processor.
- Do not mix RDIMMs or LRDIMMs.
- LRDIMMs are supported up to 3 DIMMs per channel.
- DIMMs of different speeds may be mixed in any order; the server will select a common optimal speed.

- The maximum memory speed is a function of the memory type, memory configuration, and processor model.
- The maximum memory capacity is a function of the memory type and number of installed processors.
- HPE memory from previous generation servers is not compatible with the DL380 Gen9 Server. Certain HPE SmartMemory features such as memory authentication and enhanced performance may not be supported.
- To realize the performance memory capabilities listed in this document, HPE SmartMemory is required. For additional information, please see the HPE SmartMemory QuickSpecs at: **http://h18000.www1.hp.com/products/quickspecs/14225_na/14225_na.html** .
- For memory population rules and additional memory guidelines, please see the DL380 Gen9 user guide at **http://www.hp.com/support**.
- There are four (4) Memory channels per processor; eight (8) channels per 2 processor server.
- There are three (3) DIMM slots for each memory channel; twenty four (24) total slots for 2 processor server.
- Memory channels1 and 3 consists of the three (3) DIMMs that are furthest from the processor.
- Memory channel 2 and 4 consists of the three (3) DIMMs that are closest to the processor.

Intel Gen9 Supported Memory Bandwidth for HPE ProLiant Gen9 Intel® Xeon® E5-2600v3 Series Processor Family

Memory Bandwidth and Capacity								
[DIMM Type]	**Registered DIMMs (RDIMMs)**					**Load Reduced (LRDIMMs)**		
DIMM Rank	Single Rank	Single Rank	Dual Rank	Dual Rank	Dual Rank	Dual Rank	Quad Rank	Quad Rank
DIMM Capacity	4GB	8GB	8GB	16GB	32GB	16GB	32GB	64GB
DIMM Native Speed (MT/s)	2133	2133	2133	2133	2133	2133	2133	2133
Voltage	Std Voltage 1.2V	Std Voltage 1.2V	Std Voltage 1.2V	Std Voltage 1.2V	Std Voltage 1.2V	Std Voltage 1.2V	Std Voltage 1.2V	Std Voltage 1.2V
SLOTS THAT CAN BE POPULATED								
24 slot servers	24	24	24	24	24	24	24	24
MAXIMUM CAPACITY (GB)								
	96	192	192	384	768	384	768	1536
POPULATED DIMM SPEED (MT/s)								
1 DIMM Per Channel	2133	2133	2133	2133	2133	2133	2133	2133
2 DIMM Per Channel	2133	2133	2133	2133	2133	2133	2133	2133
3 DIMM Per Channel	1600	1600	1600	1600	1600	1866	1866	1866

Memory Speed by Processor Model

Processor Models	Supported Memory Speeds
E5-2609v3, E5-2603v3	1600MHz
E5-2640v3, E5-2630v3, E5-2620v3, E5-2630Lv3, E5-2623v3	1866MHz
E5-2637v3, E5-2690v3, E5-2670v3, E5-2650v3, E5-2697v3, E5-2683v3, E5-2667v3, E5-2643v3, E5-2650Lv3, E5-2695v3, E5-2660v3, E5-2680v3, E5-2687Wv3, E5-2698v3, E5-2699v3	2133MHz

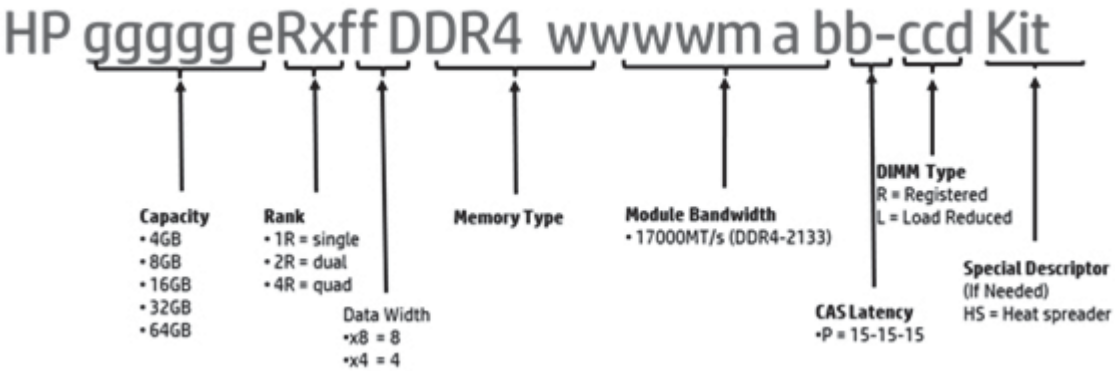
Standard and Maximum Memory Capacity (Pre-configured Models)

Pre Configured Models	Standard Memory	Maximum Memory Plus Optional Memory	Standard Memory Replaced with Optional Memory
E5-2609v3	8GB (1x8GB)	1480GB (23x64GB, 1x8GB)	1536GB (24x64GB)
E5-2620v3	16GB (1x16GB)	1488GB (23x64GB, 1x16GB)	1536GB (24x64GB)
E5-2650v3, E5-2690v3	32GB (2x16GB)	1440GB (22x64GB, 2x16GB)	1536GB (24x64GB)

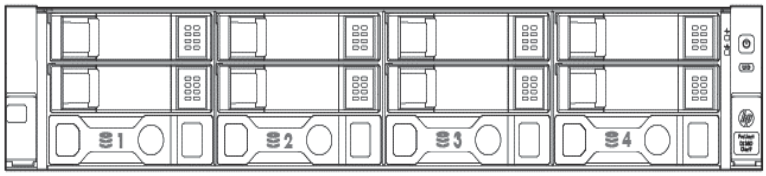
DDR4 memory options part number decoder

NOTE: Capacity references are rounded to the common gigabyte (GB) values.

- 2GB = 2,048MB
- 4GB = 4,096MB
- 8GB = 8,192MB
- 16GB = 16,384MB
- 32GB = 32,768MB
- 64GB = 65,536MB



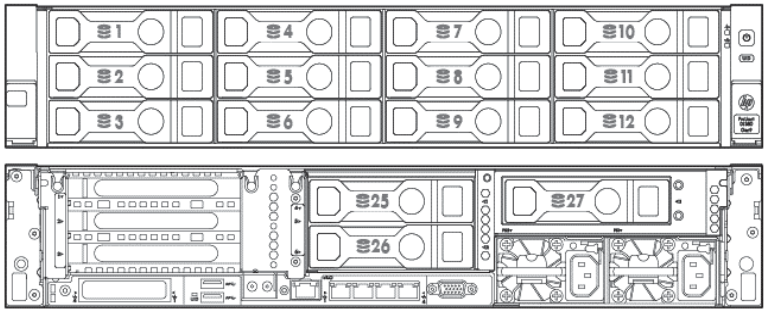
4LFF hot-plug drive model



1-4

4 x LFF SATA/SAS/SSD Hot Pluggable Hard Drive Bays

12 LFF + 3 rear LFF hot-plug drive model



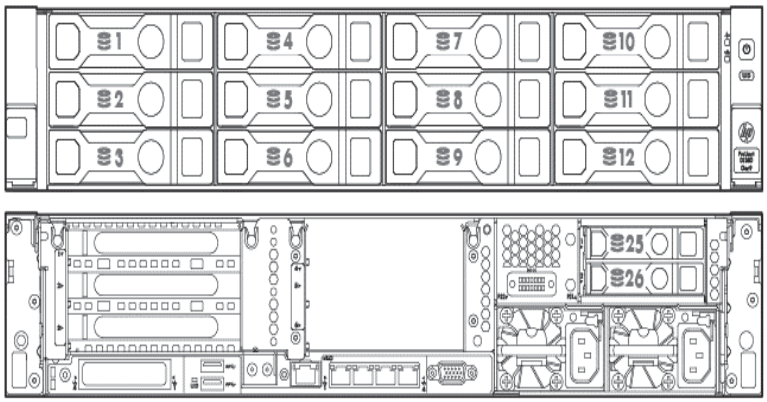
1-12

12 x LFF SATA/SAS/SSD Hot Pluggable Hard Drive Bays

25-27

3 x LFF SATA/SAS/SSD Hot Pluggable Rear Hard Drive Bays

12 LFF + 2 rear SFF hot-plug drive model



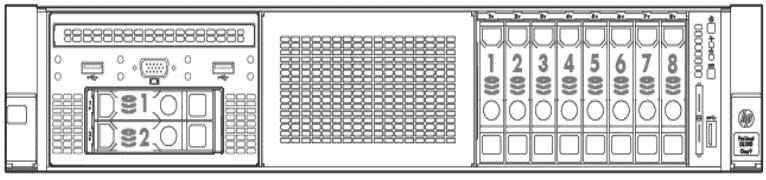
1-12

12 x LFF SATA/SAS/SDD Hot Pluggable Hard Drive Bays

25-26

2 x SFF SATA/SAS/SSD Hot Pluggable Rear Hard Drive Bays

8 SFF (+2 SFF) hot-plug drive model with Universal Media Bay



1-8

8 x SFF SATA/SAS/SDD Hot Pluggable Hard drive bays

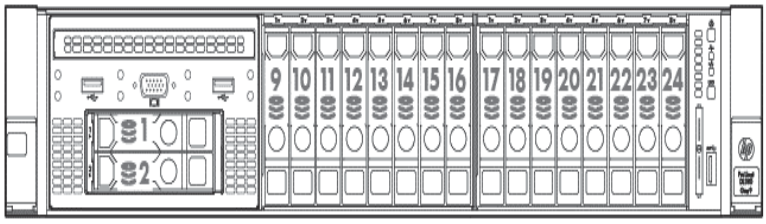
1-2

2 x SFF SATA/SAS/SSD Hot Pluggable Hard Drive Bays

16 SFF (+2 SFF) hot-plug drive model with Universal Media Bay

9-24

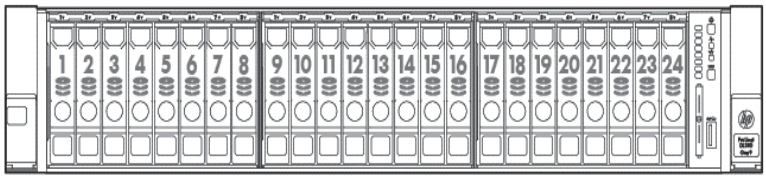
16 x SFF SATA/SAS/SDD Hot Pluggable Hard drive bays



1-2

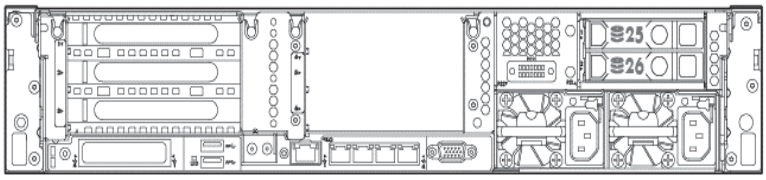
2 x SFF SATA/SAS/SSD Hot Pluggable Hard Drive Bays

24 SFF + rear 2 SFF hot-plug drive model



1-24

24 x SFF SATA/SAS/SDD Hot Pluggable Hard drive bays



25-26

2 x SFF SATA/SAS/SSD Hot Pluggable Rear Hard Drive Bays

NOTE: **Drives behind the SAS expander will be labeled continuous, drives behind a controller will be numbered 1-8.**

NOTE: **With a SAS Expander and rear drive support the 2SFF rear will be labeled 25 & 26, for 3LFF they will be numbered 25-27.**

System Unit	**Dimensions**		SFF Drives: 3.44 x 17.54 x 26.75 in (8.73 x 44.55 x 67.94 cm) LFF Drives: 3.44 x 17.54 x 28.75 in (8.73 x 44.55 x 73.02 cm) **NOTE: Dimensions without Bezel.**
	Weight (approximate)	Minimum: (Minimum - 8SFF server with 1xSFF HDD and 7 HDD blanks, 1x processor, 1x power supply (plus blank), 1x Flexible Smart Array, 1x Riser installed)	32.6 lb (14.759 kg)
		Maximum: (Maximum - 12 LFF hard drives (No rear drives), 2x processors, 2x power supplies, 1x Flexible Smart Array, 2x Risers installed)	51.5 lb (23.6 kg)
	Input Requirements (per power supply)	Range Line Voltage	100 to 120 VAC 200 to 240 VAC
	BTU Rating	Maximum	For 800W Power Supply: 3207 BTU/hr (at 100 VAC), 3071 BTU/hr (at 200 VAC), 3112 BTU/hr (at 240 VAC) for China Only For 500W Power Supply: 1979 BTU/hr (at 100 VAC), 1911 BTU/hr (at 200 VAC), 1965 BTU/hr (at 240 VAC) for China Only
	Power Supply Output (per power supply)	Rated Steady-State Power	For 1400W Power Supply: 1400W (at 240 VAC), 1400W (at 240 VAC) For 800W Power Supply: 800W (at 100 VAC), 800W (at 240 VAC), 800W (at 240 VAC) input for China only For 500W Power Supply: 500W (at 100 VAC), 500W (at 240 VAC), 500W (at 240 VAC) input for China only
		Maximum Peak Power	For 1400W Power Supply: 1400W (at 200 to 240 1VAC), 1400W (at 240 VAC) input for China only For 800W Power Supply: 800W (at 100 to 127 VAC), 800W (at 200 to 240 1VAC), 800W (at 240 VAC) input for China only For 500W Power Supply: 500W (at 100 to 127 VAC), 500W (at 200 to 240 VAC), 500W (at 240 VAC) input for China only
	System Inlet Temperature	Standard Operating Support	10° to 35°C (50° to 95°F) at sea level with an altitude derating of 1.0°C per every 305 m (1.8°F per every 1000 ft) above sea

		level to a maximum of 3050 m (10,000 ft), no direct sustained sunlight. Maximum rate of change is 20°C/hr (36°F/hr). The upper limit and rate of change may be limited by the type and number of options installed. System performance during standard operating support may be reduced if operating with a fan fault or above 30°C (86°F).
	Extended Ambient Operating Support	For approved hardware configurations, the supported system inlet range is extended to be: 5° to 10°C (41° to 50°F) and 35° to 40°C (95° to 104°F) at sea level with an altitude derating of 1.0°C per every 175 m (1.8°F per every 574 ft) above 900 m (2953 ft) to a maximum of 3050 m (10,000 ft). The approved hardware configurations for this system are listed at the URL: **http://www.hp.com/servers/Ashrae** For approved hardware configurations, the supported system inlet range is extended to be: 40° to 45°C (104° to 113°F) at sea level with an altitude derating of 1.0°C per every 125 m (1.8°F per every 410 ft) above 900 m (2953 ft) to a maximum of 3050 m (10,000 ft). The approved hardware configurations for this system are listed at the URL: **http://www.hp.com/servers/Ashrae** System performance may be reduced if operating in the extended ambient operating range or with a fan fault.
	Non-operating	-30° to 60°C (-22° to 140°F). Maximum rate of change is 20°C/hr (36°F/hr).
Relative Humidity	Operating	Minimum to be the higher (more moisture) of -12°C (10.4°F) dew point or 8% relative humidity. Maximum to be the lower (less moisture) of 24°C (75.2°F) dew point or 90% relative humidity.
(non-condensing)	Non-operating	5 to 95% relative humidity (Rh), 38.7°C (101.7°F) maximum wet bulb temperature, non-condensing.
Altitude	Operating	3050 m (10,000 ft). This value may be limited by the type and number of options installed. Maximum allowable altitude change rate is 457 m/min (1500 ft/min).
	Non-operating	9144 m (30,000 ft). Maximum allowable altitude change rate is 457 m/min (1500 ft/min).
Acoustic Noise	Listed are the declared A-Weighted sound power levels (LWAd) and declared average bystander position A-Weighted sound pressure levels (LpAm) when the product is operating in a 23°C ambient environment. Noise emissions were measured in accordance with ISO 7779 (ECMA 74) and declared in accordance with ISO 9296 (ECMA 109).	
	Idle	
	L WAd	4.0 B Entry LFF 4.1 B Entry 4.2 B Base

			5.7 B Base LFF
			4.3 B Perf
		L pAm	23 dBA Entry LFF
			24 dBA Entry
			24 dBA Base
			39 dBA Base LFF
			25 dBA Perf
		Operating	
		L WAd	4.3 B Entry LFF
			4.6 B Entry
			4.8 B Base
			5.9 B Base LFF
			5.6 B Perf
		L pAm	25 dBA Entry LFF
			29 dBA Entry
			30 dBA Base
			31 dBA Base LFF
			39 dBA Perf
		NOTE: The Listed sound levels apply to standard shipping configurations (Entry LFF, Entry, Base, Base LFF and Performance models) additional options may result in increased sound levels. The Base LFF model leverages our High Efficiency Fans, other models are shipping with standard fan options.	
	Emissions Classification (EMC)	FCC Rating	Class A
		Normative Standards	CISPR 22; EN55022; EN55024; FCC CFR 47, Pt 15; ICES-003; CNS13438; GB9254; K22;K24; EN 61000-3-2; EN 61000-3-3; EN 60950-1; IEC 60950-1
		NOTE: Product conformance to cited product specifications is based on sample (type) testing, evaluation, or assessment. This product or family of products is eligible to bear the appropriate compliance logos and statements. **NOTE:** The Listed sound levels apply to standard shipping configurations. Additional options may result in increased sound levels.	
HPE Dynamic Smart Array B140i Controller	**Number of PCI links**	Four	
	PCI link rate	4 Gb/s	
	Storage protocol support	SATA	
	SAS/SATA peak data transfer rate	6 Gb/s	
	Number of SAS/SATA links	10 links	
	SAS/SATA connectivity	2x4 connectors; 2x1 connectors	

	Expander support	No
	Drives supported (max)	Up to 10 Internal Drives
	RAID support	0, 1, 10, 5 SATA
	Software management	HPE SSA, SMH, SIM
	Warranty	Server warranty
	HPE Secure Encryption license	Not Supported
	HPE SmartCache License	Not Supported
	HPE Smart Storage Administrator	Supported
HPE Ethernet 1Gb 4-port 331i Adapter	**Network Interface**	10Base-T/100Base-TX/1000Base-TX
	Compatibility	IEEE 802.3 10Base-T IEEE 802.3ab 1000Base-T IEEE 802.3u 100Base-TX
	Data Transfer Method	PCI Express, two lanes (x2)
	Controller	BCM5719
	Network Transfer Rate	10Base-T (Half-Duplex) 10 Mb/s per port, 40 Mb/s combined 10Base-T (Full-Duplex) 20 Mb/s per port, 80 Mb/s combined 100Base-TX (Half-Duplex) 100 Mb/s per port, 400 Mb/s combined 100Base-TX (Full-Duplex) 200 Mb/s per port, 800 Mb/s combined 1000Base-TX (Half and Full-Duplex) 1000Mb/s per port, 4000 Mb/s combined 1000Base-TX (Full-Duplex) 2000Mb/s per port, 8000 Mb/s combined
	Connector	Four RJ-45
	Cable Support	10 Base-T Categories 3, 4 or 5 UTP; up to 328 ft (100 m) 10/100/1000 Base-TX Category 5 or higher UTP; up to 328 ft (100 m)
Environment-friendly	**End-of-life Management and Recycling**	Hewlett-Packard offers end-of-life Hewlett Packard Enterprise product return, trade-in, and recycling programs in many geographic areas. For trade-in information, please go to: **http://www.hp.com/go/green**. To recycle your product, please go

Products and Approach

to: **http://www.hp.com/go/green** or contact your nearest Hewlett Packard Enterprise sales office. Products returned to Hewlett Packard Enterprise will be recycled, recovered or disposed of in a responsible manner.

The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard Enterprise web site at: **http://www.hp.com/go/green**. These instructions may be used by recyclers and other WEEE treatment facilities as well as HPE OEM customers who integrate and re-sell Hewlett Packard Enterprise equipment.

Date	Version History	Action	Description of Change
16-Feb-2016	From Version 13 to 14	Added	New HDD offering was added to HPE Drives.
		Changed	HPE Computation and Graphics Accelerators, HPE Data Center Racks, and HPE Power Distribution Units (PDUs) were revised.
		Removed	Obsolete SKUs were removed from the QuickSpecs.
17-Dec-2015	From Version 12 to 13	Changed	Smart Buy models section was revised in the NA version only.
1-Dec-2015	From Version 11 to 12	Added	New HDD offering was added to HPE Drives. New options added to Graphics Options, HPE PCIe Workload Accelerator Options, and HPE Tape Backup.
		Changed	On System Management Chipset, Maximum Internal Storage, Embedded Management, and Server utilities were revised. Product images were updated.
		Removed	Obsolete SKUs were removed from the QuickSpecs.
28-Sep-2015	From Version 10 to 11	Added	Added new 6Gb SATA Solid State Drives. Added new HPE OneView management software.
		Changed	Maximun Internal Storage was revised.
		Removed	Obsolete SKUs were removed from the QuickSpecs.
17-Aug-2015	From Version 9 to 10	Added	Added new Solid State Drives offering. Added new graphic options.
		Changed	What's New changed to: New support for NVMe PCIe SSDs New Graphic card options Service and Support section was updated. Maximun Internal Storage and Core Options were revised.
		Removed	Obsolete SKUs were removed from the QuickSpecs.
1-Jun-2015	From Version 8 to 9	Added	New larger capacity HDDs (up to 8TB LFF), Max capacity 120TB were added. New higher capacity memory (64GB), Max capacity 1.5TB was added. New Networking options were added.

			Optional Software added to HPE Storage Controllers.
		Changed	Updated max HDD and memory capacity due to new options added. HPE SmartCache Software, HPE Disk Backup System, HPE Uninterruptible Power Systems (UPS) were updated.
30-Mar-2015	From Version 7 to 8	Added	New Hard Drives offering. Optical Software added to HPE Storage Controllers. Added new HPE Care Pack Services. Added new HPE PCIe Workload Accelerator Options.
		Changed	What's New, Standard Features, Unique Options, Power Supplies, HPE Storage Controllers, HPE Disk Storage Systems, and Technical Specifications were revised.
		Removed	Removed obsolete HPE Care Pack Services.
17-Feb-2015	From Version 6 to 7	Added	Added Smart Buy Models to the NA version only.
9-Feb-2015	From Version 5 to 6	Added	What's new section was added. Added new HDD offering, new computational Graphics options, and new G4 UPS models.
		Changed	HPE Drives, HPE Computation and Graphics Accelerators, HPE Tape Backup, HPE Disk Backup, HPE Rack Mount, Consoles, KVM Switches, and Keyboards, and HPE Uninterruptible Power Systems (UPS) sections were revised.
1-Dec-2014	From Version 4 to 5	Changed	Changes made throughout the entire QuickSpecs.
13-Oct-2014	From Version 3 to 4	Changed	Corrected inconsistencies between Product Bulletin and Concentra versions.
13-Oct-2014	From Version 2 to 3	Added	6G SATA Enterprise Value G1 Solid State Drives were added to Core Option section. HPE PCIe Workload Accelerator Options, HPE USB and SD options, and HPE Care Pack Services were added to the Additional Options section.
		Changed	Standard Features, Optional Features, Pre-Configured MOdels, Configuration Information - Factory Integrated Models, Core Options, Additional Options, and Memory sections were revised.
19-Sep-2014	From Version 1 to 2	Changed	Changes were made throughout the QuickSpecs

hp.com/qref/dl380gen9

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For hard drives, 1GB = 1 billion bytes. Actual formatted capacity is less

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Hewlett Packard Enterprise



Bird Technologies TX RX Systems Brand

Mini AutoQuad™ Tower Top Amplifier System

428E-Series, Motorola TTA01, RMC01, RMC03

Bird, TX RX Systems brand, Auto Quad Tower-Top Amplifier (TTA) system is a high performance, quadrature-coupled low noise amplifier (LNA). The TTA increases receive sensitivity, improves receiver noise figure and can make all the difference in mission critical communications.

The TTA operates independently, monitoring LNA current and automatically switching to a redundant LNA if needed. Status reporting is accomplished via AISG compliant telemetry between the controlling processor in the Tower Box and the base control unit. The base control unit has an on board AISG modem which does not require the use of an external data cable. This telemetry does not interfere with RF Signals in any way and communicates the LNA currents, temperature and operational status to the base control unit LCD display. Test modes and manual switching between LNA's is also accomplished by way of the telemetry system.

The TTA consists of two components: the tower top amplifier mounted close to the antenna and the control unit. The control unit is available in two styles, either with or without a receiver multicoupler. In order to reduce the size of the TTA and simultaneously provide 120 dB of isolation to a TX carrier, filtering has been split between the TTA and the base unit.

Preliminary

FEATURES

- All tower top ports protected by internal surge suppressors.
- Two independent Quadrature Coupled LNA's in the tower top assembly provides the redundancy needed to ensure maximum uptime.
- Microprocessors continuously monitor amplifiers and will switch tower top LNA's if needed.
- Ethernet
- Multiple Real-Time Status and Alarm Annuciation Methods:
  - Secure SNMP (v3.0) Trap Messaging (compliant with Genesis and other SNMP Managers)
  - Form-C contacts
  - Front Panel Status Indicators
- Wind loading is reduced due to the smaller enclosure size.
- Available with a 16 port receive mulicoupler or a control monitoring unit.
- Expandable as needed to 32, 40 or 48 ports.

APPLICATIONS

The TTA is designed to increase the performance of a Base Transceiver Station (BTS) while ensuring reliable communications for critical Public Safety applications. This increase in sensitivity can make up for the imbalance between mobile and handheld users in critical systems.

The TTA is used when cable losses exceed 1.5 dB

Mini AutoQuad™ Tower Top Amplifier System

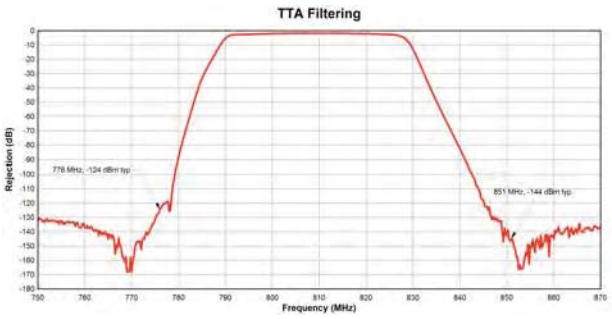
428E-Series, Motorola TTA01, RMC01, RMC03

SYSTEM SPECIFICATIONS

Frequency Band		700-800 MHz
Reserve Gain	MCU CMU	15.0 +1 / -0.25 dB 8.0 +/- 0.5 dB
Noise Figure		< 2.7 dB
Amplifier IIP3		< + 15 dBm
Rejection		110 dB min. at 776 and 851 MHz
Total Power Dissipation		17W

TOWER TOP AMPLIFIER SPECIFICATIONS

Frequency Band	796-824 MHz
Preselector Included	Yes
Preselector Frequency Range	796 – 824 MHz
Type of Amplifier	Quadrature Coupled (Redundant)
Amplifier Switching	Automatic
Type of Amplifier Switching	Solid State RF Switch
Return Loss of all RF Ports	> 14 dB
Power Requirements	Power derived from Rx Cable
Operating Temperature Range	-30° C to +60° C
Amplifier Redundancy	Automatic change - over
Lightning Protection	Impulse suppressor on all external ports
Test Port Included	Yes
Coupling Test Port (Test in/Amp in)	30dB +/-2dB
50 Ohm Termination Test	Controlled by base unit
Type of RF Test Switching	Solid State RF Switch
Bypass Test Mode	Controlled by base unit
Enclosure	Weather resistant Housing, Designed to NEMA Standards
Dimensions	9.25" x 5.125" x 6"
Net Weight	8.9 lbs



A steep skirted TEM bandpass filter in the tower box augmented by a ceramic filter in the base unit provide a selective 32 MHz system window.

BASE UNIT SPECIFICATIONS

MULTICOUPLER UNIT (MCU) CONTROL MONITORING UNIT (CMU)

Frequency Band	MCU/CMU	796-824 MHz
Amplifier Type	MCU	Quadrature Coupled
Amplifier Output IP3	MCU	> +45dBm
Number of Output Ports	MCU CMU	16 expandable to 32 1 for ESS and 1 for Rx Test
RF Port Return Loss (Min)	MCU/CMU	> 14 dB
TTA Connector	MCU/CMU	N-Female
Receiver Connector	MCU CMU	BNC-Female N-Female
Rx-Rx Port Isolation (Min)	MCU/CMU	>20 dB
Receive Test Port	MCU CMU	N/A N-Female
Test Port Input (Front of RMC)	MCU/CMU	BNC- Female
Test Port Output (Rear of RMC)	MCU/CMU	N- Female
Alarm Contacts	MCU	Form-C contacts
Ethernet RJ45	MCU/CMU	Access from front panel
Power Requirements	MCU/CMU	90-240 VAC @ 50/60 Hz or -48 VDC
Operating Temp Range	MCU/CMU	0°C to +50°C
Enclosure	MCU/CMU	Standard EIA 19" Rack Mounting
Dimensions (HWD)	MCU/CMU	1 RU x 19"x 14" (38 x 483 x 356 mm)
Net Weight	MCU CMU	11.5 lbs 10.5 lbs

Tower Top Amplifier will function up to 70°C without shutting down however, the specifications are not guaranteed outside the rated temperature range. MCU/CMU specification values are typical unless noted otherwise.

OPTIONAL PRODUCTS

Model Numbers	Motorola Model Numbers	Description
89-83F-03-03	**DS8983F0303**	792-806 MHz, 3 MHz Bandwidth Preselector
89-83F-03-06	**DS8983F0306**	792-806 MHz, 6 MHz Bandwidth Preselector
89-83F-03-09	**DS8983F0309**	792-806 MHz, 9 MHz Bandwidth Preselector
89-83F-03-14	**DS8983F0314**	792-806 MHz, 14 MHz Bandwidth Preselector
89-86A-03-03	**DS8986A0303**	806-824 MHz, 3 MHz Bandwidth Preselector
89-86A-03-05	**DS8986A0305**	806-824 MHz, 5 MHz Bandwidth Preselector
89-86A-03-10	**DS8986A0310**	806-824 MHz, 10 MHz Bandwidth Preselector
89-86A-03-15	**DS8986A0315**	806-824 MHz, 15 MHz Bandwidth Preselector
89-86A-03-18	**DS8986A0318**	806-824 MHz, 18 MHz Bandwidth Preselector
75-83K-01	**DS7583K01**	Expansion Kit, 16-32 Port, 792-902 MHz
75-83K-02	**DS7583K02**	Expansion Kit, 16-40 Port, 792-902 MHz
75-83K-03	**DS7583K03**	Expansion Kit, 16-48 Port, 792-902 MHz
91-00-123	**DS9100123**	TTA Mounting Bracket

Model Numbers	Motorola Model Numbers	Description	Power Req
428E-83I-01-T	DS428E83I01T	TTA, Mini AutoQuad, 796-824 MHz, tower top box only	
428E-83I-01-M-110	DS428E83I01M110	Multicoupler Unit (MCU) 16-port, 796-824 MHz, used with 428E-83I-01-T	AC
428E-83I-01-M-48	DS428E83I01M48	Multicoupler Unit (MCU) 16-port, 796-824 MHz, used with 428E-83I-01-T	-48
428E-83I-01-C-110	DS428E83I01C110	Control Monitoring Unit (CMU) for TTA, w/o RX Multicoupler, 796-824 MHz, used with 428E-83I-01-T	AC
428E-83I-01-C-48	DS428E83I01C48	Control Monitoring Unit (CMU) for TTA, w/o RX Multicoupler, 796-824 MHz, used with 428E-83I-01-T	-48

Preliminary

Bird Technologies®
30303 Aurora Rd. | Solon, OH 44139 | 866.695.4569 | www.bird-technologies.com



Bird Technologies® TX RX Systems Brand

Public Safety Non-Diversity/Diversity Tower Top Amplifier System

437-83I Migratable Series

Bird, TX RX Systems brand, is well known for its reliable Public Safety Mini AutoQuad and Dual Diversity TTA products. Now Bird has designed another innovative model that brings both technologies together. With this new design the TTA can be ordered with a fully redundant Low Noise Amplifier to support your current public safety, non-diversity system, then at a later time have the ability to migrate to a dual diversity system by simply changing a software setting at the Base Unit and adding the right deck configuration. The product can also be ordered preconfigured as a dual diversity system. As always the TTA's have the high performance specifications you have come to expect from Bird.

Tower Top Amplifiers increase receive sensitivity by improving total system noise figure. This can make all the difference for mission critical communications at the time you need it most. The TTA consists of two components: the tower top amplifier mounted close to the antenna and the base control unit. The base control unit is available in two styles, a CMU that is specifically designed to interface directly with one or two GTR8000 ESS receive networks and an MCU which is designed to interface directly to 16 individual receivers operating in single or dual diversity mode depending on the configuration.

Diversity Operating Mode:
The signals from two separate antenna paths are carefully matched to maximize the aperture gain of a dual diversity radio system. The TTA uses a single quadrature coupled Low Noise Amplifier (LNA) assembly for each network path.

Non-Diversity Operating Mode:
The signal is received from a single antenna path. The TTA uses two quadrature coupled Low Noise Amplifier (LNA) assemblies with built in intelligence to monitor the LNA health and automatically switch to the redundant LNA if needed. Manual switching between LNA's is also available through the base control unit.

FEATURES

- Quadrature-coupled low noise amplifier (LNA) improves RX sensitivity.
- PolyPhaser™ impulse suppressors provide protection from lightning.
- High performance filtering in tower top and base control unit.
- Compact, light weight, weather-resistant enclosure.
- One rack-unit high base control unit.

APPLICATIONS

The TTA is designed to increase the performance of a Base Transceiver Station (BTS) while ensuring reliable communications for critical Public Safety applications. This increase in sensitivity can make up for the imbalance between mobile and handheld users in critical systems

The TTA is used when cable losses exceed 1.5 dB

Public Safety Non-Diversity/Diversity Tower Top Amplifier System

437-83I Migratable Series

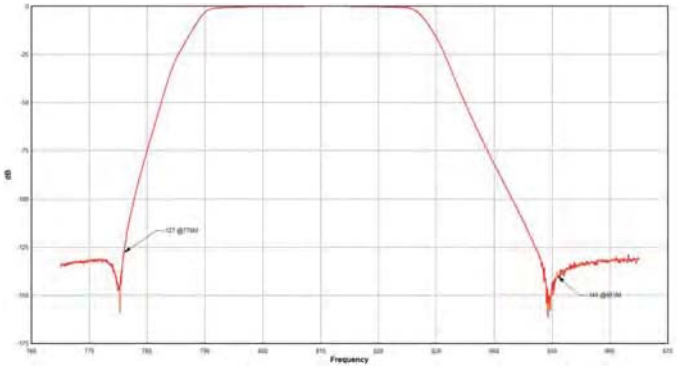
SYSTEM SPECIFICATIONS

Bandwidth		796 – 824 MHz
System Noise Figure		≤ 3.5 dB
System IIP3	MCU CMU	+12 dBm min +15 dBm min
System Gain	MCU CMU	15.0 +1 / -0.25 dB * 10.0 +/- 0.5 dB *
Filter Rejection		110 dB min, 776 and 851 MHz
Total Power Dissipation		30 W Nominal Dual Diversity 22W Nominal Non-Diveristy

TOWER TOP AMPLIFIER SPECIFICATIONS

Frequency Range	796-824 MHz
Integrated Test Port Coupling	30 dB -/+ 2 dB
Antenna Port RL	14 dB min
Power Requirements	12 VDC
Lightning Protection	Impulse suppression on all external ports
Operating Temp Range	-30°C to +60°C
Enclosure	NEMA 4 Style Enclosure
Connectors	N-Female
Enclosure Dimensions (HWD)	11.3"x7"x10.2"
Weight	25 lbs

700/800 MHz Composite TTA Filtering



A steep skirted TEM bandpass filter in the tower box augmented by a ceramic filter in the base unit provide a selective system window

*System gain specified with 6 dB line loss from TTA output to RMC input.

BASE UNIT SPECIFICATIONS

MULTICOUPLER UNIT (MCU)
CONTROL MONITORING UNIT (CMU)

RF Input Impedance	MCU/CMU	50 ohms Nominal
Input RL	MCU/CMU	14 dB min
Power Requirements	MCU/CMU	± 48 VDC or 85-250 VAC 50/60 Hz, depending upon model and +12VDC battery backup
Operating Temperature	MCU/CMU	0°C to +50°C at non-condensing humidity
700/800 Dimensions	MCU/CMU	1 RU x 19" x 18"
Weight	MCU CMU	11.5 lbs 10.5 lbs

RESERVE GAIN ADJUSTMENT (EACH CHANNEL)

Coarse	MCU/CMU	0 – 10 dB in 0.5 dB steps
Fine (diversity mode)	MCU/CMU	0-1.0 dB in < 0.1 dB steps (Fine adjustment accommodates accurate channel to channel amplitude balance)

CONNECTORS

N-Female RF Connections	MCU/CMU	Main A, Main B and Test Lines
BNC Female	MCU/CMU	Input to Test Line and bypass (on front panel)
Ethernet RJ45	MCU/CMU	Access from front panel
Form C Contacts	MCU/CMU	Separate alarms for A and B Channels in diversity mode
16 BNC Female Outputs for each channel	MCU	Labeled RxA-1 through RxA-16 and RxB-1 through RxB-16
BNC Female	MCU	Outputs for splitting expansion
2 N Female Outputs for each channel	CMU	Labeled RxA, RxA-Test, RxB, RxB-Test

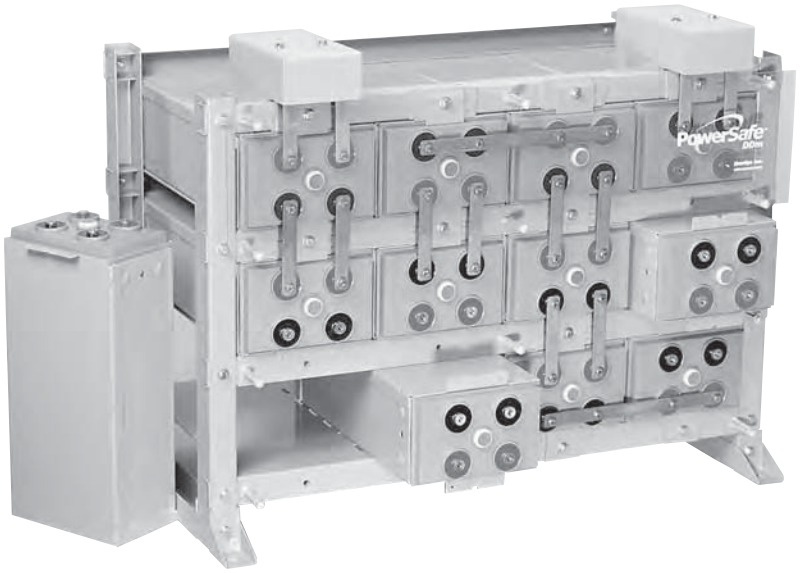
Public Safety Non-Diversity/Diversity Tower Top Amplifier System

437-83I Migratable Series

PRODUCT PART NUMBER

Model Numbers	Motorola Model Numbers	Description
TTA Model Configured for Non-Diversity or Dual Diversity:		
437-83I-01-T	DS43783I01T	TTA, 796-824MHz, Non-Diversity or Dual Diversity Tower Top Box
Base Unit Models Configured for Dual Diversity:		
437-83I-01-C-110	DS43783I01C110	Control Monitoring Unit, 796-824MHz, Dual Diversity, Ethernet, 110VAC
437-83I-01-C-48	DS43783I01C48	Control Monitoring Unit, 796-824MHz, Dual Diversity, Ethernet, 48VDC
437-83I-01-M-110	DS43783I01M110	Multicoupler Unit, 796-824MHz, Dual Diversity, Ethernet, 110VAC
437-83I-01-M-48	DS43783I01M48	Multicoupler Unit, 796-824MHz, Dual Diversity, Ethernet, 48VDC
Base Unit Models Configured for Non-Diversity but migratable to Dual Diversity:		
437-83I-01M-C-110	DS43783I01MC110	Migratable-Control Monitoring Unit, 796-824MHz, Ethernet, 110VAC
437-83I-01M-C-48	DS43783I01MC48	Migratable-Control Monitoring Unit, 796-824MHz, Ethernet, 48VDC
437-83I-01M-M-110	DS43783I01MM110	Migratable-Multicoupler Unit, 796-824MHz, Ethernet, 110VAC
437-83I-01M-M-48	DS43783I01MM48	Migratable-Multicoupler Unit, 796-824MHz, Ethernet, 48VDC
437-83I-01M-C-Kit	DS43783I01MCKit	Migratable Kit-Control Monitoring Unit, 796-824MHz, Dual Diversity
437-83I-01M-M-Kit	DS43783I01MMKit	Migratable Kit-Multicoupler Unit, 796-824MHz, Dual Diversity
Optional Filtering:		
89-83N-01-03	DS8983N0103	798-824 MHz, 3 MHz Bandwidth Preselector, Non Diversity
89-83N-01-06	DS8983N0106	798-824 MHz, 6 MHz Bandwidth Preselector, Non Diversity
89-83N-01-09	DS8983N0109	798-824 MHz, 9 MHz Bandwidth Preselector, Non Diversity
89-83N-01-15	DS8983N0115	798-824 MHz, 15 MHz Bandwidth Preselector, Non Diversity
89-83N-01D-03	DS8983N01D03	798-824 MHz, 3 MHz Bandwidth Preselector, Dual Diversity
89-83N-01D-06	DS8983N01D06	798-824 MHz, 6 MHz Bandwidth Preselector, Dual Diversity
89-83N-01D-09	DS8983N01D09	798-824 MHz, 9 MHz Bandwidth Preselector, Dual Diversity
89-83N-01D-15	DS8983N01D15	798-824 MHz, 15 MHz Bandwidth Preselector, Dual Diversity
Optional Expansion Kits:		
75-83K-01	DS7583K01	Expansion Kit, 16-32 Ports, Non Diversity
75-83K-02	DS7583K02	Expansion Kit, 16-40 Ports, Non Diversity
75-83K-03	DS7583K03	Expansion Kit, 16-48 Ports, Non Diversity
75-83K-04	DS7583K04	Expansion Kit, 16-32 Ports, Dual Diversity
75-83K-05	DS7583K05	Expansion Kit, 16-40 Ports, Dual Diversity
75-83K-06	DS7583K06	Expansion Kit, 16-48 Ports, Dual Diversity
Mounting Bracket:		
91-00-123	DS9100123	TTA Mounting Bracket Kit

PowerSafe® DDm



PERFORMANCE SPECIFICATIONS

105 Ah – 2000 Ah

EnerSys®
Power/Full Solutions

RESERVE POWER

Publication No. US-DDm-PS-004 January 2012

PowerSafe® DDm

The **PowerSafe**® DDm battery range offers an ideal solution for large capacity valve regulated lead-acid battery requirements. **PowerSafe** DDm battery's steel can (module) design concept, with its integral racking system, provides a cost effective battery system with a compact, quick and simple installation process.

The PowerSafe DDm battery system's cutting-edge technology incorporates an enhanced cell design with a superior racking system. The enhanced cell incorporates thicker positive plates for longer life. The welded/epoxy, dual post seal design provides the highest integrity seal in the industry. The large copper post design also enhances the high rate performance.

Cells are encased in dedicated protective steel cans (modules) that maintain constant, uniform compression for the life of the cell. The easy to assemble racking system provides total flexibility for system configuration and allows fast, simple installation even in the most difficult locations.

PowerSafe DDm battery, with its optimized recombination technology and extra thick plates, provides excellent performance and service life across a wide range of applications including: telecommunications, power generation/distribution sites and UPS.

Construction

- Positive plate — Thick 0.252" lead-calcium-tin grids minimize corrosion and prolong life
- Negative plate — Balanced lead-calcium grids optimize recombination efficiency
- AGM separator — Mechanically strong, low electrical resistance, microporous glass fiber which completely absorbs the electrolyte into its structure
- Container/Cover — Flame retardant polypropylene (UL94 V-0/L.O.I. 28%)
- Containers are single-piece construction
- Electrolyte — Diluted sulfuric acid
- Terminal post — Lead casting terminal, threaded copper insert, with large surface area, to provide maximum conductivity
- Terminal seal — Ring burn with secondary epoxy resin seal is 100% water bath tested in the factory and proven in service
- Relief valve — Operates at 2-3 psi and is complete with integral flame arrestor

Features

- 100% "out of box" initial battery capacity
- VRLA recombinant technology - low maintenance - no watering required
- Up to 2000 Ah in a single cell
- Frame design allows for maximum heat dissipation
- Certified to 1997 UBC Zone 4 to six high on DDm125 and eight high on DDm35, DDm50, DDm85 and DDm100 sizes
- Steel module design, cells factory installed in permanent steel modules with 1 or 2 cells per can
- Module can be configured 2, 3, 4 or 6 cells wide in single cell modules; 2, 4 or 6 cells wide in 2-cell modules for maximum flexibility
- Simplified installation
- Top termination standard, optional side termination available
- Clear flame retardant front safety shields allow for easy visual inspection without removal

Benefits of the steel can (module) design

- Ease of installation, simply set up rack and install modules
- Uniform and consistent compression
- "Designed-In" thermal management allows maximum air flow
- Flexible configuration
- Cell protection from damage during transport

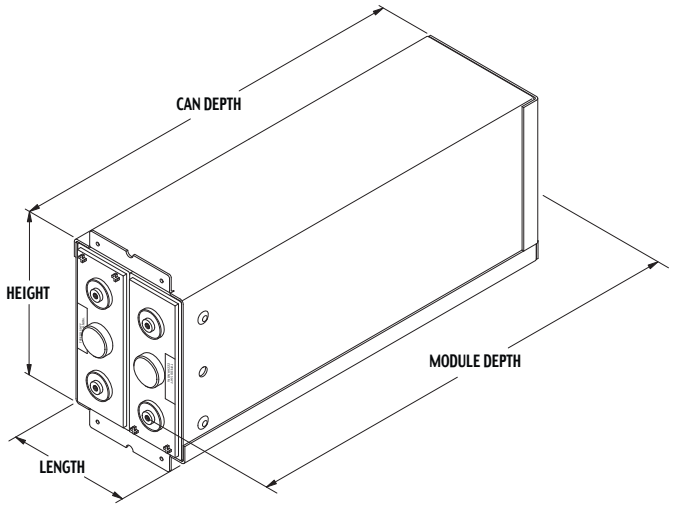
Installation

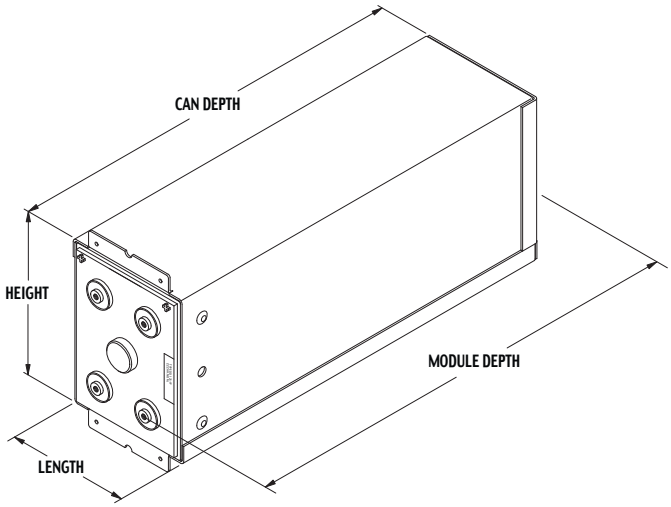
- Steel module design is easier to install, does not require removal from protective steel cans (modules) during installation
- Flexible configuration — 2, 3, 4 or 6 cells wide in single cell modules or 2, 4 or 6 cells wide in 2-cell modules
- Total front access for easy maintenance
- Floor anchoring — easy access during install, rack can be set before stowing modules
- Top termination standard — optional side termination available
- Transition kits available to mount relay rack above battery system

GENERAL SPECIFICATIONS

PowerSafe® DDm Battery Type	Nominal Capacity (Ah) 10hr. rate 1.80Vpc @ 20°C	8hr. rate 1.75Vpc @ 77°F	Nominal Dimensions Length mm	Length in	Height mm	Height in	Can Depth mm	Can Depth in	Module Depth mm	Module Depth in	Typical Weight of Cell(s) in Can kg	Typical Weight of Cell(s) in Can lbs	Internal* Resistance Micro-Ohms	Short Circuit Current (Amps)	Electrolyte (1.300 S.G.) Volume (per cell) oz	Volume (per cell) L	Weight (per cell) lbs	Weight (per cell) kg	Pure Acid (1.835 S.G.) Volume (per cell) oz	Volume (per cell) L	Weight (per cell) lbs	Weight (per cell) kg	Lead Weight (per cell) lbs	Lead Weight (per cell) kg
2DDm35-07	105	105	112	4.4	165	6.5	333	13.1	366	14.4	19.1	42.0	1400	1500	47	1.4	4	1.8	13.5	0.04	1.6	0.7	10.5	4.7
2DDm50-09	200	200	188	7.4	165	6.5	333	13.1	366	14.4	34.3	75.4	825	2527	77	2.3	6.5	3.0	21.8	0.6	2.6	1.2	21	9.5
2DDm50-13	300	300	265	10.4	165	6.5	333	13.1	366	14.4	49.5	108.9	550	3791	128	3.6	10.4	4.7	34.6	1.0	4.1	1.9	32	14.5
DDm50-17	400	400	176	6.9	165	6.5	333	13.1	366	14.4	34.0	74.7	413	5048	166	4.9	14.1	6.4	47.4	1.4	5.6	2.5	44	19.9
2DDm85-13	510	510	265	10.4	165	6.5	519	20.4	554	21.8	75.7	166.5	515	4049	230	6.8	19.4	8.8	64.0	1.9	7.7	3.5	48	21.8
2DDm85-15	595	595	303	11.9	165	6.5	519	20.4	554	21.8	88.5	194.8	441	4728	269	7.8	22.4	10.1	74.2	2.2	8.9	4.0	58	26.3
DDm85-21	850	850	214	8.4	165	6.5	519	20.4	554	21.8	64.5	142.0	309	6748	371	11.0	31.5	14.3	105.0	3.1	12.5	5.7	85	38.6
DDm85-25	020	1020	252	9.9	165	6.5	519	20.4	554	21.8	74.4	163.7	258	8081	435	13.0	37.3	16.9	124.0	3.7	14.8	6.7	99	44.9
DDm85-27	1105	1105	271	10.7	165	6.5	519	20.4	554	21.8	80.8	177.8	238	8761	474	14.0	40.1	18.2	133.0	3.9	15.9	7.2	109	49.4
DDm85-33	1360	1360	328	12.9	165	6.5	519	20.4	554	21.8	97.9	217.5	193	10803	576	17.2	49.3	22.3	164.0	4.8	19.5	8.8	139	63.1
DDm100-21	1000	1000	214	8.4	165	6.5	590	23.2	624	24.5	73.5	163.4	270	7722	422	12.5	35.8	16.2	119.0	3.5	14.2	6.4	105	47.6
DDm100-25	1200	1200	252	9.9	165	6.5	590	23.2	624	24.5	86.5	192.1	225	9267	499	14.9	42.7	19.4	142.0	4.2	16.9	7.7	127	57.6
DDm100-27	1300	1300	271	10.7	165	6.5	590	23.2	624	24.5	92.0	204.3	208	10024	550	16.1	46.1	20.9	154.0	4.5	18.3	8.3	138	62.6
DDm100-33	1600	1600	328	12.9	165	6.5	590	23.2	624	24.5	115.3	256.3	169	12337	666	19.7	56.4	25.6	188.0	5.6	22.3	10.1	172	78
DDm125-25	1500	1500	252	9.9	226	8.9	562	22.1	597	23.5	112.3	249.6	168	12411	640	18.8	53.9	24.5	179.0	5.3	21.4	9.7	164	74.4
DDm125-27	1625	1625	271	10.7	226	8.9	562	22.1	597	23.5	120.8	268.4	155	13452	691	20.3	58.2	26.4	193.0	5.7	23.0	10.4	178	80.7
DDm125-33	2000	2000	328	12.9	226	8.9	562	22.1	597	23.5	144.1	320.3	126	16548	845	25.0	71.6	32.5	238.0	7.0	28.4	12.9	220	99.8

* Resistance Values are for reference only and not intended to represent an ohmic value or base line measurement.





PowerSafe® DDm

PowerSafe® DDm Battery Type	Ah Capacity	Cells per module	Nominal Voltage (V)	Nominal Row Height mm	Nominal Row Height in	Nominal Stack Depth mm	Nominal Stack Depth in	Non-Seismic Nominal Stack Length** 2 Wide mm	2 Wide in	3 Wide mm	3 Wide in	4 Wide mm	4 Wide in	6 Wide mm	6 Wide in	Typical System Weight Per Cell (1) Unpacked kg	Unpacked lbs.	Packed kg	Packed lbs
2DDm35-07	105	2	4	219.2	8.63	412.8	16.25	324.6*	12.78*	N/A	N/A	438.4*	17.26*	429.3	16.90	12.0	26.0	13.3	29.3
2DDm50-09	200	2	4	219.2	8.63	412.8	16.25	400.8*	15.78*	N/A	N/A	467.6	18.41	657.9	25.90	21.3	47.0	22.8	50.3
2DDm50-13	300	2	4	219.2	8.63	412.8	16.25	477.0*	18.78*	N/A	N/A	620.0	24.41	886.5	34.90	29.5	65.0	31.0	68.3
DDm50-17	400	1	2	219.2	8.63	412.8	16.25	441.5	17.38	619.0	24.37	791.2	31.15	1144.5	45.06	39.9	88.0	41.4	91.3
2DDm85-13	510	2	4	219.2	8.63	596.9	23.50	477.0*	18.78*	N/A	N/A	620.0	24.41	886.5	34.90	43.6	96.0	45.1	99.3
2DDm85-15	595	2	4	219.2	8.63	596.9	23.50	515.1*	20.28*	N/A	N/A	696.2	27.41	1000.8	39.40	50.4	111.0	51.9	114.3
DDm85-21	850	1	2	219.2	8.63	596.9	23.50	517.4	20.37	732.0	28.82	943.6	37.15	1412.2	55.60	72.1	159.0	73.6	162.3
DDm85-25	1020	1	2	219.2	8.63	596.9	23.50	593.6	23.37	846.3	33.32	1096.0	43.15	1640.1	64.57	83.0	183.0	84.5	186.3
DDm85-27	1105	1	2	219.2	8.63	596.9	23.50	631.7	24.87	903.7	35.58	1172.5	46.16	1755.4	69.11	90.3	199.0	91.8	202.3
DDm85-33	1360	1	2	219.2	8.63	596.9	23.50	746.0	29.37	1074.9	42.32	1400.8	55.15	2098.0	82.60	111.1	245.0	112.6	248.3
DDm100-21	1000	1	2	219.2	8.63	666.8	26.25	517.4	20.37	732.0	28.82	943.6	37.15	1412.2	55.60	83.9	185.0	85.4	188.3
DDm100-25	1200	1	2	219.2	8.63	666.8	26.25	593.6	23.37	846.3	33.32	1096.0	43.15	1640.1	64.57	99.3	219.0	100.9	222.3
DDm100-27	1300	1	2	219.2	8.63	666.8	26.25	631.7	24.87	903.7	35.58	1172.5	46.16	1172.5	69.11	107.1	236.0	108.6	239.3
DDm100-33	1600	1	2	219.2	8.63	666.8	26.25	746.0	29.37	1074.9	42.32	1400.8	55.15	2098.0	82.60	130.2	287.0	131.7	290.3
DDm125-25	1500	1	2	279.4	11.00	698.5	27.50	621.8	24.48	870.5	34.27	1127.0	44.37	1668.3	65.68	122.0	269.0	123.5	272.3
DDm125-27	1625	1	2	279.4	11.00	698.5	27.50	659.9	25.98	927.9	36.53	1203.2	47.37	1783.6	70.22	131.5	290.0	133.3	293.3
DDm125-33	2000	1	2	279.4	11.00	698.5	27.50	774.2	30.48	1099.0	43.27	1431.8	56.37	2126.2	83.71	161.0	355.0	162.5	358.3

(1) Includes hardware for calculating system weight
* Standard top termination not available, stack length is with same side termination
** Stack dimensions representative of single stack configurations. Contact EnerSys for seismic qualification of systems.

FORMULA

SYSTEM HEIGHT = (ROW HEIGHT x # OF CELL HIGH) + 9.0”
SYSTEM LENGTH = STACK LENGTH x # OF STACKS
SYSTEM WEIGHT = CELL WEIGHT x # OF CELLS

ACTUAL EXAMPLE: 24-DDm85-21,

4 cells wide per stack x 6 cells high per stack

SYSTEM HEIGHT = (8.63” x 6) + 9.0” = 60.78”
SYSTEM LENGTH = 37.15” x 1 = 37.15”
SYSTEM WEIGHT = 159.0 lbs. x 24 = 3816.0 lbs.

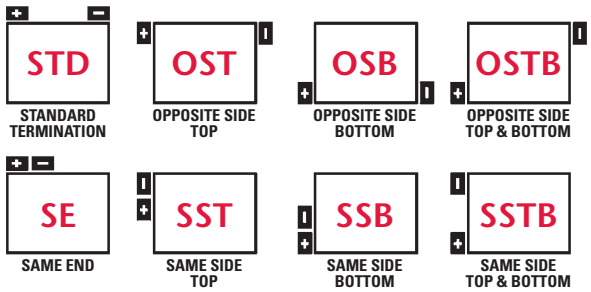
ADDITIONAL EXAMPLE: 240-DDm125-25,

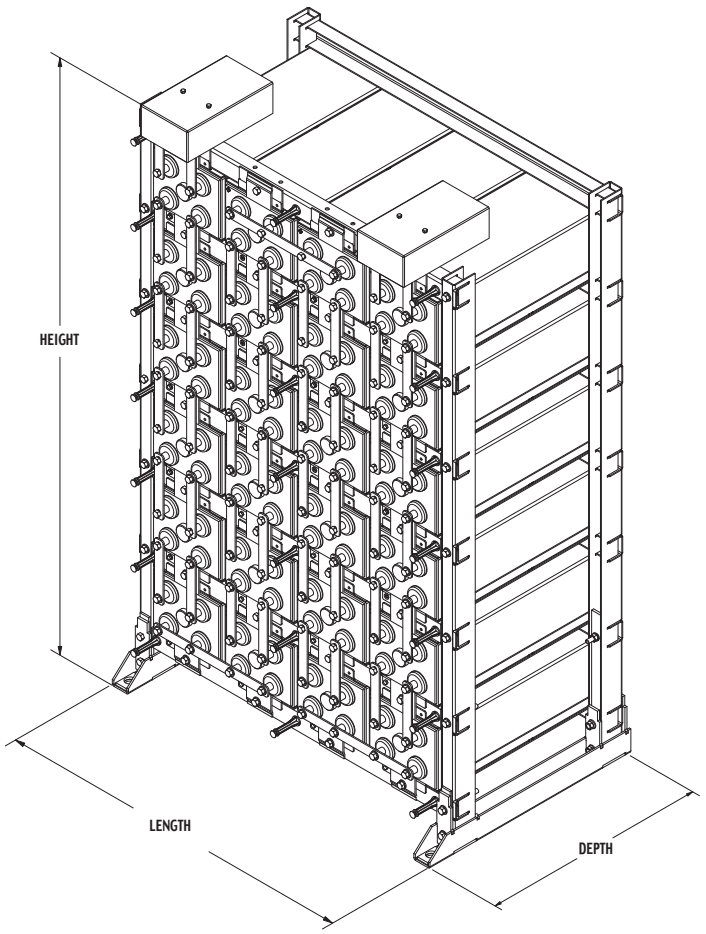
4 cells wide per stack x 6 cells high per stack

SYSTEM HEIGHT = (11.00” x 6) + 9.0” = 75.00”
SYSTEM LENGTH = 44.37” x 10 = 443.70”
SYSTEM WEIGHT = 269.0 lbs x 240 = 64,560.0 lbs.

TERMINATION LOCATIONS

Not all locations are possible for all configurations.





Discharge Rates in Amperes to 1.75Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes					Hours									
		1	15	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	252	148	101	84	72	63	38	28	22	19	16	13	11	9.6	5.6
DDm50-09	200	361	242	184	157	138	123	75	55	43	36	31	25	21	18	10
DDm50-13	300	541	364	275	236	207	184	113	82	65	54	47	38	31	27	16
DDm50-17	400	722	485	367	315	276	246	150	110	86	72	63	50	42	36	21
DDm85-13	510	674	525	416	367	329	297	189	141	113	95	82	65	52	45	25
DDm85-15	595	787	613	485	428	383	347	220	164	132	111	96	75	61	52	29
DDm85-21	850	1124	875	693	612	547	495	315	234	188	158	137	108	87	74	41
DDm85-25	1020	1348	1050	832	734	657	594	378	281	226	190	164	129	105	89	49
DDm85-27	1105	1461	1138	901	795	712	644	409	304	245	206	177	140	114	97	54
DDm85-33	1360	1797	1400	1109	978	876	792	504	375	302	253	218	172	140	119	66
DDm100-21	1000	1306	1006	799	707	634	575	369	274	219	184	159	126	104	89	49
DDm100-25	1200	1568	1207	959	848	761	690	442	329	263	221	191	151	125	107	59
DDm100-27	1300	1697	1308	1039	919	824	747	479	357	285	239	207	164	135	116	64
DDm100-33	1600	2090	1609	1279	1131	1014	920	590	439	351	294	254	202	166	142	78
DDm125-25	1500	1937	1542	1238	1093	979	886	569	420	333	278	240	189	155	132	74
DDm125-27	1625	2097	1671	1341	1184	1060	960	617	455	361	301	259	205	167	143	80
DDm125-33	2000	2583	2056	1650	1457	1305	1182	759	560	444	370	319	252	206	176	98

Discharge Rates in Amperes to 1.78Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes					Hours									
		1	15	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	227	139	96	81	70	62	37	28	22	19	16	13	11	9.5	5.6
DDm50-09	200	325	227	174	151	133	119	74	55	43	36	31	25	21	18	10
DDm50-13	300	488	340	261	226	200	179	112	82	65	54	47	38	31	27	16
DDm50-17	400	651	454	348	302	266	238	149	110	86	72	63	50	42	36	21
DDm85-13	510	608	486	390	346	311	283	184	138	111	94	81	64	52	45	25
DDm85-15	595	710	567	455	403	363	330	214	161	130	109	95	75	61	52	29
DDm85-21	850	1014	811	650	576	519	472	306	230	186	156	135	107	87	74	41
DDm85-25	1020	1215	973	779	691	622	566	367	276	223	188	162	128	105	89	49
DDm85-27	1105	1318	1054	844	749	674	613	398	299	241	203	176	139	113	97	54
DDm85-33	1360	1621	1297	1039	922	830	755	490	368	297	250	217	171	140	119	66
DDm100-21	1000	1186	937	752	667	602	549	359	268	215	181	156	124	102	88	49
DDm100-25	1200	1424	1125	902	801	722	658	430	322	258	217	188	149	123	105	58
DDm100-27	1300	1542	1219	977	868	782	713	466	349	279	235	203	161	133	114	63
DDm100-33	1600	1899	1500	1203	1068	963	878	574	429	344	289	250	198	164	141	78
DDm125-25	1500	1755	1430	1160	1029	926	843	550	412	333	278	240	189	155	132	74
DDm125-27	1625	1900	1549	1257	1115	1004	913	596	447	361	301	259	205	167	143	80
DDm125-33	2000	2340	1906	1547	1373	1235	1124	734	550	444	370	319	252	206	176	98

Discharge Rates in Amperes to 1.80Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes					Hours									
		1	15	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	211	132	93	78	68	60	57	27	22	18	16	13	11	9.4	5.5
DDm50-09	200	302	216	167	146	129	116	73	55	43	36	31	25	21	18	10
DDm50-13	300	452	324	250	218	194	174	110	82	65	54	47	38	31	27	16
DDm50-17	400	603	432	333	291	258	232	146	109	86	72	63	50	42	36	21
DDm85-13	510	563	460	372	331	298	272	179	135	110	93	80	63	52	44	25
DDm85-15	595	657	536	434	386	348	318	209	158	128	108	94	74	60	52	29
DDm85-21	850	939	766	620	551	497	454	298	226	183	154	134	106	86	74	41
DDm85-25	1020	1128	919	744	661	596	544	358	271	220	185	161	127	104	88	49
DDm85-27	1105	1221	996	805	716	646	590	388	293	238	201	174	137	112	96	53
DDm85-33	1360	1504	1226	991	881	795	726	477	361	293	247	214	169	138	118	66
DDm100-21	1000	1107	891	719	639	578	528	350	263	212	178	154	122	101	87	48
DDm100-25	1200	1328	1069	863	767	694	634	420	316	254	214	185	147	121	104	58
DDm100-27	1300	1440	1158	935	831	751	687	455	342	275	231	200	159	131	113	63
DDm100-33	1600	1770	1425	1150	1023	925	845	561	421	339	285	247	196	162	139	77
DDm125-25	1500	1633	1352	1105	984	888	810	535	403	326	275	239	189	155	132	74
DDm125-27	1625	1771	1465	1197	1066	962	878	579	437	353	298	259	205	167	143	80
DDm125-33	2000	2177	1803	1474	1312	1184	1080	713	537	435	367	319	252	206	176	98

* 8hr Rate to 1.75Vpc at 77°F

Discharge Rates in Amperes to 1.83Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes					Hours									
		1	15	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	186	121	86	73	64	57	35	26	21	18	16	13	11	9.2	5.4
DDm50-09	200	266	199	155	136	122	110	71	53	42	35	31	25	21	18	10
DDm50-13	300	400	298	233	204	182	165	106	79	63	53	46	37	31	27	16
DDm50-17	400	533	397	310	272	243	220	141	105	84	71	62	50	42	36	21
DDm85-13	510	498	419	344	307	278	254	171	130	106	90	78	62	51	43	24
DDm85-15	595	581	488	401	358	324	297	199	152	124	105	91	72	59	51	28
DDm85-21	850	829	698	572	511	463	424	284	216	177	150	130	103	84	72	40
DDm85-25	1020	996	837	687	614	555	508	341	260	212	180	156	124	101	87	48
DDm85-27	1105	1078	907	744	665	602	551	370	281	230	195	169	134	110	94	52
DDm85-33	1360	1328	1116	916	818	741	678	455	346	283	240	208	165	135	115	64
DDm100-21	1000	988	818	667	596	540	495	335	254	205	173	150	119	99	85	47
DDm100-25	1200	1185	982	801	715	648	594	401	305	246	208	180	143	118	102	56
DDm100-27	1300	1285	1064	867	775	702	643	435	330	267	225	195	155	128	110	61
DDm100-33	1600	1580	1309	1068	954	864	792	535	406	328	277	240	191	158	136	75
DDm125-25	1500	1444	1232	1019	912	826	756	507	386	314	266	232	185	152	131	74
DDm125-27	1625	1564	1335	1104	988	895	819	549	418	340	288	251	200	165	141	80
DDm125-33	2000	1926	1643	1359	1216	1102	1008	676	514	419	355	309	246	203	174	98

Discharge Rates in Amperes to 1.85Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes					Hours									
		1	15	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	170	113	82	70	61	55	34	26	21	17	15	12	10	9.0	5.3
DDm50-09	200	244	186	147	129	116	105	68	51	41	35	30	24	21	18	10
DDm50-13	300	365	279	220	194	174	158	103	77	62	52	45	37	31	27	15
DDm50-17	400	487	373	293	258	232	210	137	103	82	69	61	49	41	36	21
DDm85-13	510	455	391	324	290	263	241	164	126	103	87	76	60	50	42	24
DDm85-15	595	531	456	378	339	307	282	191	147	120	102	89	70	58	50	28
DDm85-21	850	758	652	539	484	439	402	273	209	171	145	127	100	82	71	40
DDm85-25	1020	909	782	647	581	527	483	328	251	205	174	152	120	99	85	48
DDm85-27	1105	986	847	701	629	571	523	355	272	222	189	165	130	107	92	52
DDm85-33	1360	1212	1043	863	774	702	644	437	335	274	232	203	160	132	113	63
DDm100-21	1000	907	768	631	566	513	471	321	246	200	169	147	117	97	83	46
DDm100-25	1200	1090	922	758	679	616	565	386	295	240	203	176	140	116	100	55
DDm100-27	1300	1180	999	821	735	667	612	418	320	260	220	191	152	126	108	60
DDm100-33	1600	1453	1229	1010	905	821	754	514	393	320	270	235	187	155	133	74
DDm125-25	1500	1316	1150	959	862	782	717	485	372	304	258	225	179	148	127	72
DDm125-27	1625	1427	1246	1039	933	848	777	525	403	329	280	244	194	161	138	78
DDm125-33	2000	1755	1533	1279	1149	1043	956	646	495	405	344	300	239	198	170	96

Discharge Rates in Amperes to 1.88Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes					Hours									
		1	15	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	144	101	74	64	56	50	32	24	19	17	15	12	9.9	8.6	5.1
DDm50-09	200	209	167	134	118	106	97	64	48	39	33	29	23	20	17	10
DDm50-13	300	314	251	200	177	159	145	96	73	59	50	44	35	30	26	15
DDm50-17	400	418	334	267	236	212	193	128	97	78	66	58	47	40	34	20
DDm85-13	510	390	350	292	264	241	221	152	118	97	83	72	57	47	40	23
DDm85-15	595	455	408	341	308	281	258	178	138	113	96	84	66	55	47	27
DDm85-21	850	651	583	487	440	401	369	254	197	162	138	120	95	78	67	38
DDm85-25	1020	780	699	584	528	481	442	305	236	194	165	144	113	94	81	46
DDm85-27	1105	846	757	633	572	522	479	330	256	210	179	156	123	102	87	49
DDm85-33	1360	1040	932	779	704	642	590	406	315	258	220	192	151	125	108	61
DDm100-21	1000	786	690	575	518	472	434	298	230	189	161	140	111	93	80	44
DDm100-25	1200	944	829	690	622	566	520	358	276	226	193	168	134	111	96	53
DDm100-27	1300	1022	898	748	674	613	564	388	299	245	209	182	145	120	104	58
DDm100-33	1600	1258	1105	920	829	755	694	477	368	302	257	224	178	148	128	71
DDm125-25	1500	1119	1022	864	781	712	654	447	346	285	243	213	170	141	122	69
DDm125-27	1625	1212	1107	936	846	772	709	484	375	308	263	231	184	153	132	75
DDm125-33	2000	1493	1363	1152	1041	950	872	595	461	380	324	284	226	188	162	92

* 8hr Rate to 1.75Vpc at 77°F

Discharge Rates in Amperes to 1.90Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes					Hours									
		1	15	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	128	91	68	59	53	47	30	23	19	16	14	11	9.5	8.3	4.9
DDm50-09	200	187	154	124	110	99	91	61	46	37	32	28	23	19	17	10
DDm50-13	300	280	231	186	165	149	136	91	69	56	48	42	34	29	25	14
DDm50-17	400	374	308	248	220	199	181	121	92	75	64	56	45	38	33	19
DDm85-13	510	348	321	270	245	224	207	144	112	92	79	69	54	45	39	22
DDm85-15	595	406	375	315	286	262	241	168	131	108	92	80	63	52	45	26
DDm85-21	850	581	535	450	409	374	345	239	186	154	131	115	90	75	65	37
DDm85-25	1020	697	643	540	490	449	413	287	224	184	157	137	108	90	77	44
DDm85-27	1105	755	696	585	531	486	448	311	242	200	170	149	117	97	84	48
DDm85-33	1360	930	857	720	654	598	551	383	298	246	210	183	144	120	103	58
DDm100-21	1000	706	637	535	484	442	407	281	218	179	153	134	107	89	77	43
DDm100-25	1200	846	764	642	581	531	489	338	261	215	184	161	128	107	92	52
DDm100-27	1300	917	828	696	630	575	530	366	283	233	199	174	139	116	100	56
DDm100-33	1600	1128	1019	856	775	708	652	450	348	287	245	215	171	142	123	69
DDm125-25	1500	983	935	797	724	662	609	419	326	269	231	202	161	135	116	67
DDm125-27	1625	1064	1013	863	784	717	660	454	353	292	250	219	174	146	126	72
DDm125-33	2000	1310	1247	1062	965	882	812	558	435	359	308	270	215	179	155	89

Discharge Rates in Amperes to 1.94Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes					Hours									
		1	15	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	94.2	73	57	49	44	40	26	20	16	14	12	9.9	8.4	7.4	4.4
DDm50-09	200	142	127	103	93	84	77	52	40	33	28	25	20	17	15	9
DDm50-13	300	212	190	155	139	126	116	78	60	49	42	37	30	26	22	13
DDm50-17	400	283	254	207	185	168	154	104	80	66	56	50	40	34	30	17
DDm85-13	510	266	263	224	204	189	175	124	98	81	69	60	48	40	35	20
DDm85-15	595	311	307	261	238	220	204	145	114	94	81	70	56	47	40	23
DDm85-21	850	444	438	373	340	315	291	207	162	135	115	100	79	67	58	33
DDm85-25	1020	533	526	447	408	377	350	248	195	162	138	120	95	80	69	39
DDm85-27	1105	577	570	485	442	409	379	269	211	175	150	130	103	86	75	43
DDm85-33	1360	711	701	596	544	503	466	331	260	215	184	160	127	106	92	53
DDm100-21	1000	545	527	450	410	379	351	246	191	158	135	118	94	79	68	38
DDm100-25	1200	654	633	540	492	455	421	295	229	190	162	142	113	95	82	46
DDm100-27	1300	709	686	585	533	493	456	319	249	205	176	153	122	103	89	50
DDm100-33	1600	872	844	720	656	606	561	393	306	253	216	189	151	126	109	61
DDm125-25	1500	757	756	654	598	553	511	360	282	234	201	176	141	119	103	60
DDm125-27	1625	820	819	709	648	599	554	390	306	254	218	190	153	129	112	65
DDm125-33	2000	1010	1008	872	797	737	682	480	376	312	268	234	188	158	138	80

* 8hr Rate to 1.75Vpc at 77°F

Discharge Rates in Kilowatts per Cell to 1.60Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes							Hours									
		5	10	15	20	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	0.474	0.373	0.303	0.255	0.196	0.161	0.137	0.121	0.073	0.054	0.044	0.037	0.032	0.026	0.022	0.019	0.011
DDm50-09	200	0.679	0.577	0.504	0.445	0.360	0.303	0.262	0.232	0.143	0.106	0.085	0.072	0.062	0.049	0.041	0.036	0.020
DDm50-13	300	1.019	0.865	0.756	0.667	0.541	0.454	0.393	0.348	0.215	0.159	0.128	0.108	0.093	0.074	0.062	0.054	0.031
DDm50-17	400	1.359	1.153	1.008	0.889	0.721	0.605	0.524	0.464	0.287	0.211	0.171	0.144	0.125	0.098	0.083	0.072	0.041
DDm85-13	510	1.437	1.275	1.143	1.037	0.869	0.748	0.655	0.583	0.362	0.268	0.217	0.183	0.159	0.125	0.104	0.089	0.049
DDm85-15	595	1.676	1.487	1.334	1.210	1.014	0.873	0.765	0.680	0.423	0.313	0.253	0.214	0.185	0.146	0.121	0.104	0.057
DDm85-21	850	2.395	2.125	1.905	1.728	1.449	1.247	1.092	0.971	0.604	0.447	0.361	0.306	0.265	0.209	0.173	0.149	0.081
DDm85-25	1020	2.874	2.550	2.286	2.074	1.738	1.496	1.311	1.165	0.725	0.537	0.434	0.367	0.318	0.251	0.208	0.178	0.097
DDm85-27	1105	3.113	2.762	2.477	2.247	1.883	1.621	1.420	1.262	0.785	0.582	0.470	0.397	0.344	0.272	0.225	0.193	0.105
DDm85-33	1360	3.831	3.400	3.049	2.765	2.318	1.995	1.748	1.554	0.967	0.716	0.578	0.489	0.424	0.334	0.278	0.238	0.130
DDm100-21	1000	2.686	2.390	2.149	1.956	1.656	1.438	1.269	1.139	0.715	0.531	0.428	0.361	0.312	0.246	0.204	0.176	0.096
DDm100-25	1200	3.223	2.868	2.579	2.348	1.988	1.725	1.523	1.366	0.858	0.637	0.513	0.433	0.374	0.295	0.245	0.211	0.116
DDm100-27	1300	3.492	3.107	2.794	2.543	2.153	1.869	1.650	1.480	0.929	0.690	0.556	0.469	0.406	0.319	0.265	0.228	0.125
DDm100-33	1600	4.298	3.824	3.439	3.130	2.650	2.300	2.031	1.822	1.144	0.849	0.684	0.577	0.499	0.393	0.327	0.281	0.154
DDm125-25	1500	4.105	3.664	3.320	3.036	2.586	2.243	1.971	1.750	1.077	0.796	0.643	0.542	0.469	0.369	0.307	0.264	0.146
DDm125-27	1625	4.447	3.969	3.596	3.288	2.802	2.430	2.135	1.896	1.167	0.862	0.696	0.587	0.508	0.400	0.333	0.286	0.158
DDm125-33	2000	5.473	4.885	4.426	4.047	3.448	2.991	2.627	2.334	1.436	1.061	0.857	0.722	0.625	0.492	0.410	0.353	0.194

Discharge Rates in Kilowatts per Cell to 1.63Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes							Hours									
		5	10	15	20	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	0.457	0.365	0.299	0.254	0.196	0.161	0.137	0.121	0.073	0.054	0.044	0.037	0.032	0.026	0.022	0.019	0.011
DDm50-09	200	0.658	0.562	0.494	0.439	0.358	0.303	0.262	0.232	0.143	0.106	0.085	0.072	0.062	0.049	0.041	0.036	0.020
DDm50-13	300	0.988	0.843	0.742	0.659	0.537	0.454	0.393	0.348	0.215	0.159	0.128	0.108	0.093	0.074	0.062	0.054	0.031
DDm50-17	400	1.317	1.124	0.989	0.878	0.715	0.605	0.524	0.464	0.287	0.211	0.171	0.144	0.125	0.098	0.083	0.072	0.041
DDm85-13	510	1.382	1.230	1.108	1.008	0.853	0.738	0.650	0.583	0.362	0.268	0.217	0.183	0.159	0.125	0.104	0.089	0.049
DDm85-15	595	1.612	1.435	1.292	1.176	0.995	0.861	0.758	0.680	0.423	0.313	0.253	0.214	0.185	0.146	0.121	0.104	0.057
DDm85-21	850	2.303	2.051	1.846	1.680	1.422	1.230	1.083	0.971	0.604	0.447	0.361	0.306	0.265	0.209	0.173	0.149	0.081
DDm85-25	1020	2.763	2.461	2.215	2.016	1.706	1.476	1.300	1.165	0.725	0.537	0.434	0.367	0.318	0.251	0.208	0.178	0.097
DDm85-27	1105	2.994	2.666	2.400	2.184	1.848	1.599	1.408	1.262	0.785	0.582	0.470	0.397	0.344	0.272	0.225	0.193	0.105
DDm85-33	1360	3.684	3.281	2.953	2.688	2.275	1.969	1.733	1.554	0.967	0.716	0.578	0.489	0.424	0.334	0.278	0.238	0.130
DDm100-21	1000	2.593	2.314	2.087	1.905	1.626	1.418	1.256	1.130	0.715	0.531	0.428	0.361	0.312	0.246	0.204	0.176	0.096
DDm100-25	1200	3.111	2.776	2.505	2.286	1.951	1.701	1.507	1.356	0.858	0.637	0.513	0.433	0.374	0.295	0.245	0.211	0.116
DDm100-27	1300	3.371	3.008	2.714	2.477	2.114	1.843	1.633	1.469	0.929	0.690	0.556	0.469	0.406	0.319	0.265	0.228	0.125
DDm100-33	1600	4.149	3.702	3.340	3.049	2.602	2.269	2.010	1.808	1.144	0.849	0.684	0.577	0.499	0.393	0.327	0.281	0.154
DDm125-25	1500	3.943	3.542	3.219	2.955	2.533	2.207	1.954	1.750	1.077	0.796	0.643	0.542	0.469	0.369	0.307	0.264	0.146
DDm125-27	1625	4.271	3.837	3.488	3.201	2.744	2.391	2.117	1.896	1.167	0.862	0.696	0.587	0.508	0.400	0.333	0.286	0.158
DDm125-33	2000	5.257	4.723	4.293	3.940	3.377	2.943	2.605	2.334	1.436	1.061	0.857	0.722	0.625	0.492	0.410	0.353	0.194

Discharge Rates in Kilowatts per Cell to 1.67Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes							Hours									
		5	10	15	20	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	0.432	0.350	0.292	0.250	0.194	0.160	0.137	0.121	0.073	0.054	0.044	0.037	0.032	0.026	0.022	0.019	0.011
DDm50-09	200	0.626	0.539	0.477	0.428	0.352	0.300	0.262	0.232	0.143	0.106	0.085	0.072	0.062	0.049	0.041	0.036	0.020
DDm50-13	300	0.939	0.809	0.716	0.642	0.528	0.450	0.393	0.348	0.215	0.159	0.128	0.108	0.093	0.074	0.062	0.054	0.031
DDm50-17	400	1.251	1.078	0.954	0.856	0.705	0.601	0.524	0.464	0.287	0.211	0.171	0.144	0.125	0.098	0.083	0.072	0.041
DDm85-13	510	1.299	1.165	1.054	0.963	0.825	0.720	0.638	0.574	0.362	0.268	0.217	0.183	0.159	0.125	0.104	0.089	0.049
DDm85-15	595	1.516	1.360	1.230	1.124	0.962	0.840	0.745	0.669	0.423	0.313	0.253	0.214	0.185	0.146	0.121	0.104	0.057
DDm85-21	850	2.165	1.942	1.757	1.605	1.375	1.200	1.064	0.956	0.604	0.447	0.361	0.306	0.265	0.209	0.173	0.149	0.081
DDm85-25	1020	2.598	2.331	2.108	1.926	1.649	1.440	1.276	1.147	0.725	0.537	0.434	0.367	0.318	0.251	0.208	0.178	0.097
DDm85-27	1105	2.815	2.525	2.283	2.087	1.787	1.560	1.383	1.243	0.785	0.582	0.470	0.397	0.344	0.272	0.225	0.193	0.105
DDm85-33	1360	3.465	3.108	2.810	2.569	2.199	1.920	1.702	1.530	0.967	0.716	0.578	0.489	0.424	0.334	0.278	0.238	0.130
DDm100-21	1000	2.450	2.201	1.995	1.827	1.573	1.382	1.232	1.111	0.715	0.531	0.428	0.361	0.312	0.246	0.204	0.176	0.096
DDm100-25	1200	2.940	2.641	2.394	2.193	1.888	1.659	1.478	1.333	0.858	0.637	0.513	0.433	0.374	0.295	0.245	0.211	0.116
DDm100-27	1300	3.185	2.861	2.593	2.376	2.045	1.797	1.601	1.444	0.929	0.690	0.556	0.469	0.406	0.319	0.265	0.228	0.125
DDm100-33	1600	3.920	3.522	3.192	2.924	2.517	2.211	1.971	1.778	1.143	0.849	0.684	0.577	0.499	0.393	0.327	0.281	0.154
DDm125-25	1500	3.716	3.358	3.071	2.832	2.445	2.145	1.911	1.726	1.077	0.796	0.643	0.542	0.469	0.369	0.307	0.264	0.146
DDm125-27	1625	4.026	3.638	3.326	3.068	2.648	2.324	2.070	1.869	1.167	0.862	0.696	0.587	0.508	0.400	0.333	0.286	0.158
DDm125-33	2000	4.955	4.477	4.094	3.776	3.259	2.861	2.548	2.301	1.436	1.061	0.857	0.722	0.625	0.492	0.410	0.353	0.194

* 8hr Rate to 1.75Vpc at 77°F

Discharge Rates in Kilowatts per Cell to 1.70Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes							Hours									
		5	10	15	20	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	0.412	0.337	0.284	0.245	0.192	0.157	0.137	0.121	0.073	0.054	0.044	0.037	0.032	0.026	0.022	0.019	0.011
DDm50-09	200	0.599	0.519	0.461	0.416	0.346	0.297	0.260	0.232	0.143	0.106	0.085	0.072	0.062	0.049	0.041	0.036	0.020
DDm50-13	300	0.898	0.779	0.692	0.624	0.520	0.445	0.390	0.348	0.215	0.159	0.128	0.108	0.093	0.074	0.062	0.054	0.031
DDm50-17	400	1.198	1.038	0.923	0.832	0.693	0.593	0.519	0.464	0.287	0.211	0.171	0.144	0.125	0.098	0.083	0.072	0.041
DDm85-13	510	1.235	1.110	1.009	0.926	0.797	0.701	0.626	0.564	0.362	0.268	0.217	0.183	0.159	0.125	0.104	0.089	0.049
DDm85-15	595	1.441	1.295	1.177	1.080	0.930	0.818	0.730	0.658	0.423	0.313	0.253	0.214	0.185	0.146	0.121	0.104	0.057
DDm85-21	850	2.059	1.850	1.682	1.543	1.329	1.168	1.043	0.940	0.604	0.447	0.361	0.306	0.265	0.209	0.173	0.149	0.081
DDm85-25	1020	2.470	2.220	2.019	1.851	1.595	1.402	1.251	1.128	0.725	0.537	0.434	0.367	0.318	0.251	0.208	0.178	0.097
DDm85-27	1105	2.676	2.405	2.187	2.005	1.727	1.519	1.355	1.222	0.785	0.582	0.470	0.397	0.344	0.272	0.225	0.193	0.105
DDm85-33	1360	3.294	2.960	2.691	2.468	2.126	1.869	1.668	1.504	0.966	0.716	0.578	0.489	0.424	0.334	0.278	0.238	0.130
DDm100-21	1000	2.337	2.106	1.918	1.762	1.525	1.347	1.206	1.092	0.709	0.531	0.428	0.361	0.312	0.246	0.204	0.176	0.096
DDm100-25	1200	2.804	2.527	2.301	2.114	1.829	1.616	1.448	1.310	0.850	0.637	0.513	0.433	0.374	0.295	0.245	0.211	0.116
DDm100-27	1300	3.038	2.738	2.493	2.290	1.982	1.751	1.568	1.419	0.921	0.690	0.556	0.469	0.406	0.319	0.265	0.228	0.125
DDm100-33	1600	3.739	3.369	3.068	2.819	2.439	2.155	1.930	1.747	1.134	0.849	0.684	0.577	0.499	0.393	0.327	0.281	0.154
DDm125-25	1500	3.534	3.208	2.948	2.728	2.364	2.086	1.867	1.690	1.077	0.796	0.643	0.542	0.469	0.369	0.307	0.264	0.146
DDm125-27	1625	3.829	3.475	3.193	2.955	2.561	2.260	2.023	1.831	1.167	0.862	0.696	0.587	0.508	0.400	0.333	0.286	0.158
DDm125-33	2000	4.713	4.277	3.931	3.637	3.152	2.782	2.489	2.254	1.436	1.061	0.857	0.722	0.625	0.492	0.410	0.353	0.194

Discharge Rates in Kilowatts per Cell to 1.75Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	.Minutes							Hours									
		5	10	15	20	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	0.374	0.311	0.266	0.232	0.185	0.154	0.134	0.119	0.073	0.054	0.044	0.037	0.032	0.026	0.022	0.019	0.011
DDm50-09	200	0.549	0.481	0.430	0.390	0.331	0.286	0.253	0.227	0.143	0.106	0.085	0.072	0.062	0.049	0.041	0.036	0.020
DDm50-13	300	0.824	0.721	0.644	0.585	0.496	0.430	0.379	0.340	0.215	0.159	0.128	0.108	0.093	0.074	0.062	0.054	0.031
DDm50-17	400	1.098	0.961	0.859	0.780	0.662	0.573	0.506	0.453	0.287	0.211	0.171	0.144	0.125	0.098	0.083	0.072	0.041
DDm85-13	510	1.118	1.010	0.926	0.855	0.742	0.659	0.594	0.541	0.355	0.266	0.216	0.183	0.159	0.125	0.104	0.089	0.049
DDm85-15	595	1.304	1.178	1.080	0.997	0.866	0.769	0.693	0.631	0.414	0.310	0.252	0.214	0.185	0.146	0.121	0.104	0.057
DDm85-21	850	1.863	1.683	1.543	1.425	1.237	1.099	0.990	0.902	0.591	0.444	0.360	0.306	0.265	0.209	0.173	0.149	0.081
DDm85-25	1020	2.236	2.020	1.852	1.710	1.484	1.318	1.188	1.082	0.710	0.532	0.433	0.367	0.318	0.251	0.208	0.178	0.097
DDm85-27	1105	2.422	2.188	2.006	1.852	1.608	1.428	1.287	1.172	0.769	0.577	0.469	0.397	0.344	0.272	0.225	0.193	0.105
DDm85-33	1360	2.981	2.693	2.469	2.280	1.979	1.758	1.584	1.443	0.946	0.710	0.577	0.489	0.424	0.334	0.278	0.238	0.130
DDm100-21	1000	2.131	1.933	1.774	1.639	1.428	1.271	1.147	1.047	0.692	0.520	0.423	0.358	0.310	0.245	0.204	0.176	0.096
DDm100-25	1200	2.557	2.320	2.129	1.967	1.713	1.525	1.377	1.257	0.831	0.625	0.508	0.429	0.372	0.294	0.245	0.211	0.116
DDm100-27	1300	2.770	2.513	2.306	2.131	1.856	1.652	1.491	1.362	0.900	0.677	0.550	0.465	0.403	0.318	0.265	0.228	0.125
DDm100-33	1600	3.409	3.093	2.839	2.623	2.284	2.033	1.835	1.676	1.108	0.833	0.677	0.572	0.496	0.392	0.326	0.281	0.154
DDm125-25	1500	3.205	2.938	2.715	2.520	2.205	1.961	1.768	1.611	1.059	0.796	0.643	0.542	0.469	0.369	0.307	0.264	0.146
DDm125-27	1625	3.472	3.183	2.941	2.730	2.389	2.125	1.915	1.746	1.147	0.862	0.696	0.587	0.508	0.400	0.333	0.286	0.158
DDm125-33	2000	4.273	3.917	3.620	3.361	2.940	2.615	2.357	2.148	1.412	1.061	0.857	0.722	0.625	0.492	0.410	0.353	0.194

Discharge Rates in Kilowatts per Cell to 1.78Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes							Hours									
		5	10	15	20	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	0.349	0.293	0.252	0.221	0.178	0.149	0.131	0.116	0.072	0.053	0.043	0.037	0.032	0.025	0.021	0.019	0.011
DDm50-09	200	0.516	0.454	0.408	0.371	0.317	0.277	0.246	0.221	0.142	0.106	0.085	0.072	0.062	0.049	0.041	0.036	0.020
DDm50-13	300	0.773	0.681	0.612	0.557	0.475	0.415	0.369	0.332	0.213	0.159	0.128	0.108	0.093	0.074	0.062	0.054	0.031
DDm50-17	400	1.031	0.907	0.816	0.743	0.634	0.554	0.492	0.443	0.284	0.211	0.171	0.144	0.125	0.098	0.083	0.072	0.041
DDm85-13	510	1.043	0.946	0.870	0.807	0.705	0.629	0.569	0.521	0.347	0.262	0.214	0.182	0.158	0.125	0.104	0.089	0.049
DDm85-15	595	1.217	1.104	1.015	0.941	0.822	0.733	0.664	0.607	0.405	0.306	0.250	0.212	0.184	0.146	0.121	0.104	0.057
DDm85-21	850	1.738	1.577	1.450	1.345	1.174	1.048	0.948	0.868	0.579	0.437	0.357	0.303	0.263	0.208	0.173	0.149	0.081
DDm85-25	1020	2.086	1.892	1.740	1.614	1.409	1.257	1.138	1.041	0.694	0.524	0.428	0.363	0.315	0.250	0.208	0.178	0.097
DDm85-27	1105	2.260	2.050	1.886	1.748	1.527	1.362	1.232	1.128	0.752	0.568	0.464	0.393	0.342	0.270	0.225	0.193	0.105
DDm85-33	1360	2.781	2.523	2.321	2.152	1.879	1.676	1.517	1.388	0.926	0.699	0.571	0.484	0.420	0.333	0.277	0.238	0.130
DDm100-21	1000	2.000	1.822	1.678	1.556	1.361	1.215	1.101	1.009	0.678	0.511	0.417	0.353	0.306	0.242	0.202	0.174	0.096
DDm100-25	1200	2.400	2.186	2.014	1.867	1.633	1.458	1.321	1.211	0.813	0.614	0.501	0.424	0.367	0.290	0.242	0.209	0.115
DDm100-27	1300	2.599	2.368	2.182	2.023	1.769	1.579	1.431	1.312	0.881	0.665	0.542	0.459	0.398	0.314	0.262	0.226	0.125
DDm100-33	1600	3.199	2.915	2.685	2.490	2.178	1.944	1.762	1.615	1.085	0.818	0.667	0.565	0.490	0.387	0.323	0.278	0.154
DDm125-25	1500	2.998	2.757	2.554	2.381	2.095	1.870	1.692	1.548	1.031	0.781	0.640	0.542	0.469	0.369	0.307	0.264	0.146
DDm125-27	1625	3.247	2.986	2.767	2.580	2.269	2.026	1.833	1.677	1.117	0.847	0.693	0.587	0.508	0.400	0.333	0.286	0.158
DDm125-33	2000	3.997	3.676	3.406	3.175	2.793	2.494	2.256	2.064	1.374	1.042	0.853	0.722	0.625	0.492	0.410	0.353	0.194

* 8hr Rate to 1.75Vpc at 77°F

Discharge Rates in Kilowatts per Cell to 1.80Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes							Hours									
		5	10	15	20	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	0.372	0.290	0.241	0.213	0.172	0.145	0.117	0.114	0.071	0.053	0.043	0.036	0.032	0.025	0.021	0.019	0.011
DDm50-09	200	0.492	0.434	0.392	0.358	0.306	0.269	0.240	0.217	0.140	0.105	0.085	0.072	0.062	0.049	0.041	0.036	0.020
DDm50-13	300	0.738	0.651	0.588	0.536	0.459	0.403	0.360	0.325	0.210	0.157	0.128	0.108	0.093	0.074	0.062	0.054	0.031
DDm50-17	400	0.984	0.868	0.784	0.715	0.612	0.538	0.480	0.434	0.280	0.209	0.170	0.144	0.125	0.098	0.083	0.072	0.041
DDm85-13	510	0.991	0.901	0.831	0.773	0.678	0.606	0.550	0.504	0.340	0.258	0.212	0.180	0.156	0.124	0.103	0.089	0.048
DDm85-15	595	1.156	1.051	0.969	0.901	0.791	0.707	0.641	0.588	0.396	0.301	0.247	0.210	0.182	0.144	0.120	0.103	0.057
DDm85-21	850	1.652	1.502	1.385	1.288	1.131	1.010	0.916	0.840	0.566	0.430	0.353	0.300	0.260	0.206	0.172	0.148	0.081
DDm85-25	1020	1.982	1.802	1.662	1.545	1.357	1.213	1.100	1.008	0.680	0.516	0.423	0.360	0.312	0.248	0.206	0.177	0.097
DDm85-27	1105	2.148	1.952	1.800	1.674	1.470	1.314	1.191	1.092	0.736	0.558	0.459	0.390	0.338	0.268	0.223	0.192	0.105
DDm85-33	1360	2.643	2.403	2.215	2.060	1.809	1.617	1.466	1.344	0.906	0.687	0.565	0.480	0.416	0.330	0.275	0.236	0.129
DDm100-21	1000	1.910	1.743	1.610	1.497	1.313	1.174	1.066	0.979	0.665	0.504	0.412	0.349	0.303	0.239	0.200	0.172	0.095
DDm100-25	1200	2.291	2.092	1.932	1.796	1.576	1.409	1.280	1.175	0.798	0.605	0.495	0.419	0.363	0.287	0.240	0.207	0.114
DDm100-27	1300	2.482	2.266	2.093	1.946	1.707	1.526	1.386	1.272	0.864	0.655	0.536	0.454	0.393	0.311	0.260	0.224	0.124
DDm100-33	1600	3.055	2.789	2.576	2.395	2.101	1.878	1.706	1.566	1.064	0.806	0.660	0.558	0.484	0.383	0.320	0.276	0.152
DDm125-25	1500	2.851	2.625	2.441	2.282	2.015	1.803	1.636	1.498	1.008	0.766	0.630	0.536	0.466	0.369	0.307	0.264	0.146
DDm125-27	1625	3.089	2.844	2.644	2.473	2.182	1.954	1.772	1.623	1.092	0.830	0.683	0.581	0.505	0.400	0.333	0.286	0.158
DDm125-33	2000	3.801	3.501	3.255	3.043	2.686	2.404	2.181	1.998	1.343	1.022	0.840	0.715	0.622	0.492	0.410	0.353	0.194

Discharge Rates in Kilowatts per Cell to 1.83Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes							Hours									
		5	10	15	20	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	0.304	0.258	0.224	0.199	0.162	0.138	0.122	0.109	0.069	0.051	0.042	0.036	0.031	0.025	0.021	0.018	0.011
DDm50-09	200	0.455	0.403	0.366	0.335	0.288	0.254	0.228	0.208	0.136	0.102	0.084	0.071	0.062	0.049	0.041	0.036	0.020
DDm50-13	300	0.682	0.604	0.549	0.503	0.432	0.382	0.342	0.311	0.204	0.153	0.125	0.106	0.092	0.073	0.062	0.054	0.031
DDm50-17	400	0.909	0.806	0.731	0.670	0.576	0.509	0.457	0.415	0.272	0.204	0.167	0.142	0.123	0.097	0.082	0.072	0.041
DDm85-13	510	0.908	0.831	0.769	0.718	0.635	0.570	0.518	0.476	0.326	0.249	0.206	0.175	0.153	0.121	0.101	0.087	0.048
DDm85-15	595	1.059	0.970	0.897	0.837	0.741	0.665	0.605	0.555	0.381	0.291	0.240	0.205	0.178	0.142	0.118	0.102	0.056
DDm85-21	850	1.513	1.385	1.281	1.196	1.059	0.951	0.864	0.793	0.544	0.415	0.343	0.292	0.254	0.202	0.169	0.145	0.080
DDm85-25	1020	1.817	1.662	1.537	1.435	1.271	1.141	1.037	0.952	0.653	0.499	0.411	0.351	0.305	0.243	0.203	0.174	0.096
DDm85-27	1105	1.967	1.801	1.665	1.555	1.377	1.236	1.123	1.031	0.707	0.540	0.446	0.380	0.331	0.263	0.219	0.189	0.104
DDm85-33	1360	2.422	2.216	2.050	1.914	1.694	1.521	1.383	1.269	0.870	0.665	0.549	0.467	0.407	0.324	0.270	0.232	0.128
DDm100-21	1000	1.765	1.620	1.503	1.402	1.236	1.109	1.009	0.927	0.639	0.490	0.402	0.341	0.296	0.234	0.196	0.169	0.093
DDm100-25	1200	2.118	1.944	1.803	1.682	1.483	1.330	1.210	1.112	0.767	0.588	0.483	0.409	0.355	0.281	0.235	0.203	0.112
DDm100-27	1300	2.295	2.106	1.954	1.822	1.606	1.441	1.311	1.205	0.831	0.637	0.523	0.443	0.385	0.305	0.255	0.220	0.122
DDm100-33	1600	2.825	2.592	2.404	2.243	1.977	1.774	1.614	1.483	1.023	0.785	0.643	0.546	0.474	0.375	0.314	0.270	0.150
DDm125-25	1500	2.610	2.421	2.262	2.121	1.883	1.694	1.540	1.414	0.963	0.740	0.611	0.520	0.453	0.361	0.303	0.262	0.146
DDm125-27	1625	2.827	2.622	2.450	2.298	2.040	1.835	1.669	1.532	1.043	0.802	0.662	0.564	0.491	0.391	0.328	0.283	0.158
DDm125-33	2000	3.480	3.228	3.016	2.828	2.511	2.258	2.054	1.886	1.284	0.987	0.815	0.694	0.605	0.481	0.404	0.349	0.194

Discharge Rates in Kilowatts per Cell to 1.85Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes							Hours									
		5	10	15	20	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	0.283	0.242	0.212	0.188	0.154	0.133	0.117	0.105	0.067	0.050	0.041	0.035	0.030	0.024	0.021	0.018	0.011
DDm50-09	200	0.428	0.381	0.347	0.319	0.275	0.243	0.219	0.200	0.133	0.100	0.082	0.070	0.060	0.048	0.041	0.035	0.020
DDm50-13	300	0.643	0.572	0.520	0.478	0.413	0.365	0.329	0.299	0.199	0.150	0.123	0.104	0.091	0.072	0.061	0.053	0.031
DDm50-17	400	0.857	0.762	0.693	0.637	0.550	0.487	0.438	0.399	0.265	0.200	0.164	0.139	0.121	0.096	0.081	0.071	0.041
DDm85-13	510	0.839	0.783	0.726	0.679	0.604	0.544	0.496	0.455	0.315	0.243	0.200	0.171	0.149	0.119	0.099	0.085	0.047
DDm85-15	595	0.979	0.913	0.847	0.792	0.705	0.635	0.578	0.531	0.367	0.283	0.234	0.199	0.174	0.138	0.116	0.100	0.055
DDm85-21	850	1.398	1.304	1.209	1.132	1.007	0.907	0.826	0.759	0.525	0.405	0.334	0.284	0.248	0.198	0.166	0.142	0.079
DDm85-25	1020	1.676	1.565	1.451	1.358	1.208	1.089	0.991	0.911	0.630	0.486	0.400	0.341	0.298	0.237	0.199	0.171	0.095
DDm85-27	1105	1.817	1.696	1.572	1.472	1.309	1.179	1.074	0.987	0.682	0.526	0.434	0.370	0.322	0.257	0.215	0.185	0.102
DDm85-33	1360	2.235	2.087	1.935	1.811	1.611	1.452	1.322	1.214	0.840	0.648	0.534	0.455	0.397	0.316	0.265	0.228	0.126
DDm100-21	1000	1.664	1.534	1.426	1.332	1.180	1.062	0.967	0.889	0.617	0.478	0.393	0.334	0.290	0.230	0.193	0.166	0.092
DDm100-25	1200	1.997	1.841	1.712	1.599	1.416	1.274	1.160	1.067	0.740	0.573	0.472	0.401	0.348	0.276	0.232	0.199	0.110
DDm100-27	1300	2.163	1.994	1.854	1.732	1.534	1.380	1.257	1.156	0.802	0.621	0.511	0.434	0.377	0.299	0.251	0.216	0.120
DDm100-33	1600	2.662	2.455	2.282	2.132	1.887	1.699	1.547	1.423	0.987	0.764	0.629	0.534	0.464	0.368	0.309	0.266	0.147
DDm125-25	1500	2.427	2.278	2.132	2.004	1.789	1.614	1.471	1.352	0.927	0.718	0.594	0.507	0.442	0.352	0.297	0.256	0.143
DDm125-27	1625	2.627	2.468	2.310	2.171	1.938	1.748	1.593	1.465	1.004	0.778	0.644	0.549	0.479	0.382	0.321	0.277	0.155
DDm125-33	2000	3.236	3.038	2.843	2.673	2.385	2.151	1.961	1.803	1.236	0.957	0.792	0.676	0.590	0.470	0.395	0.341	0.191

* 8hr Rate to 1.75Vpc at 77°F

Discharge Rates in Kilowatts per Cell to 1.88Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes							Hours									
		5	10	15	20	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	0.251	0.217	0.191	0.170	0.141	0.123	0.109	0.097	0.063	0.048	0.039	0.033	0.029	0.023	0.020	0.017	0.010
DDm50-09	200	0.387	0.346	0.316	0.292	0.254	0.225	0.203	0.186	0.125	0.096	0.079	0.067	0.058	0.046	0.039	0.034	0.020
DDm50-13	300	0.580	0.519	0.473	0.437	0.381	0.338	0.305	0.278	0.188	0.143	0.118	0.100	0.087	0.069	0.059	0.052	0.030
DDm50-17	400	0.773	0.692	0.631	0.583	0.508	0.451	0.407	0.371	0.250	0.191	0.157	0.133	0.116	0.092	0.079	0.069	0.040
DDm85-13	510	0.733	0.707	0.658	0.618	0.553	0.501	0.458	0.423	0.295	0.230	0.190	0.163	0.142	0.113	0.095	0.082	0.046
DDm85-15	595	0.855	0.825	0.768	0.721	0.645	0.585	0.535	0.494	0.344	0.269	0.222	0.190	0.165	0.132	0.111	0.095	0.053
DDm85-21	850	1.222	1.179	1.097	1.030	0.922	0.835	0.764	0.705	0.491	0.384	0.317	0.271	0.236	0.189	0.158	0.136	0.076
DDm85-25	1020	1.465	1.414	1.317	1.236	1.106	1.003	0.917	0.847	0.589	0.461	0.381	0.325	0.284	0.227	0.190	0.163	0.091
DDm85-27	1105	1.588	1.532	1.427	1.339	1.198	1.086	0.993	0.917	0.639	0.499	0.413	0.352	0.307	0.245	0.205	0.177	0.099
DDm85-33	1360	1.953	1.886	1.756	1.648	1.475	1.337	1.222	1.129	0.786	0.614	0.508	0.433	0.378	0.302	0.253	0.218	0.122
DDm100-21	1000	1.478	1.396	1.301	1.221	1.089	0.985	0.899	0.830	0.577	0.452	0.374	0.319	0.278	0.222	0.186	0.160	0.089
DDm100-25	1200	1.772	1.675	1.561	1.465	1.307	1.182	1.079	0.996	0.693	0.542	0.448	0.382	0.333	0.266	0.223	0.192	0.107
DDm100-27	1300	1.921	1.815	1.691	1.587	1.416	1.280	1.169	1.079	0.750	0.587	0.486	0.414	0.361	0.288	0.242	0.208	0.116
DDm100-33	1600	2.363	2.233	2.082	1.953	1.743	1.576	1.439	1.328	0.924	0.723	0.598	0.510	0.444	0.355	0.298	0.257	0.143
DDm125-25	1500	2.102	2.046	1.925	1.818	1.633	1.482	1.356	1.249	0.862	0.676	0.561	0.480	0.420	0.337	0.284	0.245	0.139
DDm125-27	1625	2.276	2.216	2.085	1.969	1.769	1.605	1.469	1.353	0.934	0.732	0.608	0.520	0.455	0.365	0.308	0.266	0.150
DDm125-33	2000	2.803	2.728	2.566	2.424	2.178	1.976	1.808	1.665	1.149	0.901	0.748	0.640	0.559	0.449	0.379	0.327	0.185

Discharge Rates in Kilowatts per Cell to 1.90Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes							Hours									
		5	10	15	20	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	0.229	0.199	0.175	0.156	0.132	0.115	0.102	0.092	0.059	0.046	0.037	0.032	0.028	0.022	0.019	0.017	0.010
DDm50-09	200	0.354	0.321	0.294	0.272	0.238	0.212	0.192	0.175	0.119	0.092	0.075	0.064	0.056	0.045	0.038	0.033	0.019
DDm50-13	300	0.532	0.482	0.441	0.408	0.357	0.318	0.287	0.263	0.178	0.137	0.113	0.096	0.084	0.067	0.057	0.050	0.029
DDm50-17	400	0.709	0.643	0.587	0.544	0.476	0.424	0.383	0.350	0.238	0.183	0.151	0.128	0.111	0.090	0.076	0.066	0.038
DDm85-13	510	0.661	0.654	0.612	0.575	0.516	0.469	0.431	0.399	0.279	0.220	0.182	0.156	0.136	0.109	0.091	0.079	0.044
DDm85-15	595	0.770	0.763	0.713	0.670	0.602	0.548	0.503	0.466	0.326	0.256	0.212	0.182	0.159	0.127	0.106	0.092	0.052
DDm85-21	850	1.100	1.090	1.019	0.958	0.860	0.782	0.719	0.665	0.465	0.366	0.304	0.259	0.226	0.182	0.152	0.131	0.074
DDm85-25	1020	1.321	1.308	1.223	1.149	1.032	0.939	0.863	0.798	0.559	0.440	0.364	0.311	0.272	0.218	0.183	0.157	0.088
DDm85-27	1105	1.430	1.417	1.325	1.245	1.117	1.017	0.934	0.865	0.605	0.476	0.395	0.337	0.294	0.236	0.198	0.170	0.096
DDm85-33	1360	1.762	1.744	1.631	1.532	1.375	1.252	1.150	1.065	0.745	0.586	0.486	0.415	0.362	0.291	0.243	0.209	0.118
DDm100-21	1000	1.339	1.297	1.213	1.141	1.023	0.928	0.851	0.787	0.548	0.431	0.357	0.305	0.266	0.214	0.180	0.155	0.086
DDm100-25	1200	1.605	1.556	1.455	1.369	1.228	1.114	1.022	0.945	0.658	0.517	0.428	0.366	0.320	0.257	0.215	0.186	0.104
DDm100-27	1300	1.741	1.686	1.576	1.483	1.330	1.207	1.107	1.023	0.712	0.560	0.464	0.396	0.346	0.278	0.233	0.201	0.112
DDm100-33	1600	2.141	2.075	1.940	1.825	1.637	1.485	1.362	1.259	0.877	0.689	0.571	0.488	0.426	0.342	0.287	0.248	0.138
DDm125-25	1500	1.865	1.864	1.778	1.684	1.521	1.386	1.270	1.172	0.813	0.642	0.534	0.457	0.400	0.323	0.272	0.236	0.134
DDm125-27	1625	2.020	2.018	1.926	1.824	1.648	1.501	1.376	1.270	0.881	0.696	0.578	0.495	0.433	0.350	0.295	0.255	0.145
DDm125-33	2000	2.487	2.486	2.371	2.245	2.028	1.847	1.694	1.563	1.085	0.857	0.711	0.609	0.533	0.431	0.363	0.314	0.179

Discharge Rates in Kilowatts per Cell to 1.94Vpc at 25˚C (77˚F)

PowerSafe® DDm Battery Type	Ah* Capacity	Minutes							Hours									
		5	10	15	20	30	40	50	1	2	3	4	5	6	8	10	12	24
DDm35-07	105	0.179	0.157	0.143	0.131	0.111	0.097	0.087	0.079	0.052	0.040	0.033	0.028	0.025	0.020	0.017	0.015	0.009
DDm50-09	200	0.274	0.267	0.247	0.230	0.202	0.181	0.165	0.152	0.104	0.081	0.067	0.057	0.049	0.041	0.035	0.030	0.017
DDm50-13	300	0.410	0.401	0.370	0.345	0.303	0.271	0.248	0.228	0.156	0.122	0.100	0.085	0.074	0.061	0.052	0.045	0.026
DDm50-17	400	0.547	0.535	0.493	0.459	0.404	0.362	0.331	0.304	0.208	0.162	0.133	0.114	0.099	0.081	0.069	0.060	0.035
DDm85-13	510	0.516	0.516	0.510	0.483	0.436	0.399	0.370	0.343	0.245	0.194	0.161	0.138	0.121	0.097	0.082	0.070	0.040
DDm85-15	595	0.602	0.601	0.595	0.564	0.508	0.465	0.431	0.400	0.286	0.226	0.188	0.161	0.141	0.114	0.095	0.082	0.047
DDm85-21	850	0.860	0.859	0.850	0.805	0.726	0.664	0.616	0.572	0.408	0.323	0.269	0.230	0.201	0.162	0.136	0.117	0.067
DDm85-25	1020	1.032	1.031	1.021	0.966	0.871	0.797	0.739	0.686	0.490	0.388	0.322	0.276	0.242	0.195	0.163	0.140	0.080
DDm85-27	1105	1.117	1.117	1.106	1.047	0.944	0.864	0.801	0.744	0.531	0.420	0.349	0.299	0.262	0.211	0.177	0.152	0.087
DDm85-33	1360	1.376	1.375	1.361	1.289	1.162	1.063	0.986	0.915	0.654	0.517	0.430	0.368	0.322	0.260	0.218	0.187	0.107
DDm100-21	1000	1.055	1.055	1.024	0.970	0.876	0.801	0.742	0.688	0.488	0.384	0.317	0.271	0.237	0.191	0.161	0.138	0.078
DDm100-25	1200	1.267	1.266	1.228	1.164	1.051	0.961	0.890	0.826	0.585	0.460	0.381	0.325	0.284	0.230	0.193	0.166	0.094
DDm100-27	1300	1.372	1.371	1.331	1.261	1.139	1.041	0.965	0.895	0.634	0.499	0.412	0.352	0.308	0.249	0.209	0.180	0.102
DDm100-33	1600	1.690	1.689	1.638	1.552	1.402	1.282	1.187	1.101	0.781	0.614	0.508	0.434	0.379	0.306	0.257	0.221	0.125
DDm125-25	1500	1.466	1.465	1.464	1.404	1.273	1.165	1.079	1.001	0.713	0.564	0.468	0.401	0.353	0.287	0.243	0.210	0.122
DDm125-27	1625	1.589	1.588	1.588	1.520	1.379	1.262	1.169	1.084	0.772	0.611	0.507	0.435	0.382	0.311	0.263	0.227	0.132
DDm125-33	2000	1.954	1.953	1.952	1.871	1.697	1.553	1.439	1.335	0.950	0.752	0.625	0.535	0.470	0.383	0.323	0.280	0.162

* 8hr Rate to 1.75Vpc at 77°F



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Wherever in the world you do business, EnerSys is with you all the way. With large manufacturing plants strategically located throughout Asia, Europe and North and South America, combined with a strong global sales and support team, and backed with a reputation for world-leading technology, our customers benefit through supply reliability, high quality products designed to meeting ever increasing technical requirements, and our commitment to providing the best solution to meeting their Reserve Power needs.

For more information, visit our website at www.enersys.com, or contact an EnerSys Reserve Power sales office.

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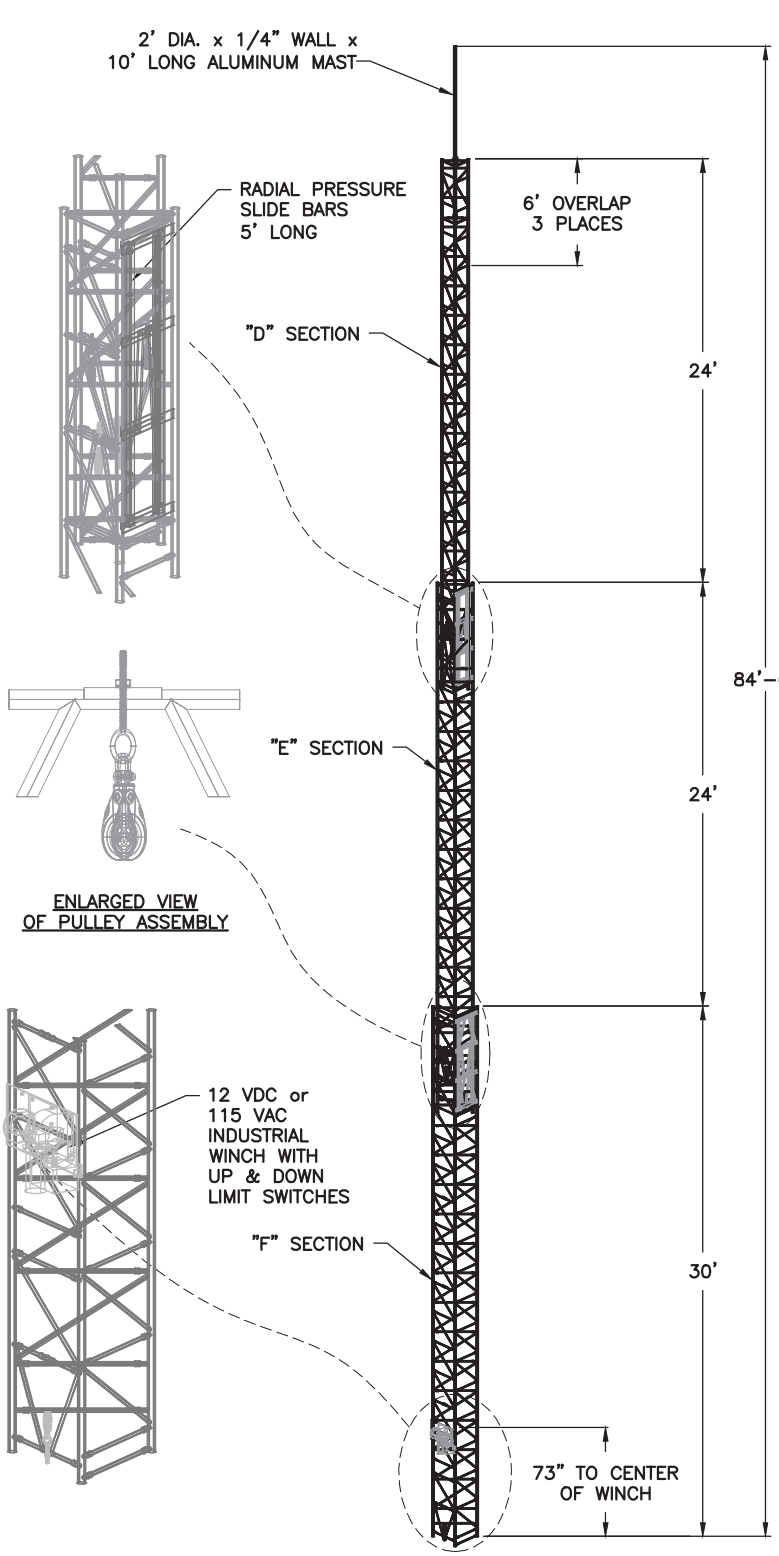
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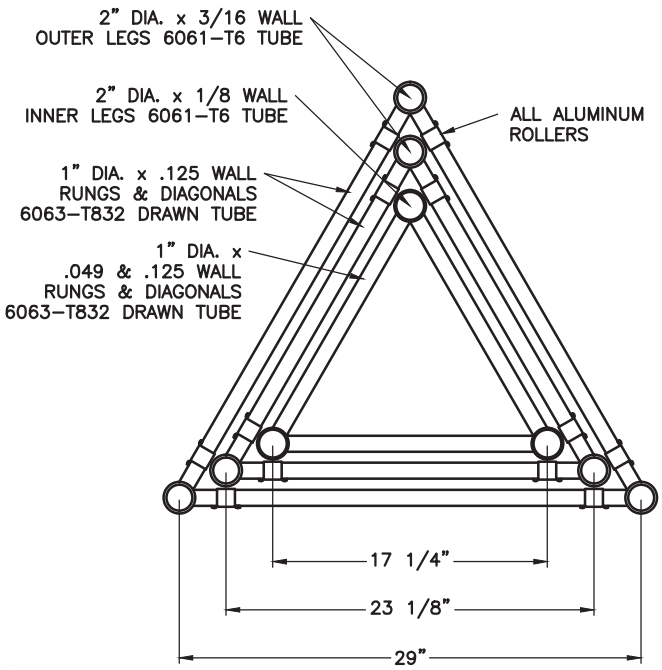
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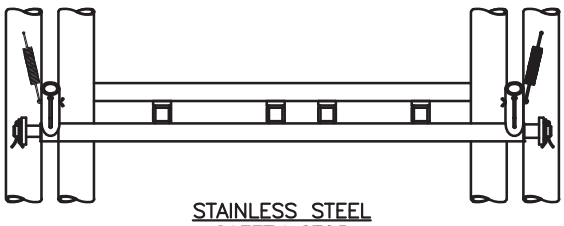
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CROSS SECTION



STAINLESS STEEL
SAFETY STOP
WITH INTERLOCK
SWITCH

PROPERLY INSTALLED THIS TOWER WILL SUPPORT 15 SQ. FT. OF ANTENNA SURFACE AREA AND 325 LBS. OF DEAD WEIGHT TO 65 MPH. PROPER INSTALLATION REQUIRES THAT THE LOWER SECTION OF THE TOWER BE BRACKETED TO A STRUCTURE AT A MINIMUM OF 8 FEET OR THAT THE LOWER SECTION BE GUYED. THIS TOWER TERMINATES AT THE TOP WITH OUR "C" SECTION AND INCORPORATES A PLATE WHICH WILL ACCEPT AN ANTENNA ROTOR OR FIXED (NON-ROTATING) MAST. THIS TOWER IS IDEAL FOR YAGI, BEAM AND OTHER DIRECTIONAL ANTENNAS.

APPROX. TOWER ASSEMBLY WT. 1000#

GENERAL NOTES:

ALL DIMENSIONS ARE IN INCHES AND FRACTIONS, UNLESS OTHERWISE SHOWN.

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DO NOT SCALE DRAWING.

REV.	DATE	DESCRIPTION	BY
D			
C			
B			
A	7-22-10	TOWER WAS T2-85UGW	HC

ALUMA TOWER CO. INC.
VERO BEACH, FL 32960

T2-85UG UNGUYED TOWER ASSEMBLY

DRWN BY:	SCALE:	DRWG. NO.
H.C.	FULL	QS-1901
DGN BY: C.D.	DATE: 2-23-10	
CKD BY: C.D.	APP'D	REV. A

Rackmount - Inverters

These inverters provide seamless back-up power for AC powered communications equipment from the site's 48 or 24 VDC battery system. A fast-acting transfer switch ensures voice and data transmissions remain uninterrupted in the event of a power grid failure or if the site utility power is disconnected for maintenance and upgrade purposes. Built in a 2RU case adaptable for 19" and 23" rack installations.



Features

- Pure sine wave AC output powers telecom equipment without performance degradation
- Continuous duty rated – full output wattage maintained even during extended power outages
- 1000 VA and 2000 VA models available – easily cascaded for N+1 redundancy, providing maximum reliability required by data centers
- Low EMI and RFI interference characteristics
- User-friendly Status and Diagnostic LCD/LED displays
- Utility bypass function with fast load transfer switch
- Remote Power Management optional via RS-232 port
- Optional SNMP card
- Numerous circuit and load protections – over-current, over-temp, overload, reverse polarity, high/low battery voltage
- Form C alarm contacts for monitoring AC "Fault" and "DC Abnormal" conditions
- Adapts for 19" or 23" racks; occupies only 2 RU (3.5")
- UL and cUL listed

Mechanical

Dimensions: 17.4"W x 3.5"H x 11.6"D
Mounting: 19" or 23" Rack
Weight: 24-1000RM and 48-1000RM – 15.4 Lbs.
48-2000RM – 17.6 Lbs.

AC Characteristics

Voltage: 100/110/115/120 VAC (selectable using RS-232 port and additional software); Factory set at 115 VAC
Frequency: 60 Hz. Standard, 50 Hz. Optional
Regulation: +/- 2%
Wave Form: Pure Sine
Outlets Rear Panel:
24-1000RM and 48-1000RM – (4 ea.) NEMA 5-15R
48-2000RM – (4 ea.) NEMA 5-20R
Total Harmonic Distortion: 6% 120V/100% linear load 4% 120V/100% SPS load
Transfer Time: <4 ms.

Specifications

Model	DC Input		AC Output	
	Voltage	Amps	KVA	WATTS
48-1000RM	40-60	25	1 KVA	800
48-2000RM	40-60	50	2 KVA	1600
24-1000RM	20-30	50	1 KVA	800

Displays

LED: Inverter On, Overload, DC Abnormal, Fault
LCD: Inverter On, Output Voltage and Frequency, Input Voltage, Load Percentage, DC Voltage, System Model, Internal Environment Temperature, Utility Status, Short Circuit, Over Temperature
Operating Temperature: 0° to 45° C
Cooling: Forced air, front-to-back
Humidity: 0-90% relative humidity
Acoustic Noise: 46 dBA @ 1 M

Alarms

Form C (Dry Contact) terminals (two sets – "DC ABNORMAL" and "FAULT")

Communication Interface

RS-232 port, serial cable included

Protection Features

DC Input Fuse and Breaker, AC Input Breaker, Output Breaker, Short Circuit, Overload, Over Temperature, Over/Under Output Voltage, Over/Under Input Voltage, Fan Failure Detection

Options

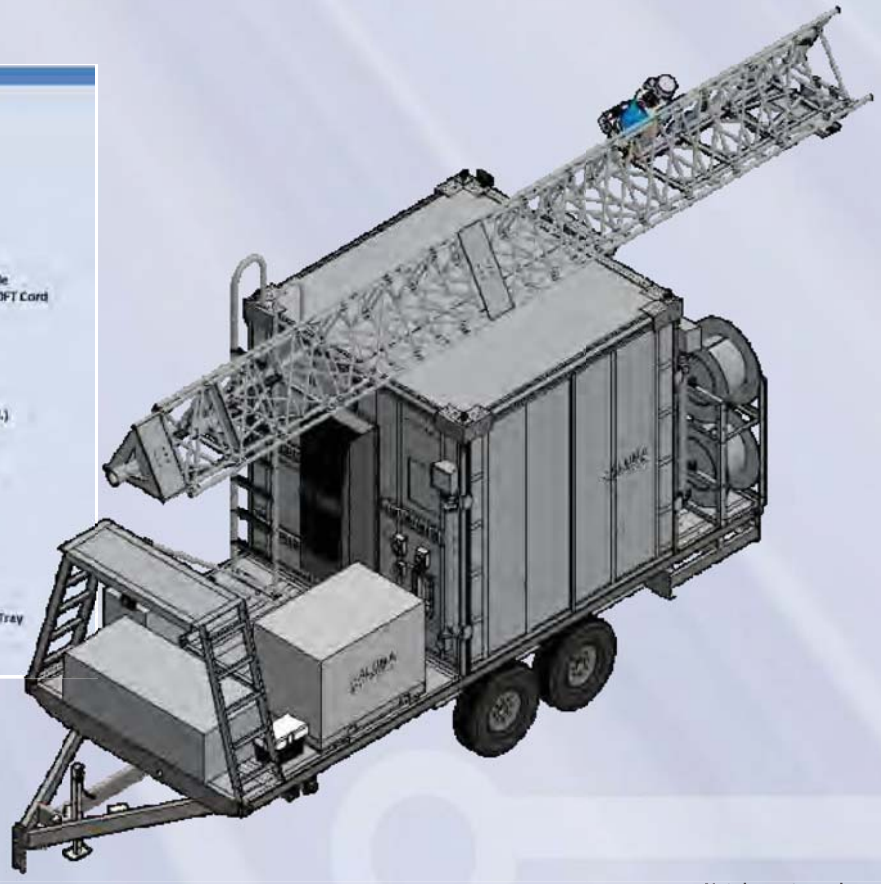
- Remote monitor via RS 232 port. SNMP card required.

SPECIFICATIONS	S8
TOWER AVAILABLE WITH TRAILER UNIT	T-50XHD, T-50XXHD, T-75XHD, T-100H
ALUMINUM SHELTER SIZE	96IN L x 96IN W x 94IN H
ALUMINUM SHELTER WEIGHT	1050 LBS
TRAILER WIDTH OVERALL	100 1/2IN
TRAILER WIDTH, FRAME ONLY	96IN
TRAILER DECK HEIGHT	33 1/2IN
TRAILER LENGTH OFTALL (W/O COUPLER)	23FT7IN (283IN)
TRAILER GROSS VEHICLE WGHT (GVWR)	11,990 LBS (13,990 AVAILABLE)
TRAILER GROSS AXLE WGHT (GAWR)	6,000 LBS (7,000 AVAILABLE)
TRAILER APPROX. WEIGHT SHIPPED *(VARIES WITH DIFFERENT ACCESSORIES)*	8,500 LBS
NUMBER OF AXLES	2 (TANDEM)
AXLE CAPACITY RATING (EACH)	6,000 LBS (7,000 AVAILABLE)
COUPLER CHANNEL (POSITIONS/HOLES)	7 POS./8 HOLES
STANDARD COUPLER SIZE	2 5/16IN BALL, 14,000 LB CAP., 2 HOLES
BRAKES	4 WHEEL ELECTRIC BRAKES *
TIRE SIZE *(NOTE: ALL RADIAL TIRES!)*	ST245/75R/16
TIRE LOAD RANGE	E (G AVAILABLE)
TIRE CAPACITY AND LOAD RATE	3000 LB
TIRE P.S.I.	65 PSI
WHEEL / RIM SIZE *(DIA./WIDTH/BOLT PATTERN)*	16IN / 6IN / 8 ON 6.5IN
SHELTER ON TRAILER HEIGHT	127 1/2IN
FINISHED HEIGHT, TOWER IN USAGE POSITION	146IN
OVERALL LENGTH WITH TOWER MOUNTED	29FT 5IN (353IN)
UID LABEL MIL-STD-130	Yes

*Note: Brakes have been updated to hydrolic.

ACCESSORIES AVAILABLE

- Guy Kit Assembly
- Anchor Kit
- Dual Obstruction Light
- Antenna Stand-off
- 12V DC Electric Winch
- Electric Winch for tilting Tower 12V DC
- 12V DC Battery Pack
- All Aluminum Storage Box
- Spare Tire
- A/C and Heat (Roof or Wall Mounted)
- 12V Work Lights
- 120V 500 Watt Floodlight With 5FT Telescoping Pole
- 120V 500 Watt Removable Floodlight w/ Tripod Base & 50FT Cord
- All Aluminum Co-Ax Cable Reel
- I/O Port Roxtec
- Telephone Inlet
- Dual Cat5
- 20 Amp Twist Lock
- 5Kw to 20Kw Diesel Quiet Run Gen.
- Custom All Aluminum Fuel Tank (25 Gal. to 150 Gal.)
- Electronic Equipment Rack
- Complete Grounding System
- Automatic & Manual Transfer Switch
- Shore-Power Cord w/ twist Lock Connection
- Dri-Dek Flooring
- All Aluminum Work Station Cabinets
- Bunk Bed
- Roof Access Ladder
- Electric Tongue Jack
- Exterior GFI Receptacle
- Solar Battery Charge
- Aluminum Underbody Dual Battery Box w/ Slide out Tray
- Cable Ring
- 22FT Little Giant Ladder
- Interior Co-Ax Cable Tray



Not drawn to scale.

Aluma Tower Company, Inc. reserves the right to make changes at any time to information contained in this document.

SE4192-SWBP2LDF(DNN) Enclosed dipole, Bi-directional, 12 dBd, low PIM, 0-10º DT, 746-960 MHz

- New wide band design covers 746-960 MHz band
- Compact, enclosed antenna with excellent low intermodulation performance
- Low PIM and Peak Instantaneous Power (PIP) rated
- 0-10º electrical downtilt available



One wideband antenna for your 700, 800, 900 MHz systems. Sinclair's SE4192-WBL series of enclosed dipole arrays offer excellent intermodulation performance covering 746-960 MHz in a single antenna. These highly versatile antennas are particularly well suited to communication systems where a specific coverage pattern is required. These include cellular systems, trunked radio, paging, and data transmission, where predictable and highly reliable performance is a must. Desgined for multi-channel systems, the PIP rated SE4192-WBL series features with low intermodulation products, highly rated average power and peak instantaneous power.

The SE4192-WBL series is also available with field adjustable reflectors that provide horizontal beamwidths between 60 and 160 degrees (See SE4192-WBAL). The creative design and construction permits excellent pattern control and greater efficiency.

This antenna support upright mounting.
Electrical downtilt is available upon request.
Clamps for mechanical downtilt can be ordered separately..

Please refer to the chart below for model name when ordering donwtilt versions.
Various downtilt configurations may subject to price difference.

Models Name	Downtilte Degree
SE4192-SWBP2LDF(D00)	0
SE4192-SWBP2LDF(D01)	1
SE4192-SWBP2LDF(D02)	2
SE4192-SWBP2LDF(D03)	3
SE4192-SWBP2LDF(D04)	4
SE4192-SWBP2LDF(D05)	5
SE4192-SWBP2LDF(D06)	6
SE4192-SWBP2LDF(D07)	7
SE4192-SWBP2LDF(D08)	8
SE4192-SWBP2LDF(D09)	9
SE4192-SWBP2LDF(D10)	10

www.sinctech.com

Region	United States	Europe, Middle East and Africa	Caribbean and Latin America	Canada and rest of the world
Telephone	USA: 1 800 263 3275	International: +44 (0) 1487 84 28 19	International: +1 905 726 7676	Canada: 1 800 263 3275 International: +1 905 727 0165
E-mail	salesusa@sinctech.com	salesuk@sinctech.com	salesla@sinctech.com	salescan@sinctech.com

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Electrical Specifications

Frequency Range	MHz	746 to 960
Bandwidth	MHz	214
Connector		7/16 DIN-Female
Gain (nominal)	dBd (dBi)	12 (14.1)
Input VSWR (max)		1.5:1
Polarization		vertical
Impedance	Ω	50
Pattern		Bi- directional
Vertical beamwidth (typ)	degrees	3.5
Average Power Input (max)	W	500
Passive intermod. (2x20W, 3rd ord.)	dBc	-150
Lightning protection		DC ground
PIP(KW, max)		25
Electrical tilt (available)		0-10 degrees

Notes

*1 : Clamps not included in measurement

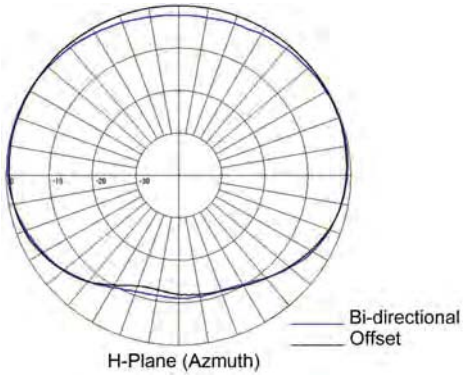
*2 : Clamps not included in measurement

Ordering Information

Please specify NN in model name when ordering, NN = 00-10, electrical downtilt degree.

Mechanical Specifications

Depth	in (mm)	8.5 (216)	*1
Length/ Height	in (mm)	216 (5486)	
Width	in (mm)	2.9 (74)	*2
Base pipe diameter	in (mm)	2.88 (73)	
Base pipe mounting length	in (mm)	85.95 (2183)	
Radiating element material		copper	
Weight	lbs (kg)	56 (25.42)	
Weight iced	lbs (kg)	135 (61.29)	
Mounting Hardware (Standard)		Clamp130	
Shipping dimensions	in (mm)	219x13x15 (5563x330x381)	
Mounting configurations		upright	



Environmental Specifications

Temperature range	°F (°C)	-40 to +140 (-40 to +60)
Wind Loading Area (Flat Plate Equivalent)	ft² (m²)	8.37 (0.78)
Wind Loading Area (1/2" ice)	ft² (m²)	10.59 (0.98)
Rated wind velocity (no ice)	mph (km/h)	100 (161)
Rated wind velocity (1/2" radial ice)	mph (km/h)	85 (137)
Lateral thrust (100 mph No Ice)	lbs (N)	438 (1948.2)
Torsional moment (100 mph No Ice)	ft-lbs (Nm)	188 (253.8)

www.sinctech.com

Region	United States	Europe, Middle East and Africa	Caribbean and Latin America	Canada and rest of the world
Telephone	USA: 1 800 263 3275	International: +44 (0) 1487 84 28 19	International: +1 905 726 7676	Canada: 1 800 263 3275 International: +1 905 727 0165
E-mail	salesusa@sinctech.com	salesuk@sinctech.com	salesla@sinctech.com	salescan@sinctech.com

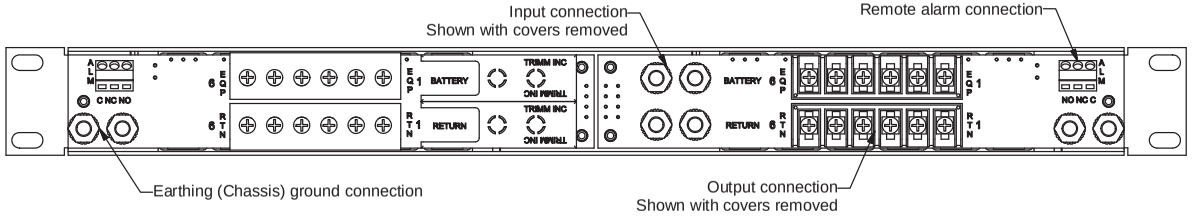
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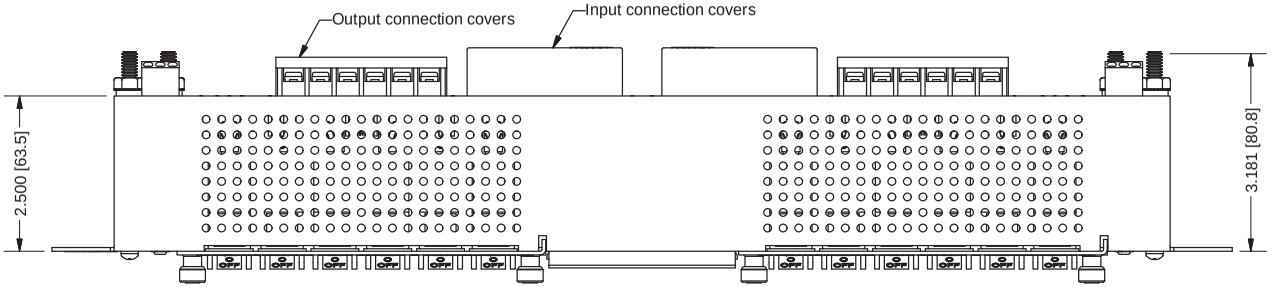
T2-85UG25 - Unit System Specifications

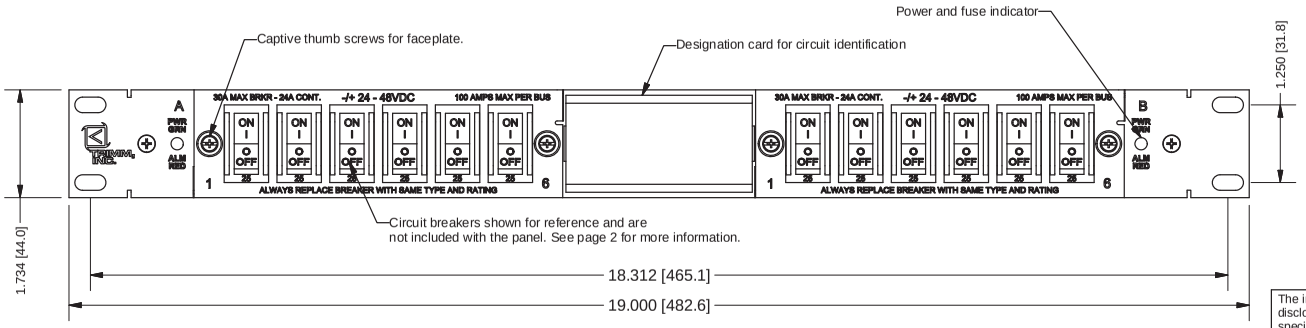
Tower Specifications– All Aluma Tower Company, Inc. towers are designed to TIA-222-G Structural Standards for Antenna Supporting Structures and Antennas.

Model	T2-85UG
Tower Construction	American Aircraft Aluminum 6061-T6
No. of Sections	3
Sections ID	F2, E2 & D2
Length of the Section	30 ft.
Sections Overlap	7 ft.
Overlap Reinforcement System	Radial Pressure Slide Bars *(Patent# 8,046,970)*
Maximum Height w/o Mast	76 ft.
Standard Mast Length	8 ft.
Maximum Height w/ Mast	80 ft.
Nested Height w/o Mast	31 ft.
Raising System	AC or DC Winch (Multiple Voltage Available)
Tilting Mechanism	AC or DC Winch (Multiple Voltage Available)
Type of Retraction	Positive
Winch Manual bypass	Yes
Lockable Mechanism	Yes – Safety Stop
Multiple height Lockable	Yes – Every 20”
Multiple Safety Redundancy	Yes
Tower Operations Temperature	-40°F / +120°F
Maximum Pay Load*	350 lbs.
Maximum Wind Load (Sail Area)*	25 sq.ft.
Maximum Wind Speed*	70 mph.
Approximate Tower Weight	850 lbs.

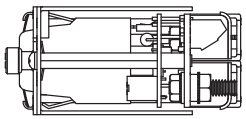
* Number reflect top section of the tower when fully erected (deployed)







Product Specifications: 9072101001 Breaker Panel			
Mechanical	Dimensions		19" W x 1.734" H x 3.5" D
	Rack Spaces		1 (1U)
	Weight		3 Lbs. (without breakers)
	Mounting		19" rack mount (23" adapter kits available)
	Finish		Black powder coated steel
Electrical	Input	Voltage	-/+ 24 TO 48 VDC
		Number of Buses	2 (A/B)
		Current	100 Amps max. per bus (200 Amps total)
		Interrupt Device Rating	125 Amps max.
	Output	Single Pole	Up to 30 Amps
		Max. Continuous Load	24 Amps
		Number of Positions	Up to 6 circuit breakers per bus
Connections	Input	2 Hole Compression Lugs	1/4" stud x 5/8" center-center spacing
		Wire Range	Up to 2/0 AWG (90 Deg. required)
		Max. Terminal Width	0.625" maximum
	Output	Barrier Strip Connectors	#6 Sems screws for ring/fork terminals
		Wire Range	Up to 10 Awg.
		Max. Terminal Width	.33" maximum
	Earthing (Chassis GND)	2 Hole Compression Lugs	1/4" stud x 5/8" center-center spacing
		Wire Range	Up to 2/0 Awg (.750" max. width)
Environment	Short Term Operating Temperature		-5° C to +55° C
	Max. Recommended Ambient		Up to +25° C
	Storage Temperature		-40° C to +70° C
	Relative Humidity		0-95% noncondensing
Alarming	Indicators		Bi-color led Green (power) Red (alarm)
	Alarm Capability		Form "C" contacts 1 set for breaker failure
	Connection Type		Set Screw (12 to 30 Awg)
Standards	Safety (Recognized)		UL 60950-1, UL 1801, CSA C22.2 No. 60950-1
			EN 60950-1, IEC 60950-1
	Telcordia (NEBS)		NEBS Level 3 Certified
Whats included: 4 x #12-24 rack mounting screws, input connection hardware (locking nuts), chassis ground connection hardware (locking nuts).			



NOTES:
1-Dimensions are in Inches [mm].
2-See page 2 for ordering information.

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TOLERANCES: -/+.015 ON OVERALL PART SIZE, -/+.010 FROM ANY BEND TO THE CENTERLINE OF ANY HOLE OR CUTOUT, -/+.005 FROM CENTERLINE TO CENTERLINE ON ANY HOLE OR CUTOUT

APPROVED BY:	DRAWN BY: BRIAN BURCH	DATE: 07/05/07	SIZE: B	DESCRIPTION: BREAKER PANEL 6/6 POS OV TYPE 1U -/+24 TO 48VDC	REV. B
			FILE CODE 907m	DRAWING NUMBER: 9072101001m	
				TRIMM, INC. 407 RAILROAD ST. BUTNER, NC. PHONE: 1-800-298-7466 FAX: 1-919-575-6200	PAGE: 1

How To Order

Take the base part number 9072101001, and add a letter to the end (up to 6) for each circuit breaker from "Breaker Letters" table to be installed. Blanking plugs are provided for unfilled positions. Each bus (A and B) must be configured identically.

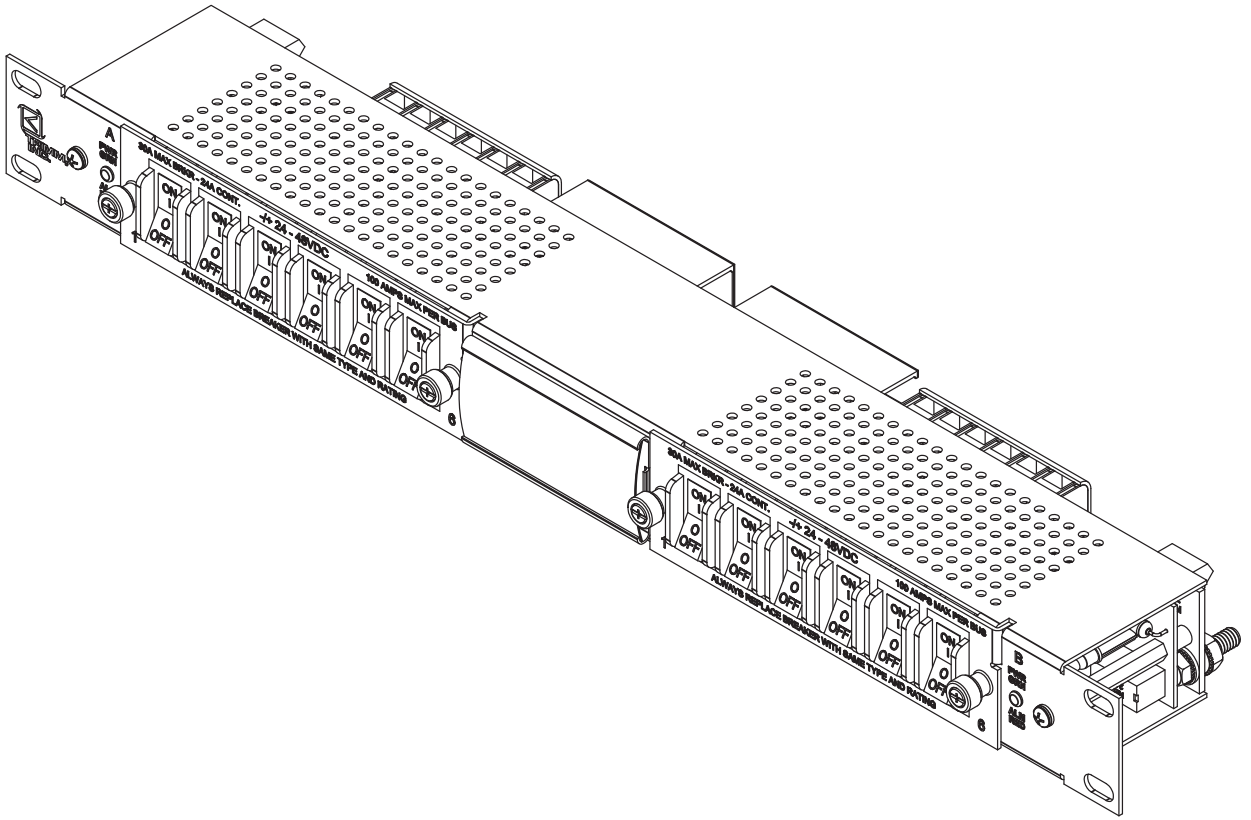
Example #1: Part number 9072101001AAABBB would be this panel with a 1/2 Amp circuit breaker in positions 1-3 (A and B bus) and a 1 Amp circuit breaker in positions 4-6 (A and B bus).

Example #2: Part number 9072101001BBB would be this panel with a 1 Amp circuit breaker in positions 1-3 (A and B bus) only and positions 4-6 (A and B bus) are unfilled.

If you wish to have the panel unfilled and circuit breakers not installed then simply order part number 9072101001 and the individual part numbers for the amperage of circuit breaker you desire from the "Breaker Part Numbers" table. Blanking plugs are not provided on unfilled panels and should be ordered separately from the table below.

Breaker Letters	
Letter	Amperage
A	1/2 Amp
B	1 Amp
C	2 Amp
D	3 Amp
E	5 Amp
F	7.5 Amp
G	10 Amp
H	15 Amp
I	20 Amp
J	25 Amp
K	30 Amp

Breaker Part Numbers*	
Part Number	Amperage
030017750A	1/2 Amp
030017750B	1 Amp
030017750C	2 Amp
030017750D	3 Amp
030017750E	5 Amp
030017750F	7.5 Amp
030017750G	10 Amp
030017750H	15 Amp
030017750I	20 Amp
030017750J	25 Amp
030017750K	30 Amp
9000200001	BLANK
*Used to order breakers separately	



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TOLERANCES: -/+.015 ON OVERALL PART SIZE, -/+.010 FROM ANY BEND TO THE CENTERLINE OF ANY HOLE OR CUTOUT, -/+.005 FROM CENTERLINE TO CENTERLINE ON ANY HOLE OR CUTOUT

APPROVED BY:

DRAWN BY: BRIAN BURCH

DATE: 07/05/07

SIZE: B

DESCRIPTION: BREAKER PANEL 6/6 POS OV TYPE 1U -/+24 TO 48VDC

REV. B

FILE CODE: 907m

DRAWING NUMBER: 9072101001m

TRIMM, INC.
407 RAILROAD ST. BUTNER, NC.
PHONE: 1-800-298-7466 FAX: 1-919-575-6200

PAGE: 2

	Core	EMS
Latitude	26 09 00.00 N	26 09 14.00 N
Longitude	080 11 16.00 W	080 10 38.00 W
True azimuth (°)	67.79	247.80
Vertical angle (°)	-0.32	0.32
Elevation (ft)	6.56	5.74
Antenna model	SC 3 - W100A (TR)	SC 3 - W100A (TR)
Antenna gain (dBi)	38.30	38.30
Antenna height (ft)	95.00	75.00
TX line model	EW90	EW90
TX line length (ft)	135.00	115.00
TX line loss (dB)	4.14	3.52
Connector loss (dB)	0.39	0.39
Frequency (MHz)	11200.00	
Polarization	Vertical	
Path length (mi)	0.71	
Free space loss (dB)	114.59	
Atmospheric absorption loss (dB)	0.02	
Net path loss (dB)	46.45	46.45
Configuration	NP	NP
Radio model	I600V3S11_40M 256Q 254M	I600V3S11_40M 256Q 254M
TX power (dBm)	22.50	22.50
EIRP (dBm)	56.27	56.89
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-63.75	-63.75
Receive signal (dBm)	-23.95	-23.95
Thermal fade margin (dB)	39.80	39.80
Dispersive fade margin (dB)	44.30	44.30
Effective fade margin (dB)	38.48	38.48
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
Annual multipath availability (%)	100.00000	100.00000
Annual multipath unavailability (sec)	0.14	0.14
Annual 2 way multipath availability (%)	100.00000	
Annual 2 way multipath unavailability (sec)	0.27	
Rain region	West Palm Beach, Florida	
Flat fade margin - rain (dB)	39.80	
Annual rain availability (%)	100.00000	
Annual rain unavailability (min)	0.00	

PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett
Rain fading method - Crane

	EMS	Point of America
Latitude	26 09 14.00 N	26 05 46.00 N
Longitude	080 10 38.00 W	080 06 26.00 W
True azimuth (°)	132.42	312.45
Vertical angle (°)	0.25	-0.31
Elevation (ft)	5.74	3.28
Antenna model	PAD 6 - 59 B (R) (TR)	PAD 6 - 59 B (R) (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna height (ft)	95.00	250.00
TX line model	EW63	EW63
TX line length (ft)	135.00	200.00
TX line loss (dB)	1.94	2.87
Connector loss (dB)	0.27	0.27
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	5.89	
Free space loss (dB)	127.82	
Atmospheric absorption loss (dB)	0.08	
Net path loss (dB)	56.66	56.66
Configuration	NP	NP
Radio model	I600V3SL6_30M 128Q 154M	I600V3SL6_30M 128Q 154M
TX power (dBm)	28.00	28.00
EIRP (dBm)	64.09	63.16
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-72.50	-72.50
Receive signal (dBm)	-28.66	-28.66
Thermal fade margin (dB)	43.84	43.84
Dispersive fade margin (dB)	47.80	47.80
Effective fade margin (dB)	42.37	42.37
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
Annual multipath availability (%)	99.99994	99.99994
Annual multipath unavailability (sec)	17.57	17.57
Annual 2 way multipath availability (%)	99.99989	
Annual 2 way multipath unavailability (sec)	35.14	

PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett

	Point of America	West Lake Park
Latitude	26 05 46.00 N	26 01 57.90 N
Longitude	080 06 26.00 W	080 07 45.70 W
True azimuth (°)	197.52	17.51
Vertical angle (°)	-0.40	0.35
Elevation (ft)	3.28	3.28
Antenna model	PAD 6 - 59 B (R) (TR)	PAD 6 - 59 B (R) (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna height (ft)	250.00	90.00
TX line model	EW63	EW63
TX line length (ft)	200.00	130.00
TX line loss (dB)	2.87	1.87
Connector loss (dB)	0.27	0.27
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	4.57	
Free space loss (dB)	125.62	
Atmospheric absorption loss (dB)	0.06	
Net path loss (dB)	54.37	54.37
Configuration	NP	NP
Radio model	I600V3SL6_30M 128Q 154M	I600V3SL6_30M 128Q 154M
TX power (dBm)	28.00	28.00
EIRP (dBm)	63.16	64.16
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-72.50	-72.50
Receive signal (dBm)	-26.37	-26.37
Thermal fade margin (dB)	46.13	46.13
Dispersive fade margin (dB)	47.80	47.80
Effective fade margin (dB)	43.88	43.88
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
Annual multipath availability (%)	99.99998	99.99998
Annual multipath unavailability (sec)	5.81	5.81
Annual 2 way multipath availability (%)	99.99996	
Annual 2 way multipath unavailability (sec)	11.62	

PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett

	West Lake Park	Channel 2
Latitude	26 01 57.90 N	25 58 48.00 N
Longitude	080 07 45.70 W	080 11 47.00 W
True azimuth (°)	228.96	48.93
Vertical angle (°)	0.03	-0.09
Elevation (ft)	3.28	6.56
Antenna model	PAD 6 - 59 B (R) (TR)	PAD 6 - 59 B (R) (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna height (ft)	113.00	140.00
TX line model	EW63	EW63
TX line length (ft)	153.00	180.00
TX line loss (dB)	2.20	2.59
Connector loss (dB)	0.27	0.27
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	5.53	
Free space loss (dB)	127.27	
Atmospheric absorption loss (dB)	0.08	
Net path loss (dB)	56.07	56.07
Configuration	NP	NP
Radio model	I600V3SL6_30M 128Q 154M	I600V3SL6_30M 128Q 154M
TX power (dBm)	28.00	28.00
EIRP (dBm)	63.83	63.44
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-72.50	-72.50
Receive signal (dBm)	-28.07	-28.07
Thermal fade margin (dB)	44.43	44.43
Dispersive fade margin (dB)	47.80	47.80
Effective fade margin (dB)	42.79	42.79
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
Annual multipath availability (%)	99.99996	99.99996
Annual multipath unavailability (sec)	13.19	13.19
Annual 2 way multipath availability (%)	99.99992	
Annual 2 way multipath unavailability (sec)	26.38	

PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett

	Channel 2	Miramar
Latitude	25 58 48.00 N	25 57 30.70 N
Longitude	080 11 47.00 W	080 20 18.50 W
True azimuth (°)	260.54	80.48
Vertical angle (°)	-0.11	0.02
Elevation (ft)	6.56	3.28
Antenna model	PAD 6 - 59 B (R) (TR)	PAD 6 - 59 B (R) (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna height (ft)	175.00	125.00
TX line model	EW63	EW63
TX line length (ft)	215.00	165.00
TX line loss (dB)	3.09	2.37
Connector loss (dB)	0.27	0.27
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	8.96	
Free space loss (dB)	131.46	
Atmospheric absorption loss (dB)	0.12	
Net path loss (dB)	60.99	60.99
Configuration	NP	NP
Radio model	I600V3SL6_30M 128Q 154M	I600V3SL6_30M 128Q 154M
TX power (dBm)	28.00	28.00
EIRP (dBm)	62.94	63.66
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-72.50	-72.50
Receive signal (dBm)	-32.99	-32.99
Thermal fade margin (dB)	39.51	39.51
Dispersive fade margin (dB)	47.80	47.80
Effective fade margin (dB)	38.91	38.91
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
Annual multipath availability (%)	99.99956	99.99956
Annual multipath unavailability (sec)	137.20	137.20
Annual 2 way multipath availability (%)	99.99913	
Annual 2 way multipath unavailability (sec)	274.40	

PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett

	Miramar	Davie
Latitude	25 57 30.70 N	26 03 56.00 N
Longitude	080 20 18.50 W	080 20 18.00 W
True azimuth (°)	0.07	180.07
Vertical angle (°)	-0.03	-0.05
Elevation (ft)	3.28	3.28
Antenna model	PAD 6 - 59 B (R) (TR)	PAD 6 - 59 B (R) (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna height (ft)	120.00	130.00
TX line model	EW63	EW63
TX line length (ft)	160.00	170.00
TX line loss (dB)	2.30	2.44
Connector loss (dB)	0.27	0.27
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	7.37	
Free space loss (dB)	129.76	
Atmospheric absorption loss (dB)	0.10	
Net path loss (dB)	58.54	58.54
Configuration	NP	NP
Radio model	I600V3SL6_30M 128Q 154M	I600V3SL6_30M 128Q 154M
TX power (dBm)	28.00	28.00
EIRP (dBm)	63.73	63.59
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-72.50	-72.50
Receive signal (dBm)	-30.54	-30.54
Thermal fade margin (dB)	41.96	41.96
Dispersive fade margin (dB)	47.80	47.80
Effective fade margin (dB)	40.95	40.95
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
Annual multipath availability (%)	99.99985	99.99985
Annual multipath unavailability (sec)	47.63	47.63
Annual 2 way multipath availability (%)	99.99970	
Annual 2 way multipath unavailability (sec)	95.26	

PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett

	Davie	BC Station 106
Latitude	26 03 56.00 N	26 08 42.00 N
Longitude	080 20 18.00 W	080 37 41.00 W
True azimuth (°)	286.96	106.83
Vertical angle (°)	-0.17	-0.03
Elevation (ft)	3.28	6.56
Antenna model	PAD 6 - 59 B (R) (TR)	PAD 6 - 59 B (R) (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna height (ft)	235.00	115.00
TX line model	EW63	EW63
TX line length (ft)	275.00	155.00
TX line loss (dB)	3.95	2.23
Connector loss (dB)	0.27	0.27
TX switch loss (dB)	0.40	0.40
Antenna model	SB 4 - W60C (DR)	SB 4 - W60C (DR)
Antenna gain (dBi)	35.40	35.40
Antenna height (ft)	205.00	85.00
TX line model	EW63	EW63
TX line length (ft)	245.00	125.00
TX line loss (dB)	3.52	1.80
Connector loss (dB)	0.27	0.27
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	18.82	
Free space loss (dB)	137.91	
Atmospheric absorption loss (dB)	0.26	
Main net path loss (dB)	68.69	68.69
Diversity net path loss (dB)	71.16	71.16
Configuration	MHSB/SD	MHSB/SD
Radio model	I600V3HL6_30M 128Q 154M	I600V3HL6_30M 128Q 154M
TX power (dBm)	31.00	31.00
EIRP (dBm)	64.68	66.40
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-72.50	-72.50
Main receive signal (dBm)	-37.69	-37.69
Diversity receive signal (dBm)	-40.16	-40.16
Thermal fade margin (dB)	34.81	34.81
Dispersive fade margin (dB)	47.80	47.80
Effective fade margin (dB)	34.60	34.60
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
SD improvement factor	36.92	36.92
Annual multipath availability (%)	99.99971	99.99971
Annual multipath unavailability (sec)	92.79	92.79
Annual 2 way multipath availability (%)	99.99941	
Annual 2 way multipath unavailability (sec)	185.58	

PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett

	BC Station 106	Markham Park
Latitude	26 08 42.00 N	26 08 43.10 N
Longitude	080 37 41.00 W	080 20 43.80 W
True azimuth (°)	89.87	269.99
Vertical angle (°)	-0.09	-0.10
Elevation (ft)	6.56	3.28
Antenna model	PAD 6 - 59 B (R) (TR)	PAD 6 - 59 B (R) (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna height (ft)	170.00	180.00
TX line model	EW63	EW63
TX line length (ft)	210.00	220.00
TX line loss (dB)	3.02	3.16
Connector loss (dB)	0.27	0.27
TX switch loss (dB)	0.40	0.40
Antenna model	SB 4 - W60C (DR)	SB 4 - W60C (DR)
Antenna gain (dBi)	35.40	35.40
Antenna height (ft)	140.00	150.00
TX line model	EW63	EW63
TX line length (ft)	180.00	190.00
TX line loss (dB)	2.59	2.73
Connector loss (dB)	0.27	0.27
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	17.56	
Free space loss (dB)	137.30	
Atmospheric absorption loss (dB)	0.24	
Main net path loss (dB)	68.07	68.07
Diversity net path loss (dB)	70.53	70.53
Configuration	MHSB/SD	MHSB/SD
Radio model	I600V3SL6_30M 128Q 154M	I600V3SL6_30M 128Q 154M
TX power (dBm)	28.00	28.00
EIRP (dBm)	62.61	62.47
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-72.50	-72.50
Main receive signal (dBm)	-40.07	-40.07
Diversity receive signal (dBm)	-42.53	-42.53
Thermal fade margin (dB)	32.43	32.43
Dispersive fade margin (dB)	47.80	47.80
Effective fade margin (dB)	32.31	32.31
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
SD improvement factor	22.56	22.55
Annual multipath availability (%)	99.99934	99.99934
Annual multipath unavailability (sec)	208.88	208.95
Annual 2 way multipath availability (%)	99.99868	
Annual 2 way multipath unavailability (sec)	417.83	

PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett

	Markham Park	Core
Latitude	26 08 43.10 N	26 09 00.00 N
Longitude	080 20 43.80 W	080 11 16.00 W
True azimuth (°)	88.08	268.15
Vertical angle (°)	-0.02	-0.09
Elevation (ft)	3.28	6.56
Antenna model	PAD 6 - 59 B (R) (TR)	PAD 6 - 59 B (R) (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna height (ft)	120.00	150.00
TX line model	EW63	EW63
TX line length (ft)	160.00	190.00
TX line loss (dB)	2.30	2.73
Connector loss (dB)	0.27	0.27
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	9.81	
Free space loss (dB)	132.24	
Atmospheric absorption loss (dB)	0.14	
Net path loss (dB)	61.35	61.35
Configuration	NP	NP
Radio model	I600V3SL6_30M 128Q 154M	I600V3SL6_30M 128Q 154M
TX power (dBm)	28.00	28.00
EIRP (dBm)	63.73	63.30
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-72.50	-72.50
Receive signal (dBm)	-33.35	-33.35
Thermal fade margin (dB)	39.15	39.15
Dispersive fade margin (dB)	47.80	47.80
Effective fade margin (dB)	38.60	38.60
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
Annual multipath availability (%)	99.99939	99.99939
Annual multipath unavailability (sec)	193.03	193.03
Annual 2 way multipath availability (%)	99.99878	
Annual 2 way multipath unavailability (sec)	386.07	

PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett

	Core	West Hollywood
Latitude	26 09 00.00 N	26 03 37.20 N
Longitude	080 11 16.00 W	080 12 00.00 W
True azimuth (°)	187.02	7.01
Vertical angle (°)	0.12	-0.19
Elevation (ft)	6.56	3.28
Antenna model	PAD 6 - 59 B (R) (TR)	PAD 6 - 59 B (R) (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna height (ft)	105.00	195.00
TX line model	EW63	EW63
TX line length (ft)	145.00	200.00
TX line loss (dB)	2.08	2.87
Connector loss (dB)	0.27	0.27
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	6.22	
Free space loss (dB)	128.29	
Atmospheric absorption loss (dB)	0.09	
Net path loss (dB)	57.27	57.27
Configuration	NP	NP
Radio model	I600V3SL6_30M 128Q 154M	I600V3SL6_30M 128Q 154M
TX power (dBm)	28.00	28.00
EIRP (dBm)	63.95	63.16
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-72.50	-72.50
Receive signal (dBm)	-29.27	-29.27
Thermal fade margin (dB)	43.23	43.23
Dispersive fade margin (dB)	47.80	47.80
Effective fade margin (dB)	41.93	41.93
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
Annual multipath availability (%)	99.99993	99.99993
Annual multipath unavailability (sec)	22.88	22.88
Annual 2 way multipath availability (%)	99.99985	
Annual 2 way multipath unavailability (sec)	45.75	

PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett

	West Hollywood	EOC
Latitude	26 03 37.20 N	26 07 25.50 N
Longitude	080 12 00.00 W	080 14 43.10 W
True azimuth (°)	327.18	147.16
Vertical angle (°)	-0.23	0.17
Elevation (ft)	3.28	3.28
Antenna model	PAD 6 - 59 B (R) (TR)	PAD 6 - 59 B (R) (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna height (ft)	195.00	100.00
TX line model	EW63	EW63
TX line length (ft)	200.00	140.00
TX line loss (dB)	2.87	2.01
Connector loss (dB)	0.27	0.27
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	5.20	
Free space loss (dB)	126.73	
Atmospheric absorption loss (dB)	0.07	
Net path loss (dB)	55.62	55.62
Configuration	NP	NP
Radio model	I600V3SL6_30M 128Q 154M	I600V3SL6_30M 128Q 154M
TX power (dBm)	28.00	28.00
EIRP (dBm)	63.16	64.02
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-72.50	-72.50
Receive signal (dBm)	-27.62	-27.62
Thermal fade margin (dB)	44.88	44.88
Dispersive fade margin (dB)	47.80	47.80
Effective fade margin (dB)	43.09	43.09
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
Annual multipath availability (%)	99.99997	99.99997
Annual multipath unavailability (sec)	10.21	10.21
Annual 2 way multipath availability (%)	99.99994	
Annual 2 way multipath unavailability (sec)	20.42	

PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett

	EOC	Tamarac
Latitude	26 07 25.50 N	26 12 43.30 N
Longitude	080 14 43.10 W	080 16 20.50 W
True azimuth (°)	344.55	164.53
Vertical angle (°)	0.09	-0.16
Elevation (ft)	3.28	7.87
Antenna model	PAD 6 - 59 B (R) (TR)	PAD 6 - 59 B (R) (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna height (ft)	100.00	170.00
TX line model	EW63	EW63
TX line length (ft)	140.00	210.00
TX line loss (dB)	2.01	3.02
Connector loss (dB)	0.27	0.27
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	6.31	
Free space loss (dB)	128.41	
Atmospheric absorption loss (dB)	0.09	
Net path loss (dB)	57.46	57.46
Configuration	NP	NP
Radio model	I600V3SL6_30M 128Q 154M	I600V3SL6_30M 128Q 154M
TX power (dBm)	28.00	28.00
EIRP (dBm)	64.02	63.01
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-72.50	-72.50
Receive signal (dBm)	-29.46	-29.46
Thermal fade margin (dB)	43.04	43.04
Dispersive fade margin (dB)	47.80	47.80
Effective fade margin (dB)	41.78	41.78
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
Annual multipath availability (%)	99.99992	99.99992
Annual multipath unavailability (sec)	24.64	24.64
Annual 2 way multipath availability (%)	99.99984	
Annual 2 way multipath unavailability (sec)	49.28	

PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett

	Tamarac	Parkland
Latitude	26 12 43.30 N	26 21 17.80 N
Longitude	080 16 20.50 W	080 16 59.20 W
True azimuth (°)	356.12	176.12
Vertical angle (°)	0.01	-0.12
Elevation (ft)	7.87	9.84
Antenna model	PAD 6 - 59 B (R) (TR)	PAD 6 - 59 B (R) (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna height (ft)	100.00	155.00
TX line model	EW63	EW63
TX line length (ft)	140.00	195.00
TX line loss (dB)	2.01	2.80
Connector loss (dB)	0.27	0.27
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	9.86	
Free space loss (dB)	132.29	
Atmospheric absorption loss (dB)	0.14	
Net path loss (dB)	61.18	61.18
Configuration	NP	NP
Radio model	I600V3SL6_30M 128Q 154M	I600V3SL6_30M 128Q 154M
TX power (dBm)	28.00	28.00
EIRP (dBm)	64.02	63.23
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-72.50	-72.50
Receive signal (dBm)	-33.18	-33.18
Thermal fade margin (dB)	39.32	39.32
Dispersive fade margin (dB)	47.80	47.80
Effective fade margin (dB)	38.74	38.74
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
Annual multipath availability (%)	99.99940	99.99940
Annual multipath unavailability (sec)	189.95	189.95
Annual 2 way multipath availability (%)	99.99880	
Annual 2 way multipath unavailability (sec)	379.90	

PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett

	Parkland	Coconut Creek
Latitude	26 21 17.80 N	26 18 10.00 N
Longitude	080 16 59.20 W	080 11 45.00 W
True azimuth (°)	123.54	303.58
Vertical angle (°)	-0.00	-0.07
Elevation (ft)	9.84	13.12
Antenna model	PAD 6 - 59 B (R) (TR)	PAD 6 - 59 B (R) (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna height (ft)	120.00	135.00
TX line model	EW63	EW63
TX line length (ft)	160.00	175.00
TX line loss (dB)	2.30	2.51
Connector loss (dB)	0.27	0.27
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	6.50	
Free space loss (dB)	128.67	
Atmospheric absorption loss (dB)	0.09	
Net path loss (dB)	57.51	57.51
Configuration	NP	NP
Radio model	I600V3SL6_30M 128Q 154M	I600V3SL6_30M 128Q 154M
TX power (dBm)	28.00	28.00
EIRP (dBm)	63.73	63.52
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-72.50	-72.50
Receive signal (dBm)	-29.51	-29.51
Thermal fade margin (dB)	42.99	42.99
Dispersive fade margin (dB)	47.80	47.80
Effective fade margin (dB)	41.75	41.75
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
Annual multipath availability (%)	99.99991	99.99991
Annual multipath unavailability (sec)	27.18	27.18
Annual 2 way multipath availability (%)	99.99983	
Annual 2 way multipath unavailability (sec)	54.35	

PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett

	Coconut Creek	Deerfield
Latitude	26 18 10.00 N	26 17 31.60 N
Longitude	080 11 45.00 W	080 06 29.40 W
True azimuth (°)	97.67	277.71
Vertical angle (°)	-0.04	-0.02
Elevation (ft)	13.12	16.40
Antenna model	PAD 6 - 59 B (R) (TR)	PAD 6 - 59 B (R) (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna height (ft)	125.00	115.00
TX line model	EW63	EW63
TX line length (ft)	165.00	155.00
TX line loss (dB)	2.37	2.23
Connector loss (dB)	0.27	0.27
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	5.49	
Free space loss (dB)	127.20	
Atmospheric absorption loss (dB)	0.08	
Net path loss (dB)	55.82	55.82
Configuration	NP	NP
Radio model	I600V3SL6_30M 128Q 154M	I600V3SL6_30M 128Q 154M
TX power (dBm)	28.00	28.00
EIRP (dBm)	63.66	63.80
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-72.50	-72.50
Receive signal (dBm)	-27.82	-27.82
Thermal fade margin (dB)	44.68	44.68
Dispersive fade margin (dB)	47.80	47.80
Effective fade margin (dB)	42.96	42.96
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
Annual multipath availability (%)	99.99996	99.99996
Annual multipath unavailability (sec)	12.41	12.41
Annual 2 way multipath availability (%)	99.99992	
Annual 2 way multipath unavailability (sec)	24.82	

PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett

	Deerfield	Pompano Beach
Latitude	26 17 31.60 N	26 13 51.90 N
Longitude	080 06 29.40 W	080 05 25.40 W
True azimuth (°)	165.28	345.29
Vertical angle (°)	0.36	-0.41
Elevation (ft)	16.40	9.84
Antenna model	PAD 6 - 59 B (R) (TR)	PAD 6 - 59 B (R) (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna height (ft)	90.00	250.00
TX line model	EW63	EW63
TX line length (ft)	130.00	200.00
TX line loss (dB)	1.87	2.87
Connector loss (dB)	0.27	0.27
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	4.34	
Free space loss (dB)	125.17	
Atmospheric absorption loss (dB)	0.06	
Net path loss (dB)	53.91	53.91
Configuration	NP	NP
Radio model	I600V3SL6_30M 128Q 154M	I600V3SL6_30M 128Q 154M
TX power (dBm)	28.00	28.00
EIRP (dBm)	64.16	63.16
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-72.50	-72.50
Receive signal (dBm)	-25.91	-25.91
Thermal fade margin (dB)	46.59	46.59
Dispersive fade margin (dB)	47.80	47.80
Effective fade margin (dB)	44.14	44.14
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
Annual multipath availability (%)	99.99999	99.99999
Annual multipath unavailability (sec)	4.68	4.68
Annual 2 way multipath availability (%)	99.99997	
Annual 2 way multipath unavailability (sec)	9.37	

PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett

	Pompano Beach	Playa
Latitude	26 13 51.90 N	26 10 34.30 N
Longitude	080 05 25.40 W	080 05 54.70 W
True azimuth (°)	187.62	7.62
Vertical angle (°)	0.06	-0.11
Elevation (ft)	9.84	9.84
Antenna model	PAD 6 - 59 B (R) (TR)	PAD 6 - 59 B (R) (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna height (ft)	250.00	280.00
TX line model	EW63	EW63
TX line length (ft)	200.00	200.00
TX line loss (dB)	2.87	2.87
Connector loss (dB)	0.27	0.27
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	3.81	
Free space loss (dB)	124.04	
Atmospheric absorption loss (dB)	0.05	
Net path loss (dB)	53.78	53.78
Configuration	NP	NP
Radio model	I600V3SL6_30M 128Q 154M	I600V3SL6_30M 128Q 154M
TX power (dBm)	28.00	28.00
EIRP (dBm)	63.16	63.16
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-72.50	-72.50
Receive signal (dBm)	-25.78	-25.78
Thermal fade margin (dB)	46.72	46.72
Dispersive fade margin (dB)	47.80	47.80
Effective fade margin (dB)	44.22	44.22
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
Annual multipath availability (%)	99.99999	99.99999
Annual multipath unavailability (sec)	3.11	3.11
Annual 2 way multipath availability (%)	99.99998	
Annual 2 way multipath unavailability (sec)	6.22	

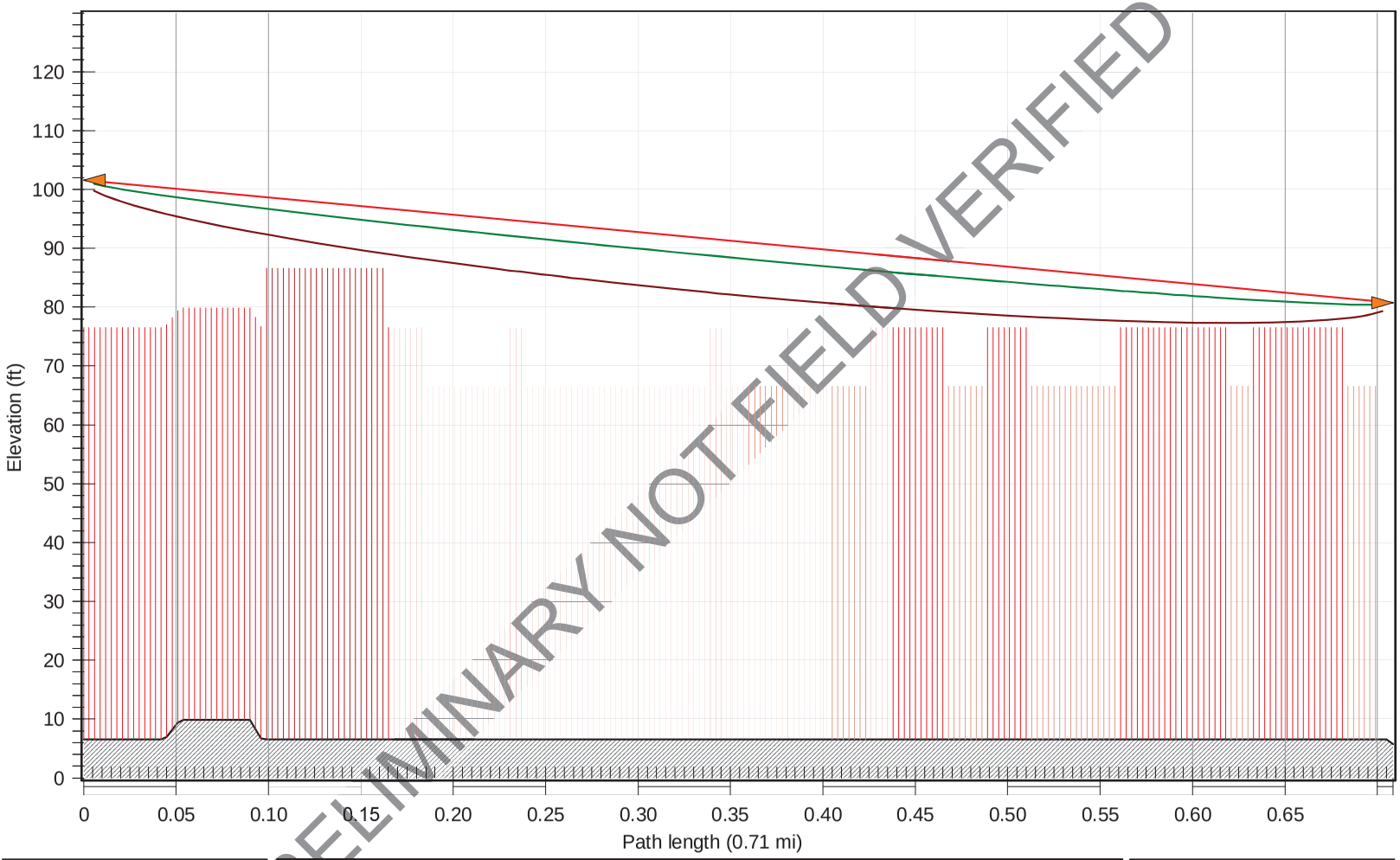
PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett

	Playa	EMS
Latitude	26 10 34.30 N	26 09 14.00 N
Longitude	080 05 54.70 W	080 10 38.00 W
True azimuth (°)	252.58	72.55
Vertical angle (°)	-0.43	0.37
Elevation (ft)	9.84	5.74
Antenna model	PAD 6 - 59 B (R) (TR)	PAD 6 - 59 B (R) (TR)
Antenna gain (dBi)	38.70	38.70
Radome loss (dB)	0.40	0.40
Antenna height (ft)	280.00	95.00
TX line model	EW63	EW63
TX line length (ft)	200.00	135.00
TX line loss (dB)	2.87	1.94
Connector loss (dB)	0.27	0.27
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	5.12	
Free space loss (dB)	126.61	
Atmospheric absorption loss (dB)	0.07	
Net path loss (dB)	55.43	55.43
Configuration	NP	NP
Radio model	I600V3SL6_30M 128Q 154M	I600V3SL6_30M 128Q 154M
TX power (dBm)	28.00	28.00
EIRP (dBm)	63.16	64.09
RX threshold criteria	1E-6 BER	1E-6 BER
RX threshold level (dBm)	-72.50	-72.50
Receive signal (dBm)	-27.43	-27.43
Thermal fade margin (dB)	45.07	45.07
Dispersive fade margin (dB)	47.80	47.80
Effective fade margin (dB)	43.21	43.21
Climatic factor	2.50	
Terrain roughness (ft)	20.00	
C factor	8.23	
Average annual temperature (°F)	74.00	
Annual multipath availability (%)	99.99997	99.99997
Annual multipath unavailability (sec)	9.52	9.52
Annual 2 way multipath availability (%)	99.99994	
Annual 2 way multipath unavailability (sec)	19.04	

PRELIMINARY SUBJECT TO CHANGE

Multipath fading method - Vigants - Barnett

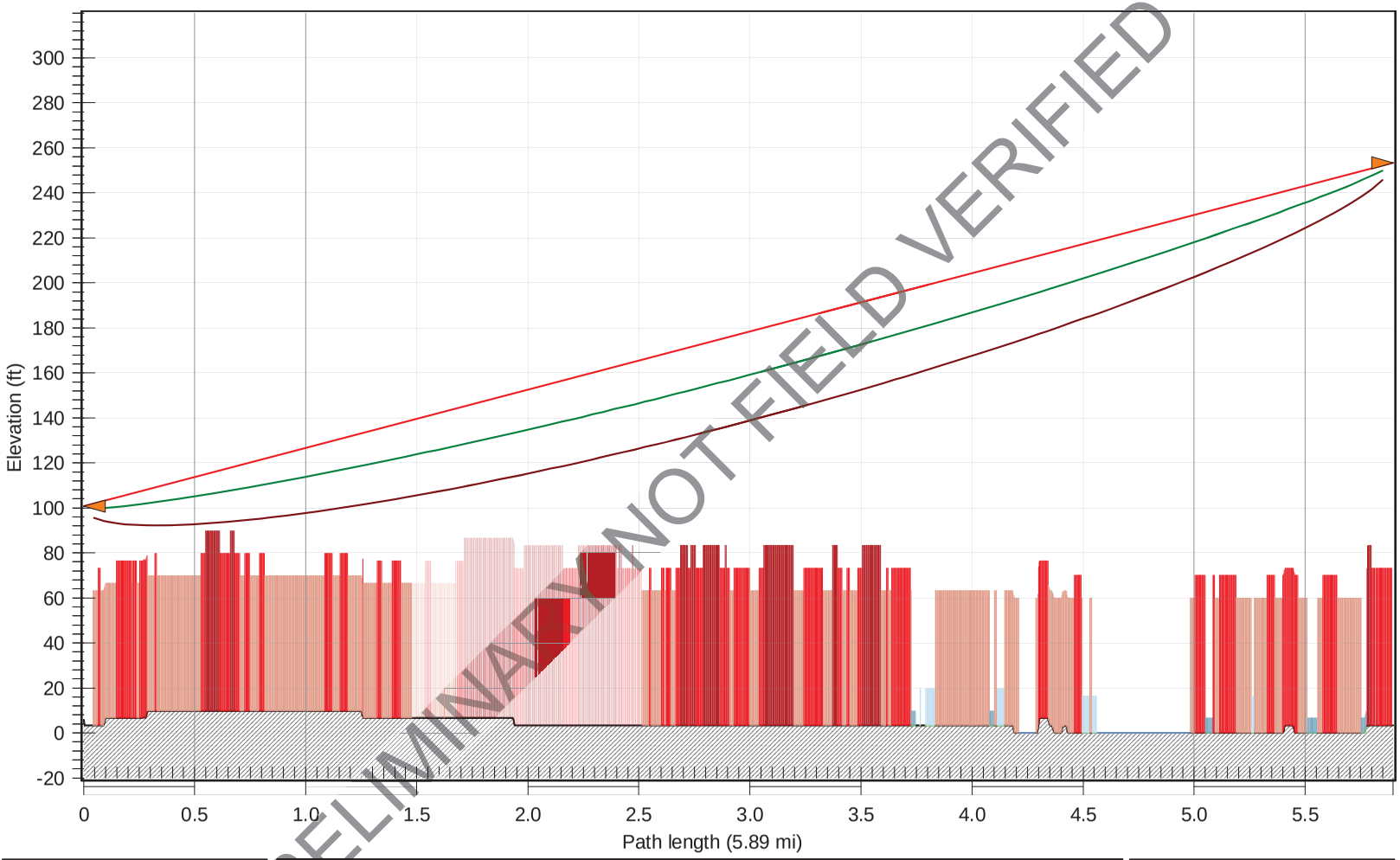


PRELIMINARY NOT FIELD VERIFIED

Core	
Latitude	26 09 00.00 N
Longitude	080 11 16.00 W
Azimuth	67.79°
Elevation	7 ft ASL
Antenna CL	95.0 ft AGL

Frequency (MHz) = 11200.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00

EMS	
Latitude	26 09 14.00 N
Longitude	080 10 38.00 W
Azimuth	247.80°
Elevation	6 ft ASL
Antenna CL	75.0 ft AGL

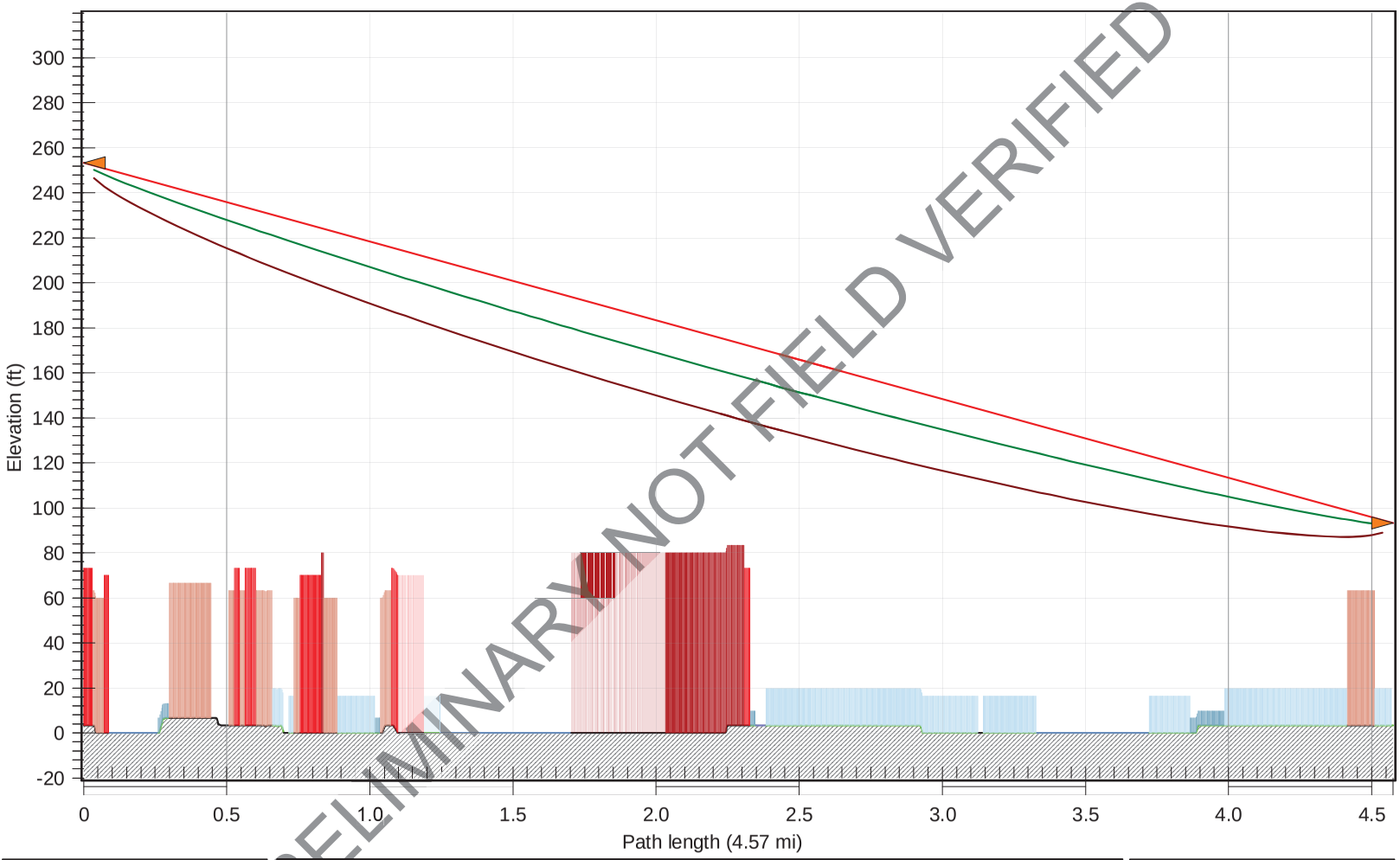


PRELIMINARY NOT FIELD VERIFIED

EMS	
Latitude	26 09 14.00 N
Longitude	080 10 38.00 W
Azimuth	132.42°
Elevation	6 ft ASL
Antenna CL	95.0 ft AGL

Frequency (MHz) = 6175.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00

Point of America	
Latitude	26 05 46.00 N
Longitude	080 06 26.00 W
Azimuth	312.45°
Elevation	3 ft ASL
Antenna CL	250.0 ft AGL

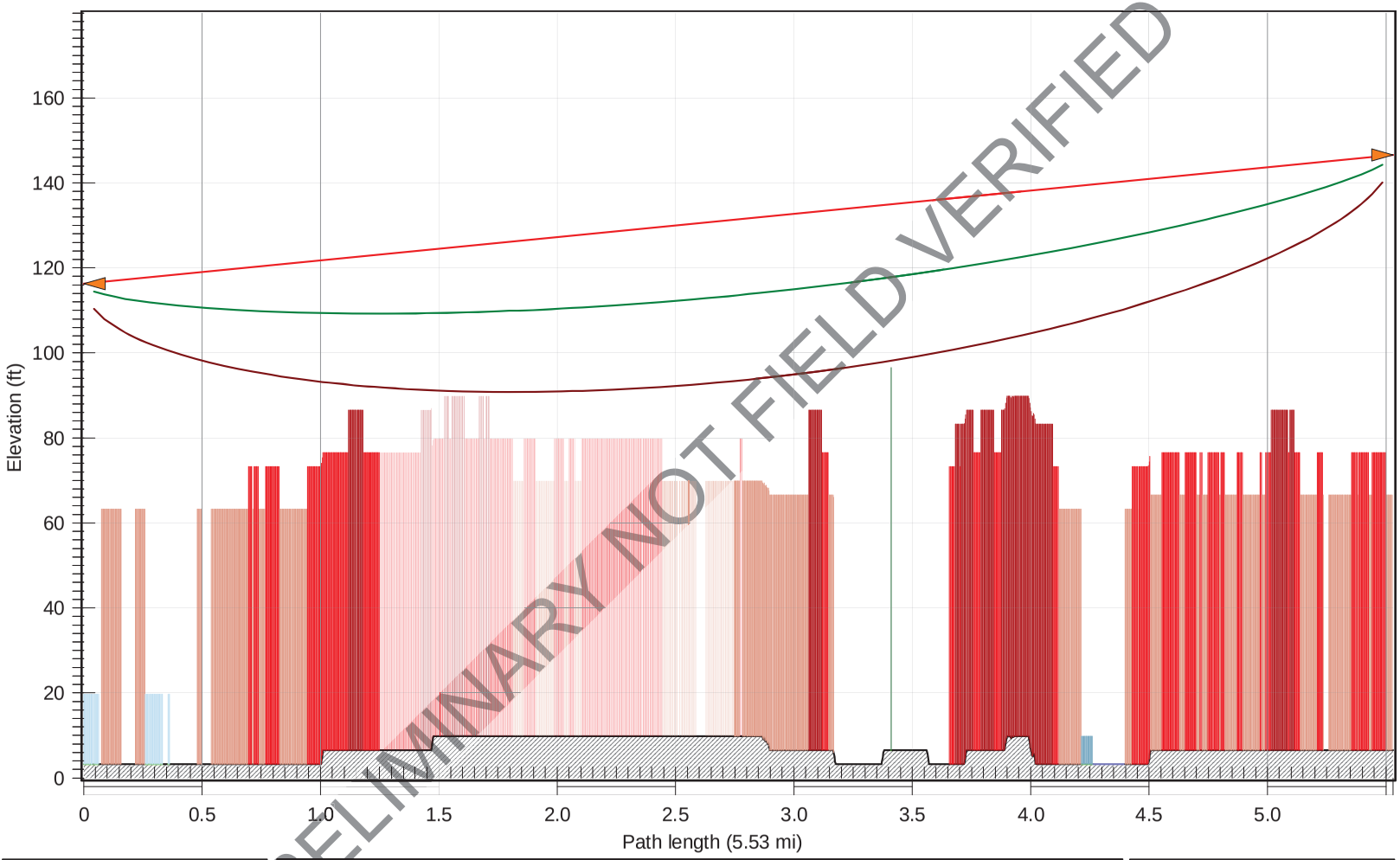


PRELIMINARY NOT FIELD VERIFIED

Point of America	
Latitude	26 05 46.00 N
Longitude	080 06 26.00 W
Azimuth	197.52°
Elevation	3 ft ASL
Antenna CL	250.0 ft AGL

Frequency (MHz) = 6175.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00

West Lake Park	
Latitude	26 01 57.90 N
Longitude	080 07 45.70 W
Azimuth	17.51°
Elevation	3 ft ASL
Antenna CL	90.0 ft AGL

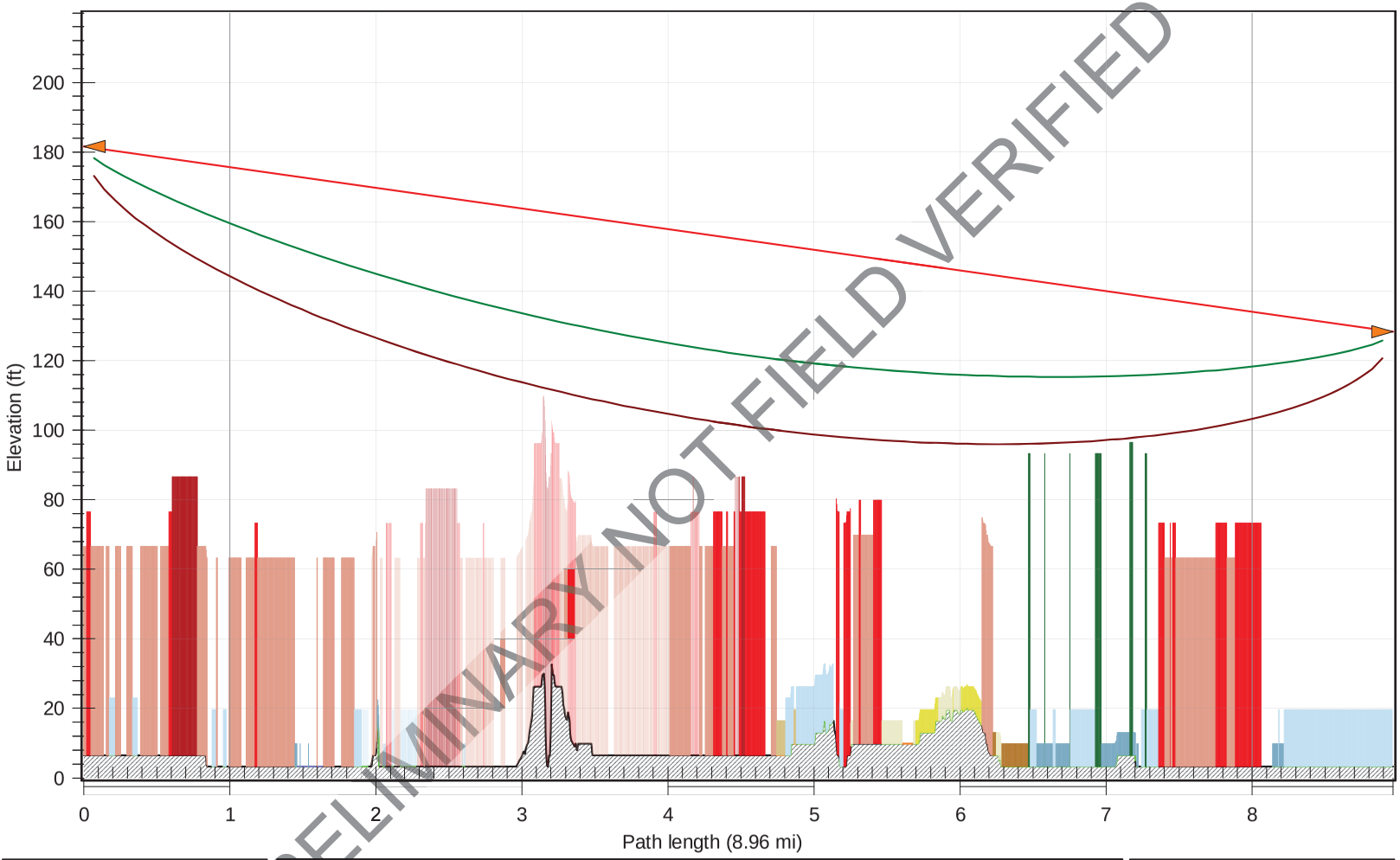


PRELIMINARY NOT FIELD VERIFIED

West Lake Park	
Latitude	26 01 57.90 N
Longitude	080 07 45.70 W
Azimuth	228.96°
Elevation	3 ft ASL
Antenna CL	113.0 ft AGL

Frequency (MHz) = 6175.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00

Channel 2	
Latitude	25 58 48.00 N
Longitude	080 11 47.00 W
Azimuth	48.93°
Elevation	7 ft ASL
Antenna CL	140.0 ft AGL

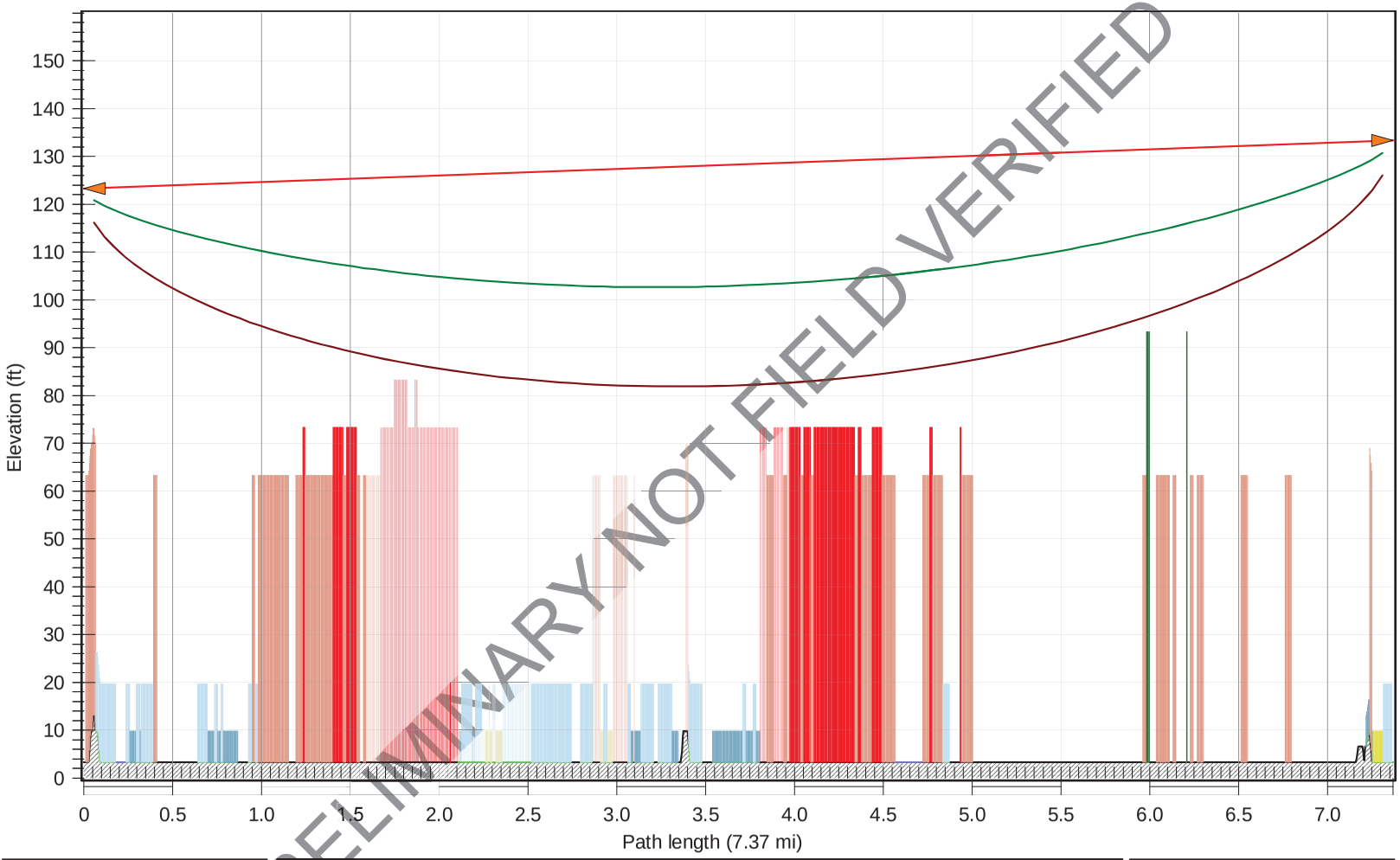


PRELIMINARY NOT FIELD VERIFIED

Channel 2	
Latitude	25 58 48.00 N
Longitude	080 11 47.00 W
Azimuth	260.54°
Elevation	7 ft ASL
Antenna CL	175.0 ft AGL

Frequency (MHz) = 6175.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00

Miramar	
Latitude	25 57 30.70 N
Longitude	080 20 18.50 W
Azimuth	80.48°
Elevation	3 ft ASL
Antenna CL	125.0 ft AGL

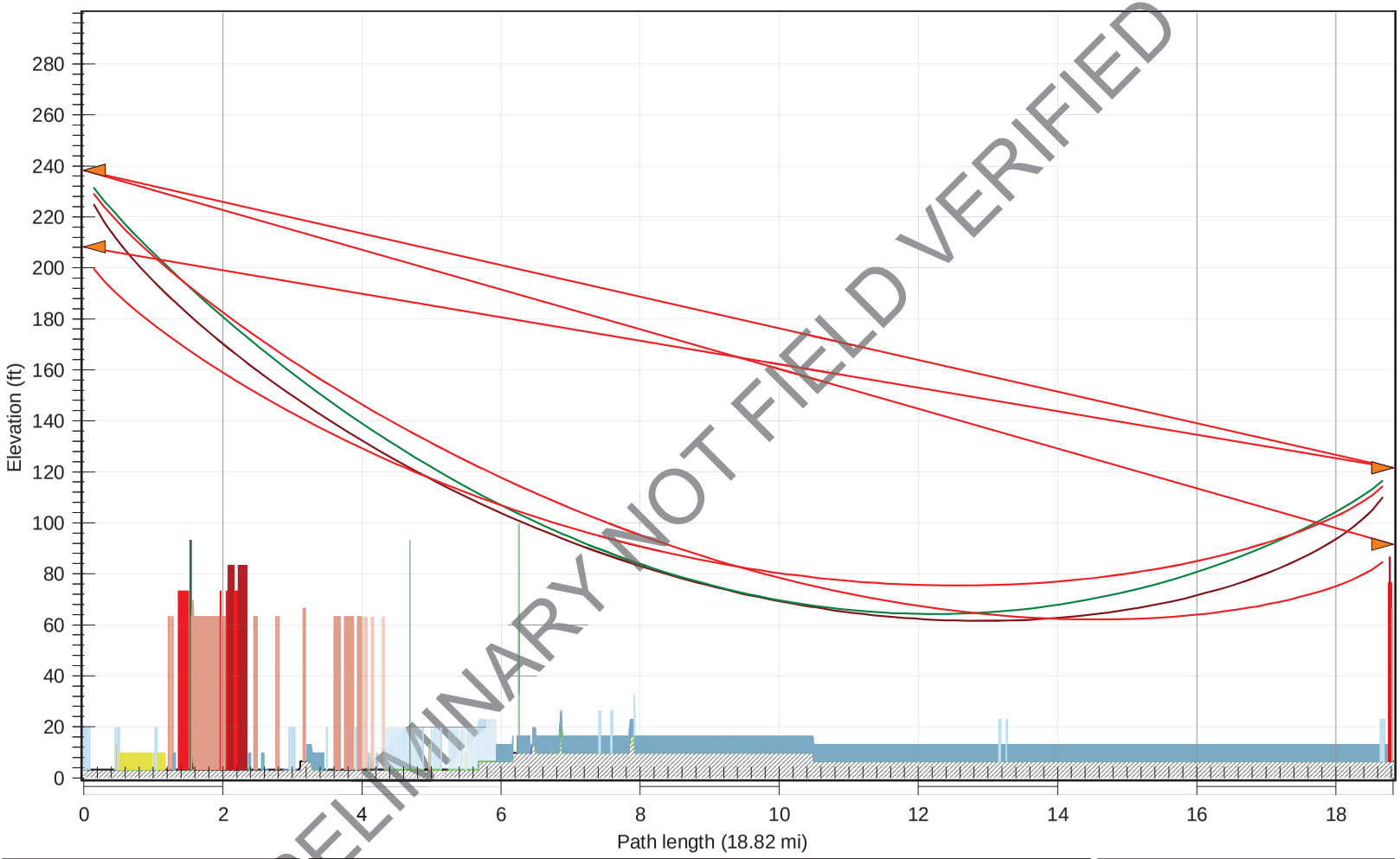


PRELIMINARY NOT FIELD VERIFIED

Miramar	
Latitude	25 57 30.70 N
Longitude	080 20 18.50 W
Azimuth	0.07°
Elevation	3 ft ASL
Antenna CL	120.0 ft AGL

Frequency (MHz) = 6175.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00

Davie	
Latitude	26 03 56.00 N
Longitude	080 20 18.00 W
Azimuth	180.07°
Elevation	3 ft ASL
Antenna CL	130.0 ft AGL

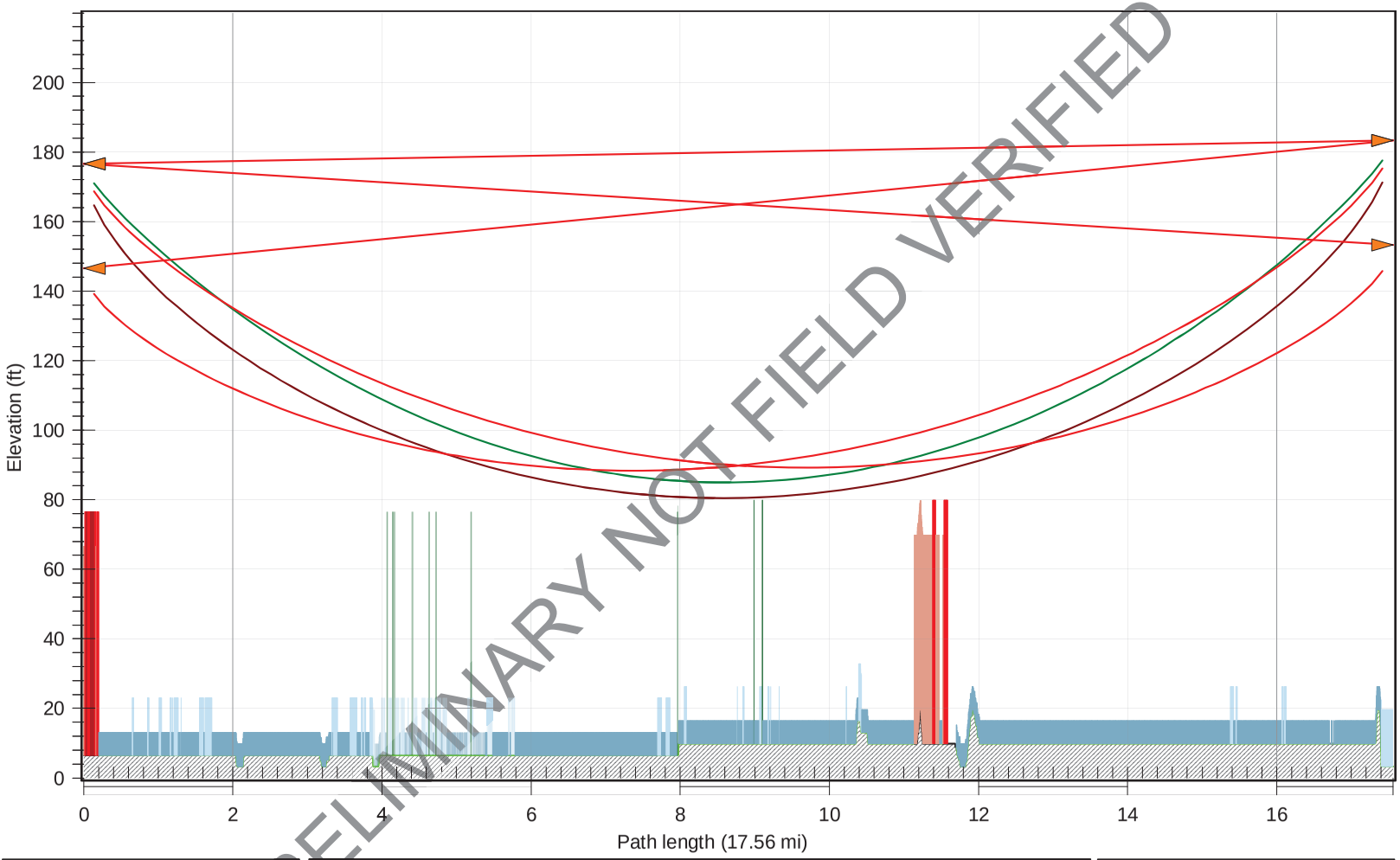


PRELIMINARY NOT FIELD VERIFIED

Davie	
Latitude	26 03 56.00 N
Longitude	080 20 18.00 W
Azimuth	286.96°
Elevation	3 ft ASL
Antenna CL	235.0, 205.0 ft AGL

Frequency (MHz) = 6175.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00
Divr 1 K = 1.330 %F1 = 60.00

BC Station 106	
Latitude	26 08 42.00 N
Longitude	080 37 41.00 W
Azimuth	106.83°
Elevation	7 ft ASL
Antenna CL	115.0, 85.0 ft AGL

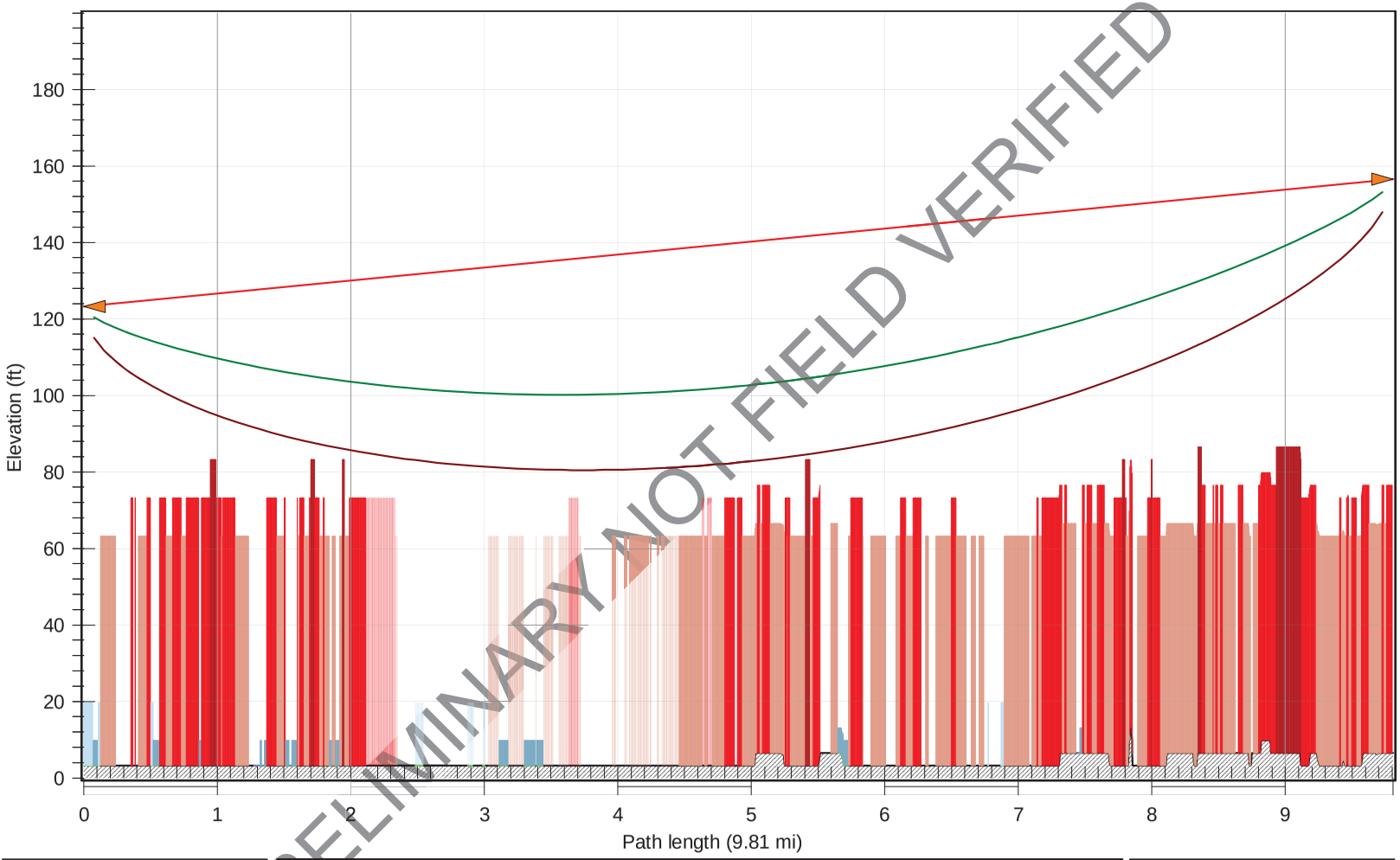


PRELIMINARY NOT FIELD VERIFIED

BC Station 106	
Latitude	26 08 42.00 N
Longitude	080 37 41.00 W
Azimuth	89.87°
Elevation	7 ft ASL
Antenna CL	170.0, 140.0 ft AGL

Frequency (MHz) = 6175.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00
Divr 1 K = 1.330 %F1 = 60.00

Markham Park	
Latitude	26 08 43.10 N
Longitude	080 20 43.80 W
Azimuth	269.99°
Elevation	3 ft ASL
Antenna CL	180.0, 150.0 ft AGL

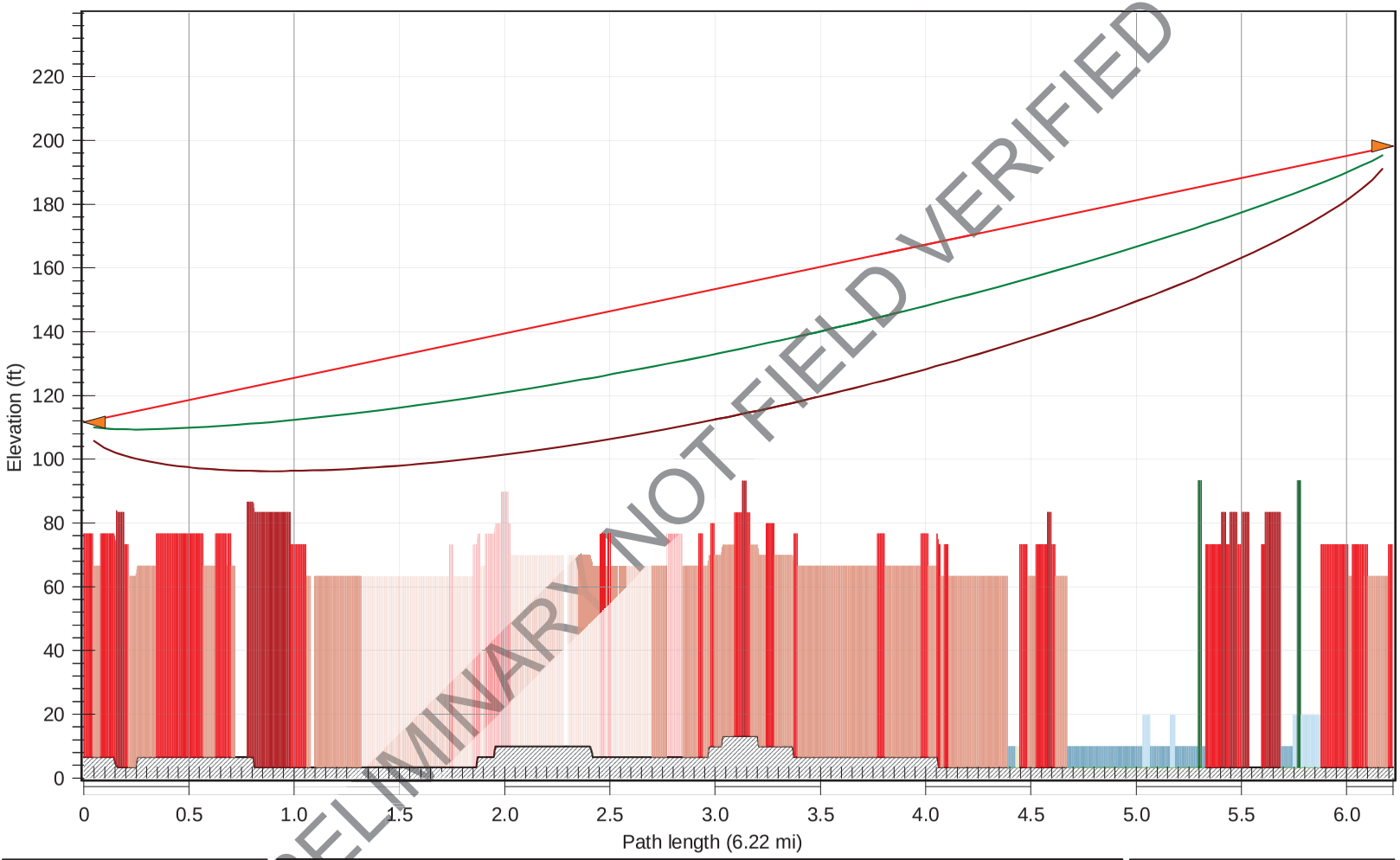


PRELIMINARY NOT FIELD VERIFIED

Markham Park	
Latitude	26 08 43.10 N
Longitude	080 20 43.80 W
Azimuth	88.08°
Elevation	3 ft ASL
Antenna CL	120.0 ft AGL

Frequency (MHz) = 6175.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00

Core	
Latitude	26 09 00.00 N
Longitude	080 11 16.00 W
Azimuth	268.15°
Elevation	7 ft ASL
Antenna CL	150.0 ft AGL

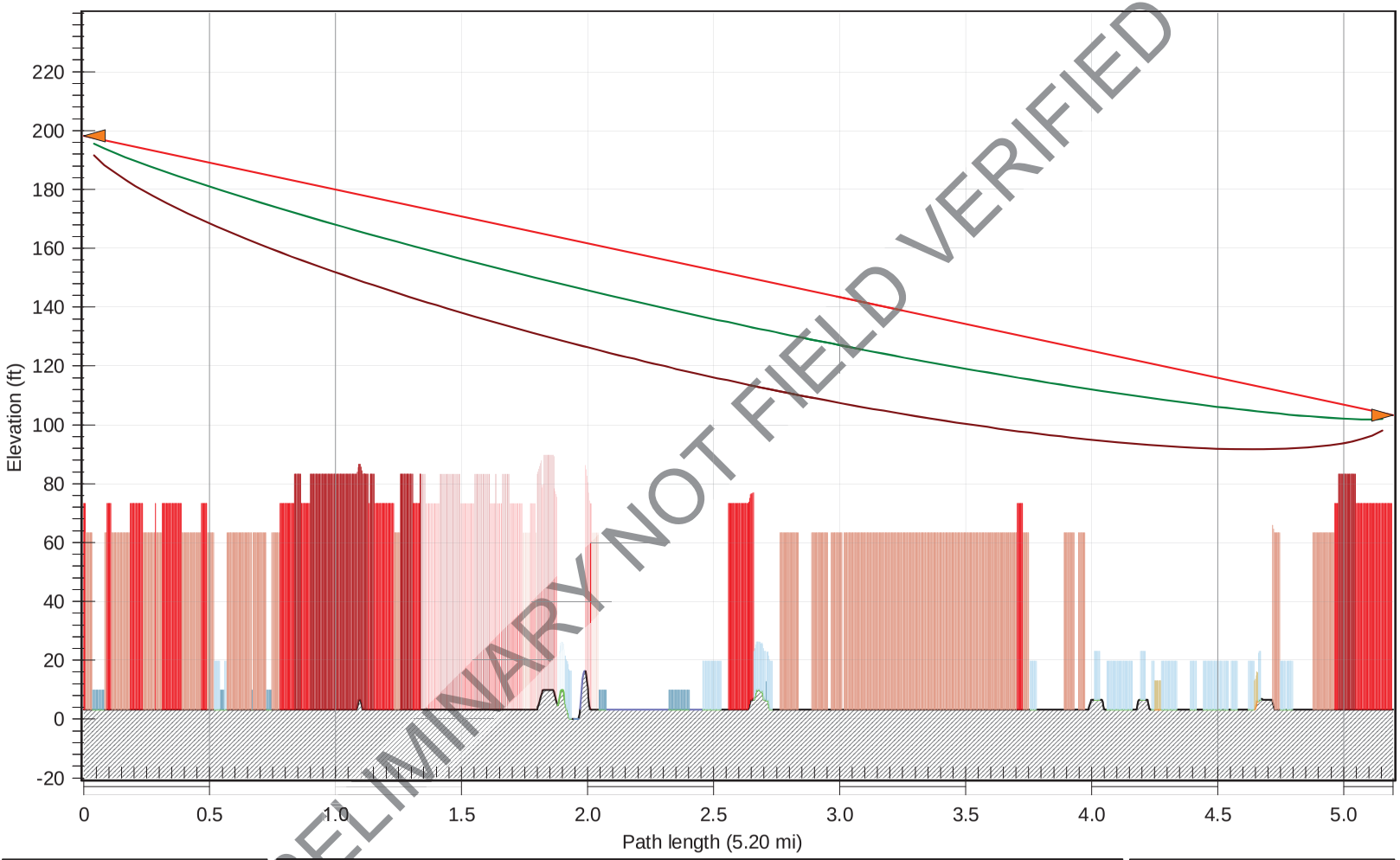


PRELIMINARY NOT FIELD VERIFIED

Core	
Latitude	26 09 00.00 N
Longitude	080 11 16.00 W
Azimuth	187.02°
Elevation	7 ft ASL
Antenna CL	105.0 ft AGL

Frequency (MHz) = 6175.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00

West Hollywood	
Latitude	26 03 37.20 N
Longitude	080 12 00.00 W
Azimuth	7.01°
Elevation	3 ft ASL
Antenna CL	195.0 ft AGL

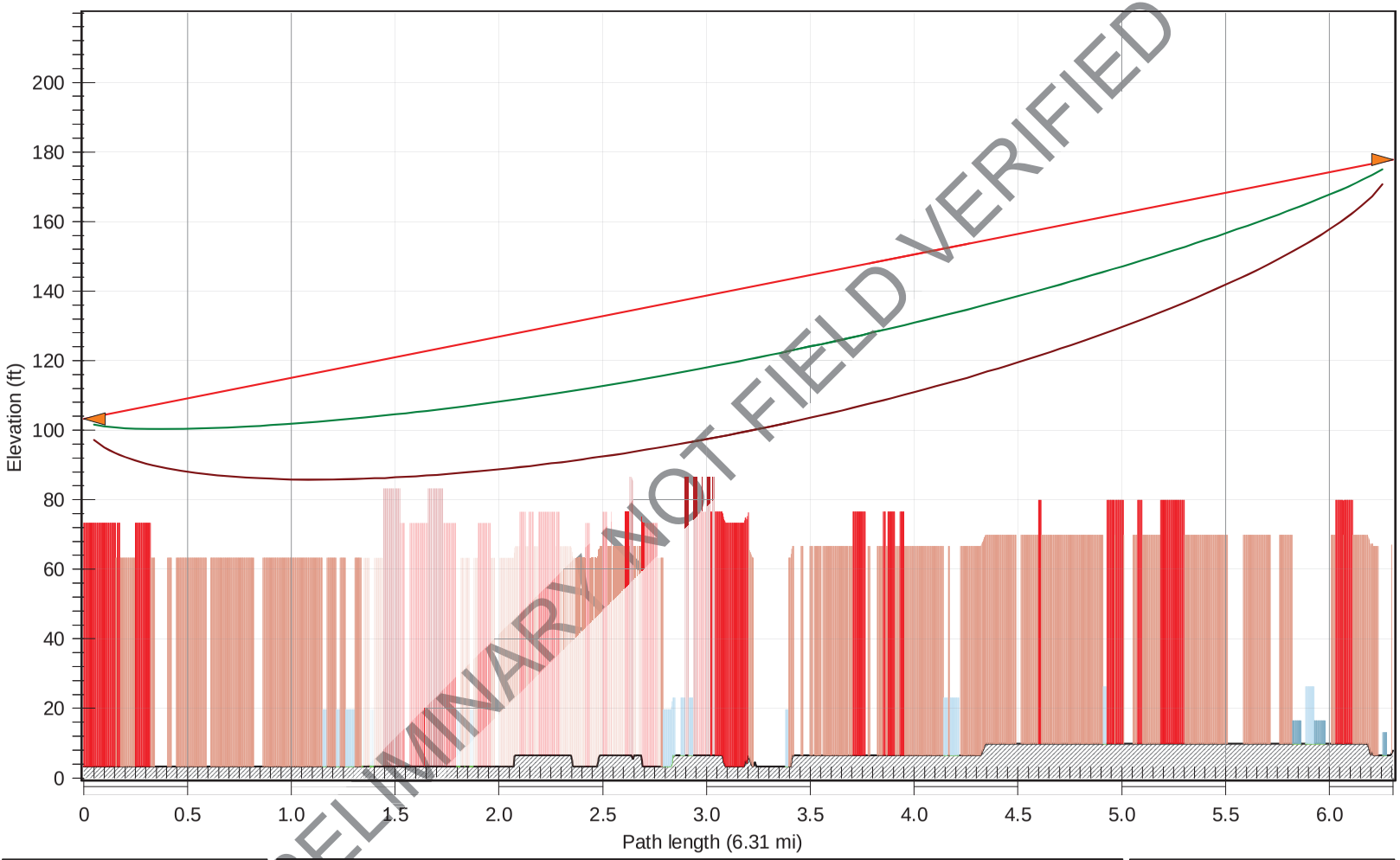


PRELIMINARY NOT FIELD VERIFIED

West Hollywood	
Latitude	26 03 37.20 N
Longitude	080 12 00.00 W
Azimuth	327.18°
Elevation	3 ft ASL
Antenna CL	195.0 ft AGL

Frequency (MHz) = 6175.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00

EOC	
Latitude	26 07 25.50 N
Longitude	080 14 43.10 W
Azimuth	147.16°
Elevation	3 ft ASL
Antenna CL	100.0 ft AGL

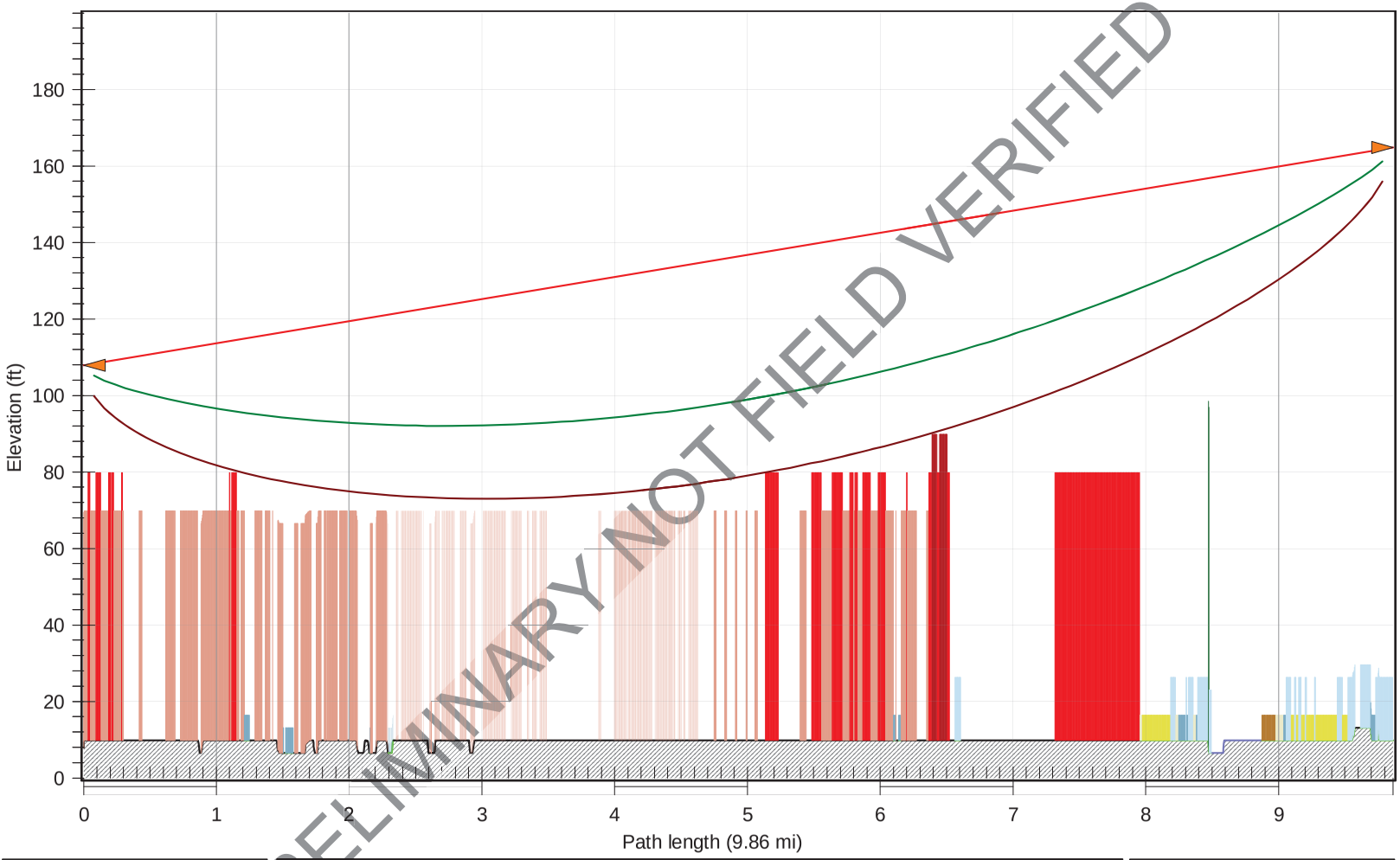


PRELIMINARY NOT FIELD VERIFIED

EOC	
Latitude	26 07 25.50 N
Longitude	080 14 43.10 W
Azimuth	344.55°
Elevation	3 ft ASL
Antenna CL	100.0 ft AGL

Frequency (MHz) = 6175.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00

Tamarac	
Latitude	26 12 43.30 N
Longitude	080 16 20.50 W
Azimuth	164.53°
Elevation	8 ft ASL
Antenna CL	170.0 ft AGL

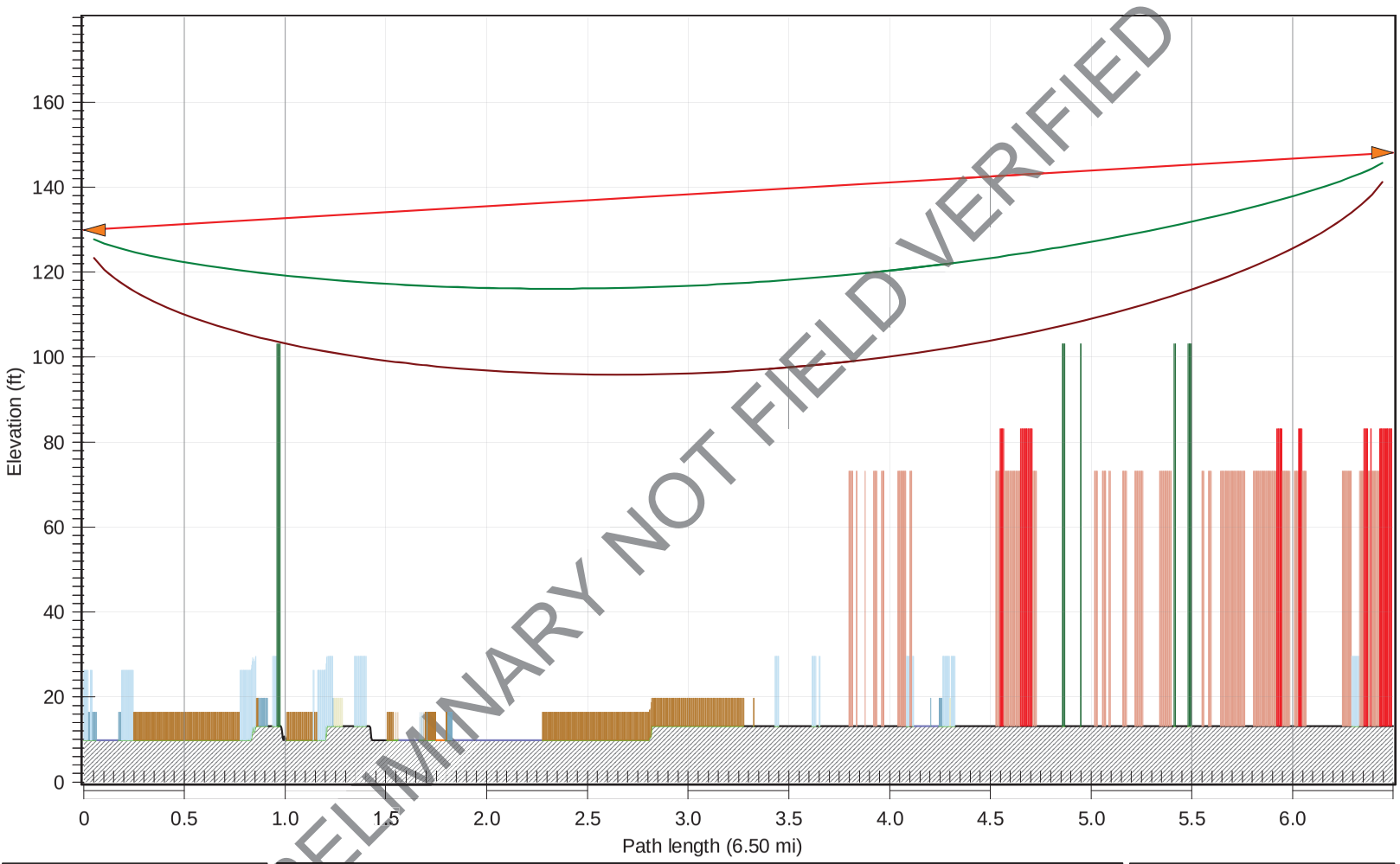


PRELIMINARY NOT FIELD VERIFIED

Tamarac	
Latitude	26 12 43.30 N
Longitude	080 16 20.50 W
Azimuth	356.12°
Elevation	8 ft ASL
Antenna CL	100.0 ft AGL

Frequency (MHz) = 6175.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00

Parkland	
Latitude	26 21 17.80 N
Longitude	080 16 59.20 W
Azimuth	176.12°
Elevation	10 ft ASL
Antenna CL	155.0 ft AGL

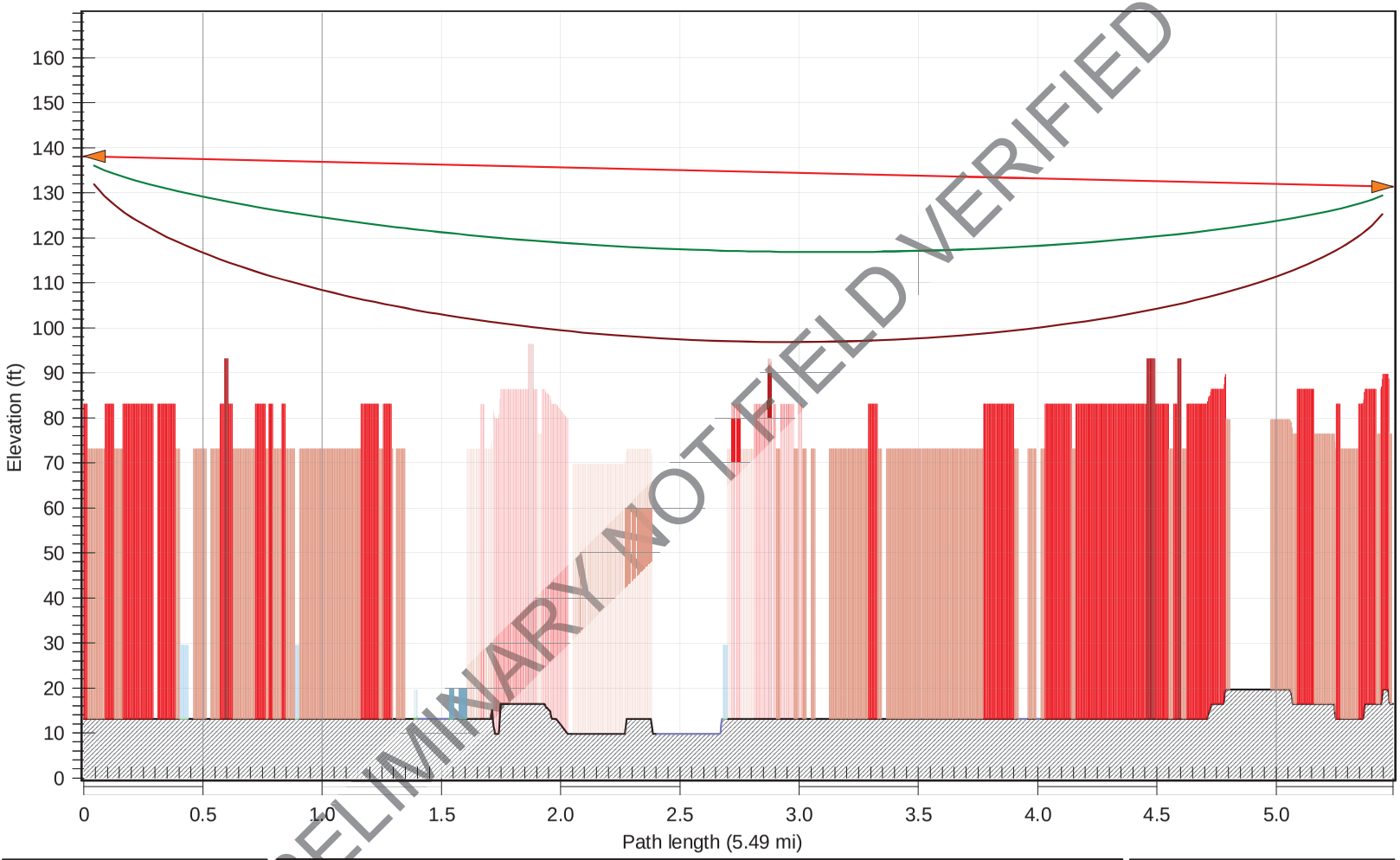


PRELIMINARY NOT FIELD VERIFIED

Parkland	
Latitude	26 21 17.80 N
Longitude	080 16 59.20 W
Azimuth	123.54°
Elevation	10 ft ASL
Antenna CL	120.0 ft AGL

Frequency (MHz) = 6175.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00

Coconut Creek	
Latitude	26 18 10.00 N
Longitude	080 11 45.00 W
Azimuth	303.58°
Elevation	13 ft ASL
Antenna CL	135.0 ft AGL

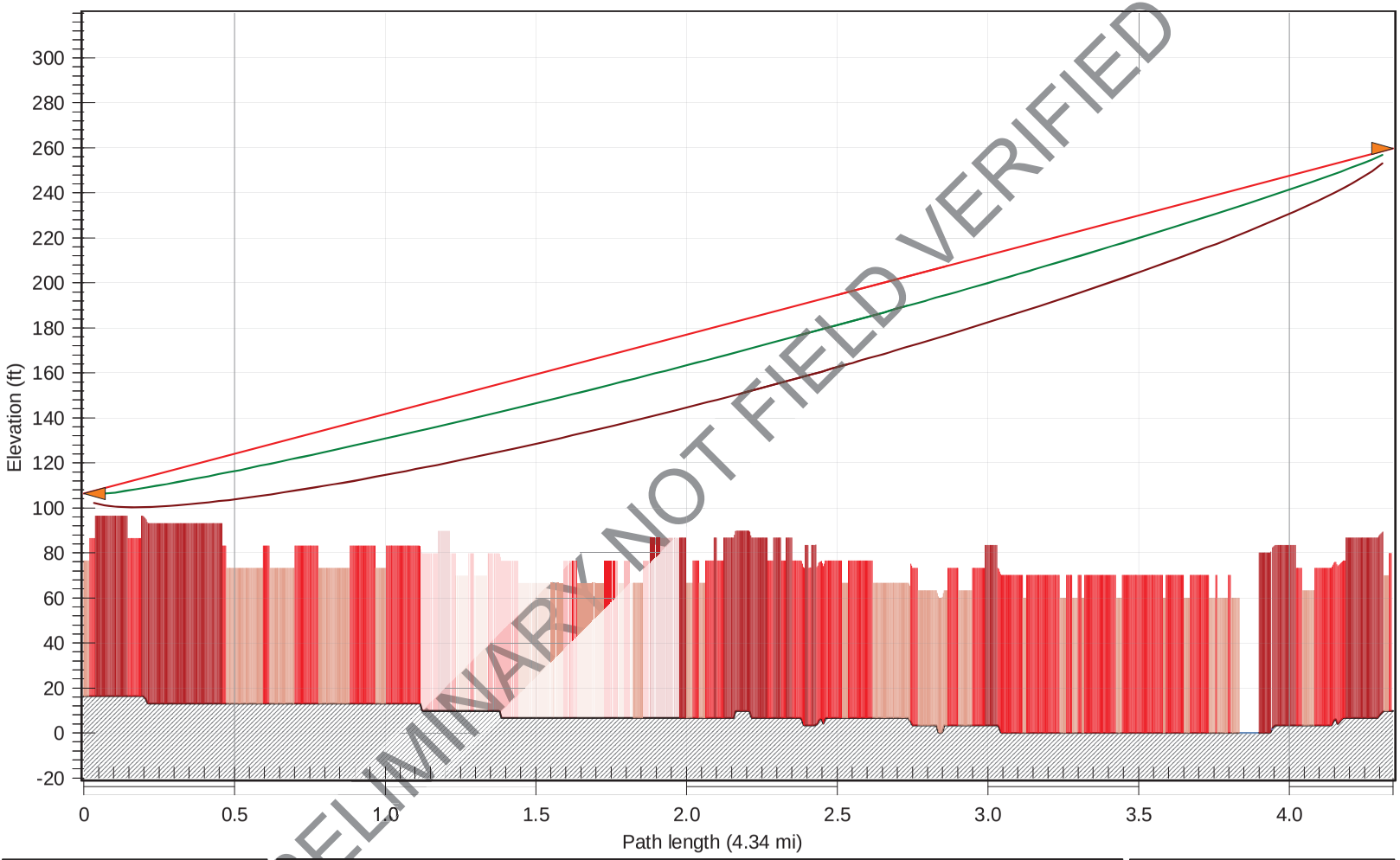


PRELIMINARY NOT FIELD VERIFIED

Coconut Creek	
Latitude	26 18 10.00 N
Longitude	080 11 45.00 W
Azimuth	97.67°
Elevation	13 ft ASL
Antenna CL	125.0 ft AGL

Frequency (MHz) = 6175.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00

Deerfield	
Latitude	26 17 31.60 N
Longitude	080 06 29.40 W
Azimuth	277.71°
Elevation	16 ft ASL
Antenna CL	115.0 ft AGL

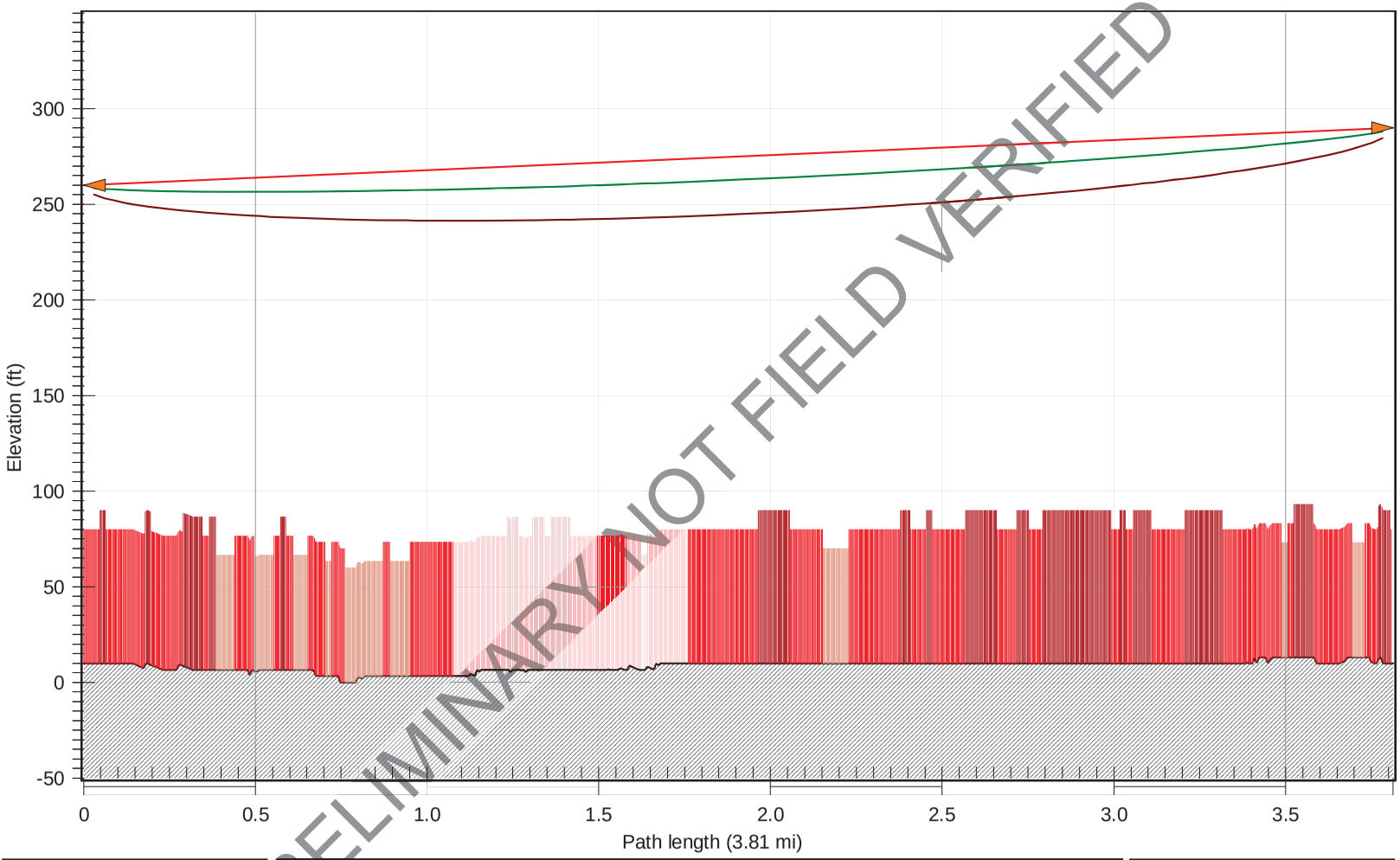


PRELIMINARY NOT FIELD VERIFIED

Deerfield	
Latitude	26 17 31.60 N
Longitude	080 06 29.40 W
Azimuth	165.28°
Elevation	16 ft ASL
Antenna CL	90.0 ft AGL

Frequency (MHz) = 6175.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00

Pompano Beach	
Latitude	26 13 51.90 N
Longitude	080 05 25.40 W
Azimuth	345.29°
Elevation	10 ft ASL
Antenna CL	250.0 ft AGL

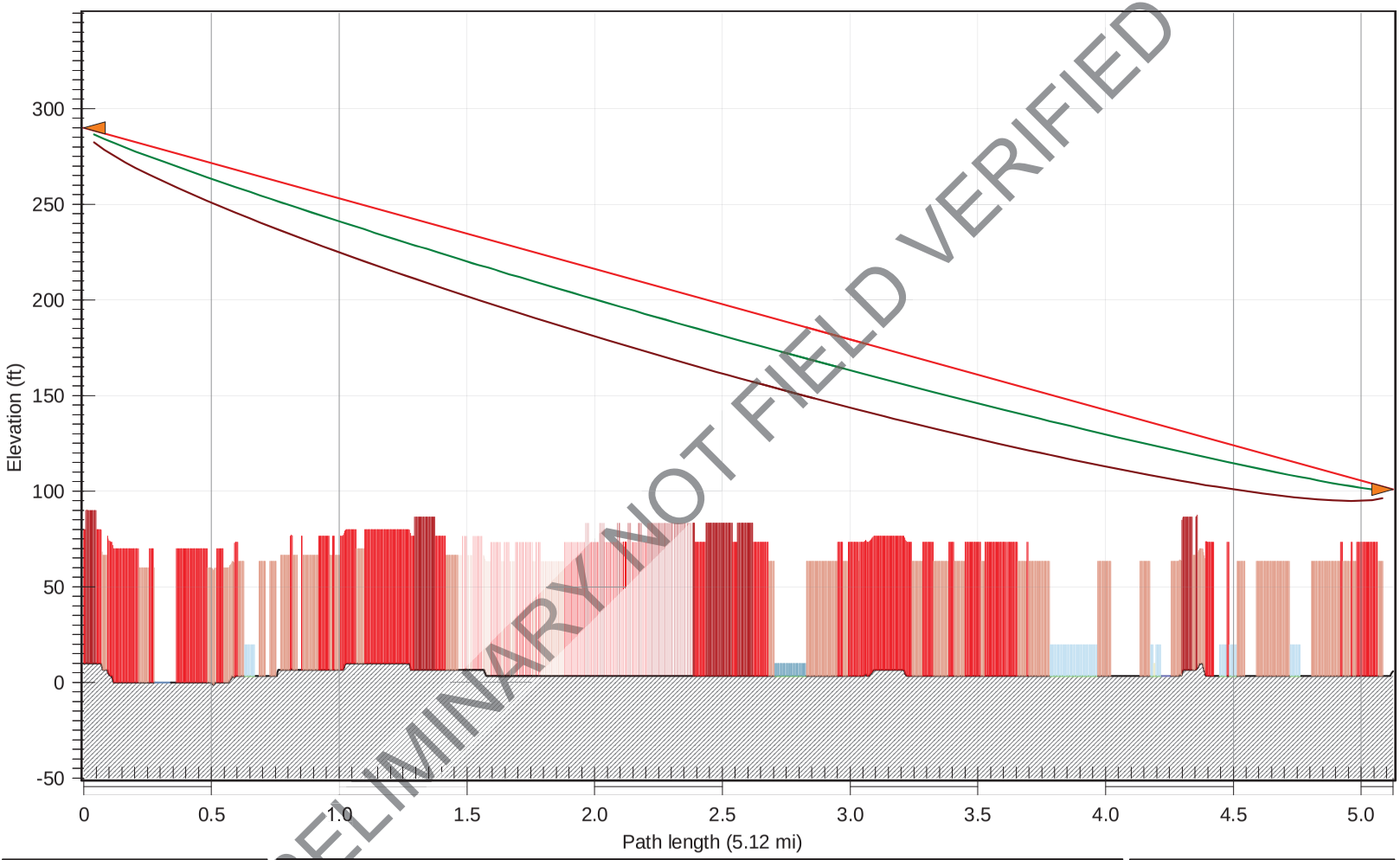


PRELIMINARY NOT FIELD VERIFIED

Pompano Beach	
Latitude	26 13 51.90 N
Longitude	080 05 25.40 W
Azimuth	187.62°
Elevation	10 ft ASL
Antenna CL	250.0 ft AGL

Frequency (MHz) = 6175.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00

Playa	
Latitude	26 10 34.30 N
Longitude	080 05 54.70 W
Azimuth	7.62°
Elevation	10 ft ASL
Antenna CL	280.0 ft AGL



PRELIMINARY NOT FIELD VERIFIED

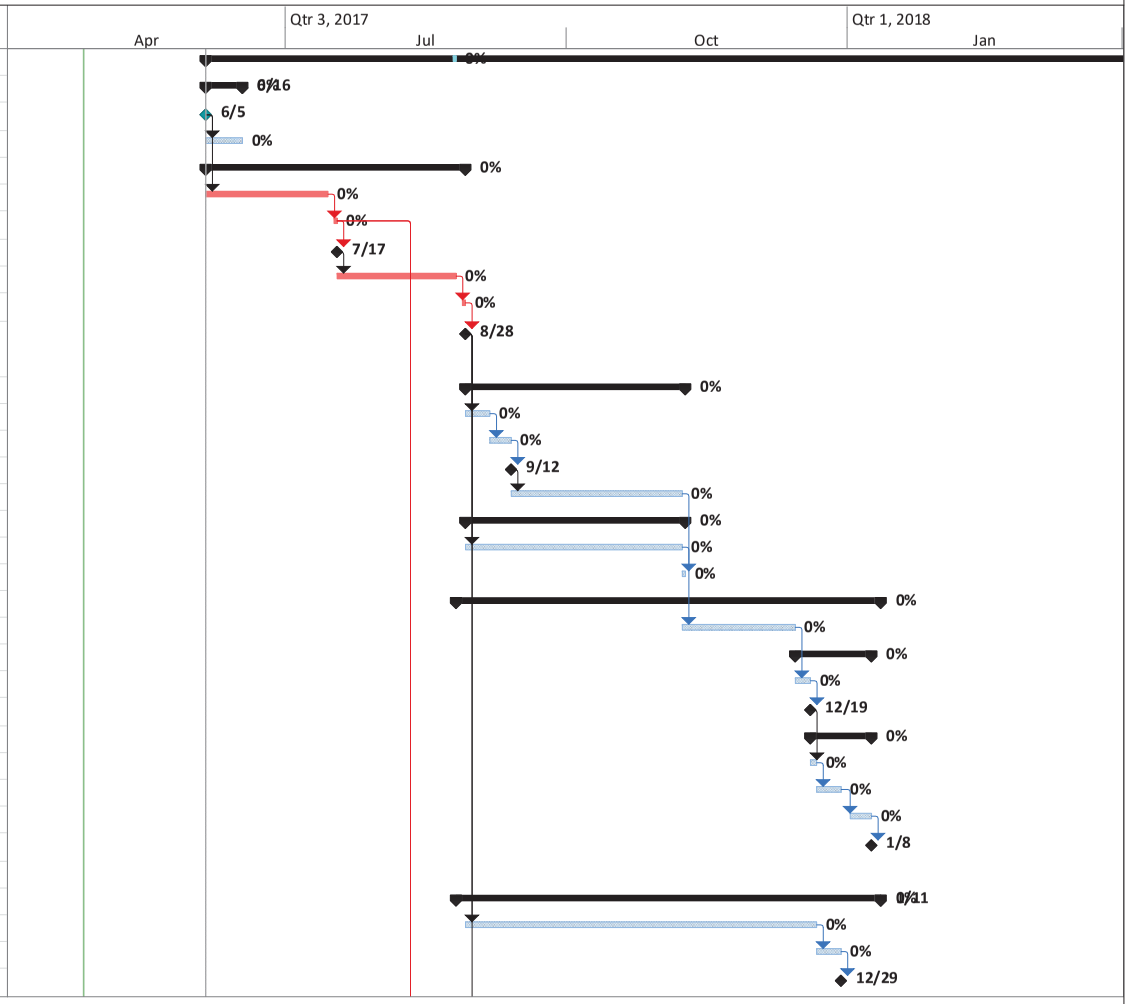
Playa	
Latitude	26 10 34.30 N
Longitude	080 05 54.70 W
Azimuth	252.58°
Elevation	10 ft ASL
Antenna CL	280.0 ft AGL

Frequency (MHz) = 6175.0
Main 1 K = 1.330 %F1 = 100.00
Main 2 K = 0.670 %F1 = 30.00

EMS	
Latitude	26 09 14.00 N
Longitude	080 10 38.00 W
Azimuth	72.55°
Elevation	6 ft ASL
Antenna CL	95.0 ft AGL

Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
1	**Broward County, FL - Preliminary Project Schedule**	**398 days**	**Mon 6/5/17**	**Mon 12/31/18**
2	**Contract**	**10 days**	**Mon 6/5/17**	**Fri 6/16/17**
3	**Contract Award**	0 days	Mon 6/5/17	Mon 6/5/17
4	Log Contract into Motorola Financial Systems	10 days	Mon 6/5/17	Fri 6/16/17
5	**Contract Design Review**	**60 days**	**Mon 6/5/17**	**Mon 8/28/17**
6	Prepare Preliminary Design Review	29 days	Mon 6/5/17	Fri 7/14/17
7	**Preliminary Design Review**	1 day	Mon 7/17/17	Mon 7/17/17
8	Customer Preliminary Design Approval	0 days	Mon 7/17/17	Mon 7/17/17
9	Update Design Documentation	29 days	Tue 7/18/17	Fri 8/25/17
10	**Final Design Review**	**1 day**	**Mon 8/28/17**	**Mon 8/28/17**
11	**Customer Final Design Approval (NTP for Implementation)**	0 days	Mon 8/28/17	Mon 8/28/17
12	**Order Processing**	**51 days**	**Tue 8/29/17**	**Wed 11/8/17**
13	Finalize Equipment Lists and Trial Validation	5 days	Tue 8/29/17	Tue 9/5/17
14	Order Administration and Shipping Information	5 days	Wed 9/6/17	Tue 9/12/17
15	Order Bridged	0 days	Tue 9/12/17	Tue 9/12/17
16	Manufacture Equipment	40 days	Wed 9/13/17	Tue 11/7/17
17	**Microwave Manufacturing**	**51 days**	**Tue 8/29/17**	**Wed 11/8/17**
18	Order and Manufacture Equipment	50 days	Tue 8/29/17	Tue 11/7/17
19	Send Microwave Equipment to CCSi for Staging	1 day	Wed 11/8/17	Wed 11/8/17
20	**CCSi System Staging**	**94 days**	**Fri 8/25/17**	**Thu 1/11/18**
21	CCSi Factory Staging	25 days	Wed 11/8/17	Thu 12/14/17
22	**Staging ATP**	**15 days**	**Fri 12/15/17**	**Mon 1/8/18**
23	Staging Acceptance ATP	3 days	Fri 12/15/17	Tue 12/19/17
24	**Customer Approval of Staging ATP**	0 days	Tue 12/19/17	Tue 12/19/17
25	**Ship Staged Equipment to Approved Project Wareh**	**12 days**	**Wed 12/20/17**	**Mon 1/8/18**
26	Equipment received in approved project warehous	2 days	Wed 12/20/17	Thu 12/21/17
27	Equipment Inventoried and grouped by site	5 days	Fri 12/22/17	Fri 12/29/17
28	Equipment Asset Tagging	5 days	Tue 1/2/18	Mon 1/8/18
29	**Equipment ready for shipment to sites**	0 days	Mon 1/8/18	Mon 1/8/18
30				
31	**Agency Subscriber Radios**	**94 days**	**Fri 8/25/17**	**Thu 1/11/18**
32	Manufacture Subscriber Radios	80 days	Tue 8/29/17	Thu 12/21/17
33	Deliver Subscriber Radios	5 days	Fri 12/22/17	Fri 12/29/17
34	**Subscriber Radios Delivered (Milestone)**	0 days	Fri 12/29/17	Fri 12/29/17

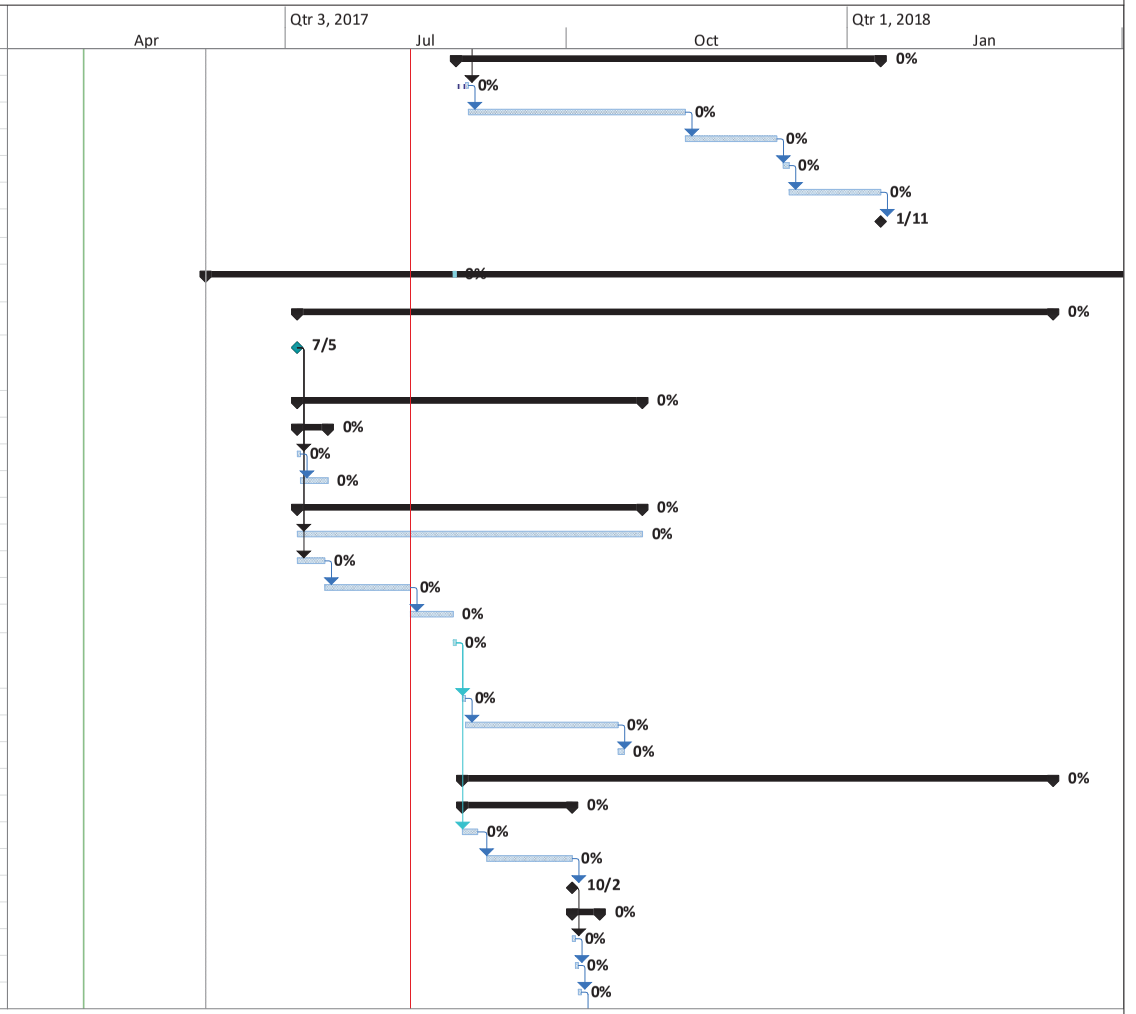


Yel- BC NTP Required
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pur- delay to sequence subs

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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
35	**Fleet mapping**	**94 days**	**Fri 8/25/17**	**Thu 1/11/18**
36	Initial Fleet Mapping Meeting	1 day	Fri 8/25/17	Tue 8/29/17
37	Customer Develops Initial Fleet map Configuration	50 days	Wed 8/30/17	Wed 11/8/17
38	Final Fleet map Configurations	20 days	Thu 11/9/17	Fri 12/8/17
39	COUNTY Approval of Fleet Map	2 days	Mon 12/11/17	Tue 12/12/17
40	Develop Programming Templates	20 days	Wed 12/13/17	Thu 1/11/18
41	**Fleet Map Complete (Milestone)**	0 days	Thu 1/11/18	Thu 1/11/18
42				
43	**SITE CONSTRUCTION**	**398 days**	**Mon 6/5/17**	**Mon 12/31/18**
44	**CORE SITE DEVELOPMENT**	**171.5 days**	**Wed 7/5/17**	**Fri 3/9/18**
45	Broward County Provides NTP for Pre Construction Phase	0 days	Wed 7/5/17	Wed 7/5/17
46	**PRE CONSTRUCTION PHASE**	**80 days**	**Wed 7/5/17**	**Wed 10/25/17**
47	**SITE ENGINEERING**	**8 days**	**Wed 7/5/17**	**Fri 7/14/17**
48	Tower Mapping (if tower dwgs unavailable)	1 day	Wed 7/5/17	Wed 7/5/17
49	Structural Analysis of antenna structure	7 days	Thu 7/6/17	Fri 7/14/17
50	**PERMITTING DOCUMENTATION AND FINAL DRAV**	**80 days**	**Wed 7/5/17**	**Wed 10/25/17**
51	NEPA/SHPO studies and approvals	80 days	Wed 7/5/17	Wed 10/25/17
52	Site Survey and mapping	7 days	Wed 7/5/17	Thu 7/13/17
53	Prepare Construction Drawings	20 days	Fri 7/14/17	Thu 8/10/17
54	**Construction Drawings Review and Approv**	10 days	Fri 8/11/17	Thu 8/24/17
55	**Broward County Site release/ Construction NTP to Contractor**	1 day	Fri 8/25/17	Fri 8/25/17
56	Place Order for New Shelter	1 day	Mon 8/28/17	Mon 8/28/17
57	Manufacture Shelter	35 days	Tue 8/29/17	Tue 10/17/17
58	Ship Shelter to Site	2 days	Wed 10/18/17	Thu 10/19/17
59	**CONSTRUCTION PHASE**	**133.5 days**	**Mon 8/28/17**	**Fri 3/9/18**
60	**Construction Permits**	**25 days**	**Mon 8/28/17**	**Mon 10/2/17**
61	Prepare and Submit Permit Package	5 days	Mon 8/28/17	Fri 9/1/17
62	Permit Review and Approval Process	20 days	Tue 9/5/17	Mon 10/2/17
63	Construction Permits Approved and Received	0 days	Mon 10/2/17	Mon 10/2/17
64	**SITE PREPARATION**	**7 days**	**Tue 10/3/17**	**Wed 10/11/17**
65	Mobilization	1 day	Tue 10/3/17	Tue 10/3/17
66	Locate existing utilities	1 day	Wed 10/4/17	Wed 10/4/17
67	Light clearing and grubbing	1 day	Thu 10/5/17	Thu 10/5/17

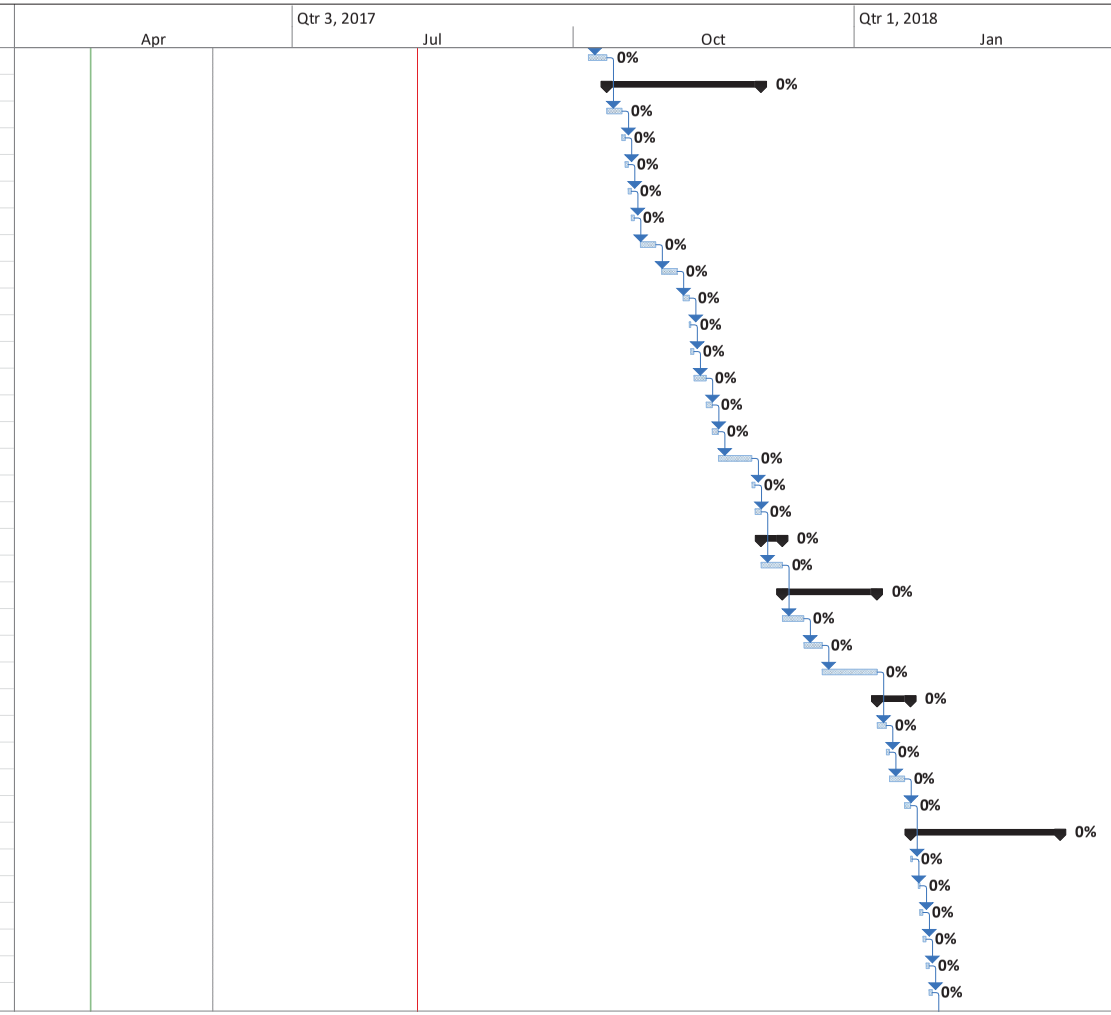


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
68	Compound grading and silt fencing	4 days	Fri 10/6/17	Wed 10/11/17
69	**SITE COMPONENTS INSTALLATION**	**34.5 days**	**Thu 10/12/17**	**Fri 12/1/17**
70	Excavate, form and rebar shelter foundations	3 days	Thu 10/12/17	Mon 10/16/17
71	Excavate, form and rebar fuel tank foundation	1 day	Tue 10/17/17	Tue 10/17/17
72	Excavate, form and rebar generator foundations	1 day	Wed 10/18/17	Wed 10/18/17
73	Foundation inspection, concrete pour and testir	1 day	Thu 10/19/17	Thu 10/19/17
74	Receive Shelter On Site	1 day	Fri 10/20/17	Fri 10/20/17
75	Offload and Install equipment shelter	5 days	Mon 10/23/17	Fri 10/27/17
76	Trench and Install underground power conduits	5 days	Mon 10/30/17	Fri 11/3/17
77	Trench and install grounding	2 days	Mon 11/6/17	Tue 11/7/17
78	Grounding Inspection	0.5 days	Wed 11/8/17	Wed 11/8/17
79	Conduit inspection and backfill	1 day	Wed 11/8/17	Thu 11/9/17
80	Install fuel tank and piping	2 days	Thu 11/9/17	Mon 11/13/17
81	Piping inspection, leakage test and trench backil	2 days	Mon 11/13/17	Wed 11/15/17
82	Pick up meter panel and Install meterboard	2 days	Wed 11/15/17	Fri 11/17/17
83	Utility hookup to the site by Electric Co.	5 days	Fri 11/17/17	Tue 11/28/17
84	Building/Electrical inspection	1 day	Tue 11/28/17	Wed 11/29/17
85	Install ice bridge from shelter to the tower	2 days	Wed 11/29/17	Fri 12/1/17
86	**EXISTING FACILITY IMPROVEMENTS**	**5 days**	**Fri 12/1/17**	**Fri 12/8/17**
87	Install DC Power System	5 days	Fri 12/1/17	Fri 12/8/17
88	**TOWER WORK**	**19 days**	**Fri 12/8/17**	**Mon 1/8/18**
89	Ship antennas, line and accessories to the site	5 days	Fri 12/8/17	Fri 12/15/17
90	Install antennas, microwave dishes and lines	4 days	Fri 12/15/17	Thu 12/21/17
91	Complete Independent Tower Inspection & Rep	10 days	Thu 12/21/17	Mon 1/8/18
92	**SITE RESTORATION**	**8 days**	**Mon 1/8/18**	**Fri 1/19/18**
93	Fencing of tower compound	3 days	Mon 1/8/18	Thu 1/11/18
94	Complete grounding connections	1 day	Thu 1/11/18	Fri 1/12/18
95	Finish Grade and gravel compound	2 days	Fri 1/12/18	Wed 1/17/18
96	Site touchup and restoration	2 days	Wed 1/17/18	Fri 1/19/18
97	**FINAL TESTING**	**35 days**	**Fri 1/19/18**	**Fri 3/9/18**
98	Line termination and Sweep test	0.5 days	Fri 1/19/18	Fri 1/19/18
99	Grounding test of the site	0.5 days	Mon 1/22/18	Mon 1/22/18
100	DC Power System Startup and Test	1 day	Mon 1/22/18	Tue 1/23/18
101	Generator Startup and Test	1 day	Tue 1/23/18	Wed 1/24/18
102	Test Fire Supression System	1 day	Wed 1/24/18	Thu 1/25/18
103	**R56 Site Audit/Punch List with Broward Co**	1 day	Thu 1/25/18	Fri 1/26/18

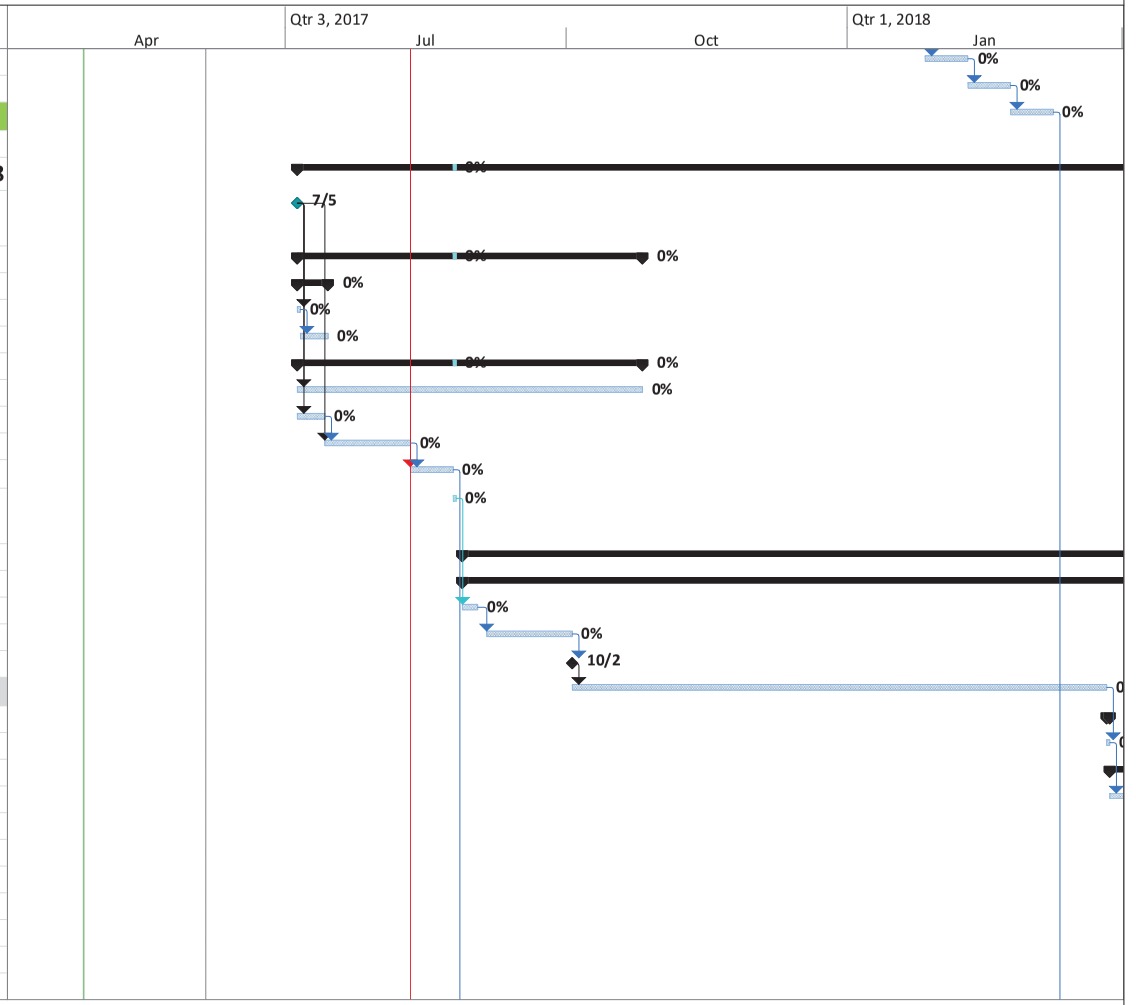


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
104	Punch List completion	10 days	Fri 1/26/18	Fri 2/9/18
105	Complete Civil As-Built Drawings	10 days	Fri 2/9/18	Fri 2/23/18
106	**Site Civil Work Substantial Completion**	**10 days**	**Fri 2/23/18**	**Fri 3/9/18**
107				
108	**COCONUT CREEK SITE DEVELOPMENT**	**242 days**	**Wed 7/5/17**	**Mon 6/18/18**
109	Broward County Provides NTP for Pre Construction Phase	0 days	Wed 7/5/17	Wed 7/5/17
110	**PRE CONSTRUCTION PHASE**	**80 days**	**Wed 7/5/17**	**Wed 10/25/17**
111	**SITE ENGINEERING**	**8 days**	**Wed 7/5/17**	**Fri 7/14/17**
112	Tower Mapping (if tower dwgs unavailable)	1 day	Wed 7/5/17	Wed 7/5/17
113	Structural Analysis of antenna structure	7 days	Thu 7/6/17	Fri 7/14/17
114	**PERMITTING DOCUMENTATION AND FINAL DRAV**	**80 days**	**Wed 7/5/17**	**Wed 10/25/17**
115	NEPA/SHPO studies and approvals	80 days	Wed 7/5/17	Wed 10/25/17
116	Site Survey and mapping	7 days	Wed 7/5/17	Thu 7/13/17
117	Prepare Construction Drawings	20 days	Fri 7/14/17	Thu 8/10/17
118	**Construction Drawings Review and Approv**	10 days	Fri 8/11/17	Thu 8/24/17
119	**Broward County Site Release/Construction NTP to Motorola**	1 day	Fri 8/25/17	Fri 8/25/17
120	**CONSTRUCTION PHASE**	**204 days**	**Mon 8/28/17**	**Mon 6/18/18**
121	**Construction Permits**	**204 days**	**Mon 8/28/17**	**Mon 6/18/18**
122	Prepare and Submit Permit Package	5 days	Mon 8/28/17	Fri 9/1/17
123	Permit Review and Approval Process	20 days	Tue 9/5/17	Mon 10/2/17
124	Construction Permits Approved and Received	0 days	Mon 10/2/17	Mon 10/2/17
125	**Sequence Time Delay Task**	120 days	Tue 10/3/17	Mon 3/26/18
126	**SITE PREPARATION**	**1 day**	**Tue 3/27/18**	**Tue 3/27/18**
127	Mobilization	1 day	Tue 3/27/18	Tue 3/27/18
128	**EXISTING FACILITY IMPROVEMENTS**	**15 days**	**Wed 3/28/18**	**Tue 4/17/18**
129	Install DC Power System	5 days	Wed 3/28/18	Tue 4/3/18
130	Install FM200 Fire Supression System	5 days	Wed 4/4/18	Tue 4/10/18
131	Install cable entry port	2 days	Wed 4/11/18	Thu 4/12/18
132	Install internal grounding	3 days	Fri 4/13/18	Tue 4/17/18
133	**TOWER WORK**	**19 days**	**Wed 4/18/18**	**Mon 5/14/18**
134	Ship antennas, line and accessories to the site	5 days	Wed 4/18/18	Tue 4/24/18
135	Install antennas, microwave dishes and lines	4 days	Wed 4/25/18	Mon 4/30/18
136	Complete Independent Tower Inspection & R	10 days	Tue 5/1/18	Mon 5/14/18

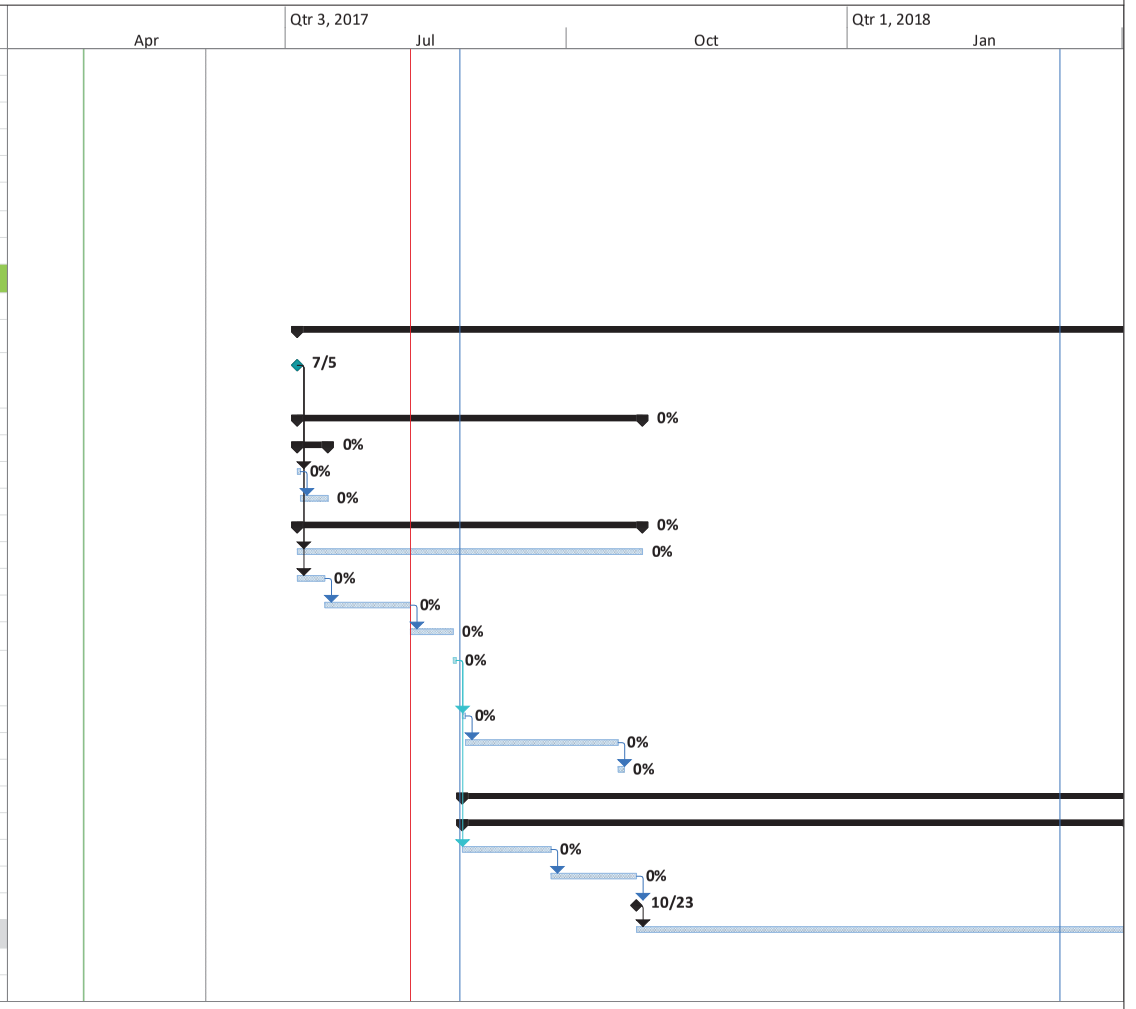


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
137	**FINAL TESTING**	**24 days**	**Tue 5/15/18**	**Mon 6/18/18**
138	Line termination and Sweep test	0.5 days	Tue 5/15/18	Tue 5/15/18
139	Grounding test of the site	0.5 days	Tue 5/15/18	Tue 5/15/18
140	DC Power System Startup and Test	1 day	Wed 5/16/18	Wed 5/16/18
141	Test Fire Supression System	1 day	Thu 5/17/18	Thu 5/17/18
142	**R56 Site Audit/Punch List with Broward (**	1 day	Fri 5/18/18	Fri 5/18/18
143	Punch List completion	10 days	Mon 5/21/18	Mon 6/4/18
144	Complete Civil As-Built Drawings	10 days	Tue 6/5/18	Mon 6/18/18
145	**Site Civil Work Substantial Completion**	**0 days**	**Mon 6/18/18**	**Mon 6/18/18**
146				
147	**MARKHAM PARK SITE DEVELOPMENT**	**274.5 days**	**Wed 7/5/17**	**Fri 8/3/18**
148	Broward County Provides NTP for Pre Construction Phase	0 days	Wed 7/5/17	Wed 7/5/17
149	**PRE CONSTRUCTION PHASE**	**80 days**	**Wed 7/5/17**	**Wed 10/25/17**
150	**SITE ENGINEERING**	**8 days**	**Wed 7/5/17**	**Fri 7/14/17**
151	Tower Mapping (if tower dwgs unavailable)	1 day	Wed 7/5/17	Wed 7/5/17
152	Structural Analysis of antenna structure	7 days	Thu 7/6/17	Fri 7/14/17
153	**PERMITTING DOCUMENTATION AND FINAL DRA**	**80 days**	**Wed 7/5/17**	**Wed 10/25/17**
154	NEPA/SHPO studies and approvals	80 days	Wed 7/5/17	Wed 10/25/17
155	Site Survey and mapping	7 days	Wed 7/5/17	Thu 7/13/17
156	Prepare Construction Drawings	20 days	Fri 7/14/17	Thu 8/10/17
157	**Construction Drawings Review and Approv**	10 days	Fri 8/11/17	Thu 8/24/17
158	**Broward County Site release/ Construction NTP to Contractor**	1 day	Fri 8/25/17	Fri 8/25/17
159	Place Order for New Shelter	1 day	Mon 8/28/17	Mon 8/28/17
160	Manufacture Shelter	35 days	Tue 8/29/17	Tue 10/17/17
161	Ship Shelter to Site	2 days	Wed 10/18/17	Thu 10/19/17
162	**CONSTRUCTION PHASE**	**236.5 days**	**Mon 8/28/17**	**Fri 8/3/18**
163	**Construction Permits**	**150 days**	**Mon 8/28/17**	**Mon 4/2/18**
164	Prepare and Submit Permit Package	20 days	Mon 8/28/17	Mon 9/25/17
165	Permit Review and Approval Process	20 days	Tue 9/26/17	Mon 10/23/17
166	Construction Permits Approved and Received	0 days	Mon 10/23/17	Mon 10/23/17
167	**Sequence Time Delay Task**	110 days	Tue 10/24/17	Mon 4/2/18
168	**SITE PREPARATION**	**7 days**	**Tue 4/3/18**	**Wed 4/11/18**
169	Mobilization	1 day	Tue 4/3/18	Tue 4/3/18

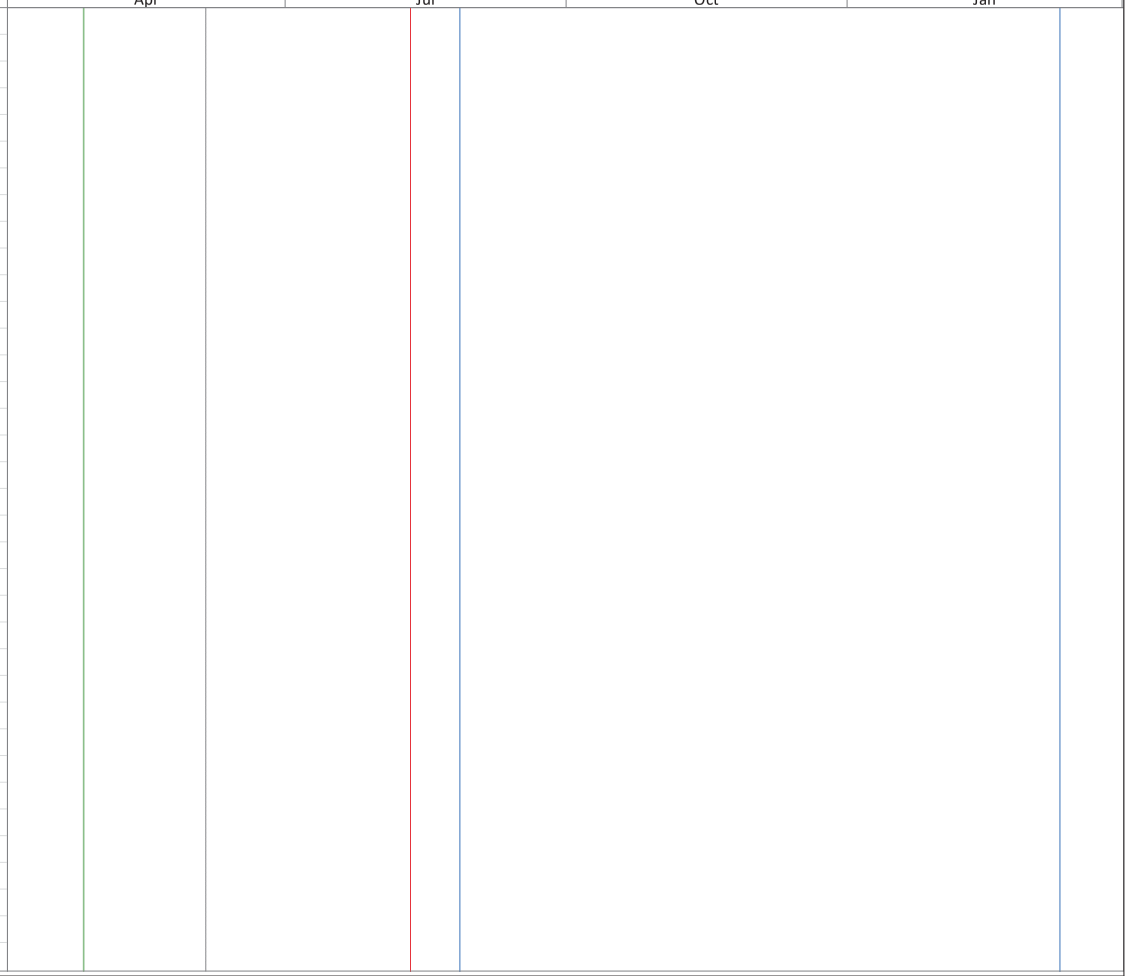


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
170	Locate existing utilities	1 day	Wed 4/4/18	Wed 4/4/18
171	Light clearing and grubbing	1 day	Thu 4/5/18	Thu 4/5/18
172	Compound grading and silt fencing	4 days	Fri 4/6/18	Wed 4/11/18
173	**SITE COMPONENTS INSTALLATION**	**34.5 days**	**Thu 4/12/18**	**Thu 5/31/18**
174	Excavate, form and rebar shelter foundations	3 days	Thu 4/12/18	Mon 4/16/18
175	Excavate, form and rebar fuel tank foundation	1 day	Tue 4/17/18	Tue 4/17/18
176	Excavate, form and rebar generator foundations	1 day	Wed 4/18/18	Wed 4/18/18
177	Foundation inspection, concrete pour and testir	1 day	Thu 4/19/18	Thu 4/19/18
178	Receive Shelter On Site	1 day	Fri 4/20/18	Fri 4/20/18
179	Offload and Install equipment shelter	5 days	Mon 4/23/18	Fri 4/27/18
180	Trench and Install underground power conduits	5 days	Mon 4/30/18	Fri 5/4/18
181	Trench and install grounding	2 days	Mon 5/7/18	Tue 5/8/18
182	Grounding Inspection	0.5 days	Wed 5/9/18	Wed 5/9/18
183	Conduit inspection and backfill	1 day	Wed 5/9/18	Thu 5/10/18
184	Install fuel tank and piping	2 days	Thu 5/10/18	Mon 5/14/18
185	Piping inspection, leakage test and trench backil	2 days	Mon 5/14/18	Wed 5/16/18
186	Pick up meter panel and Install meterboard	2 days	Wed 5/16/18	Fri 5/18/18
187	Utility hookup to the site by Electric Co.	5 days	Fri 5/18/18	Fri 5/25/18
188	Building/Electrical inspection	1 day	Fri 5/25/18	Tue 5/29/18
189	Install ice bridge from shelter to the tower	2 days	Tue 5/29/18	Thu 5/31/18
190	**EXISTING FACILITY IMPROVEMENTS**	**5 days**	**Thu 5/31/18**	**Thu 6/7/18**
191	Install DC Power System	5 days	Thu 5/31/18	Thu 6/7/18
192	**TOWER WORK**	**19 days**	**Thu 6/7/18**	**Thu 7/5/18**
193	Ship antennas, line and accessories to the site	5 days	Thu 6/7/18	Thu 6/14/18
194	Install microwave dishes, antennas and lines	4 days	Thu 6/14/18	Wed 6/20/18
195	Complete Independent Tower Inspection & Rep	10 days	Wed 6/20/18	Thu 7/5/18
196	**SITE RESTORATION**	**8 days**	**Wed 6/20/18**	**Mon 7/2/18**
197	Fencing of tower compound	3 days	Wed 6/20/18	Mon 6/25/18
198	Complete grounding connections	1 day	Mon 6/25/18	Tue 6/26/18
199	Finish Grade and gravel compound	2 days	Tue 6/26/18	Thu 6/28/18
200	Site touchup and restoration	2 days	Thu 6/28/18	Mon 7/2/18
201	**FINAL TESTING**	**23 days**	**Mon 7/2/18**	**Fri 8/3/18**
202	Line termination and Sweep test	0.5 days	Mon 7/2/18	Mon 7/2/18
203	Grounding test of the site	0.5 days	Tue 7/3/18	Tue 7/3/18
204	Test Fire Supression System	1 day	Tue 7/3/18	Thu 7/5/18
205	**R56 Site Audit/Punch List with Broward Co**	1 day	Thu 7/5/18	Fri 7/6/18

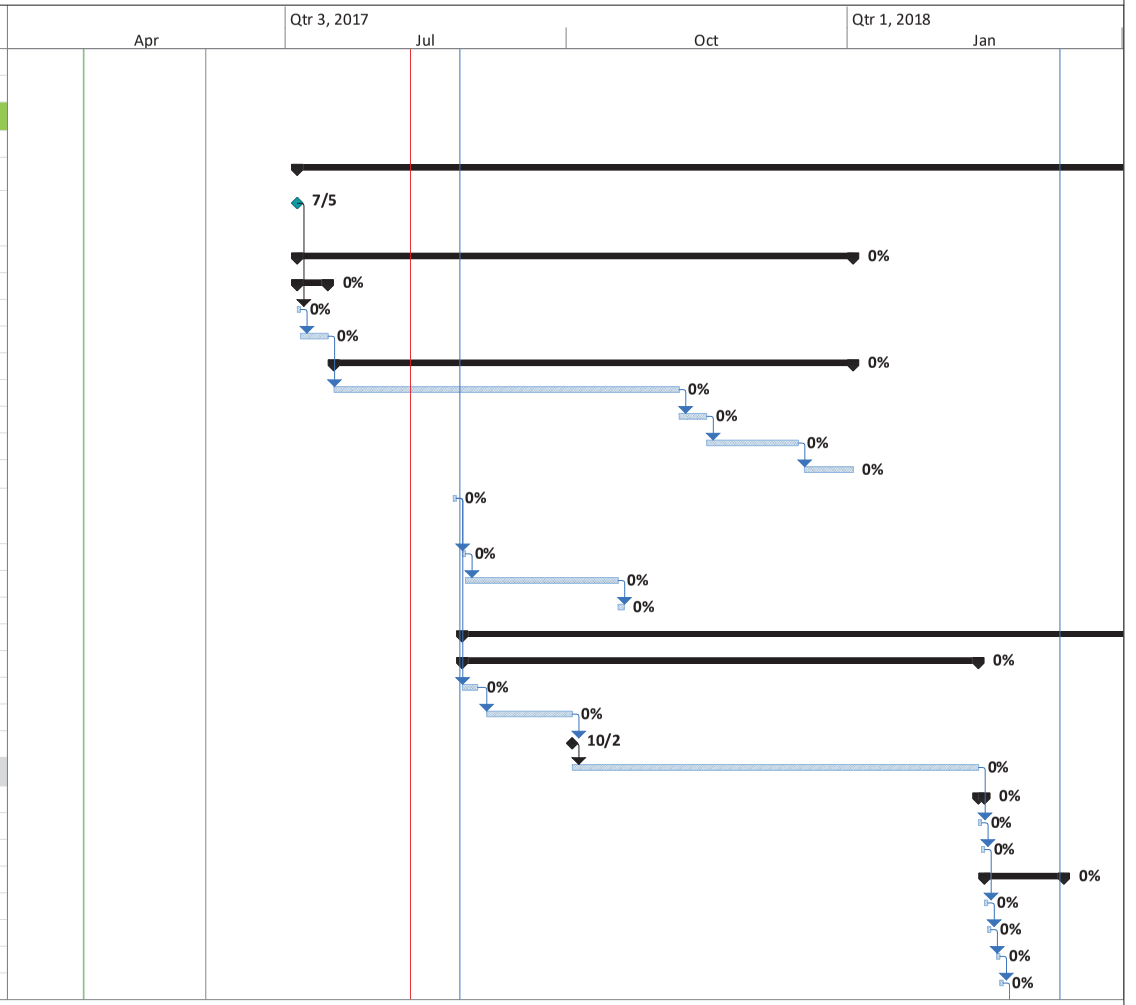


Yel- BC NTP Required
grn- BC Approval Required
pur- delay to sequence subs

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Inactive Milestone
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Deadline

Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
206	Punch List completion	10 days	Fri 7/6/18	Fri 7/20/18
207	Complete Civil As-Built Drawings	10 days	Fri 7/20/18	Fri 8/3/18
208	**Site Civil Work Substantial Completion**	**0 days**	**Fri 8/3/18**	**Fri 8/3/18**
209				
210	**DAVIE SITE DEVELOPMENT**	**245 days**	**Wed 7/5/17**	**Thu 6/21/18**
211	Broward County Provides NTP for Pre Construction Phase	0 days	Wed 7/5/17	Wed 7/5/17
212	**PRE CONSTRUCTION PHASE**	**125 days**	**Wed 7/5/17**	**Tue 1/2/18**
213	**SITE ENGINEERING**	**8 days**	**Wed 7/5/17**	**Fri 7/14/17**
214	Tower Mapping (if tower dwgs unavailable)	1 day	Wed 7/5/17	Wed 7/5/17
215	Structural Analysis of antenna structure	7 days	Thu 7/6/17	Fri 7/14/17
216	**PERMITTING DOCUMENTATION AND FINAL DRAV**	**117 days**	**Mon 7/17/17**	**Tue 1/2/18**
217	NEPA/SHPO studies and approvals	80 days	Mon 7/17/17	Mon 11/6/17
218	Site Survey and mapping	7 days	Tue 11/7/17	Wed 11/15/17
219	Prepare Construction Drawings	20 days	Thu 11/16/17	Fri 12/15/17
220	**Construction Drawings Review and Approv**	10 days	Mon 12/18/17	Tue 1/2/18
221	**Broward County Site release/ Construction NTP to Contractor**	1 day	Fri 8/25/17	Fri 8/25/17
222	Place Order for New Generator	1 day	Mon 8/28/17	Mon 8/28/17
223	Manufacture Generator	35 days	Tue 8/29/17	Tue 10/17/17
224	Ship Shelter to Site	2 days	Wed 10/18/17	Thu 10/19/17
225	**CONSTRUCTION PHASE**	**207 days**	**Mon 8/28/17**	**Thu 6/21/18**
226	**Construction Permits**	**115 days**	**Mon 8/28/17**	**Mon 2/12/18**
227	Prepare and Submit Permit Package	5 days	Mon 8/28/17	Fri 9/1/17
228	Permit Review and Approval Process	20 days	Tue 9/5/17	Mon 10/2/17
229	Construction Permits Approved and Received	0 days	Mon 10/2/17	Mon 10/2/17
230	**Sequence Time Delay Task**	90 days	Tue 10/3/17	Mon 2/12/18
231	**SITE PREPARATION**	**2 days**	**Tue 2/13/18**	**Wed 2/14/18**
232	Mobilization	1 day	Tue 2/13/18	Tue 2/13/18
233	Locate existing utilities	1 day	Wed 2/14/18	Wed 2/14/18
234	**SITE COMPONENTS INSTALLATION**	**18 days**	**Thu 2/15/18**	**Mon 3/12/18**
235	Excavate, form and rebar fuel tank foundation	1 day	Thu 2/15/18	Thu 2/15/18
236	Excavate, form and rebar generator foundations	1 day	Fri 2/16/18	Fri 2/16/18
237	Foundation inspection, concrete pour and testir	1 day	Mon 2/19/18	Mon 2/19/18
238	Receive Generator on Site	1 day	Tue 2/20/18	Tue 2/20/18

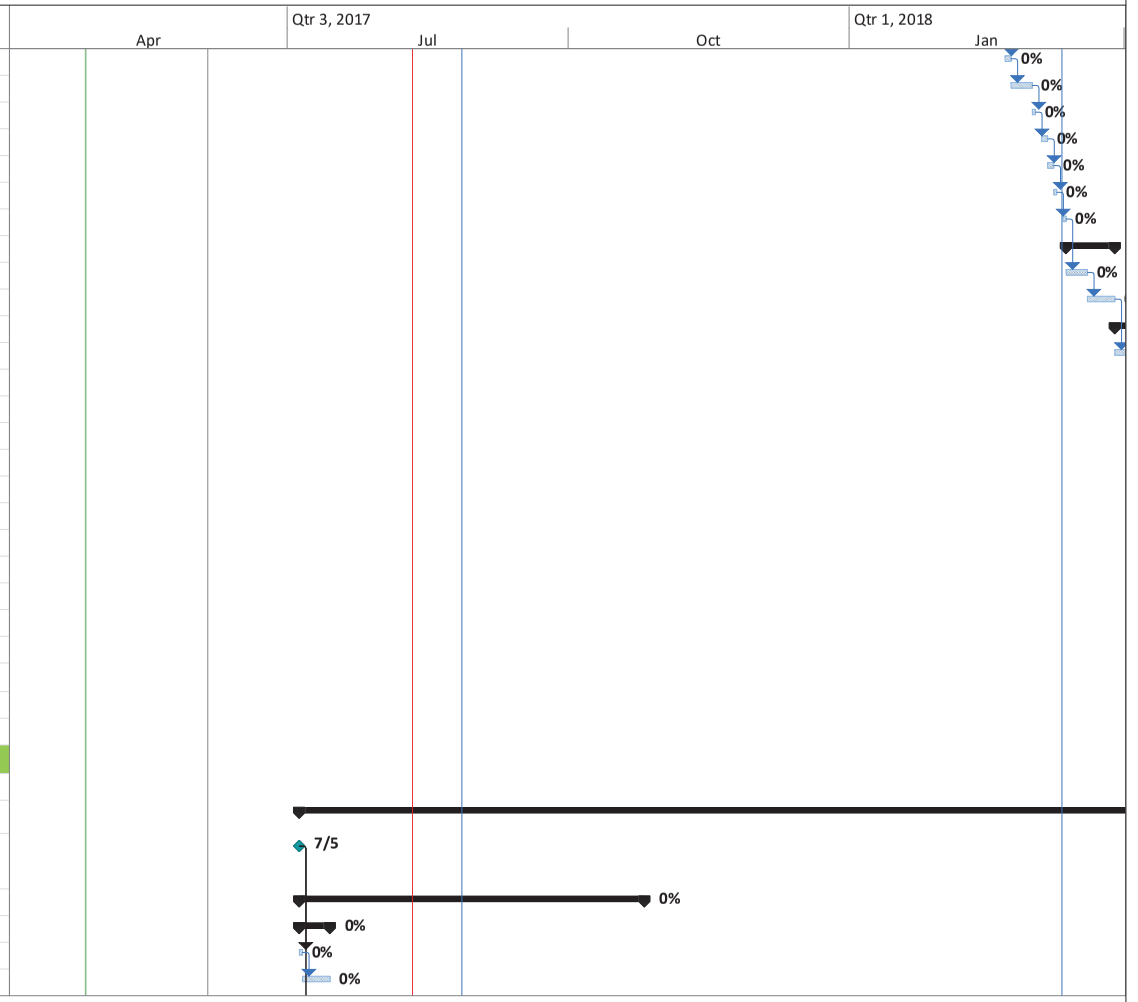


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
239	Install Generator	2 days	Wed 2/21/18	Thu 2/22/18
240	Trench and Install underground power conduits	5 days	Fri 2/23/18	Thu 3/1/18
241	Conduit inspection and backfill	1 day	Fri 3/2/18	Fri 3/2/18
242	Install fuel tank and piping	2 days	Mon 3/5/18	Tue 3/6/18
243	Piping inspection, leakage test and trench backil	2 days	Wed 3/7/18	Thu 3/8/18
244	Building/Electrical inspection	1 day	Fri 3/9/18	Fri 3/9/18
245	Add trapeze to ice bridge from shelter to the tov	1 day	Mon 3/12/18	Mon 3/12/18
246	**EXISTING FACILITY IMPROVEMENTS**	**12 days**	**Tue 3/13/18**	**Wed 3/28/18**
247	Install FM200 Fire Supression System	5 days	Tue 3/13/18	Mon 3/19/18
248	Install DC Power System	7 days	Tue 3/20/18	Wed 3/28/18
249	**TOWER WORK**	**19 days**	**Thu 3/29/18**	**Tue 4/24/18**
250	Ship antennas, line and accessories to the site	5 days	Thu 3/29/18	Wed 4/4/18
251	Install microwave dishes, antennas and lines	4 days	Thu 4/5/18	Tue 4/10/18
252	Complete Independent Tower Inspection & Rep	10 days	Wed 4/11/18	Tue 4/24/18
253	**SITE RESTORATION**	**8 days**	**Wed 4/25/18**	**Fri 5/4/18**
254	Fencing of tower compound	3 days	Wed 4/25/18	Fri 4/27/18
255	Complete grounding connections	1 day	Mon 4/30/18	Mon 4/30/18
256	Finish Grade and gravel compound	2 days	Tue 5/1/18	Wed 5/2/18
257	Site touchup and restoration	2 days	Thu 5/3/18	Fri 5/4/18
258	**FINAL TESTING**	**33 days**	**Mon 5/7/18**	**Thu 6/21/18**
259	Line termination and Sweep test	0.5 days	Mon 5/7/18	Mon 5/7/18
260	Grounding test of the site	0.5 days	Mon 5/7/18	Mon 5/7/18
261	Test Fire Supression System	1 day	Tue 5/8/18	Tue 5/8/18
262	**R56 Site Audit/Punch List with Broward Co**	1 day	Wed 5/9/18	Wed 5/9/18
263	Punch List completion	10 days	Thu 5/10/18	Wed 5/23/18
264	Complete Civil As-Built Drawings	10 days	Thu 5/24/18	Thu 6/7/18
265	**Site Civil Work Substantial Completion**	**10 days**	**Fri 6/8/18**	**Thu 6/21/18**
266				
267	**EMS SITE DEVELOPMENT**	**250 days**	**Wed 7/5/17**	**Thu 6/28/18**
268	Broward County Provides NTP for Pre Construction Phase	0 days	Wed 7/5/17	Wed 7/5/17
269	**PRE CONSTRUCTION PHASE**	**80 days**	**Wed 7/5/17**	**Wed 10/25/17**
270	**SITE ENGINEERING**	**8 days**	**Wed 7/5/17**	**Fri 7/14/17**
271	Tower Mapping (if tower dwgs unavailable)	1 day	Wed 7/5/17	Wed 7/5/17
272	Structural Analysis of antenna structure	7 days	Thu 7/6/17	Fri 7/14/17

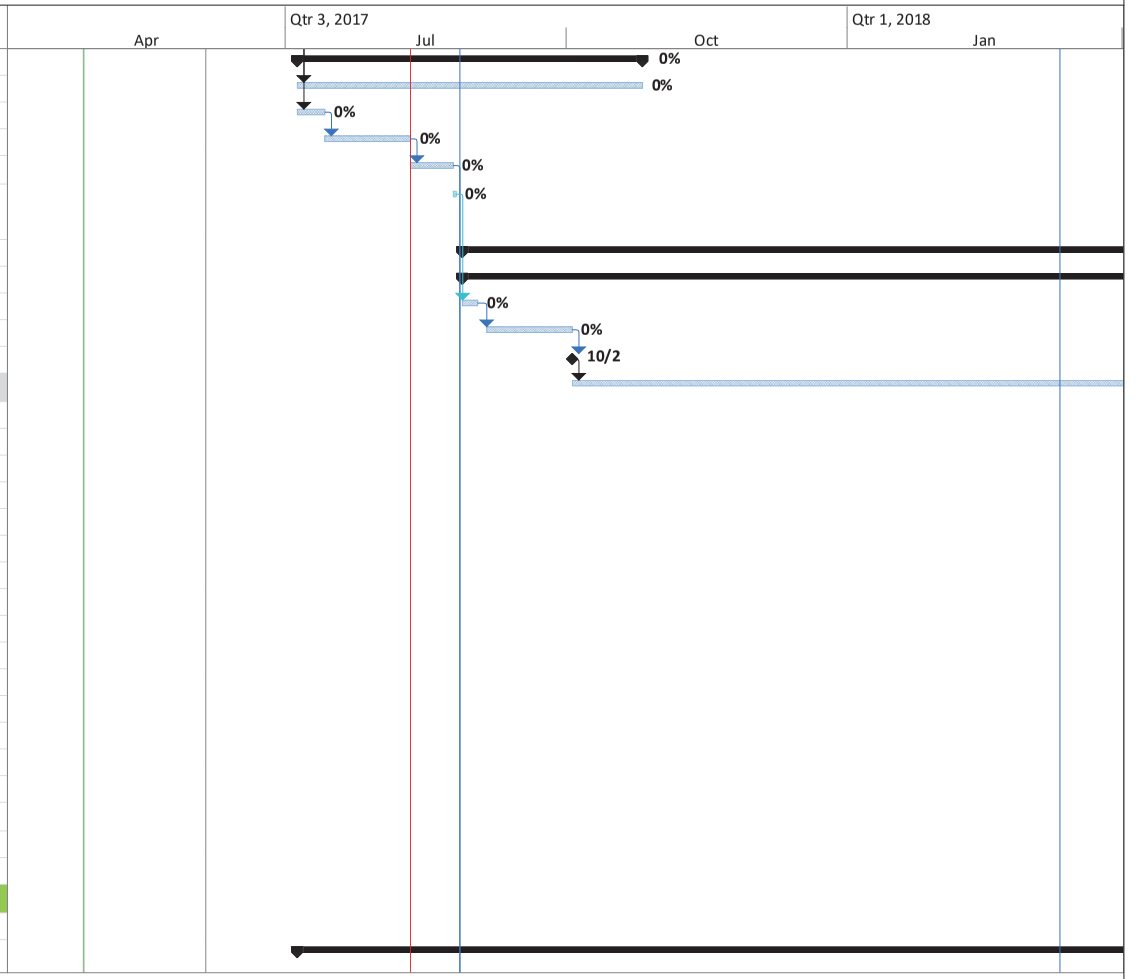


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
273	**PERMITTING DOCUMENTATION AND FINAL DRAV**	**80 days**	**Wed 7/5/17**	**Wed 10/25/17**
274	NEPA/SHPO studies and approvals	80 days	Wed 7/5/17	Wed 10/25/17
275	Site Survey and mapping	7 days	Wed 7/5/17	Thu 7/13/17
276	Prepare Construction Drawings	20 days	Fri 7/14/17	Thu 8/10/17
277	**Construction Drawings Review and Approv**	10 days	Fri 8/11/17	Thu 8/24/17
278	**Broward County Site Release/Construction NTP to Motorola**	1 day	Fri 8/25/17	Fri 8/25/17
279	**CONSTRUCTION PHASE**	**212 days**	**Mon 8/28/17**	**Thu 6/28/18**
280	**Construction Permits**	**155 days**	**Mon 8/28/17**	**Mon 4/9/18**
281	Prepare and Submit Permit Package	5 days	Mon 8/28/17	Fri 9/1/17
282	Permit Review and Approval Process	20 days	Tue 9/5/17	Mon 10/2/17
283	Construction Permits Approved and Received	0 days	Mon 10/2/17	Mon 10/2/17
284	**Sequence Time Delay Task**	130 days	Tue 10/3/17	Mon 4/9/18
285	**SITE PREPARATION**	**1 day**	**Tue 4/10/18**	**Tue 4/10/18**
286	Mobilization	1 day	Tue 4/10/18	Tue 4/10/18
287	**EXISTING FACILITY IMPROVEMENTS**	**13 days**	**Wed 4/11/18**	**Fri 4/27/18**
288	Install DC Power System	5 days	Wed 4/11/18	Tue 4/17/18
289	Install FM200 Fire Supression System	5 days	Wed 4/18/18	Tue 4/24/18
290	Install internal grounding	3 days	Wed 4/25/18	Fri 4/27/18
291	**TOWER WORK**	**19 days**	**Mon 4/30/18**	**Thu 5/24/18**
292	Ship antennas, line and accessories to the site	5 days	Mon 4/30/18	Fri 5/4/18
293	Install microwave dishes, antennas and lines	4 days	Mon 5/7/18	Thu 5/10/18
294	Complete Independent Tower Inspection & Rep	10 days	Fri 5/11/18	Thu 5/24/18
295	**FINAL TESTING**	**24 days**	**Fri 5/25/18**	**Thu 6/28/18**
296	Line termination and Sweep test	0.5 days	Fri 5/25/18	Fri 5/25/18
297	Grounding test of the site	0.5 days	Fri 5/25/18	Fri 5/25/18
298	DC Power System Startup and Test	1 day	Tue 5/29/18	Tue 5/29/18
299	Test Fire Supression System	1 day	Wed 5/30/18	Wed 5/30/18
300	**R56 Site Audit/Punch List with Broward Co**	1 day	Thu 5/31/18	Thu 5/31/18
301	Punch List completion	10 days	Fri 6/1/18	Thu 6/14/18
302	Complete Civil As-Built Drawings	10 days	Fri 6/15/18	Thu 6/28/18
303	**Site Civil Work Substantial Completion**	**0 days**	**Thu 6/28/18**	**Thu 6/28/18**
304				
305	**EOC SITE DEVELOPMENT**	**194 days**	**Wed 7/5/17**	**Tue 4/10/18**

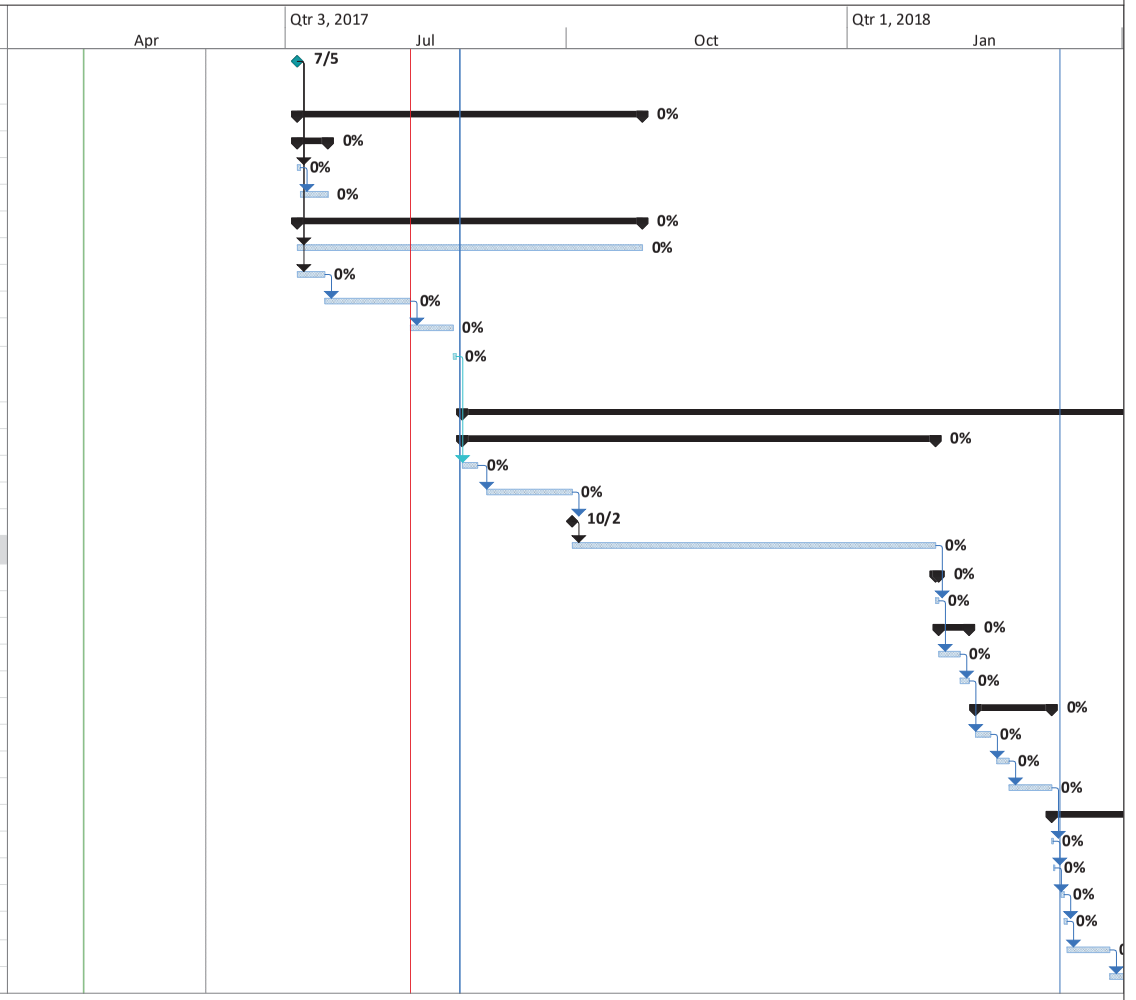


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
306	Broward County Provides NTP for Pre Construction Phase	0 days	Wed 7/5/17	Wed 7/5/17
307	**PRE CONSTRUCTION PHASE**	**80 days**	**Wed 7/5/17**	**Wed 10/25/17**
308	**SITE ENGINEERING**	**8 days**	**Wed 7/5/17**	**Fri 7/14/17**
309	Tower Mapping (if tower dwgs unavailable)	1 day	Wed 7/5/17	Wed 7/5/17
310	Structural Analysis of antenna structure	7 days	Thu 7/6/17	Fri 7/14/17
311	**PERMITTING DOCUMENTATION AND FINAL DRAV**	**80 days**	**Wed 7/5/17**	**Wed 10/25/17**
312	NEPA/SHPO studies and approvals	80 days	Wed 7/5/17	Wed 10/25/17
313	Site Survey and mapping	7 days	Wed 7/5/17	Thu 7/13/17
314	Prepare Construction Drawings	20 days	Fri 7/14/17	Thu 8/10/17
315	**Construction Drawings Review and Approv**	10 days	Fri 8/11/17	Thu 8/24/17
316	**Broward County Site Release/Construction NTP to Motorola**	1 day	Fri 8/25/17	Fri 8/25/17
317	**CONSTRUCTION PHASE**	**156 days**	**Mon 8/28/17**	**Tue 4/10/18**
318	**Construction Permits**	**105 days**	**Mon 8/28/17**	**Mon 1/29/18**
319	Prepare and Submit Permit Package	5 days	Mon 8/28/17	Fri 9/1/17
320	Permit Review and Approval Process	20 days	Tue 9/5/17	Mon 10/2/17
321	Construction Permits Approved and Received	0 days	Mon 10/2/17	Mon 10/2/17
322	**Sequence Time Delay Task**	80 days	Tue 10/3/17	Mon 1/29/18
323	**SITE PREPARATION**	**1 day**	**Tue 1/30/18**	**Tue 1/30/18**
324	Mobilization	1 day	Tue 1/30/18	Tue 1/30/18
325	**EXISTING FACILITY IMPROVEMENTS**	**8 days**	**Wed 1/31/18**	**Fri 2/9/18**
326	Install DC Power System	5 days	Wed 1/31/18	Tue 2/6/18
327	Install internal grounding	3 days	Wed 2/7/18	Fri 2/9/18
328	**TOWER WORK**	**19 days**	**Mon 2/12/18**	**Thu 3/8/18**
329	Ship microwave dishes and waveguide to the sit	5 days	Mon 2/12/18	Fri 2/16/18
330	Install microwave dishes and waveguide	4 days	Mon 2/19/18	Thu 2/22/18
331	Complete Independent Tower Inspection & Rep	10 days	Fri 2/23/18	Thu 3/8/18
332	**FINAL TESTING**	**23 days**	**Fri 3/9/18**	**Tue 4/10/18**
333	Line termination and Sweep test	0.5 days	Fri 3/9/18	Fri 3/9/18
334	Grounding test of the site	0.5 days	Fri 3/9/18	Fri 3/9/18
335	DC Power System Startup and Test	1 day	Mon 3/12/18	Mon 3/12/18
336	**R56 Site Audit/Punch List with Broward Co**	1 day	Tue 3/13/18	Tue 3/13/18
337	Punch List completion	10 days	Wed 3/14/18	Tue 3/27/18
338	Complete Civil As-Built Drawings	10 days	Wed 3/28/18	Tue 4/10/18

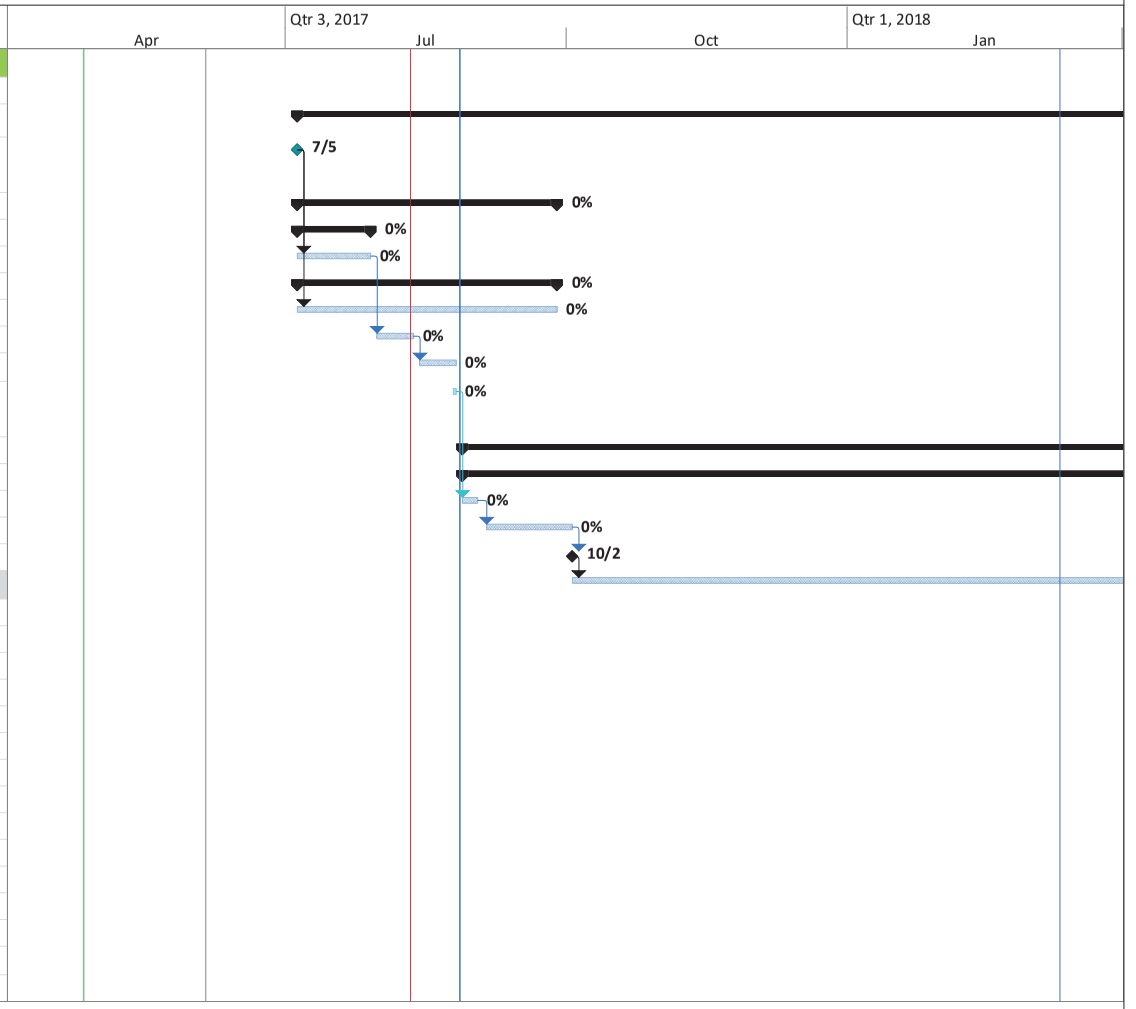


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
339	**Site Civil Work Substantial Completion**	**0 days**	**Tue 4/10/18**	**Tue 4/10/18**
340				
341	**POMPANO BEACH CLUB SITE DEVELOPMEI**	**260 days**	**Wed 7/5/17**	**Fri 7/13/18**
342	Broward County Provides NTP for Pre Construction Phase	0 days	Wed 7/5/17	Wed 7/5/17
343	**PRE CONSTRUCTION PHASE**	**60 days**	**Wed 7/5/17**	**Wed 9/27/17**
344	**SITE ENGINEERING**	**18 days**	**Wed 7/5/17**	**Fri 7/28/17**
345	Structural Analysis of roof top structure	18 days	Wed 7/5/17	Fri 7/28/17
346	**PERMITTING DOCUMENTATION AND FINAL DRA**	**60 days**	**Wed 7/5/17**	**Wed 9/27/17**
347	NEPA/SHPO studies and approvals	60 days	Wed 7/5/17	Wed 9/27/17
348	Prepare Construction Drawings	10 days	Mon 7/31/17	Fri 8/11/17
349	**Construction Drawings Review and Approv**	10 days	Mon 8/14/17	Fri 8/25/17
350	**Broward County Site Release/Construction NTP to Motorola**	1 day	Fri 8/25/17	Fri 8/25/17
351	**CONSTRUCTION PHASE**	**222 days**	**Mon 8/28/17**	**Fri 7/13/18**
352	**Construction Permits**	**165 days**	**Mon 8/28/17**	**Mon 4/23/18**
353	Prepare and Submit Permit Package	5 days	Mon 8/28/17	Fri 9/1/17
354	Permit Review and Approval Process	20 days	Tue 9/5/17	Mon 10/2/17
355	Construction Permits Approved and Received	0 days	Mon 10/2/17	Mon 10/2/17
356	**Sequence Time Delay Task**	140 days	Tue 10/3/17	Mon 4/23/18
357	**SITE PREPARATION**	**1 day**	**Tue 4/24/18**	**Tue 4/24/18**
358	Mobilization	1 day	Tue 4/24/18	Tue 4/24/18
359	**EXISTING FACILITY IMPROVEMENTS**	**8 days**	**Wed 4/25/18**	**Fri 5/4/18**
360	Install DC Power System	5 days	Wed 4/25/18	Tue 5/1/18
361	Install internal grounding	3 days	Wed 5/2/18	Fri 5/4/18
362	**TOWER WORK**	**25 days**	**Mon 5/7/18**	**Mon 6/11/18**
363	Ship antennas and line to the site	5 days	Mon 5/7/18	Fri 5/11/18
364	Install microwave dishes antennas and line	10 days	Mon 5/14/18	Fri 5/25/18
365	Complete Independent Tower Inspection & Rep	10 days	Tue 5/29/18	Mon 6/11/18
366	**FINAL TESTING**	**23 days**	**Tue 6/12/18**	**Fri 7/13/18**
367	Line termination and Sweep test	0.5 days	Tue 6/12/18	Tue 6/12/18
368	Grounding test of the site	0.5 days	Tue 6/12/18	Tue 6/12/18
369	DC Power System Startup and Test	1 day	Wed 6/13/18	Wed 6/13/18
370	**R56 Site Audit/Punch List with Broward Co**	1 day	Thu 6/14/18	Thu 6/14/18
371	Punch List completion	10 days	Fri 6/15/18	Thu 6/28/18

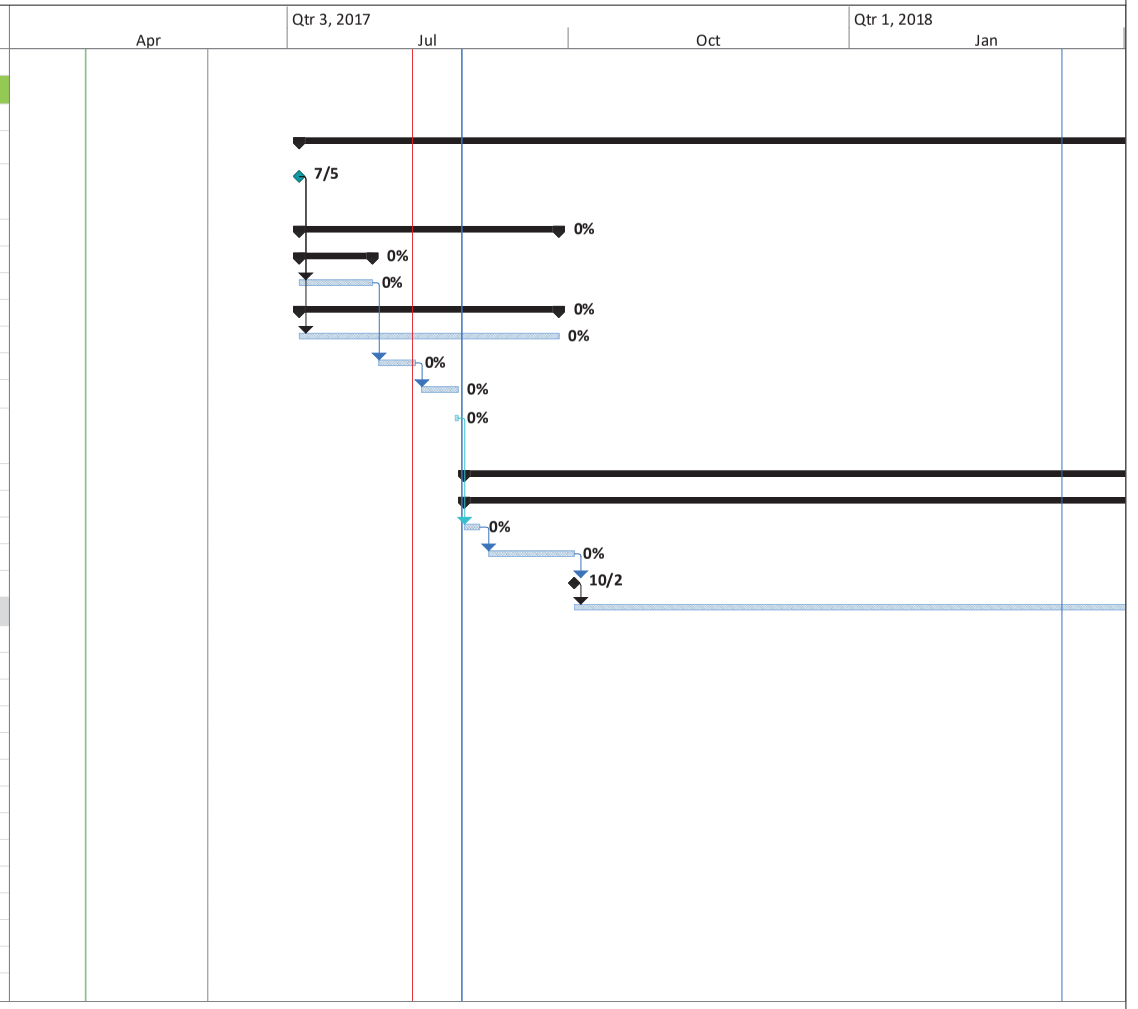


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Broward County, FL
Preliminary Project Schedule

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372	Complete Civil As-Built Drawings	10 days	Fri 6/29/18	Fri 7/13/18
373	**Site Civil Work Substantial Completion**	**0 days**	**Fri 7/13/18**	**Fri 7/13/18**
374				
375	**POINTS OF AMERICA SITE DEVELOPMENT**	**270 days**	**Wed 7/5/17**	**Fri 7/27/18**
376	Broward County Provides NTP for Pre Construction Phase	0 days	Wed 7/5/17	Wed 7/5/17
377	**PRE CONSTRUCTION PHASE**	**60 days**	**Wed 7/5/17**	**Wed 9/27/17**
378	**SITE ENGINEERING**	**18 days**	**Wed 7/5/17**	**Fri 7/28/17**
379	Structural Analysis of roof top structure	18 days	Wed 7/5/17	Fri 7/28/17
380	**PERMITTING DOCUMENTATION AND FINAL DRAV**	**60 days**	**Wed 7/5/17**	**Wed 9/27/17**
381	NEPA/SHPO studies and approvals	60 days	Wed 7/5/17	Wed 9/27/17
382	Prepare Construction Drawings	10 days	Mon 7/31/17	Fri 8/11/17
383	**Construction Drawings Review and Approv**	10 days	Mon 8/14/17	Fri 8/25/17
384	**Broward County Site Release/Construction NTP to Motorola**	1 day	Fri 8/25/17	Fri 8/25/17
385	**CONSTRUCTION PHASE**	**232 days**	**Mon 8/28/17**	**Fri 7/27/18**
386	**Construction Permits**	**175 days**	**Mon 8/28/17**	**Mon 5/7/18**
387	Prepare and Submit Permit Package	5 days	Mon 8/28/17	Fri 9/1/17
388	Permit Review and Approval Process	20 days	Tue 9/5/17	Mon 10/2/17
389	Construction Permits Approved and Received	0 days	Mon 10/2/17	Mon 10/2/17
390	**Sequence Time Delay Task**	150 days	Tue 10/3/17	Mon 5/7/18
391	**SITE PREPARATION**	**1 day**	**Tue 5/8/18**	**Tue 5/8/18**
392	Mobilization	1 day	Tue 5/8/18	Tue 5/8/18
393	**EXISTING FACILITY IMPROVEMENTS**	**8 days**	**Wed 5/9/18**	**Fri 5/18/18**
394	Install DC Power System	5 days	Wed 5/9/18	Tue 5/15/18
395	Install internal grounding	3 days	Wed 5/16/18	Fri 5/18/18
396	**TOWER WORK**	**25 days**	**Mon 5/21/18**	**Mon 6/25/18**
397	Ship antennas and line to the site	5 days	Mon 5/21/18	Fri 5/25/18
398	Install microwave dishes antennas and line	10 days	Tue 5/29/18	Mon 6/11/18
399	Complete Independent Tower Inspection & Rep	10 days	Tue 6/12/18	Mon 6/25/18
400	**FINAL TESTING**	**23 days**	**Tue 6/26/18**	**Fri 7/27/18**
401	Line termination and Sweep test	0.5 days	Tue 6/26/18	Tue 6/26/18
402	Grounding test of the site	0.5 days	Tue 6/26/18	Tue 6/26/18
403	DC Power System Startup and Test	1 day	Wed 6/27/18	Wed 6/27/18
404	**R56 Site Audit/Punch List with Broward Co**	1 day	Thu 6/28/18	Thu 6/28/18

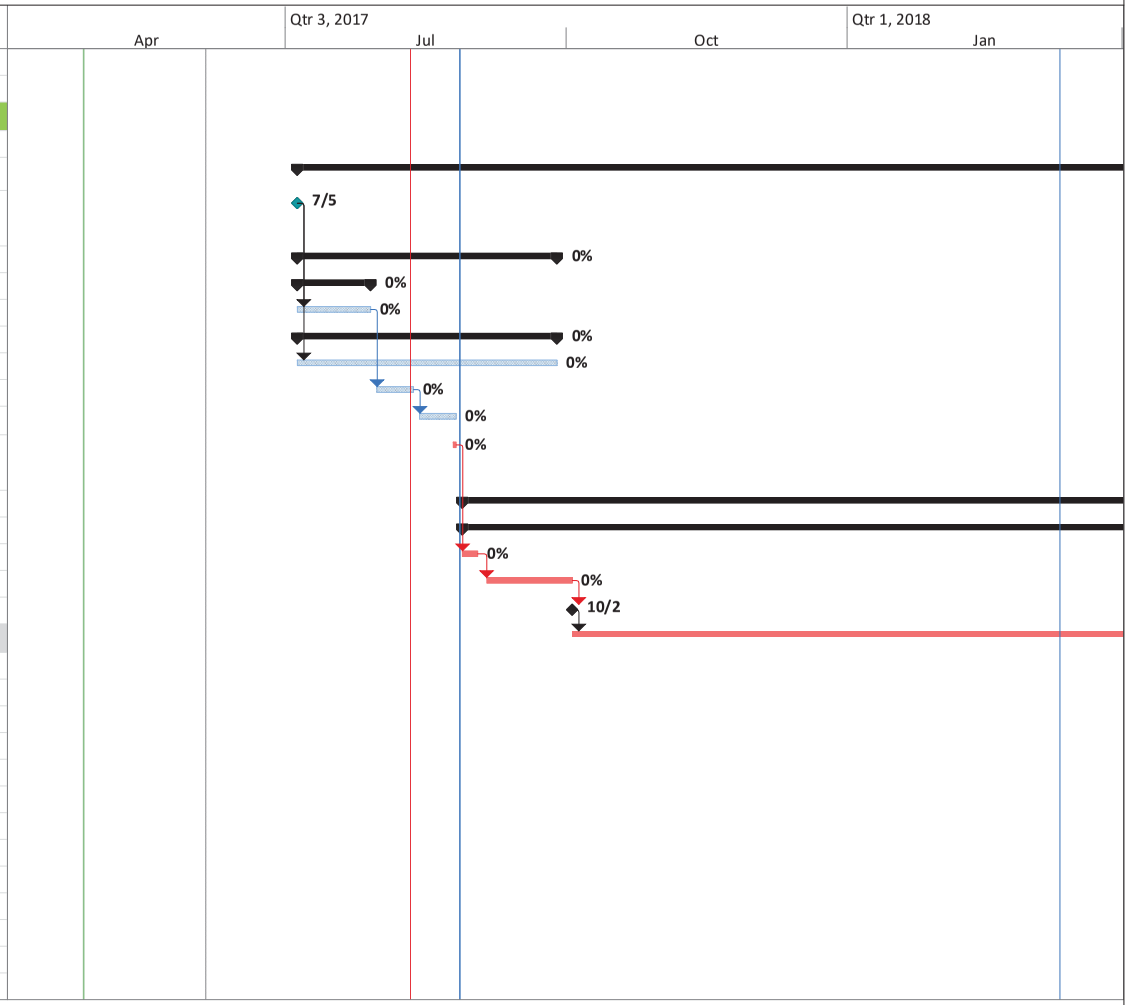


Yel- BC NTP Required
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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
405	Punch List completion	10 days	Fri 6/29/18	Fri 7/13/18
406	Complete Civil As-Built Drawings	10 days	Mon 7/16/18	Fri 7/27/18
407	**Site Civil Work Substantial Completion**	**0 days**	**Fri 7/27/18**	**Fri 7/27/18**
408				
409	**PLAYA SITE DEVELOPMENT**	**280 days**	**Wed 7/5/17**	**Fri 8/10/18**
410	Broward County Provides NTP for Pre Construction Phase	0 days	Wed 7/5/17	Wed 7/5/17
411	**PRE CONSTRUCTION PHASE**	**60 days**	**Wed 7/5/17**	**Wed 9/27/17**
412	**SITE ENGINEERING**	**18 days**	**Wed 7/5/17**	**Fri 7/28/17**
413	Structural Analysis of roof top structure	18 days	Wed 7/5/17	Fri 7/28/17
414	**PERMITTING DOCUMENTATION AND FINAL DRAV**	**60 days**	**Wed 7/5/17**	**Wed 9/27/17**
415	NEPA/SHPO studies and approvals	60 days	Wed 7/5/17	Wed 9/27/17
416	Prepare Construction Drawings	10 days	Mon 7/31/17	Fri 8/11/17
417	**Construction Drawings Review and Approv**	10 days	Mon 8/14/17	Fri 8/25/17
418	**Broward County Site Release/Construction NTP to Motorola**	1 day	Fri 8/25/17	Fri 8/25/17
419	**CONSTRUCTION PHASE**	**242 days**	**Mon 8/28/17**	**Fri 8/10/18**
420	**Construction Permits**	**185 days**	**Mon 8/28/17**	**Mon 5/21/18**
421	Prepare and Submit Permit Package	5 days	Mon 8/28/17	Fri 9/1/17
422	Permit Review and Approval Process	20 days	Tue 9/5/17	Mon 10/2/17
423	Construction Permits Approved and Received	0 days	Mon 10/2/17	Mon 10/2/17
424	**Sequence Time Delay Task**	160 days	Tue 10/3/17	Mon 5/21/18
425	**SITE PREPARATION**	**1 day**	**Tue 5/22/18**	**Tue 5/22/18**
426	Mobilization	1 day	Tue 5/22/18	Tue 5/22/18
427	**EXISTING FACILITY IMPROVEMENTS**	**8 days**	**Wed 5/23/18**	**Mon 6/4/18**
428	Install DC Power System	5 days	Wed 5/23/18	Wed 5/30/18
429	Install internal grounding	3 days	Thu 5/31/18	Mon 6/4/18
430	**TOWER WORK**	**25 days**	**Tue 6/5/18**	**Tue 7/10/18**
431	Ship antennas and line to the site	5 days	Tue 6/5/18	Mon 6/11/18
432	Install microwave dishes antennas and line	10 days	Tue 6/12/18	Mon 6/25/18
433	Complete Independent Tower Inspection & Rep	10 days	Tue 6/26/18	Tue 7/10/18
434	**FINAL TESTING**	**23 days**	**Wed 7/11/18**	**Fri 8/10/18**
435	Line termination and Sweep test	0.5 days	Wed 7/11/18	Wed 7/11/18
436	Grounding test of the site	0.5 days	Wed 7/11/18	Wed 7/11/18
437	DC Power System Startup and Test	1 day	Thu 7/12/18	Thu 7/12/18

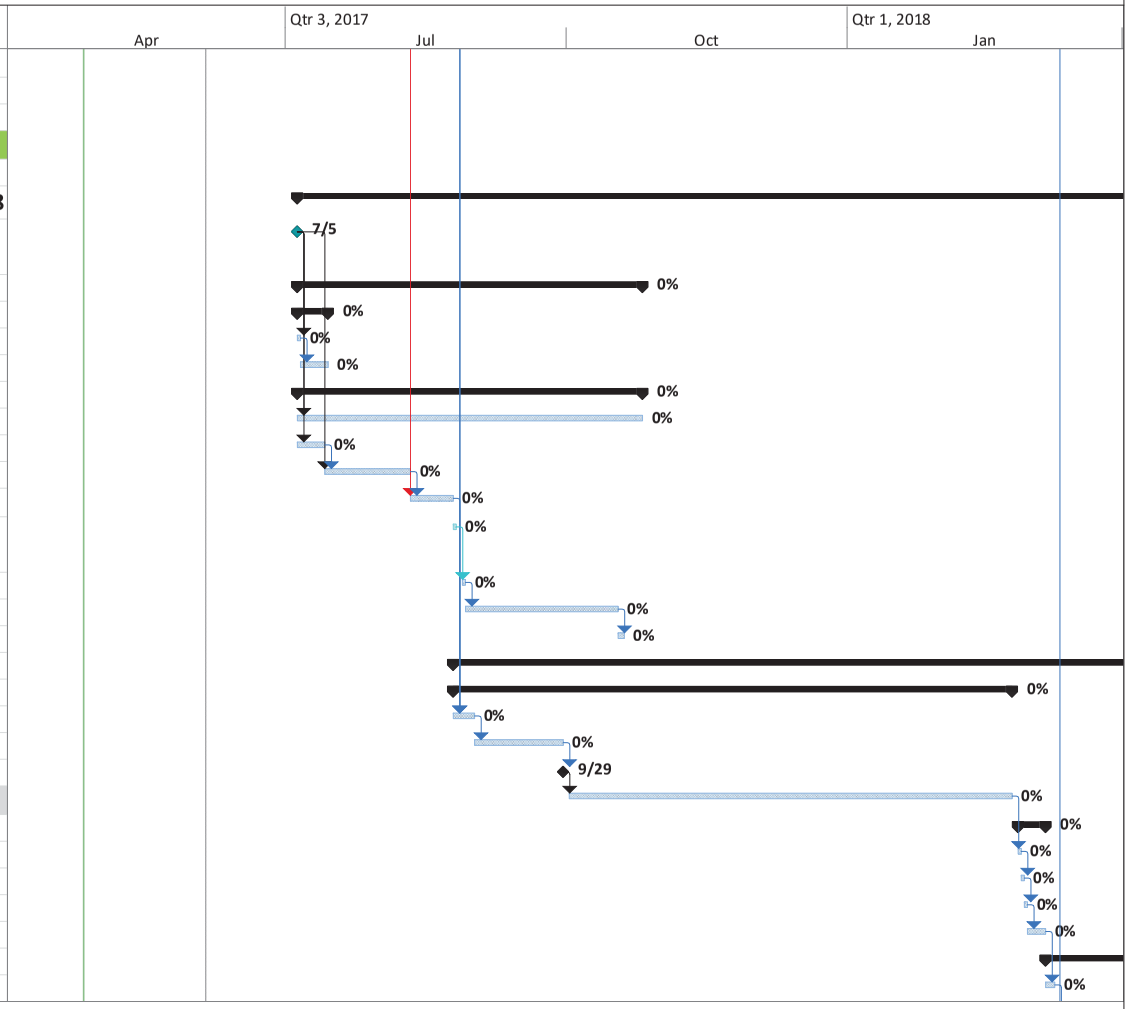


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Inactive Task, Inactive Milestone, Inactive Summary, Deadline

Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
438	**R56 Site Audit/Punch List with Broward Co**	1 day	Fri 7/13/18	Fri 7/13/18
439	Punch List completion	10 days	Mon 7/16/18	Fri 7/27/18
440	Complete Civil As-Built Drawings	10 days	Mon 7/30/18	Fri 8/10/18
441	**Site Civil Work Substantial Completion**	**0 days**	**Fri 8/10/18**	**Fri 8/10/18**
442				
443	**MIRAMAR SITE DEVELOPMENT**	**270.5 days**	**Wed 7/5/17**	**Mon 7/30/18**
444	Broward County Provides NTP for Pre Construction Phase	0 days	Wed 7/5/17	Wed 7/5/17
445	**PRE CONSTRUCTION PHASE**	**80 days**	**Wed 7/5/17**	**Wed 10/25/17**
446	**SITE ENGINEERING**	**8 days**	**Wed 7/5/17**	**Fri 7/14/17**
447	Tower Mapping (if tower dwgs unavailable)	1 day	Wed 7/5/17	Wed 7/5/17
448	Structural Analysis of antenna structure	7 days	Thu 7/6/17	Fri 7/14/17
449	**PERMITTING DOCUMENTATION AND FINAL DRAV**	**80 days**	**Wed 7/5/17**	**Wed 10/25/17**
450	NEPA/SHPO studies and approvals	80 days	Wed 7/5/17	Wed 10/25/17
451	Site Survey and mapping	7 days	Wed 7/5/17	Thu 7/13/17
452	Prepare Construction Drawings	20 days	Fri 7/14/17	Thu 8/10/17
453	**Construction Drawings Review and Approv**	10 days	Fri 8/11/17	Thu 8/24/17
454	**Broward County Site release/ Construction NTP to Contractor**	1 day	Fri 8/25/17	Fri 8/25/17
455	Place Order for New Shelter	1 day	Mon 8/28/17	Mon 8/28/17
456	Manufacture Shelter	35 days	Tue 8/29/17	Tue 10/17/17
457	Ship Shelter to Site	2 days	Wed 10/18/17	Thu 10/19/17
458	**CONSTRUCTION PHASE**	**233.5 days**	**Fri 8/25/17**	**Mon 7/30/18**
459	**Construction Permits**	**125 days**	**Fri 8/25/17**	**Fri 2/23/18**
460	Prepare and Submit Permit Package	5 days	Fri 8/25/17	Thu 8/31/17
461	Permit Review and Approval Process	20 days	Fri 9/1/17	Fri 9/29/17
462	Construction Permits Approved and Received	0 days	Fri 9/29/17	Fri 9/29/17
463	**Sequence Time Delay Task**	100 days	Mon 10/2/17	Fri 2/23/18
464	**SITE PREPARATION**	**7 days**	**Mon 2/26/18**	**Tue 3/6/18**
465	Mobilization	1 day	Mon 2/26/18	Mon 2/26/18
466	Locate existing utilities	1 day	Tue 2/27/18	Tue 2/27/18
467	Light clearing and grubbing	1 day	Wed 2/28/18	Wed 2/28/18
468	Compound grading and silt fencing	4 days	Thu 3/1/18	Tue 3/6/18
469	**SITE COMPONENTS INSTALLATION**	**34.5 days**	**Wed 3/7/18**	**Tue 4/24/18**
470	Excavate, form and rebar shelter foundations	3 days	Wed 3/7/18	Fri 3/9/18

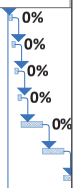


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
471	Excavate, form and rebar fuel tank foundation	1 day	Mon 3/12/18	Mon 3/12/18
472	Excavate, form and rebar generator foundations	1 day	Tue 3/13/18	Tue 3/13/18
473	Foundation inspection, concrete pour and testir	1 day	Wed 3/14/18	Wed 3/14/18
474	Receive Shelter On Site	1 day	Thu 3/15/18	Thu 3/15/18
475	Offload and Install equipment shelter	5 days	Fri 3/16/18	Thu 3/22/18
476	Trench and Install underground power conduits	5 days	Fri 3/23/18	Thu 3/29/18
477	Trench and install grounding	2 days	Fri 3/30/18	Mon 4/2/18
478	Grounding Inspection	0.5 days	Tue 4/3/18	Tue 4/3/18
479	Conduit inspection and backfill	1 day	Tue 4/3/18	Wed 4/4/18
480	Install fuel tank and piping	2 days	Wed 4/4/18	Fri 4/6/18
481	Piping inspection, leakage test and trench backil	2 days	Fri 4/6/18	Tue 4/10/18
482	Pick up meter panel and Install meterboard	2 days	Tue 4/10/18	Thu 4/12/18
483	Utility hookup to the site by Electric Co.	5 days	Thu 4/12/18	Thu 4/19/18
484	Building/Electrical inspection	1 day	Thu 4/19/18	Fri 4/20/18
485	Install ice bridge from shelter to the tower	2 days	Fri 4/20/18	Tue 4/24/18
486	**EXISTING FACILITY IMPROVEMENTS**	**5 days**	**Tue 4/24/18**	**Tue 5/1/18**
487	Install DC Power System	5 days	Tue 4/24/18	Tue 5/1/18
488	**TOWER WORK**	**19 days**	**Tue 5/1/18**	**Tue 5/29/18**
489	Ship antennas, line and accessories to the site	5 days	Tue 5/1/18	Tue 5/8/18
490	Install antennas, microwave dishes and lines	4 days	Tue 5/8/18	Mon 5/14/18
491	Complete Independent Tower Inspection & Rep	10 days	Mon 5/14/18	Tue 5/29/18
492	**SITE RESTORATION**	**8 days**	**Tue 5/29/18**	**Fri 6/8/18**
493	Fencing of tower compound	3 days	Tue 5/29/18	Fri 6/1/18
494	Complete grounding connections	1 day	Fri 6/1/18	Mon 6/4/18
495	Finish Grade and gravel compound	2 days	Mon 6/4/18	Wed 6/6/18
496	Site touchup and restoration	2 days	Wed 6/6/18	Fri 6/8/18
497	**FINAL TESTING**	**35 days**	**Fri 6/8/18**	**Mon 7/30/18**
498	Line termination and Sweep test	0.5 days	Fri 6/8/18	Fri 6/8/18
499	Grounding test of the site	0.5 days	Mon 6/11/18	Mon 6/11/18
500	DC Power System Startup and Test	1 day	Mon 6/11/18	Tue 6/12/18
501	Generator Startup and Test	1 day	Tue 6/12/18	Wed 6/13/18
502	Test Fire Supression System	1 day	Wed 6/13/18	Thu 6/14/18
503	**R56 Site Audit/Punch List with Broward Co**	1 day	Thu 6/14/18	Fri 6/15/18
504	Punch List completion	10 days	Fri 6/15/18	Fri 6/29/18
505	Complete Civil As-Built Drawings	10 days	Fri 6/29/18	Mon 7/16/18
506	**Site Civil Work Substantial Completion**	**10 days**	**Mon 7/16/18**	**Mon 7/30/18**

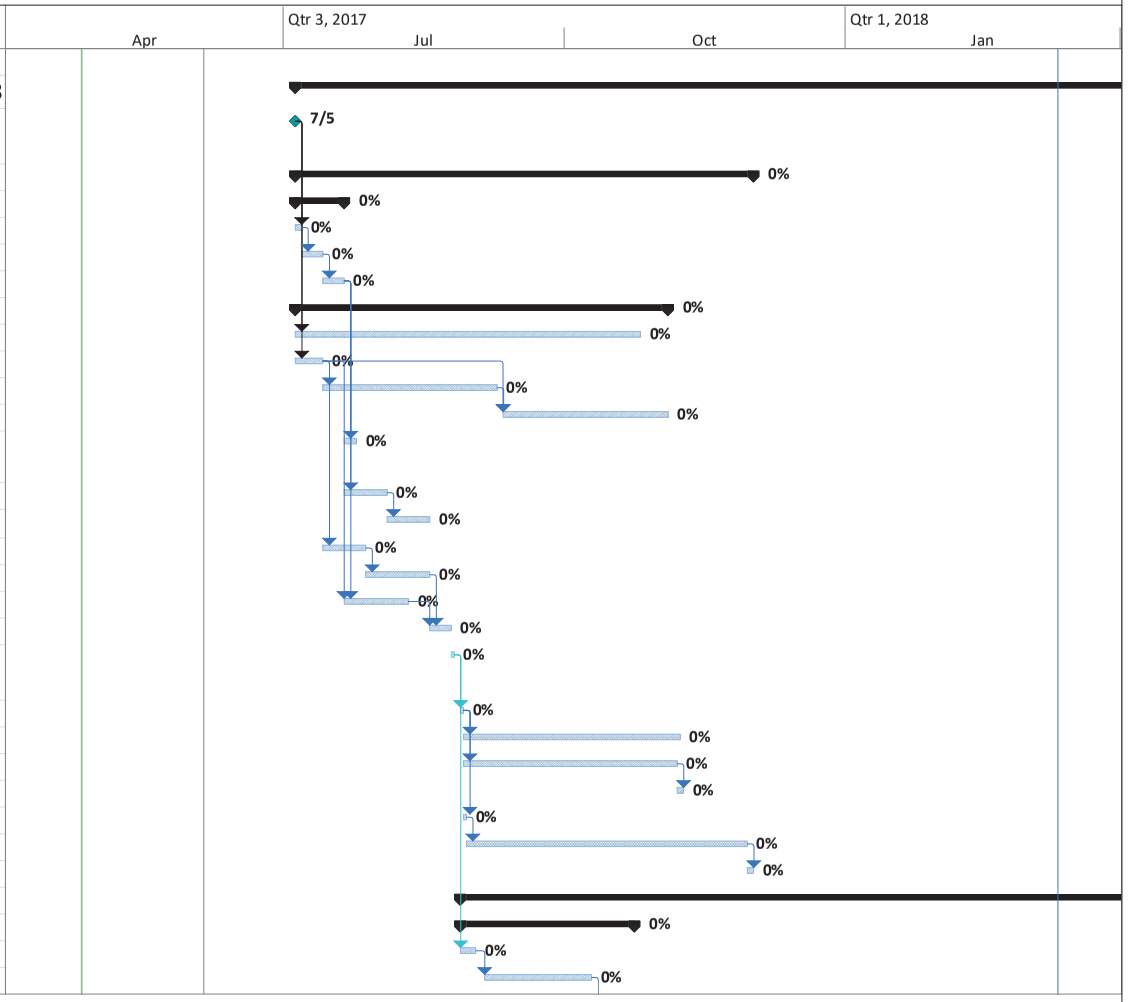


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
507				
508	**CH2 SITE DEVELOPMENT**	**197.5 days**	**Wed 7/5/17**	**Mon 4/16/18**
509	Broward County Provides NTP for Pre Construction Phase	0 days	Wed 7/5/17	Wed 7/5/17
510	**PRE CONSTRUCTION PHASE**	**105 days**	**Wed 7/5/17**	**Fri 12/1/17**
511	**SITE ENGINEERING**	**12 days**	**Wed 7/5/17**	**Thu 7/20/17**
512	Site visit with AMEC FW	2 days	Wed 7/5/17	Thu 7/6/17
513	Prepare site sketch/site layout	5 days	Fri 7/7/17	Thu 7/13/17
514	Broward County Review and approval of site ske	5 days	Fri 7/14/17	Thu 7/20/17
515	**PERMITTING DOCUMENTATION AND FINAL DRAV**	**87 days**	**Wed 7/5/17**	**Fri 11/3/17**
516	NEPA/SHPO studies and approvals	80 days	Wed 7/5/17	Wed 10/25/17
517	Site Survey and mapping	7 days	Wed 7/5/17	Thu 7/13/17
518	FAA application (7460-1) and approval	40 days	Fri 7/14/17	Fri 9/8/17
519	FCC Tower Registration Application	40 days	Mon 9/11/17	Fri 11/3/17
520	Review Shelter Drawings based on Port Entry Orientation	2 days	Fri 7/21/17	Mon 7/24/17
521	Prepared Construction Drawings of new site	10 days	Fri 7/21/17	Thu 8/3/17
522	**Construction Drawings Review and Approv**	10 days	Fri 8/4/17	Thu 8/17/17
523	Microwave Path Study & report	10 days	Fri 7/14/17	Thu 7/27/17
524	Tower Design and drawings	15 days	Fri 7/28/17	Thu 8/17/17
525	Geotechnical testing and report	15 days	Fri 7/21/17	Thu 8/10/17
526	Tower Foundation Design	5 days	Fri 8/18/17	Thu 8/24/17
527	**Broward County Site release/ Construction NTP to Contractor**	1 day	Fri 8/25/17	Fri 8/25/17
528	Place Order for New Tower	1 day	Mon 8/28/17	Mon 8/28/17
529	Manufacture Tower	50 days	Tue 8/29/17	Tue 11/7/17
530	Ship Anchor Bolts & Baseplates to new site	49 days	Tue 8/29/17	Mon 11/6/17
531	Ship Tower Steel to new site	2 days	Tue 11/7/17	Wed 11/8/17
532	Place Order for New Shelter	1 day	Tue 8/29/17	Tue 8/29/17
533	Shelter Manufacturing	63 days	Wed 8/30/17	Wed 11/29/17
534	Ship Shelter to Site	2 days	Thu 11/30/17	Fri 12/1/17
535	**CONSTRUCTION PHASE**	**159.5 days**	**Mon 8/28/17**	**Mon 4/16/18**
536	**Construction Permits**	**40 days**	**Mon 8/28/17**	**Mon 10/23/17**
537	Prepare and Submit Permit Package	5 days	Mon 8/28/17	Fri 9/1/17
538	Permit Review and Approval Process	25 days	Tue 9/5/17	Mon 10/9/17

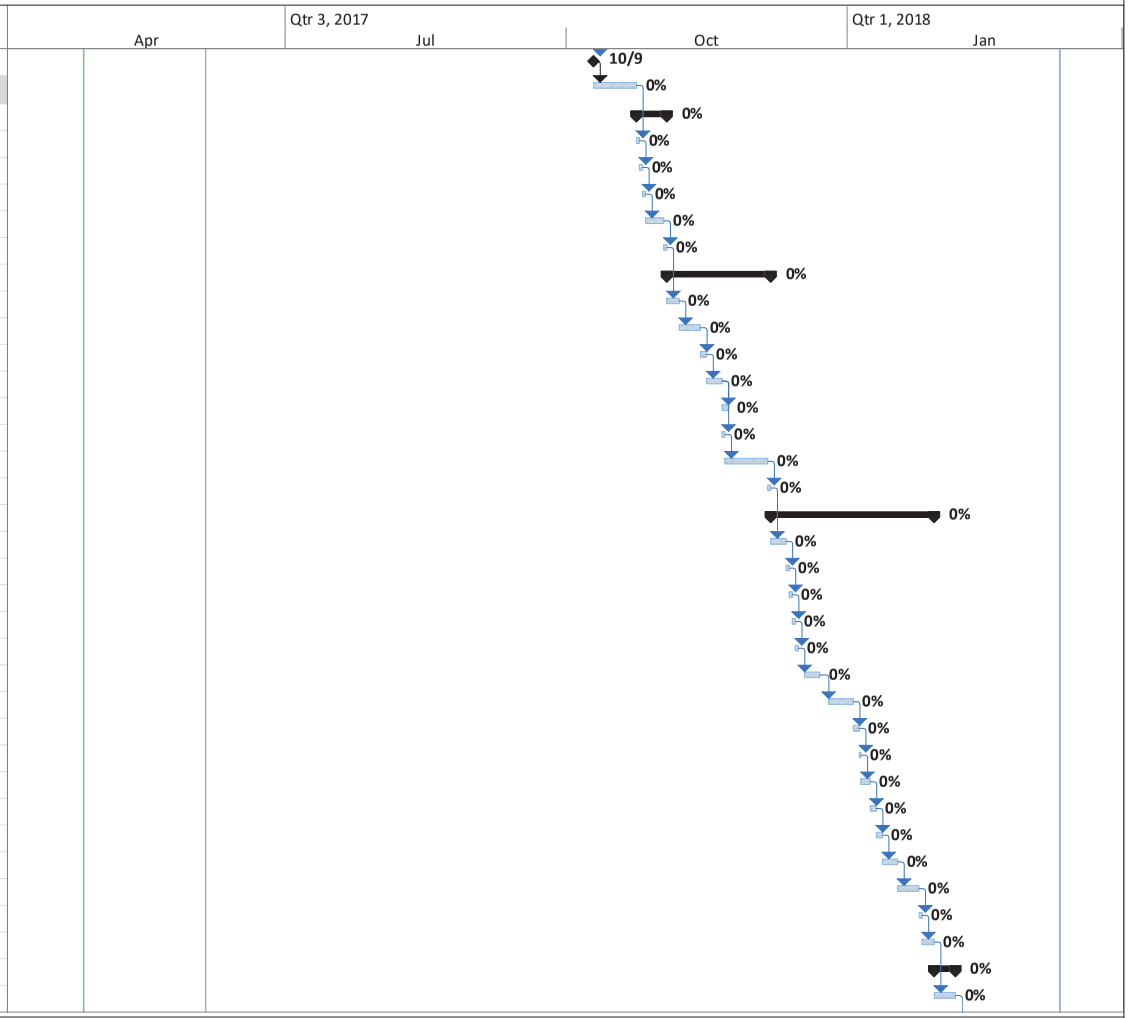


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ID	Task Name	Duration	Start	Finish
539	Construction Permits Approved and Received	0 days	Mon 10/9/17	Mon 10/9/17
540	**Sequence Time Delay Task**	10 days	Tue 10/10/17	Mon 10/23/17
541	**SITE PREPARATION**	**8 days**	**Tue 10/24/17**	**Thu 11/2/17**
542	Mobilization	1 day	Tue 10/24/17	Tue 10/24/17
543	Locate existing utilities	1 day	Wed 10/25/17	Wed 10/25/17
544	Light clearing and grubbing	1 day	Thu 10/26/17	Thu 10/26/17
545	Compound grading and silt fencing	4 days	Fri 10/27/17	Wed 11/1/17
546	Construction Staking	1 day	Thu 11/2/17	Thu 11/2/17
547	**TOWER WORK**	**22 days**	**Fri 11/3/17**	**Wed 12/6/17**
548	Receive anchor bolts and base plates at new site	2 days	Fri 11/3/17	Mon 11/6/17
549	Drill, rebar and pour drilled pier foundation	5 days	Tue 11/7/17	Mon 11/13/17
550	Foundation inspection, concrete testing	2 days	Tue 11/14/17	Wed 11/15/17
551	Strip forms, backfill and compaction	3 days	Thu 11/16/17	Mon 11/20/17
552	Receive Tower at new site	2 days	Tue 11/21/17	Wed 11/22/17
553	Notify FAA of impending tower construction (74	1 day	Tue 11/21/17	Tue 11/21/17
554	Tower assembly and stacking	8 days	Wed 11/22/17	Tue 12/5/17
555	Notify FAA of tower completion (7460-2)	1 day	Wed 12/6/17	Wed 12/6/17
556	**SITE COMPONENTS INSTALLATION**	**34.5 days**	**Thu 12/7/17**	**Mon 1/29/18**
557	Excavate, form and rebar shelter foundations	3 days	Thu 12/7/17	Mon 12/11/17
558	Excavate, form and rebar fuel tank foundation	1 day	Tue 12/12/17	Tue 12/12/17
559	Excavate, form and rebar generator foundations	1 day	Wed 12/13/17	Wed 12/13/17
560	Foundation inspection, concrete pour and testir	1 day	Thu 12/14/17	Thu 12/14/17
561	Receive Shelter On Site	1 day	Fri 12/15/17	Fri 12/15/17
562	Offload and Install equipment shelter	5 days	Mon 12/18/17	Fri 12/22/17
563	Trench and Install underground power conduits	5 days	Tue 12/26/17	Tue 1/2/18
564	Trench and install grounding	2 days	Wed 1/3/18	Thu 1/4/18
565	Grounding Inspection	0.5 days	Fri 1/5/18	Fri 1/5/18
566	Conduit inspection and backfill	1 day	Fri 1/5/18	Mon 1/8/18
567	Install fuel tank and piping	2 days	Mon 1/8/18	Wed 1/10/18
568	Piping inspection, leakage test and trench backil	2 days	Wed 1/10/18	Fri 1/12/18
569	Pick up meter panel and Install meterboard	2 days	Fri 1/12/18	Wed 1/17/18
570	Utility hookup to the site by Electric Co.	5 days	Wed 1/17/18	Wed 1/24/18
571	Building/Electrical inspection	1 day	Wed 1/24/18	Thu 1/25/18
572	Install ice bridge from shelter to the tower	2 days	Thu 1/25/18	Mon 1/29/18
573	**EXISTING FACILITY IMPROVEMENTS**	**5 days**	**Mon 1/29/18**	**Mon 2/5/18**
574	Install DC Power System	5 days	Mon 1/29/18	Mon 2/5/18

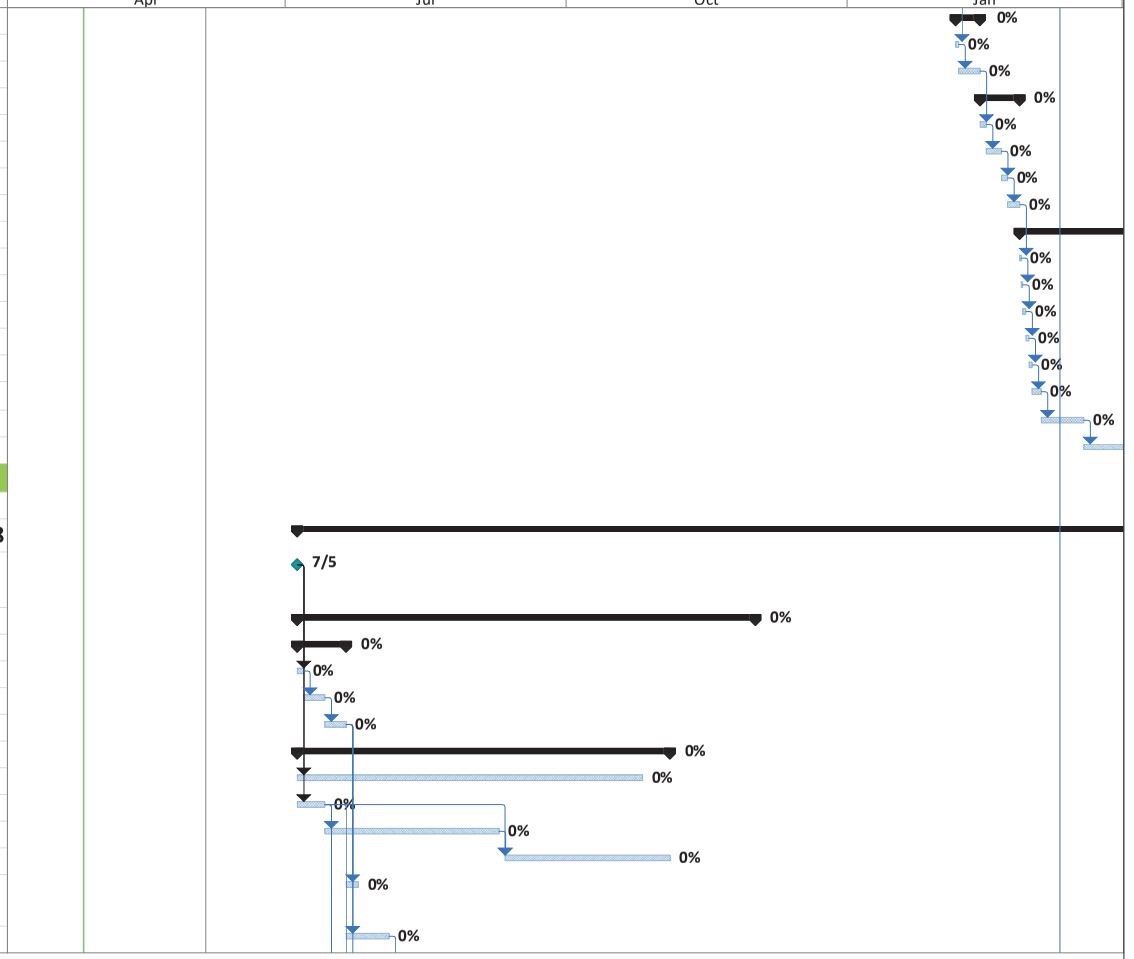


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
575	**Antenna and Line Installation**	**6 days**	**Mon 2/5/18**	**Tue 2/13/18**
576	Ship antennas, line and accessories to the site	1 day	Mon 2/5/18	Tue 2/6/18
577	Install antennas, microwave dishes and lines	5 days	Tue 2/6/18	Tue 2/13/18
578	**Compound Completion**	**9 days**	**Tue 2/13/18**	**Mon 2/26/18**
579	Finish Grade and gravel compound	2 days	Tue 2/13/18	Thu 2/15/18
580	Fencing of tower compound	3 days	Thu 2/15/18	Tue 2/20/18
581	Complete grounding connections	2 days	Tue 2/20/18	Thu 2/22/18
582	Site touchup and restoration	2 days	Thu 2/22/18	Mon 2/26/18
583	**FINAL TESTING**	**35 days**	**Mon 2/26/18**	**Mon 4/16/18**
584	Line termination and Sweep test	0.5 days	Mon 2/26/18	Mon 2/26/18
585	Grounding test of the site	0.5 days	Tue 2/27/18	Tue 2/27/18
586	DC Power System Startup and Test	1 day	Tue 2/27/18	Wed 2/28/18
587	Generator Startup and Test	1 day	Wed 2/28/18	Thu 3/1/18
588	Test Fire Supression System	1 day	Thu 3/1/18	Fri 3/2/18
589	**R56 Site Audit/Punch List with Broward Co**	1 day	Fri 3/2/18	Mon 3/5/18
590	Punch List completion	10 days	Mon 3/5/18	Mon 3/19/18
591	Complete Civil As-Built Drawings	10 days	Mon 3/19/18	Mon 4/2/18
592	**Site Civil Work Substantial Completion**	**10 days**	**Mon 4/2/18**	**Mon 4/16/18**
593				
594	**DEERFIELD SITE DEVELOPMENT**	**207.5 days**	**Wed 7/5/17**	**Mon 4/30/18**
595	Broward County Provides NTP for Pre Construction Phase	0 days	Wed 7/5/17	Wed 7/5/17
596	**PRE CONSTRUCTION PHASE**	**105 days**	**Wed 7/5/17**	**Fri 12/1/17**
597	**SITE ENGINEERING**	**12 days**	**Wed 7/5/17**	**Thu 7/20/17**
598	Site visit with AMEC FW	2 days	Wed 7/5/17	Thu 7/6/17
599	Prepare site sketch/site layout	5 days	Fri 7/7/17	Thu 7/13/17
600	Broward County Review and approval of site ske	5 days	Fri 7/14/17	Thu 7/20/17
601	**PERMITTING DOCUMENTATION AND FINAL DRA**	**87 days**	**Wed 7/5/17**	**Fri 11/3/17**
602	NEPA/SHPO studies and approvals	80 days	Wed 7/5/17	Wed 10/25/17
603	Site Survey and mapping	7 days	Wed 7/5/17	Thu 7/13/17
604	FAA application (7460-1) and approval	40 days	Fri 7/14/17	Fri 9/8/17
605	FCC Tower Registration Application	40 days	Mon 9/11/17	Fri 11/3/17
606	Review Shelter Drawings based on Port Entry Orientation	2 days	Fri 7/21/17	Mon 7/24/17
607	Prepared Construction Drawings of new site	10 days	Fri 7/21/17	Thu 8/3/17

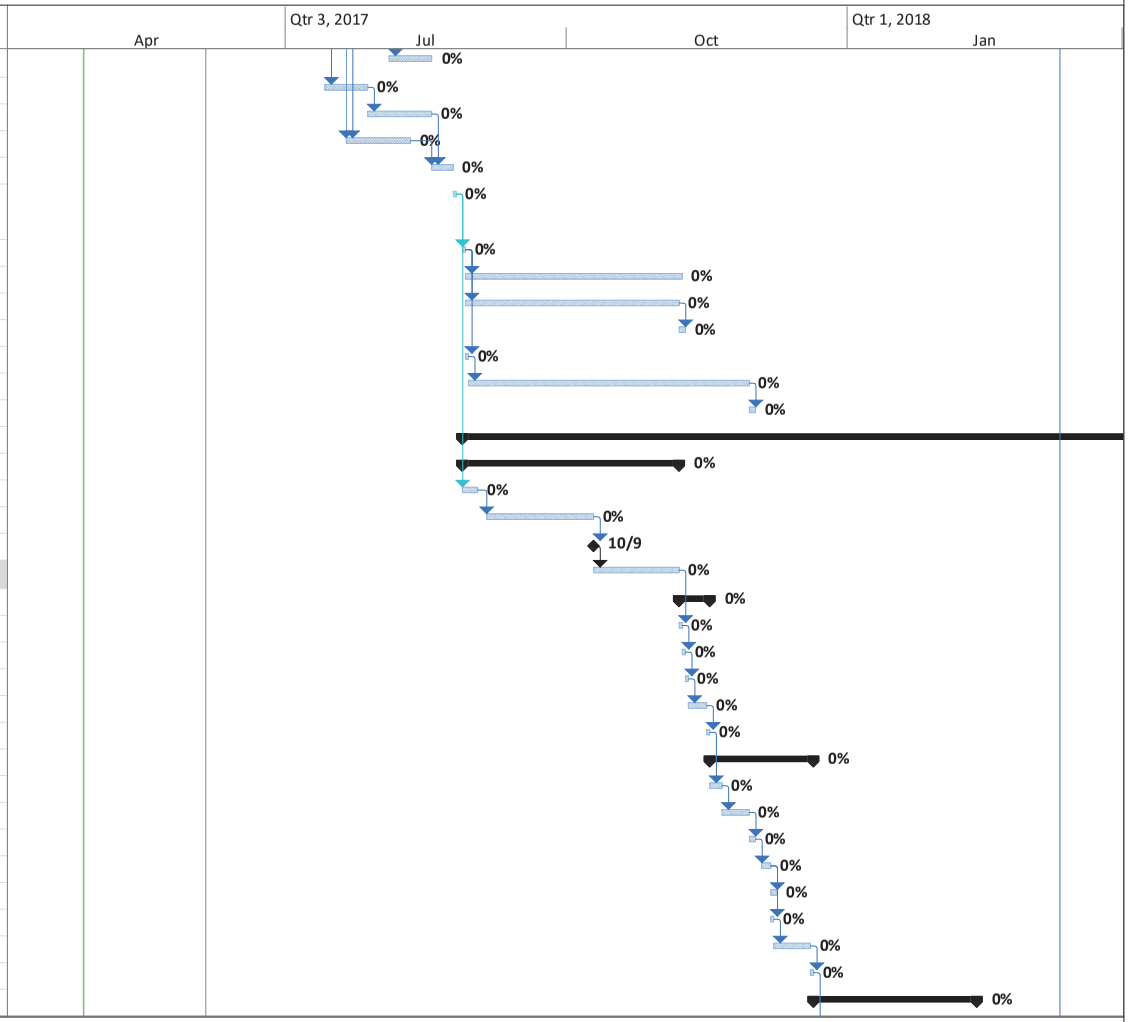


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pur- delay to sequence subs

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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
608	**Construction Drawings Review and Approv**	10 days	Fri 8/4/17	Thu 8/17/17
609	Microwave Path Study & report	10 days	Fri 7/14/17	Thu 7/27/17
610	Tower Design and drawings	15 days	Fri 7/28/17	Thu 8/17/17
611	Geotechnical testing and report	15 days	Fri 7/21/17	Thu 8/10/17
612	Tower Foundation Design	5 days	Fri 8/18/17	Thu 8/24/17
613	**Broward County Site release/ Construction NTP to Contractor**	1 day	Fri 8/25/17	Fri 8/25/17
614	Place Order for New Tower	1 day	Mon 8/28/17	Mon 8/28/17
615	Manufacture Tower	50 days	Tue 8/29/17	Tue 11/7/17
616	Ship Anchor Bolts & Baseplates to new site	49 days	Tue 8/29/17	Mon 11/6/17
617	Ship Tower Steel to new site	2 days	Tue 11/7/17	Wed 11/8/17
618	Place Order for New Shelter	1 day	Tue 8/29/17	Tue 8/29/17
619	Shelter Manufacturing	63 days	Wed 8/30/17	Wed 11/29/17
620	Ship Shelter to Site	2 days	Thu 11/30/17	Fri 12/1/17
621	**CONSTRUCTION PHASE**	**169.5 days**	**Mon 8/28/17**	**Mon 4/30/18**
622	**Construction Permits**	**50 days**	**Mon 8/28/17**	**Mon 11/6/17**
623	Prepare and Submit Permit Package	5 days	Mon 8/28/17	Fri 9/1/17
624	Permit Review and Approval Process	25 days	Tue 9/5/17	Mon 10/9/17
625	Construction Permits Approved and Received	0 days	Mon 10/9/17	Mon 10/9/17
626	**Sequence Time Delay Task**	20 days	Tue 10/10/17	Mon 11/6/17
627	**SITE PREPARATION**	**8 days**	**Tue 11/7/17**	**Thu 11/16/17**
628	Mobilization	1 day	Tue 11/7/17	Tue 11/7/17
629	Locate existing utilities	1 day	Wed 11/8/17	Wed 11/8/17
630	Light clearing and grubbing	1 day	Thu 11/9/17	Thu 11/9/17
631	Compound grading and silt fencing	4 days	Fri 11/10/17	Wed 11/15/17
632	Construction Staking	1 day	Thu 11/16/17	Thu 11/16/17
633	**TOWER WORK**	**22 days**	**Fri 11/17/17**	**Wed 12/20/17**
634	Receive anchor bolts and base plates at new site	2 days	Fri 11/17/17	Mon 11/20/17
635	Drill, rebar and pour drilled pier foundation	5 days	Tue 11/21/17	Wed 11/29/17
636	Foundation inspection, concrete testing	2 days	Thu 11/30/17	Fri 12/1/17
637	Strip forms, backfill and compaction	3 days	Mon 12/4/17	Wed 12/6/17
638	Receive Tower at new site	2 days	Thu 12/7/17	Fri 12/8/17
639	Notify FAA of impending tower construction (74	1 day	Thu 12/7/17	Thu 12/7/17
640	Tower assembly and stacking	8 days	Fri 12/8/17	Tue 12/19/17
641	Notify FAA of tower completion (7460-2)	1 day	Wed 12/20/17	Wed 12/20/17
642	**SITE COMPONENTS INSTALLATION**	**34.5 days**	**Thu 12/21/17**	**Mon 2/12/18**

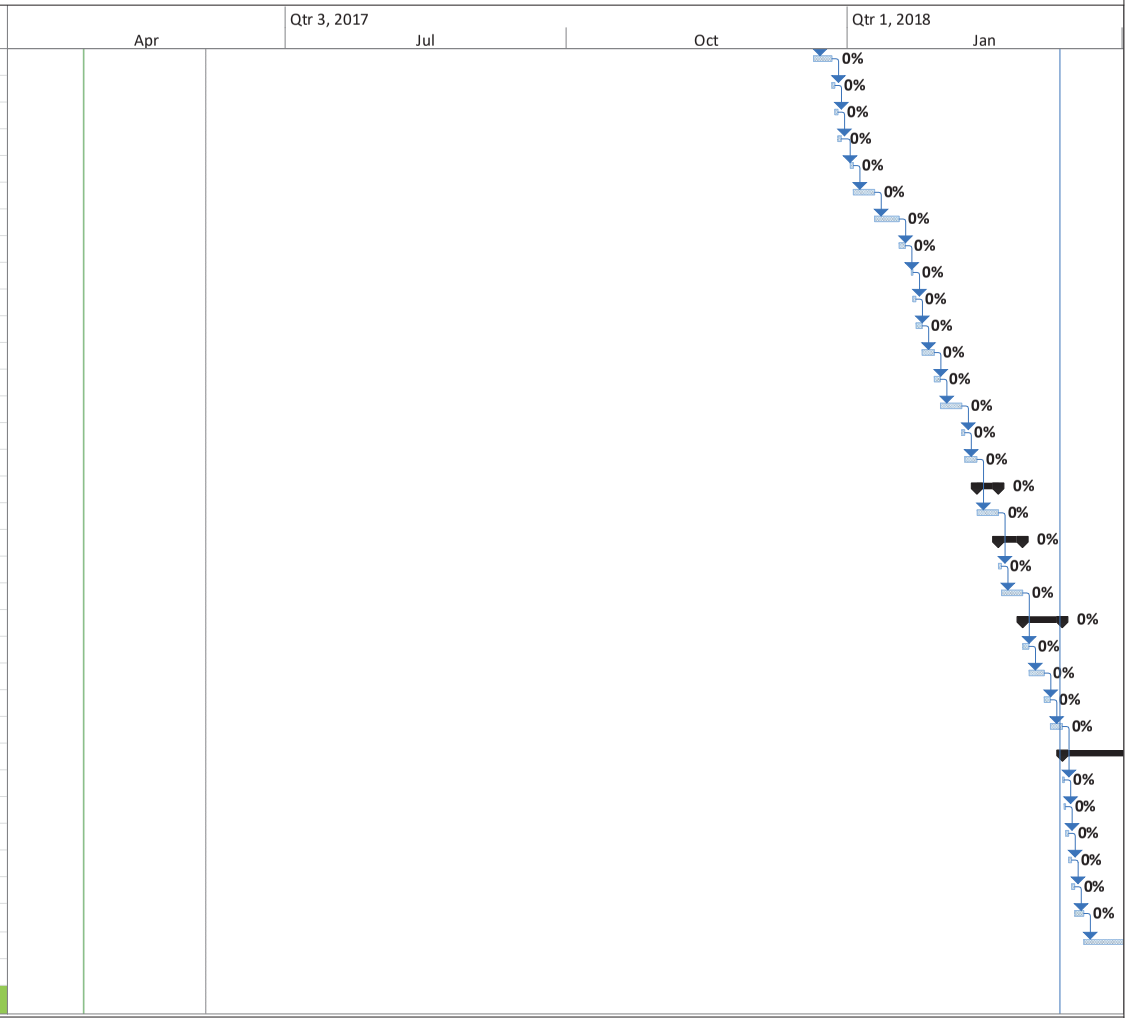


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Manual Summary
Project Summary
External Tasks
External Milestone
Inactive Task
Inactive Milestone
Inactive Summary
Deadline

Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
643	Excavate, form and rebar shelter foundations	3 days	Thu 12/21/17	Tue 12/26/17
644	Excavate, form and rebar fuel tank foundation	1 day	Wed 12/27/17	Wed 12/27/17
645	Excavate, form and rebar generator foundations	1 day	Thu 12/28/17	Thu 12/28/17
646	Foundation inspection, concrete pour and testir	1 day	Fri 12/29/17	Fri 12/29/17
647	Receive Shelter On Site	1 day	Tue 1/2/18	Tue 1/2/18
648	Offload and Install equipment shelter	5 days	Wed 1/3/18	Tue 1/9/18
649	Trench and Install underground power conduits	5 days	Wed 1/10/18	Wed 1/17/18
650	Trench and install grounding	2 days	Thu 1/18/18	Fri 1/19/18
651	Grounding Inspection	0.5 days	Mon 1/22/18	Mon 1/22/18
652	Conduit inspection and backfill	1 day	Mon 1/22/18	Tue 1/23/18
653	Install fuel tank and piping	2 days	Tue 1/23/18	Thu 1/25/18
654	Piping inspection, leakage test and trench backil	2 days	Thu 1/25/18	Mon 1/29/18
655	Pick up meter panel and Install meterboard	2 days	Mon 1/29/18	Wed 1/31/18
656	Utility hookup to the site by Electric Co.	5 days	Wed 1/31/18	Wed 2/7/18
657	Building/Electrical inspection	1 day	Wed 2/7/18	Thu 2/8/18
658	Install ice bridge from shelter to the tower	2 days	Thu 2/8/18	Mon 2/12/18
659	**EXISTING FACILITY IMPROVEMENTS**	**5 days**	**Mon 2/12/18**	**Mon 2/19/18**
660	Install DC Power System	5 days	Mon 2/12/18	Mon 2/19/18
661	**Antenna and Line Installation**	**6 days**	**Mon 2/19/18**	**Tue 2/27/18**
662	Ship antennas, line and accessories to the site	1 day	Mon 2/19/18	Tue 2/20/18
663	Install antennas, microwave dishes and lines	5 days	Tue 2/20/18	Tue 2/27/18
664	**Compound Completion**	**9 days**	**Tue 2/27/18**	**Mon 3/12/18**
665	Finish Grade and gravel compound	2 days	Tue 2/27/18	Thu 3/1/18
666	Fencing of tower compound	3 days	Thu 3/1/18	Tue 3/6/18
667	Complete grounding connections	2 days	Tue 3/6/18	Thu 3/8/18
668	Site touchup and restoration	2 days	Thu 3/8/18	Mon 3/12/18
669	**FINAL TESTING**	**35 days**	**Mon 3/12/18**	**Mon 4/30/18**
670	Line termination and Sweep test	0.5 days	Mon 3/12/18	Mon 3/12/18
671	Grounding test of the site	0.5 days	Tue 3/13/18	Tue 3/13/18
672	DC Power System Startup and Test	1 day	Tue 3/13/18	Wed 3/14/18
673	Generator Startup and Test	1 day	Wed 3/14/18	Thu 3/15/18
674	Test Fire Supression System	1 day	Thu 3/15/18	Fri 3/16/18
675	**R56 Site Audit/Punch List with Broward Co**	1 day	Fri 3/16/18	Mon 3/19/18
676	Punch List completion	10 days	Mon 3/19/18	Mon 4/2/18
677	Complete Civil As-Built Drawings	10 days	Mon 4/2/18	Mon 4/16/18
678	**Site Civil Work Substantial Completion**	**10 days**	**Mon 4/16/18**	**Mon 4/30/18**

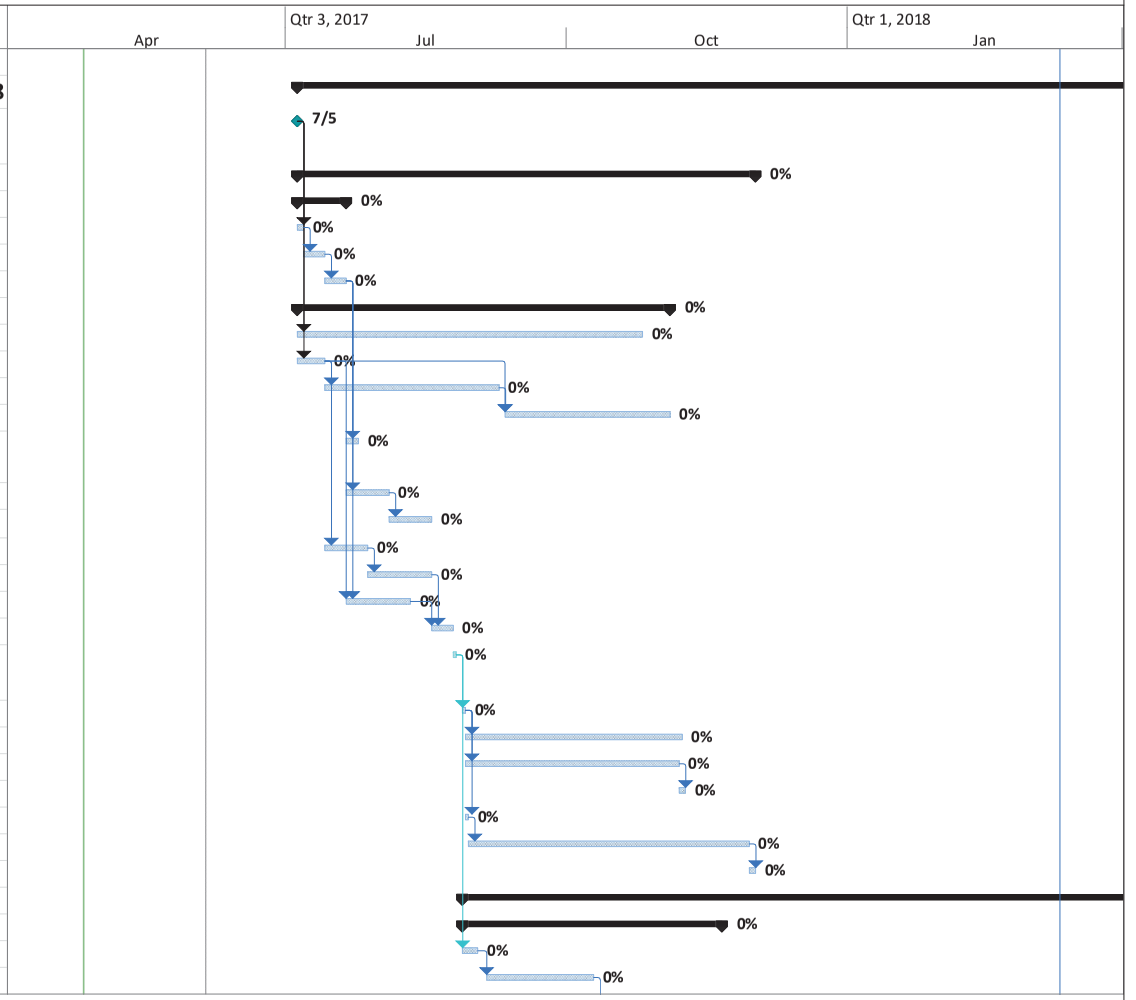


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
679				
680	**WEST LAKE PARK SITE DEVELOPMENT**	**217.5 days**	**Wed 7/5/17**	**Mon 5/14/18**
681	Broward County Provides NTP for Pre Construction Phase	0 days	Wed 7/5/17	Wed 7/5/17
682	**PRE CONSTRUCTION PHASE**	**105 days**	**Wed 7/5/17**	**Fri 12/1/17**
683	**SITE ENGINEERING**	**12 days**	**Wed 7/5/17**	**Thu 7/20/17**
684	Site visit with AMEC FW	2 days	Wed 7/5/17	Thu 7/6/17
685	Prepare site sketch/site layout	5 days	Fri 7/7/17	Thu 7/13/17
686	Broward County Review and approval of site ske	5 days	Fri 7/14/17	Thu 7/20/17
687	**PERMITTING DOCUMENTATION AND FINAL DRAV**	**87 days**	**Wed 7/5/17**	**Fri 11/3/17**
688	NEPA/SHPO studies and approvals	80 days	Wed 7/5/17	Wed 10/25/17
689	Site Survey and mapping	7 days	Wed 7/5/17	Thu 7/13/17
690	FAA application (7460-1) and approval	40 days	Fri 7/14/17	Fri 9/8/17
691	FCC Tower Registration Application	40 days	Mon 9/11/17	Fri 11/3/17
692	Review Shelter Drawings based on Port Entry Orientation	2 days	Fri 7/21/17	Mon 7/24/17
693	Prepared Construction Drawings of new site	10 days	Fri 7/21/17	Thu 8/3/17
694	**Construction Drawings Review and Approv**	10 days	Fri 8/4/17	Thu 8/17/17
695	Microwave Path Study & report	10 days	Fri 7/14/17	Thu 7/27/17
696	Tower Design and drawings	15 days	Fri 7/28/17	Thu 8/17/17
697	Geotechnical testing and report	15 days	Fri 7/21/17	Thu 8/10/17
698	Tower Foundation Design	5 days	Fri 8/18/17	Thu 8/24/17
699	**Broward County Site release/ Construction NTP to Contractor**	1 day	Fri 8/25/17	Fri 8/25/17
700	Place Order for New Tower	1 day	Mon 8/28/17	Mon 8/28/17
701	Manufacture Tower	50 days	Tue 8/29/17	Tue 11/7/17
702	Ship Anchor Bolts & Baseplates to new site	49 days	Tue 8/29/17	Mon 11/6/17
703	Ship Tower Steel to new site	2 days	Tue 11/7/17	Wed 11/8/17
704	Place Order for New Shelter	1 day	Tue 8/29/17	Tue 8/29/17
705	Shelter Manufacturing	63 days	Wed 8/30/17	Wed 11/29/17
706	Ship Shelter to Site	2 days	Thu 11/30/17	Fri 12/1/17
707	**CONSTRUCTION PHASE**	**179.5 days**	**Mon 8/28/17**	**Mon 5/14/18**
708	**Construction Permits**	**60 days**	**Mon 8/28/17**	**Mon 11/20/17**
709	Prepare and Submit Permit Package	5 days	Mon 8/28/17	Fri 9/1/17
710	Permit Review and Approval Process	25 days	Tue 9/5/17	Mon 10/9/17

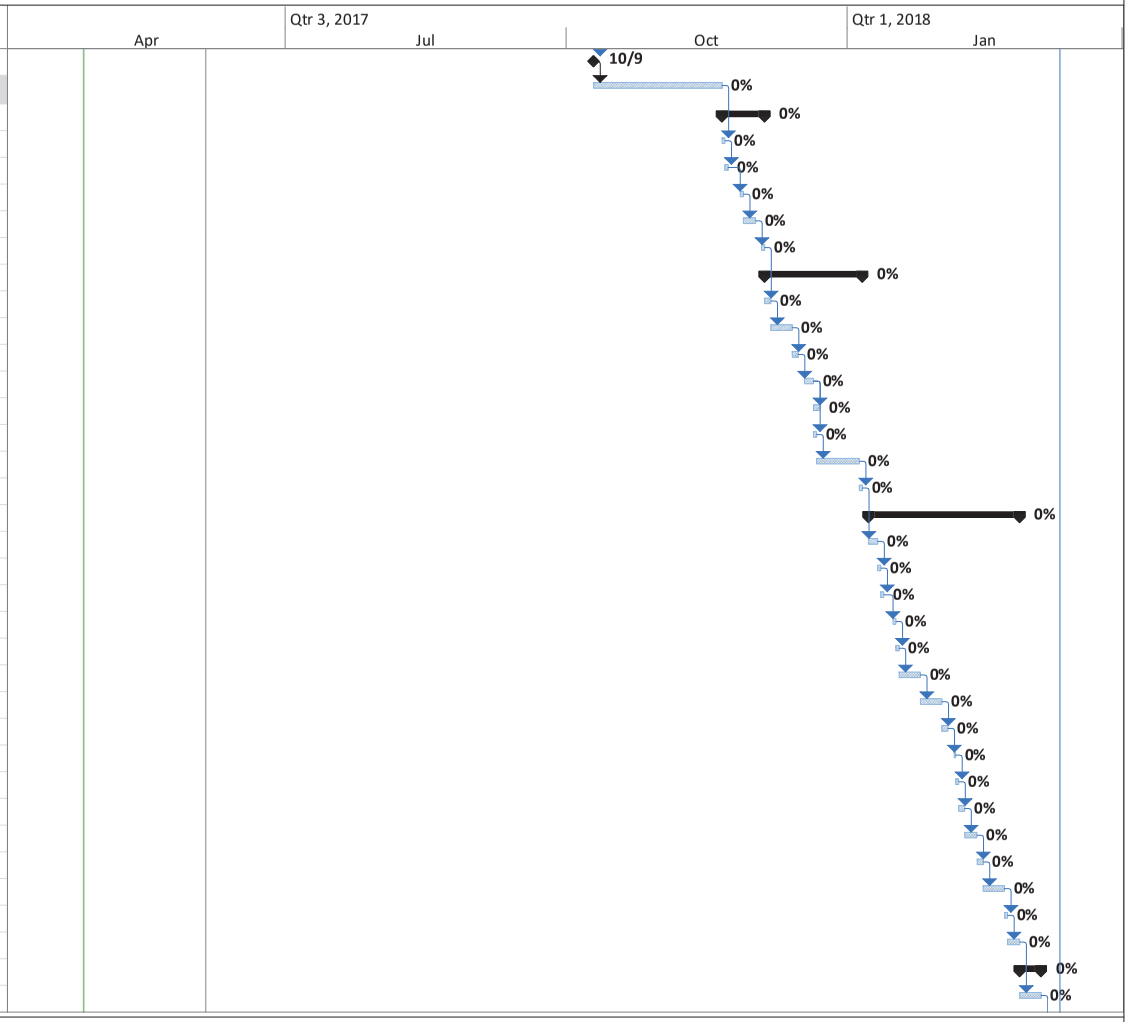


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
711	Construction Permits Approved and Received	0 days	Mon 10/9/17	Mon 10/9/17
712	**Sequence Time Delay Task**	**30 days**	**Tue 10/10/17**	**Mon 11/20/17**
713	**SITE PREPARATION**	**8 days**	**Tue 11/21/17**	**Mon 12/4/17**
714	Mobilization	1 day	Tue 11/21/17	Tue 11/21/17
715	Locate existing utilities	1 day	Wed 11/22/17	Wed 11/22/17
716	Light clearing and grubbing	1 day	Mon 11/27/17	Mon 11/27/17
717	Compound grading and silt fencing	4 days	Tue 11/28/17	Fri 12/1/17
718	Construction Staking	1 day	Mon 12/4/17	Mon 12/4/17
719	**TOWER WORK**	**22 days**	**Tue 12/5/17**	**Fri 1/5/18**
720	Receive anchor bolts and base plates at new site	2 days	Tue 12/5/17	Wed 12/6/17
721	Drill, rebar and pour drilled pier foundation	5 days	Thu 12/7/17	Wed 12/13/17
722	Foundation inspection, concrete testing	2 days	Thu 12/14/17	Fri 12/15/17
723	Strip forms, backfill and compaction	3 days	Mon 12/18/17	Wed 12/20/17
724	Receive Tower at new site	2 days	Thu 12/21/17	Fri 12/22/17
725	Notify FAA of impending tower construction (74	1 day	Thu 12/21/17	Thu 12/21/17
726	Tower assembly and stacking	8 days	Fri 12/22/17	Thu 1/4/18
727	Notify FAA of tower completion (7460-2)	1 day	Fri 1/5/18	Fri 1/5/18
728	**SITE COMPONENTS INSTALLATION**	**34.5 days**	**Mon 1/8/18**	**Mon 2/26/18**
729	Excavate, form and rebar shelter foundations	3 days	Mon 1/8/18	Wed 1/10/18
730	Excavate, form and rebar fuel tank foundation	1 day	Thu 1/11/18	Thu 1/11/18
731	Excavate, form and rebar generator foundations	1 day	Fri 1/12/18	Fri 1/12/18
732	Foundation inspection, concrete pour and testir	1 day	Tue 1/16/18	Tue 1/16/18
733	Receive Shelter On Site	1 day	Wed 1/17/18	Wed 1/17/18
734	Offload and Install equipment shelter	5 days	Thu 1/18/18	Wed 1/24/18
735	Trench and Install underground power conduits	5 days	Thu 1/25/18	Wed 1/31/18
736	Trench and install grounding	2 days	Thu 2/1/18	Fri 2/2/18
737	Grounding Inspection	0.5 days	Mon 2/5/18	Mon 2/5/18
738	Conduit inspection and backfill	1 day	Mon 2/5/18	Tue 2/6/18
739	Install fuel tank and piping	2 days	Tue 2/6/18	Thu 2/8/18
740	Piping inspection, leakage test and trench backil	2 days	Thu 2/8/18	Mon 2/12/18
741	Pick up meter panel and Install meterboard	2 days	Mon 2/12/18	Wed 2/14/18
742	Utility hookup to the site by Electric Co.	5 days	Wed 2/14/18	Wed 2/21/18
743	Building/Electrical inspection	1 day	Wed 2/21/18	Thu 2/22/18
744	Install ice bridge from shelter to the tower	2 days	Thu 2/22/18	Mon 2/26/18
745	**EXISTING FACILITY IMPROVEMENTS**	**5 days**	**Mon 2/26/18**	**Mon 3/5/18**
746	Install DC Power System	5 days	Mon 2/26/18	Mon 3/5/18

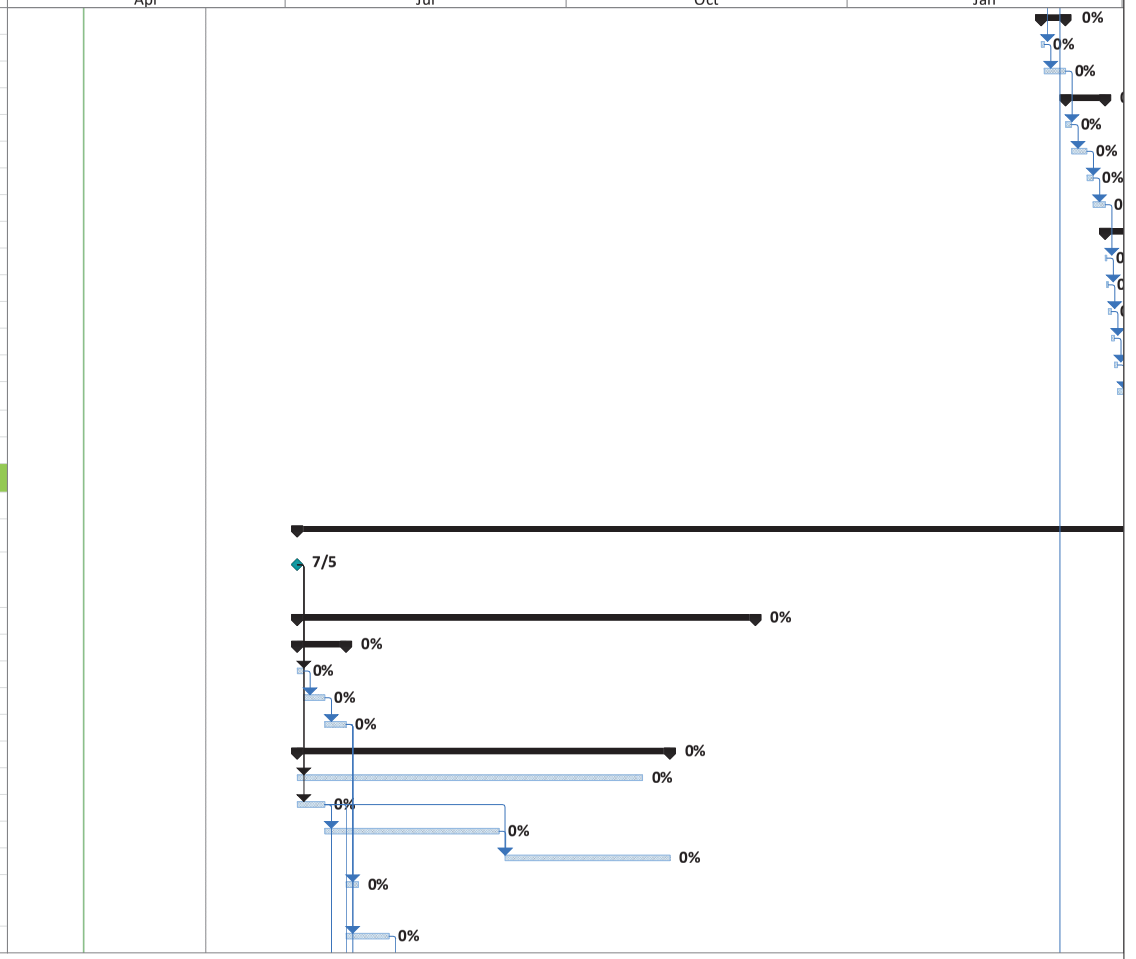


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
747	**Antenna and Line Installation**	**6 days**	**Mon 3/5/18**	**Tue 3/13/18**
748	Ship antennas, line and accessories to the site	1 day	Mon 3/5/18	Tue 3/6/18
749	Install antennas, microwave dishes and lines	5 days	Tue 3/6/18	Tue 3/13/18
750	**Compound Completion**	**9 days**	**Tue 3/13/18**	**Mon 3/26/18**
751	Finish Grade and gravel compound	2 days	Tue 3/13/18	Thu 3/15/18
752	Fencing of tower compound	3 days	Thu 3/15/18	Tue 3/20/18
753	Complete grounding connections	2 days	Tue 3/20/18	Thu 3/22/18
754	Site touchup and restoration	2 days	Thu 3/22/18	Mon 3/26/18
755	**FINAL TESTING**	**35 days**	**Mon 3/26/18**	**Mon 5/14/18**
756	Line termination and Sweep test	0.5 days	Mon 3/26/18	Mon 3/26/18
757	Grounding test of the site	0.5 days	Tue 3/27/18	Tue 3/27/18
758	DC Power System Startup and Test	1 day	Tue 3/27/18	Wed 3/28/18
759	Generator Startup and Test	1 day	Wed 3/28/18	Thu 3/29/18
760	Test Fire Supression System	1 day	Thu 3/29/18	Fri 3/30/18
761	**R56 Site Audit/Punch List with Broward Co**	1 day	Fri 3/30/18	Mon 4/2/18
762	Punch List completion	10 days	Mon 4/2/18	Mon 4/16/18
763	Complete Civil As-Built Drawings	10 days	Mon 4/16/18	Mon 4/30/18
764	**Site Civil Work Substantial Completion**	**10 days**	**Mon 4/30/18**	**Mon 5/14/18**
765				
766	**WEST HOLLYWOOD SITE DEVELOPMENT**	**227.5 days**	**Wed 7/5/17**	**Tue 5/29/18**
767	Broward County Provides NTP for Pre Construction Phase	0 days	Wed 7/5/17	Wed 7/5/17
768	**PRE CONSTRUCTION PHASE**	**105 days**	**Wed 7/5/17**	**Fri 12/1/17**
769	**SITE ENGINEERING**	**12 days**	**Wed 7/5/17**	**Thu 7/20/17**
770	Site visit with AMEC FW	2 days	Wed 7/5/17	Thu 7/6/17
771	Prepare site sketch/site layout	5 days	Fri 7/7/17	Thu 7/13/17
772	Broward County Review and approval of site ske	5 days	Fri 7/14/17	Thu 7/20/17
773	**PERMITTING DOCUMENTATION AND FINAL DRA**	**87 days**	**Wed 7/5/17**	**Fri 11/3/17**
774	NEPA/SHPO studies and approvals	80 days	Wed 7/5/17	Wed 10/25/17
775	Site Survey and mapping	7 days	Wed 7/5/17	Thu 7/13/17
776	FAA application (7460-1) and approval	40 days	Fri 7/14/17	Fri 9/8/17
777	FCC Tower Registration Application	40 days	Mon 9/11/17	Fri 11/3/17
778	Review Shelter Drawings based on Port Entry Orientation	2 days	Fri 7/21/17	Mon 7/24/17
779	Prepared Construction Drawings of new site	10 days	Fri 7/21/17	Thu 8/3/17

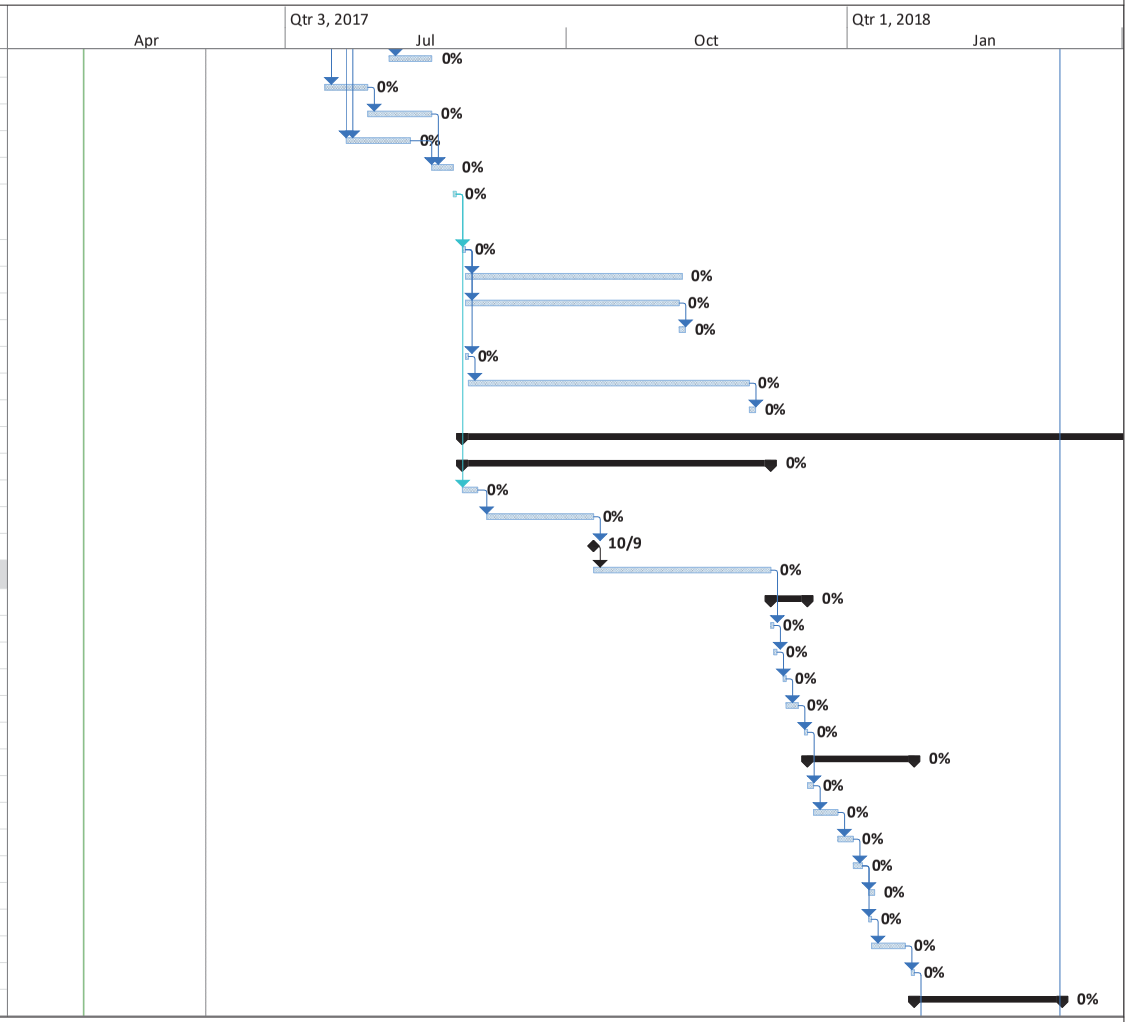


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
780	**Construction Drawings Review and Approv**	10 days	Fri 8/4/17	Thu 8/17/17
781	Microwave Path Study & report	10 days	Fri 7/14/17	Thu 7/27/17
782	Tower Design and drawings	15 days	Fri 7/28/17	Thu 8/17/17
783	Geotechnical testing and report	15 days	Fri 7/21/17	Thu 8/10/17
784	Tower Foundation Design	5 days	Fri 8/18/17	Thu 8/24/17
785	**Broward County Site release/ Construction NTP to Contractor**	1 day	Fri 8/25/17	Fri 8/25/17
786	Place Order for New Tower	1 day	Mon 8/28/17	Mon 8/28/17
787	Manufacture Tower	50 days	Tue 8/29/17	Tue 11/7/17
788	Ship Anchor Bolts & Baseplates to new site	49 days	Tue 8/29/17	Mon 11/6/17
789	Ship Tower Steel to new site	2 days	Tue 11/7/17	Wed 11/8/17
790	Place Order for New Shelter	1 day	Tue 8/29/17	Tue 8/29/17
791	Shelter Manufacturing	63 days	Wed 8/30/17	Wed 11/29/17
792	Ship Shelter to Site	2 days	Thu 11/30/17	Fri 12/1/17
793	**CONSTRUCTION PHASE**	**189.5 days**	**Mon 8/28/17**	**Tue 5/29/18**
794	**Construction Permits**	**70 days**	**Mon 8/28/17**	**Wed 12/6/17**
795	Prepare and Submit Permit Package	5 days	Mon 8/28/17	Fri 9/1/17
796	Permit Review and Approval Process	25 days	Tue 9/5/17	Mon 10/9/17
797	Construction Permits Approved and Received	0 days	Mon 10/9/17	Mon 10/9/17
798	**Sequence Time Delay Task**	40 days	Tue 10/10/17	Wed 12/6/17
799	**SITE PREPARATION**	**8 days**	**Thu 12/7/17**	**Mon 12/18/17**
800	Mobilization	1 day	Thu 12/7/17	Thu 12/7/17
801	Locate existing utilities	1 day	Fri 12/8/17	Fri 12/8/17
802	Light clearing and grubbing	1 day	Mon 12/11/17	Mon 12/11/17
803	Compound grading and silt fencing	4 days	Tue 12/12/17	Fri 12/15/17
804	Construction Staking	1 day	Mon 12/18/17	Mon 12/18/17
805	**TOWER WORK**	**22 days**	**Tue 12/19/17**	**Mon 1/22/18**
806	Receive anchor bolts and base plates at new site	2 days	Tue 12/19/17	Wed 12/20/17
807	Drill, rebar and pour drilled pier foundation	5 days	Thu 12/21/17	Thu 12/28/17
808	Foundation inspection, concrete testing	2 days	Fri 12/29/17	Tue 1/2/18
809	Strip forms, backfill and compaction	3 days	Wed 1/3/18	Fri 1/5/18
810	Receive Tower at new site	2 days	Mon 1/8/18	Tue 1/9/18
811	Notify FAA of impending tower construction (74	1 day	Mon 1/8/18	Mon 1/8/18
812	Tower assembly and stacking	8 days	Tue 1/9/18	Fri 1/19/18
813	Notify FAA of tower completion (7460-2)	1 day	Mon 1/22/18	Mon 1/22/18
814	**SITE COMPONENTS INSTALLATION**	**34.5 days**	**Tue 1/23/18**	**Mon 3/12/18**

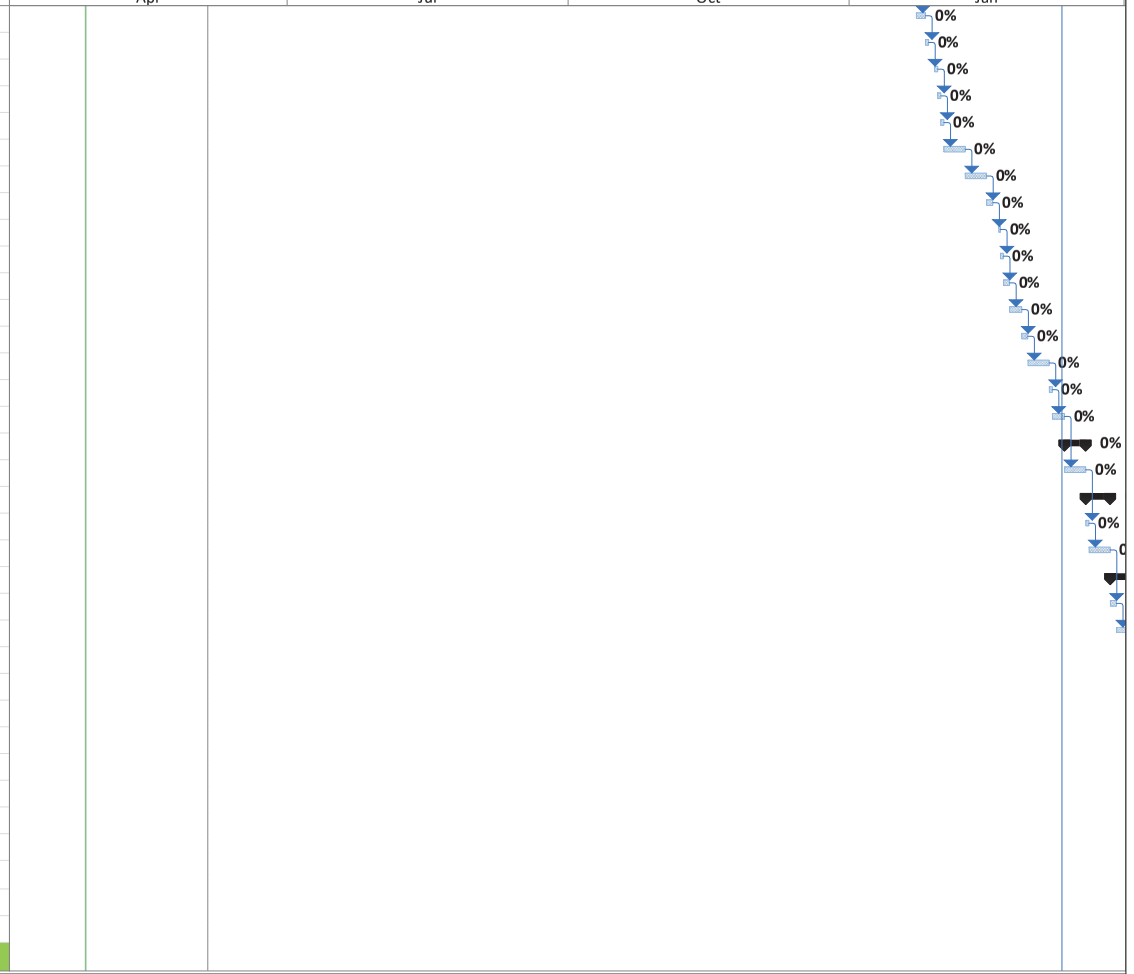


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
815	Excavate, form and rebar shelter foundations	3 days	Tue 1/23/18	Thu 1/25/18
816	Excavate, form and rebar fuel tank foundation	1 day	Fri 1/26/18	Fri 1/26/18
817	Excavate, form and rebar generator foundations	1 day	Mon 1/29/18	Mon 1/29/18
818	Foundation inspection, concrete pour and testir	1 day	Tue 1/30/18	Tue 1/30/18
819	Receive Shelter On Site	1 day	Wed 1/31/18	Wed 1/31/18
820	Offload and Install equipment shelter	5 days	Thu 2/1/18	Wed 2/7/18
821	Trench and Install underground power conduits	5 days	Thu 2/8/18	Wed 2/14/18
822	Trench and install grounding	2 days	Thu 2/15/18	Fri 2/16/18
823	Grounding Inspection	0.5 days	Mon 2/19/18	Mon 2/19/18
824	Conduit inspection and backfill	1 day	Mon 2/19/18	Tue 2/20/18
825	Install fuel tank and piping	2 days	Tue 2/20/18	Thu 2/22/18
826	Piping inspection, leakage test and trench backil	2 days	Thu 2/22/18	Mon 2/26/18
827	Pick up meter panel and Install meterboard	2 days	Mon 2/26/18	Wed 2/28/18
828	Utility hookup to the site by Electric Co.	5 days	Wed 2/28/18	Wed 3/7/18
829	Building/Electrical inspection	1 day	Wed 3/7/18	Thu 3/8/18
830	Install ice bridge from shelter to the tower	2 days	Thu 3/8/18	Mon 3/12/18
831	**EXISTING FACILITY IMPROVEMENTS**	**5 days**	**Mon 3/12/18**	**Mon 3/19/18**
832	Install DC Power System	5 days	Mon 3/12/18	Mon 3/19/18
833	**Antenna and Line Installation**	**6 days**	**Mon 3/19/18**	**Tue 3/27/18**
834	Ship antennas, line and accessories to the site	1 day	Mon 3/19/18	Tue 3/20/18
835	Install antennas, microwave dishes and lines	5 days	Tue 3/20/18	Tue 3/27/18
836	**Compound Completion**	**9 days**	**Tue 3/27/18**	**Mon 4/9/18**
837	Finish Grade and gravel compound	2 days	Tue 3/27/18	Thu 3/29/18
838	Fencing of tower compound	3 days	Thu 3/29/18	Tue 4/3/18
839	Complete grounding connections	2 days	Tue 4/3/18	Thu 4/5/18
840	Site touchup and restoration	2 days	Thu 4/5/18	Mon 4/9/18
841	**FINAL TESTING**	**35 days**	**Mon 4/9/18**	**Tue 5/29/18**
842	Line termination and Sweep test	0.5 days	Mon 4/9/18	Mon 4/9/18
843	Grounding test of the site	0.5 days	Tue 4/10/18	Tue 4/10/18
844	DC Power System Startup and Test	1 day	Tue 4/10/18	Wed 4/11/18
845	Generator Startup and Test	1 day	Wed 4/11/18	Thu 4/12/18
846	Test Fire Supression System	1 day	Thu 4/12/18	Fri 4/13/18
847	**R56 Site Audit/Punch List with Broward Co**	1 day	Fri 4/13/18	Mon 4/16/18
848	Punch List completion	10 days	Mon 4/16/18	Mon 4/30/18
849	Complete Civil As-Built Drawings	10 days	Mon 4/30/18	Mon 5/14/18
850	**Site Civil Work Substantial Completion**	**10 days**	**Mon 5/14/18**	**Tue 5/29/18**

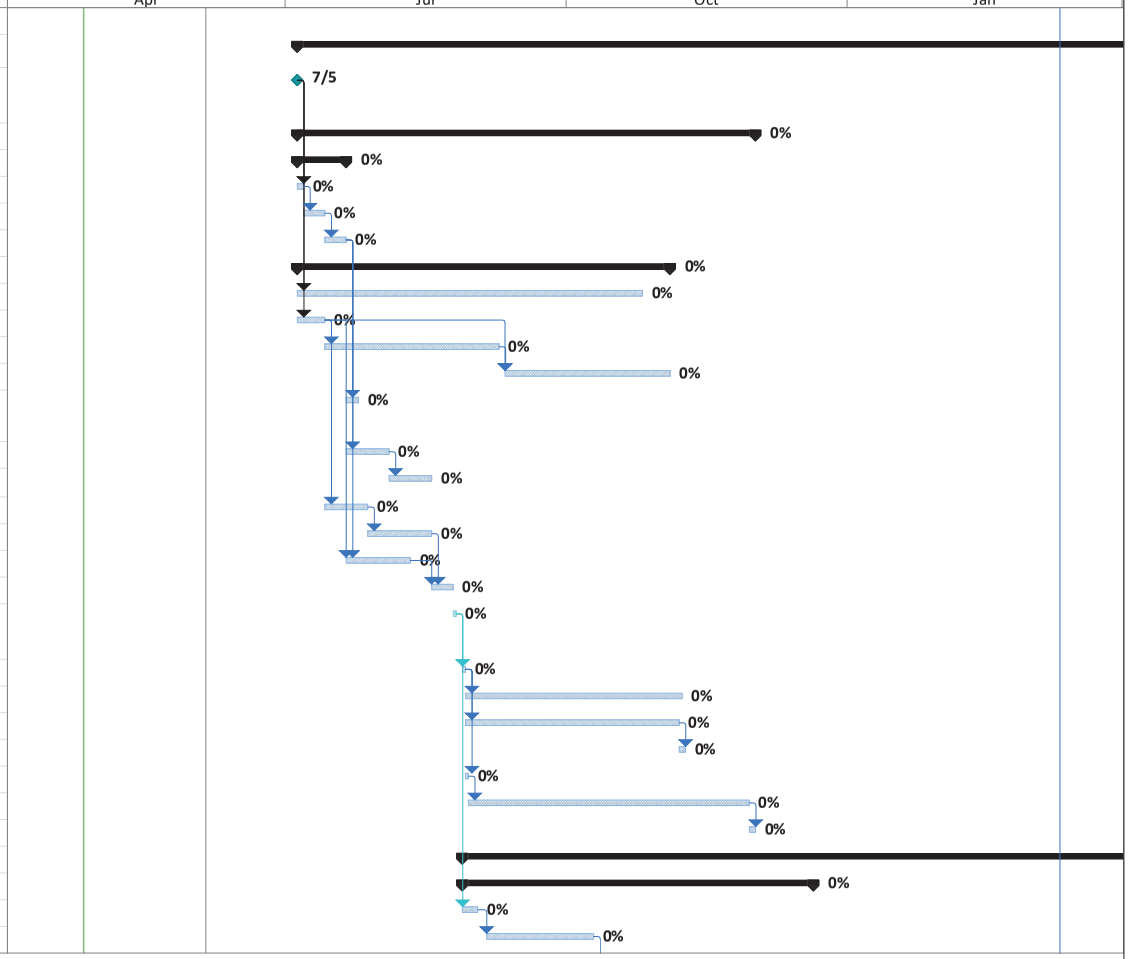


Yel- BC NTP Required
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Summary Progress
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Manual Summary
Project Summary
External Tasks
External Milestone
Inactive Task
Inactive Milestone
Inactive Summary
Deadline

Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
851				
852	**TAMARAC SITE DEVELOPMENT**	**237.5 days**	**Wed 7/5/17**	**Tue 6/12/18**
853	Broward County Provides NTP for Pre Construction Phase	0 days	Wed 7/5/17	Wed 7/5/17
854	**PRE CONSTRUCTION PHASE**	**105 days**	**Wed 7/5/17**	**Fri 12/1/17**
855	**SITE ENGINEERING**	**12 days**	**Wed 7/5/17**	**Thu 7/20/17**
856	Site visit with AMEC FW	2 days	Wed 7/5/17	Thu 7/6/17
857	Prepare site sketch/site layout	5 days	Fri 7/7/17	Thu 7/13/17
858	Broward County Review and approval of site ske	5 days	Fri 7/14/17	Thu 7/20/17
859	**PERMITTING DOCUMENTATION AND FINAL DRAV**	**87 days**	**Wed 7/5/17**	**Fri 11/3/17**
860	NEPA/SHPO studies and approvals	80 days	Wed 7/5/17	Wed 10/25/17
861	Site Survey and mapping	7 days	Wed 7/5/17	Thu 7/13/17
862	FAA application (7460-1) and approval	40 days	Fri 7/14/17	Fri 9/8/17
863	FCC Tower Registration Application	40 days	Mon 9/11/17	Fri 11/3/17
864	Review Shelter Drawings based on Port Entry Orientation	2 days	Fri 7/21/17	Mon 7/24/17
865	Prepared Construction Drawings of new site	10 days	Fri 7/21/17	Thu 8/3/17
866	**Construction Drawings Review and Approv**	10 days	Fri 8/4/17	Thu 8/17/17
867	Microwave Path Study & report	10 days	Fri 7/14/17	Thu 7/27/17
868	Tower Design and drawings	15 days	Fri 7/28/17	Thu 8/17/17
869	Geotechnical testing and report	15 days	Fri 7/21/17	Thu 8/10/17
870	Tower Foundation Design	5 days	Fri 8/18/17	Thu 8/24/17
871	**Broward County Site release/ Construction NTP to Contractor**	1 day	Fri 8/25/17	Fri 8/25/17
872	Place Order for New Tower	1 day	Mon 8/28/17	Mon 8/28/17
873	Manufacture Tower	50 days	Tue 8/29/17	Tue 11/7/17
874	Ship Anchor Bolts & Baseplates to new site	49 days	Tue 8/29/17	Mon 11/6/17
875	Ship Tower Steel to new site	2 days	Tue 11/7/17	Wed 11/8/17
876	Place Order for New Shelter	1 day	Tue 8/29/17	Tue 8/29/17
877	Shelter Manufacturing	63 days	Wed 8/30/17	Wed 11/29/17
878	Ship Shelter to Site	2 days	Thu 11/30/17	Fri 12/1/17
879	**CONSTRUCTION PHASE**	**199.5 days**	**Mon 8/28/17**	**Tue 6/12/18**
880	**Construction Permits**	**80 days**	**Mon 8/28/17**	**Wed 12/20/17**
881	Prepare and Submit Permit Package	5 days	Mon 8/28/17	Fri 9/1/17
882	Permit Review and Approval Process	25 days	Tue 9/5/17	Mon 10/9/17

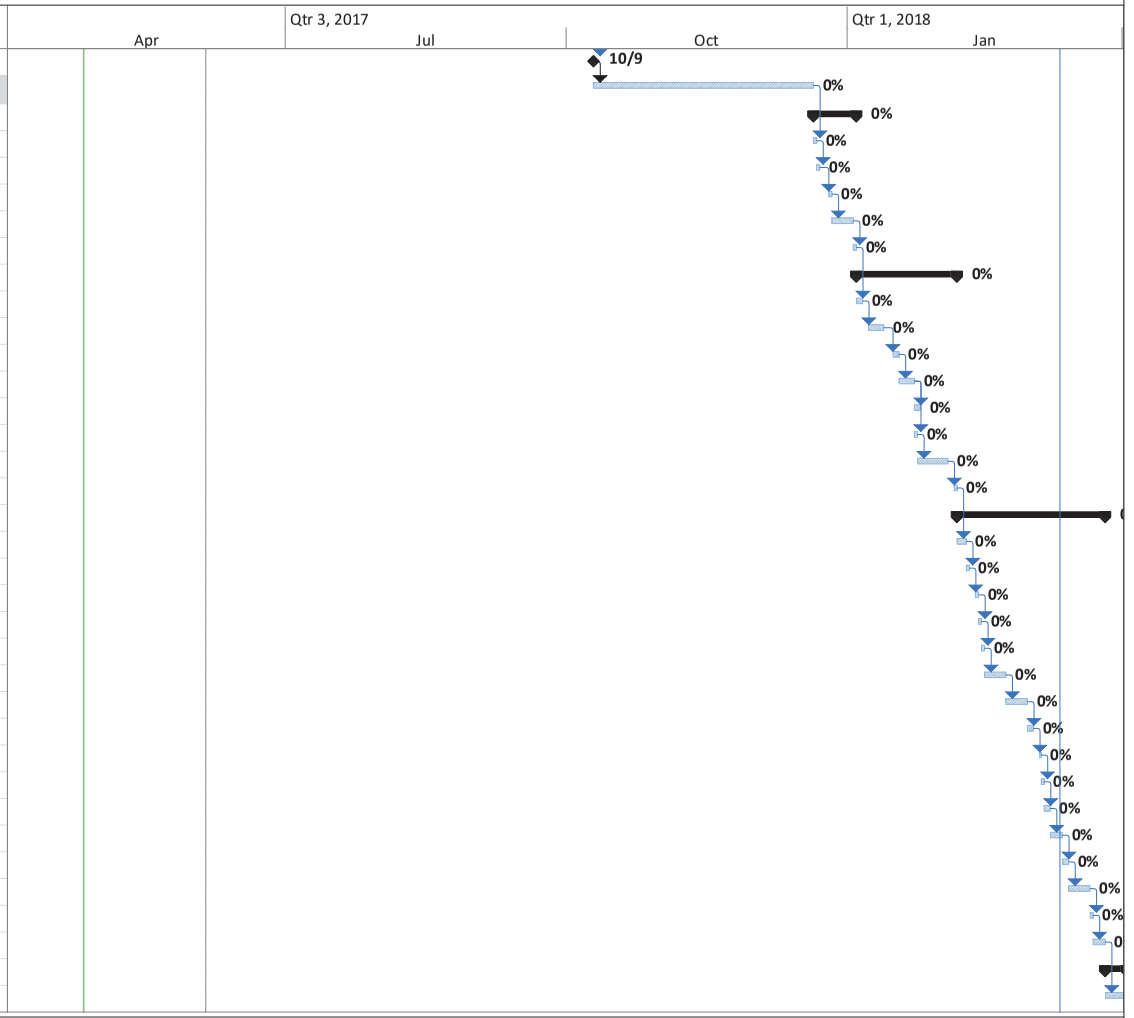


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Inactive Task
Inactive Milestone
Inactive Summary
Deadline

Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
883	Construction Permits Approved and Received	0 days	Mon 10/9/17	Mon 10/9/17
884	**Sequence Time Delay Task**	50 days	Tue 10/10/17	Wed 12/20/17
885	**SITE PREPARATION**	**8 days**	**Thu 12/21/17**	**Wed 1/3/18**
886	Mobilization	1 day	Thu 12/21/17	Thu 12/21/17
887	Locate existing utilities	1 day	Fri 12/22/17	Fri 12/22/17
888	Light clearing and grubbing	1 day	Tue 12/26/17	Tue 12/26/17
889	Compound grading and silt fencing	4 days	Wed 12/27/17	Tue 1/2/18
890	Construction Staking	1 day	Wed 1/3/18	Wed 1/3/18
891	**TOWER WORK**	**22 days**	**Thu 1/4/18**	**Mon 2/5/18**
892	Receive anchor bolts and base plates at new site	2 days	Thu 1/4/18	Fri 1/5/18
893	Drill, rebar and pour drilled pier foundation	5 days	Mon 1/8/18	Fri 1/12/18
894	Foundation inspection, concrete testing	2 days	Tue 1/16/18	Wed 1/17/18
895	Strip forms, backfill and compaction	3 days	Thu 1/18/18	Mon 1/22/18
896	Receive Tower at new site	2 days	Tue 1/23/18	Wed 1/24/18
897	Notify FAA of impending tower construction (74	1 day	Tue 1/23/18	Tue 1/23/18
898	Tower assembly and stacking	8 days	Wed 1/24/18	Fri 2/2/18
899	Notify FAA of tower completion (7460-2)	1 day	Mon 2/5/18	Mon 2/5/18
900	**SITE COMPONENTS INSTALLATION**	**34.5 days**	**Tue 2/6/18**	**Mon 3/26/18**
901	Excavate, form and rebar shelter foundations	3 days	Tue 2/6/18	Thu 2/8/18
902	Excavate, form and rebar fuel tank foundation	1 day	Fri 2/9/18	Fri 2/9/18
903	Excavate, form and rebar generator foundations	1 day	Mon 2/12/18	Mon 2/12/18
904	Foundation inspection, concrete pour and testir	1 day	Tue 2/13/18	Tue 2/13/18
905	Receive Shelter On Site	1 day	Wed 2/14/18	Wed 2/14/18
906	Offload and Install equipment shelter	5 days	Thu 2/15/18	Wed 2/21/18
907	Trench and Install underground power conduits	5 days	Thu 2/22/18	Wed 2/28/18
908	Trench and install grounding	2 days	Thu 3/1/18	Fri 3/2/18
909	Grounding Inspection	0.5 days	Mon 3/5/18	Mon 3/5/18
910	Conduit inspection and backfill	1 day	Mon 3/5/18	Tue 3/6/18
911	Install fuel tank and piping	2 days	Tue 3/6/18	Thu 3/8/18
912	Piping inspection, leakage test and trench backil	2 days	Thu 3/8/18	Mon 3/12/18
913	Pick up meter panel and Install meterboard	2 days	Mon 3/12/18	Wed 3/14/18
914	Utility hookup to the site by Electric Co.	5 days	Wed 3/14/18	Wed 3/21/18
915	Building/Electrical inspection	1 day	Wed 3/21/18	Thu 3/22/18
916	Install ice bridge from shelter to the tower	2 days	Thu 3/22/18	Mon 3/26/18
917	**EXISTING FACILITY IMPROVEMENTS**	**5 days**	**Mon 3/26/18**	**Mon 4/2/18**
918	Install DC Power System	5 days	Mon 3/26/18	Mon 4/2/18

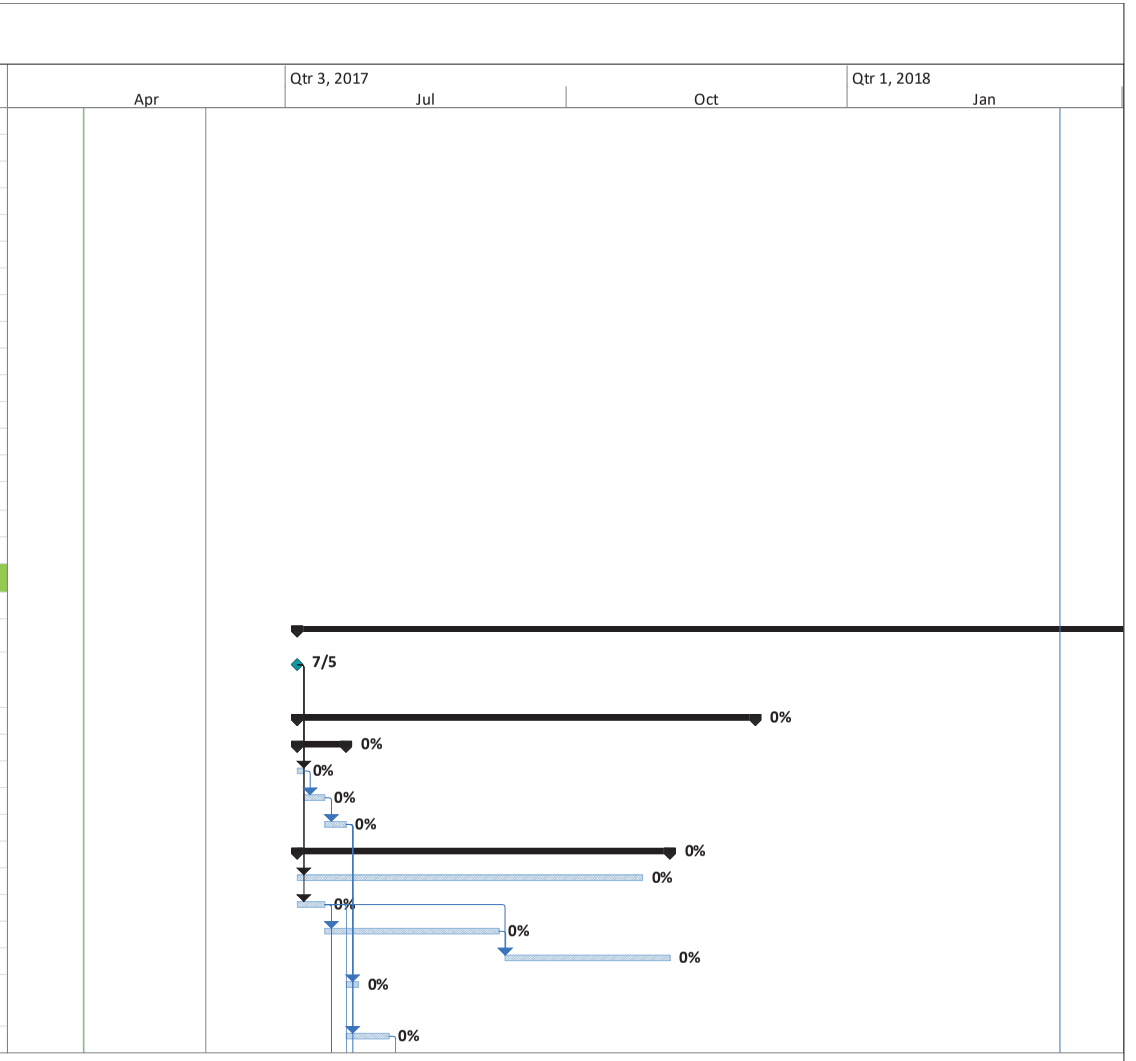


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Inactive Summary
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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
919	**Antenna and Line Installation**	**6 days**	**Mon 4/2/18**	**Tue 4/10/18**
920	Ship antennas, line and accessories to the site	1 day	Mon 4/2/18	Tue 4/3/18
921	Install antennas, microwave dishes and lines	5 days	Tue 4/3/18	Tue 4/10/18
922	**Compound Completion**	**9 days**	**Tue 4/10/18**	**Mon 4/23/18**
923	Finish Grade and gravel compound	2 days	Tue 4/10/18	Thu 4/12/18
924	Fencing of tower compound	3 days	Thu 4/12/18	Tue 4/17/18
925	Complete grounding connections	2 days	Tue 4/17/18	Thu 4/19/18
926	Site touchup and restoration	2 days	Thu 4/19/18	Mon 4/23/18
927	**FINAL TESTING**	**35 days**	**Mon 4/23/18**	**Tue 6/12/18**
928	Line termination and Sweep test	0.5 days	Mon 4/23/18	Mon 4/23/18
929	Grounding test of the site	0.5 days	Tue 4/24/18	Tue 4/24/18
930	DC Power System Startup and Test	1 day	Tue 4/24/18	Wed 4/25/18
931	Generator Startup and Test	1 day	Wed 4/25/18	Thu 4/26/18
932	Test Fire Supression System	1 day	Thu 4/26/18	Fri 4/27/18
933	**R56 Site Audit/Punch List with Broward Co**	1 day	Fri 4/27/18	Mon 4/30/18
934	Punch List completion	10 days	Mon 4/30/18	Mon 5/14/18
935	Complete Civil As-Built Drawings	10 days	Mon 5/14/18	Tue 5/29/18
936	**Site Civil Work Substantial Completion**	**10 days**	**Tue 5/29/18**	**Tue 6/12/18**
937				
938	**FS106 SITE DEVELOPMENT**	**247.5 days**	**Wed 7/5/17**	**Tue 6/26/18**
939	Broward County Provides NTP for Pre Construction Phase	0 days	Wed 7/5/17	Wed 7/5/17
940	**PRE CONSTRUCTION PHASE**	**105 days**	**Wed 7/5/17**	**Fri 12/1/17**
941	**SITE ENGINEERING**	**12 days**	**Wed 7/5/17**	**Thu 7/20/17**
942	Site visit with AMEC FW	2 days	Wed 7/5/17	Thu 7/6/17
943	Prepare site sketch/site layout	5 days	Fri 7/7/17	Thu 7/13/17
944	Broward County Review and approval of site ske	5 days	Fri 7/14/17	Thu 7/20/17
945	**PERMITTING DOCUMENTATION AND FINAL DRA**	**87 days**	**Wed 7/5/17**	**Fri 11/3/17**
946	NEPA/SHPO studies and approvals	80 days	Wed 7/5/17	Wed 10/25/17
947	Site Survey and mapping	7 days	Wed 7/5/17	Thu 7/13/17
948	FAA application (7460-1) and approval	40 days	Fri 7/14/17	Fri 9/8/17
949	FCC Tower Registration Application	40 days	Mon 9/11/17	Fri 11/3/17
950	Review Shelter Drawings based on Port Entry Orientation	2 days	Fri 7/21/17	Mon 7/24/17
951	Prepared Construction Drawings of new site	10 days	Fri 7/21/17	Thu 8/3/17

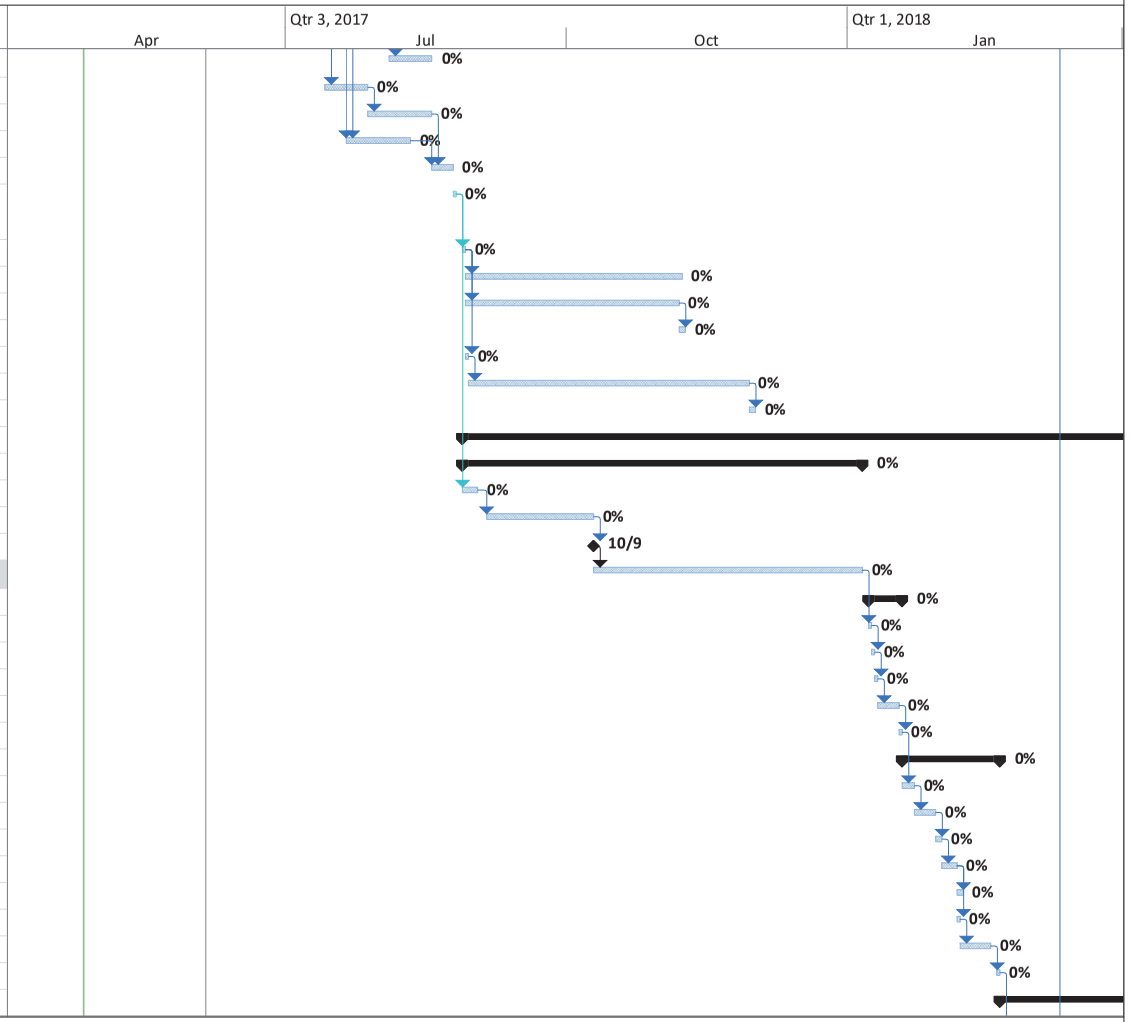


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
952	**Construction Drawings Review and Approv**	10 days	Fri 8/4/17	Thu 8/17/17
953	Microwave Path Study & report	10 days	Fri 7/14/17	Thu 7/27/17
954	Tower Design and drawings	15 days	Fri 7/28/17	Thu 8/17/17
955	Geotechnical testing and report	15 days	Fri 7/21/17	Thu 8/10/17
956	Tower Foundation Design	5 days	Fri 8/18/17	Thu 8/24/17
957	**Broward County Site release/ Construction NTP to Contractor**	1 day	Fri 8/25/17	Fri 8/25/17
958	Place Order for New Tower	1 day	Mon 8/28/17	Mon 8/28/17
959	Manufacture Tower	50 days	Tue 8/29/17	Tue 11/7/17
960	Ship Anchor Bolts & Baseplates to new site	49 days	Tue 8/29/17	Mon 11/6/17
961	Ship Tower Steel to new site	2 days	Tue 11/7/17	Wed 11/8/17
962	Place Order for New Shelter	1 day	Tue 8/29/17	Tue 8/29/17
963	Shelter Manufacturing	63 days	Wed 8/30/17	Wed 11/29/17
964	Ship Shelter to Site	2 days	Thu 11/30/17	Fri 12/1/17
965	**CONSTRUCTION PHASE**	**209.5 days**	**Mon 8/28/17**	**Tue 6/26/18**
966	**Construction Permits**	**90 days**	**Mon 8/28/17**	**Fri 1/5/18**
967	Prepare and Submit Permit Package	5 days	Mon 8/28/17	Fri 9/1/17
968	Permit Review and Approval Process	25 days	Tue 9/5/17	Mon 10/9/17
969	Construction Permits Approved and Received	0 days	Mon 10/9/17	Mon 10/9/17
970	**Sequence Time Delay Task**	60 days	Tue 10/10/17	Fri 1/5/18
971	**SITE PREPARATION**	**8 days**	**Mon 1/8/18**	**Thu 1/18/18**
972	Mobilization	1 day	Mon 1/8/18	Mon 1/8/18
973	Locate existing utilities	1 day	Tue 1/9/18	Tue 1/9/18
974	Light clearing and grubbing	1 day	Wed 1/10/18	Wed 1/10/18
975	Compound grading and silt fencing	4 days	Thu 1/11/18	Wed 1/17/18
976	Construction Staking	1 day	Thu 1/18/18	Thu 1/18/18
977	**TOWER WORK**	**22 days**	**Fri 1/19/18**	**Mon 2/19/18**
978	Receive anchor bolts and base plates at new site	2 days	Fri 1/19/18	Mon 1/22/18
979	Drill, rebar and pour drilled pier foundation	5 days	Tue 1/23/18	Mon 1/29/18
980	Foundation inspection, concrete testing	2 days	Tue 1/30/18	Wed 1/31/18
981	Strip forms, backfill and compaction	3 days	Thu 2/1/18	Mon 2/5/18
982	Receive Tower at new site	2 days	Tue 2/6/18	Wed 2/7/18
983	Notify FAA of impending tower construction (74	1 day	Tue 2/6/18	Tue 2/6/18
984	Tower assembly and stacking	8 days	Wed 2/7/18	Fri 2/16/18
985	Notify FAA of tower completion (7460-2)	1 day	Mon 2/19/18	Mon 2/19/18
986	**SITE COMPONENTS INSTALLATION**	**34.5 days**	**Tue 2/20/18**	**Mon 4/9/18**

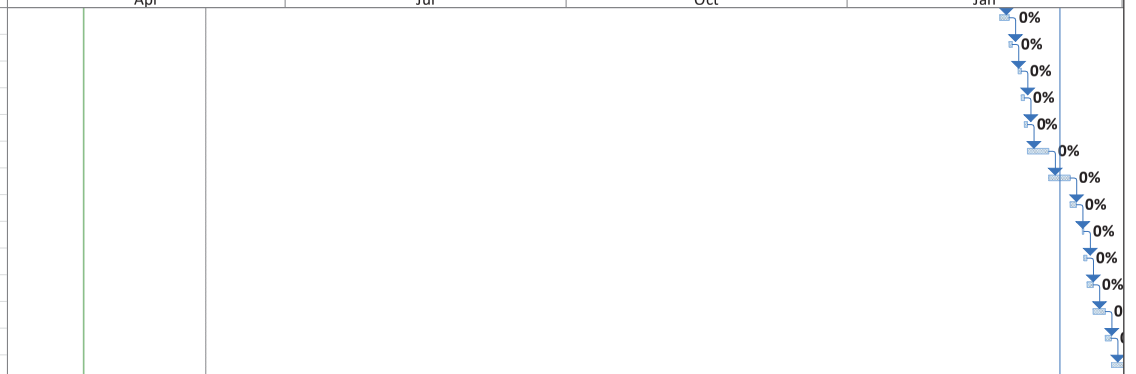


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
987	Excavate, form and rebar shelter foundations	3 days	Tue 2/20/18	Thu 2/22/18
988	Excavate, form and rebar fuel tank foundation	1 day	Fri 2/23/18	Fri 2/23/18
989	Excavate, form and rebar generator foundations	1 day	Mon 2/26/18	Mon 2/26/18
990	Foundation inspection, concrete pour and testir	1 day	Tue 2/27/18	Tue 2/27/18
991	Receive Shelter On Site	1 day	Wed 2/28/18	Wed 2/28/18
992	Offload and Install equipment shelter	5 days	Thu 3/1/18	Wed 3/7/18
993	Trench and Install underground power conduits	5 days	Thu 3/8/18	Wed 3/14/18
994	Trench and install grounding	2 days	Thu 3/15/18	Fri 3/16/18
995	Grounding Inspection	0.5 days	Mon 3/19/18	Mon 3/19/18
996	Conduit inspection and backfill	1 day	Mon 3/19/18	Tue 3/20/18
997	Install fuel tank and piping	2 days	Tue 3/20/18	Thu 3/22/18
998	Piping inspection, leakage test and trench backil	2 days	Thu 3/22/18	Mon 3/26/18
999	Pick up meter panel and Install meterboard	2 days	Mon 3/26/18	Wed 3/28/18
1000	Utility hookup to the site by Electric Co.	5 days	Wed 3/28/18	Wed 4/4/18
1001	Building/Electrical inspection	1 day	Wed 4/4/18	Thu 4/5/18
1002	Install ice bridge from shelter to the tower	2 days	Thu 4/5/18	Mon 4/9/18
1003	**EXISTING FACILITY IMPROVEMENTS**	**5 days**	**Mon 4/9/18**	**Mon 4/16/18**
1004	Install DC Power System	5 days	Mon 4/9/18	Mon 4/16/18
1005	**Antenna and Line Installation**	**6 days**	**Mon 4/16/18**	**Tue 4/24/18**
1006	Ship antennas, line and accessories to the site	1 day	Mon 4/16/18	Tue 4/17/18
1007	Install antennas, microwave dishes and lines	5 days	Tue 4/17/18	Tue 4/24/18
1008	**Compound Completion**	**9 days**	**Tue 4/24/18**	**Mon 5/7/18**
1009	Finish Grade and gravel compound	2 days	Tue 4/24/18	Thu 4/26/18
1010	Fencing of tower compound	3 days	Thu 4/26/18	Tue 5/1/18
1011	Complete grounding connections	2 days	Tue 5/1/18	Thu 5/3/18
1012	Site touchup and restoration	2 days	Thu 5/3/18	Mon 5/7/18
1013	**FINAL TESTING**	**35 days**	**Mon 5/7/18**	**Tue 6/26/18**
1014	Line termination and Sweep test	0.5 days	Mon 5/7/18	Mon 5/7/18
1015	Grounding test of the site	0.5 days	Tue 5/8/18	Tue 5/8/18
1016	DC Power System Startup and Test	1 day	Tue 5/8/18	Wed 5/9/18
1017	Generator Startup and Test	1 day	Wed 5/9/18	Thu 5/10/18
1018	Test Fire Supression System	1 day	Thu 5/10/18	Fri 5/11/18
1019	**R56 Site Audit/Punch List with Broward Co**	1 day	Fri 5/11/18	Mon 5/14/18
1020	Punch List completion	10 days	Mon 5/14/18	Tue 5/29/18
1021	Complete Civil As-Built Drawings	10 days	Tue 5/29/18	Tue 6/12/18
1022	**Site Civil Work Substantial Completion**	**10 days**	**Tue 6/12/18**	**Tue 6/26/18**

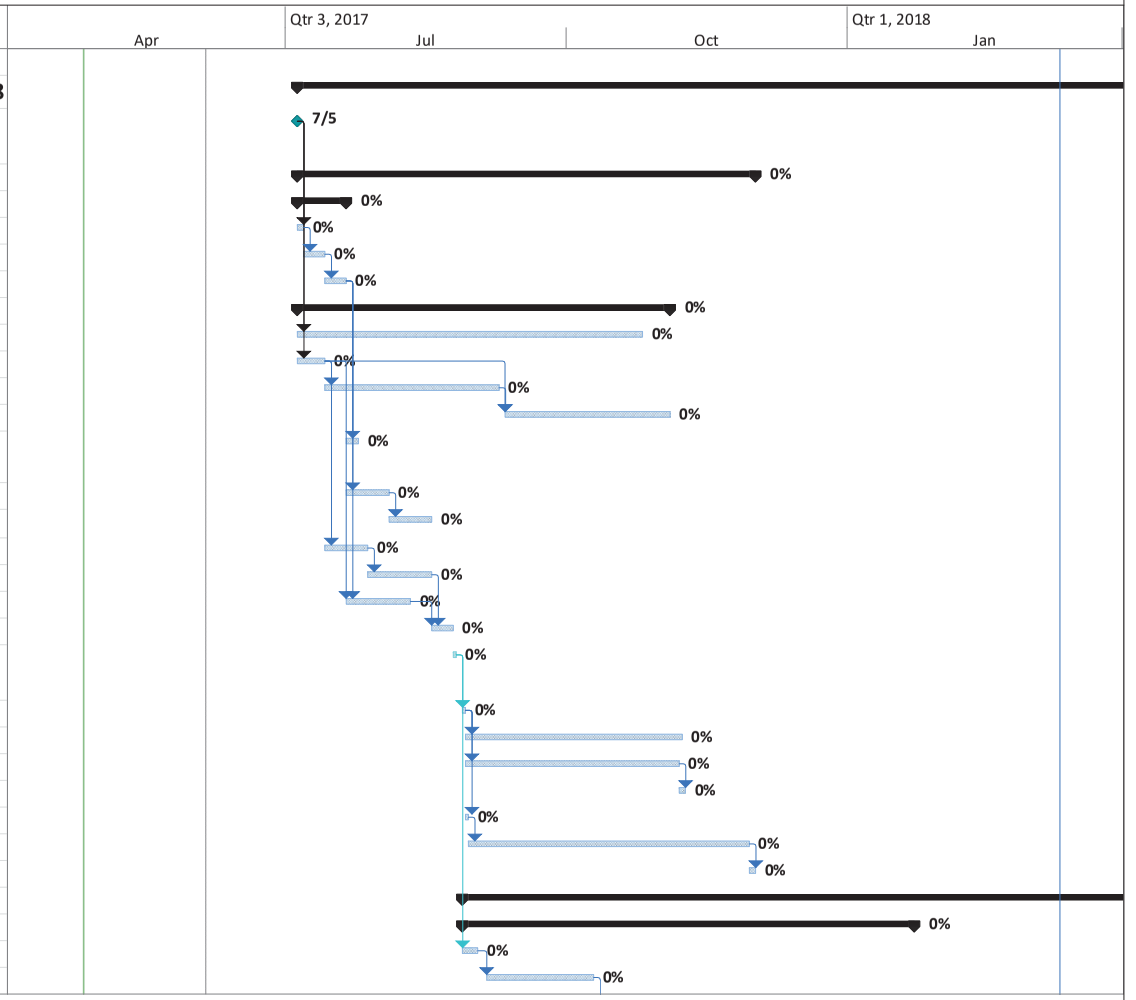


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
1023				
1024	**PARKLAND SITE DEVELOPMENT**	**257.5 days**	**Wed 7/5/17**	**Wed 7/11/18**
1025	Broward County Provides NTP for Pre Construction Phase	0 days	Wed 7/5/17	Wed 7/5/17
1026	**PRE CONSTRUCTION PHASE**	**105 days**	**Wed 7/5/17**	**Fri 12/1/17**
1027	**SITE ENGINEERING**	**12 days**	**Wed 7/5/17**	**Thu 7/20/17**
1028	Site visit with AMEC FW	2 days	Wed 7/5/17	Thu 7/6/17
1029	Prepare site sketch/site layout	5 days	Fri 7/7/17	Thu 7/13/17
1030	Broward County Review and approval of site ske	5 days	Fri 7/14/17	Thu 7/20/17
1031	**PERMITTING DOCUMENTATION AND FINAL DRAV**	**87 days**	**Wed 7/5/17**	**Fri 11/3/17**
1032	NEPA/SHPO studies and approvals	80 days	Wed 7/5/17	Wed 10/25/17
1033	Site Survey and mapping	7 days	Wed 7/5/17	Thu 7/13/17
1034	FAA application (7460-1) and approval	40 days	Fri 7/14/17	Fri 9/8/17
1035	FCC Tower Registration Application	40 days	Mon 9/11/17	Fri 11/3/17
1036	Review Shelter Drawings based on Port Entry Orientation	2 days	Fri 7/21/17	Mon 7/24/17
1037	Prepared Construction Drawings of new site	10 days	Fri 7/21/17	Thu 8/3/17
1038	**Construction Drawings Review and Approv**	10 days	Fri 8/4/17	Thu 8/17/17
1039	Microwave Path Study & report	10 days	Fri 7/14/17	Thu 7/27/17
1040	Tower Design and drawings	15 days	Fri 7/28/17	Thu 8/17/17
1041	Geotechnical testing and report	15 days	Fri 7/21/17	Thu 8/10/17
1042	Tower Foundation Design	5 days	Fri 8/18/17	Thu 8/24/17
1043	**Broward County Site release/ Construction NTP to Contractor**	1 day	Fri 8/25/17	Fri 8/25/17
1044	Place Order for New Tower	1 day	Mon 8/28/17	Mon 8/28/17
1045	Manufacture Tower	50 days	Tue 8/29/17	Tue 11/7/17
1046	Ship Anchor Bolts & Baseplates to new site	49 days	Tue 8/29/17	Mon 11/6/17
1047	Ship Tower Steel to new site	2 days	Tue 11/7/17	Wed 11/8/17
1048	Place Order for New Shelter	1 day	Tue 8/29/17	Tue 8/29/17
1049	Shelter Manufacturing	63 days	Wed 8/30/17	Wed 11/29/17
1050	Ship Shelter to Site	2 days	Thu 11/30/17	Fri 12/1/17
1051	**CONSTRUCTION PHASE**	**219.5 days**	**Mon 8/28/17**	**Wed 7/11/18**
1052	**Construction Permits**	**100 days**	**Mon 8/28/17**	**Mon 1/22/18**
1053	Prepare and Submit Permit Package	5 days	Mon 8/28/17	Fri 9/1/17
1054	Permit Review and Approval Process	25 days	Tue 9/5/17	Mon 10/9/17

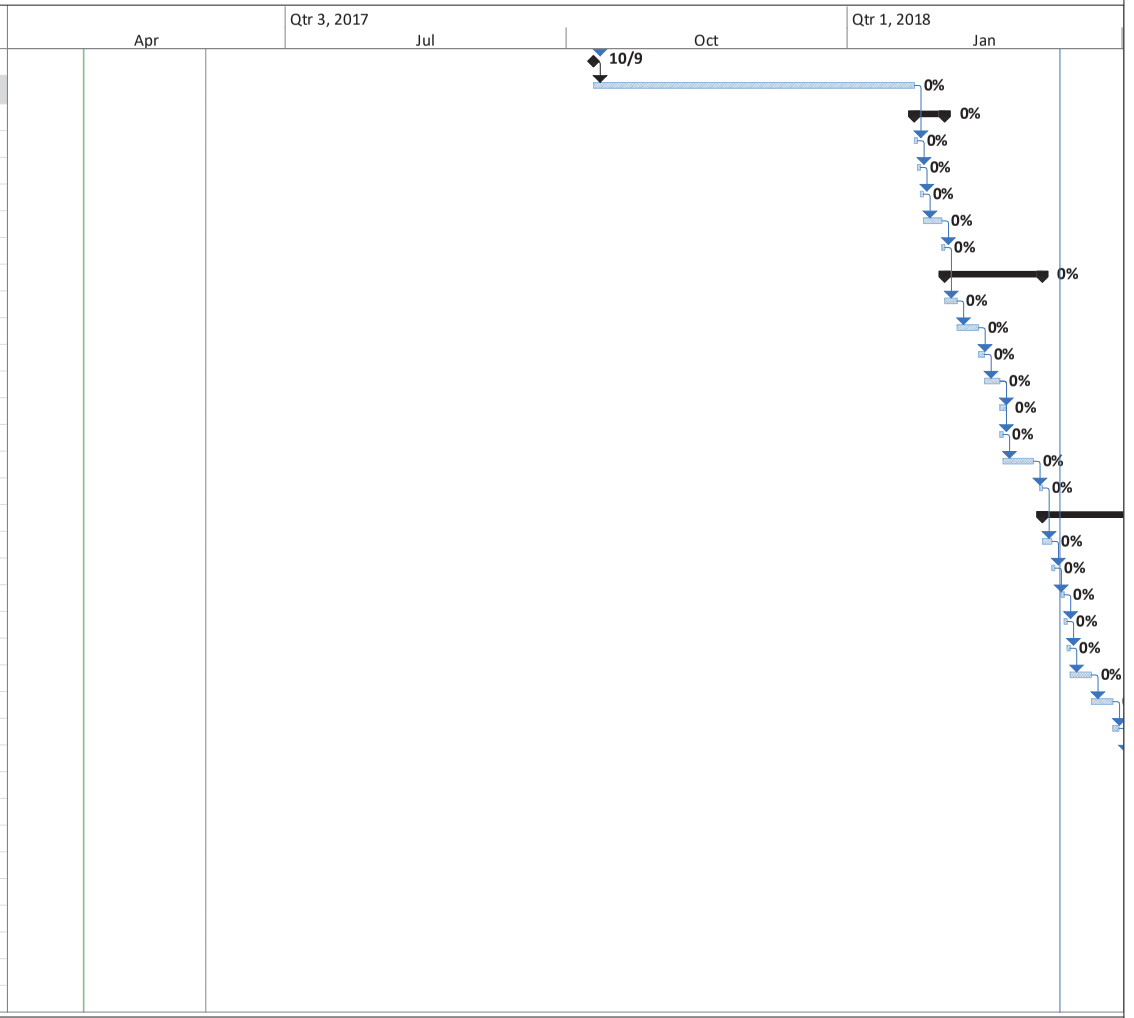


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
1055	Construction Permits Approved and Received	0 days	Mon 10/9/17	Mon 10/9/17
1056	**Sequence Time Delay Task**	70 days	Tue 10/10/17	Mon 1/22/18
1057	**SITE PREPARATION**	**8 days**	**Tue 1/23/18**	**Thu 2/1/18**
1058	Mobilization	1 day	Tue 1/23/18	Tue 1/23/18
1059	Locate existing utilities	1 day	Wed 1/24/18	Wed 1/24/18
1060	Light clearing and grubbing	1 day	Thu 1/25/18	Thu 1/25/18
1061	Compound grading and silt fencing	4 days	Fri 1/26/18	Wed 1/31/18
1062	Construction Staking	1 day	Thu 2/1/18	Thu 2/1/18
1063	**TOWER WORK**	**22 days**	**Fri 2/2/18**	**Mon 3/5/18**
1064	Receive anchor bolts and base plates at new site	2 days	Fri 2/2/18	Mon 2/5/18
1065	Drill, rebar and pour drilled pier foundation	5 days	Tue 2/6/18	Mon 2/12/18
1066	Foundation inspection, concrete testing	2 days	Tue 2/13/18	Wed 2/14/18
1067	Strip forms, backfill and compaction	3 days	Thu 2/15/18	Mon 2/19/18
1068	Receive Tower at new site	2 days	Tue 2/20/18	Wed 2/21/18
1069	Notify FAA of impending tower construction (74	1 day	Tue 2/20/18	Tue 2/20/18
1070	Tower assembly and stacking	8 days	Wed 2/21/18	Fri 3/2/18
1071	Notify FAA of tower completion (7460-2)	1 day	Mon 3/5/18	Mon 3/5/18
1072	**SITE COMPONENTS INSTALLATION**	**34.5 days**	**Tue 3/6/18**	**Mon 4/23/18**
1073	Excavate, form and rebar shelter foundations	3 days	Tue 3/6/18	Thu 3/8/18
1074	Excavate, form and rebar fuel tank foundation	1 day	Fri 3/9/18	Fri 3/9/18
1075	Excavate, form and rebar generator foundations	1 day	Mon 3/12/18	Mon 3/12/18
1076	Foundation inspection, concrete pour and testir	1 day	Tue 3/13/18	Tue 3/13/18
1077	Receive Shelter On Site	1 day	Wed 3/14/18	Wed 3/14/18
1078	Offload and Install equipment shelter	5 days	Thu 3/15/18	Wed 3/21/18
1079	Trench and Install underground power conduits	5 days	Thu 3/22/18	Wed 3/28/18
1080	Trench and install grounding	2 days	Thu 3/29/18	Fri 3/30/18
1081	Grounding Inspection	0.5 days	Mon 4/2/18	Mon 4/2/18
1082	Conduit inspection and backfill	1 day	Mon 4/2/18	Tue 4/3/18
1083	Install fuel tank and piping	2 days	Tue 4/3/18	Thu 4/5/18
1084	Piping inspection, leakage test and trench backil	2 days	Thu 4/5/18	Mon 4/9/18
1085	Pick up meter panel and Install meterboard	2 days	Mon 4/9/18	Wed 4/11/18
1086	Utility hookup to the site by Electric Co.	5 days	Wed 4/11/18	Wed 4/18/18
1087	Building/Electrical inspection	1 day	Wed 4/18/18	Thu 4/19/18
1088	Install ice bridge from shelter to the tower	2 days	Thu 4/19/18	Mon 4/23/18
1089	**EXISTING FACILITY IMPROVEMENTS**	**5 days**	**Mon 4/23/18**	**Mon 4/30/18**
1090	Install DC Power System	5 days	Mon 4/23/18	Mon 4/30/18

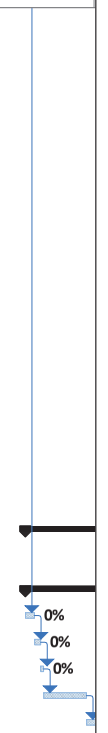


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ID	Task Name	Duration	Start	Finish
1091	**Antenna and Line Installation**	**6 days**	**Mon 4/30/18**	**Tue 5/8/18**
1092	Ship antennas, line and accessories to the site	1 day	Mon 4/30/18	Tue 5/1/18
1093	Install antennas, microwave dishes and lines	5 days	Tue 5/1/18	Tue 5/8/18
1094	**Compound Completion**	**9 days**	**Tue 5/8/18**	**Mon 5/21/18**
1095	Finish Grade and gravel compound	2 days	Tue 5/8/18	Thu 5/10/18
1096	Fencing of tower compound	3 days	Thu 5/10/18	Tue 5/15/18
1097	Complete grounding connections	2 days	Tue 5/15/18	Thu 5/17/18
1098	Site touchup and restoration	2 days	Thu 5/17/18	Mon 5/21/18
1099	**FINAL TESTING**	**35 days**	**Mon 5/21/18**	**Wed 7/11/18**
1100	Line termination and Sweep test	0.5 days	Mon 5/21/18	Mon 5/21/18
1101	Grounding test of the site	0.5 days	Tue 5/22/18	Tue 5/22/18
1102	DC Power System Startup and Test	1 day	Tue 5/22/18	Wed 5/23/18
1103	Generator Startup and Test	1 day	Wed 5/23/18	Thu 5/24/18
1104	Test Fire Supression System	1 day	Thu 5/24/18	Fri 5/25/18
1105	**R56 Site Audit/Punch List with Broward Co**	1 day	Fri 5/25/18	Tue 5/29/18
1106	Punch List completion	10 days	Tue 5/29/18	Tue 6/12/18
1107	Complete Civil As-Built Drawings	10 days	Tue 6/12/18	Tue 6/26/18
1108	**Site Civil Work Substantial Completion**	**10 days**	**Tue 6/26/18**	**Wed 7/11/18**
1109				
1110	**SITE EQUIPMENT INSTALLATIONS**	**122.5 days**	**Fri 3/9/18**	**Thu 8/30/18**
1111				
1112	**CORE SITE EQUIPMENT INSTALLATION**	**30 days**	**Fri 3/9/18**	**Fri 4/20/18**
1113	Ship equipment to site	1 day	Fri 3/9/18	Mon 3/12/18
1114	Microwave equipment installation	2 days	Mon 3/12/18	Wed 3/14/18
1115	Microwave equipment alignment and test	1 day	Wed 3/14/18	Thu 3/15/18
1116	FNE Equipment installation	10 days	Thu 3/15/18	Thu 3/29/18
1117	FNE Equipment program & configure	10 days	Thu 3/29/18	Thu 4/12/18
1118	Site Equipment test and baseline	5 days	Thu 4/12/18	Thu 4/19/18
1119	Broward County Site Audit	1 day	Thu 4/19/18	Fri 4/20/18
1120	**Broward County Site Approved**	0 days	Fri 4/20/18	Fri 4/20/18
1121				
1122	**COCONUT CREEK SITE EQUIPMENT INSTALLATIC**	**14 days**	**Tue 6/19/18**	**Mon 7/9/18**
1123	Ship equipment to site	1 day	Tue 6/19/18	Tue 6/19/18
1124	Microwave equipment installation	2 days	Wed 6/20/18	Thu 6/21/18
1125	Microwave equipment alignment and test	1 day	Fri 6/22/18	Fri 6/22/18



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ID	Task Name	Duration	Start	Finish
1126	FNE Equipment installation	5 days	Mon 6/25/18	Fri 6/29/18
1127	FNE Equipment program & configure	2 days	Mon 7/2/18	Tue 7/3/18
1128	Site Equipment test and baseline	2 days	Thu 7/5/18	Fri 7/6/18
1129	Broward County Site Audit	1 day	Mon 7/9/18	Mon 7/9/18
1130	**Broward County Site Approved**	0 days	Mon 7/9/18	Mon 7/9/18
1131				
1132	**MARKHAM PARK SITE EQUIPMENT INSTALLATI(**	**14 days**	**Fri 8/3/18**	**Thu 8/23/18**
1133	Ship equipment to site	1 day	Fri 8/3/18	Mon 8/6/18
1134	Microwave equipment installation	2 days	Mon 8/6/18	Wed 8/8/18
1135	Microwave equipment alignment and test	1 day	Wed 8/8/18	Thu 8/9/18
1136	FNE Equipment installation	5 days	Thu 8/9/18	Thu 8/16/18
1137	FNE Equipment program & configure	2 days	Thu 8/16/18	Mon 8/20/18
1138	Site Equipment test and baseline	2 days	Mon 8/20/18	Wed 8/22/18
1139	Broward County Site Audit	1 day	Wed 8/22/18	Thu 8/23/18
1140	**Broward County Site Approved**	0 days	Thu 8/23/18	Thu 8/23/18
1141				
1142	**DAVIE SITE EQUIPMENT INSTALLATION**	**14 days**	**Fri 6/22/18**	**Thu 7/12/18**
1143	Ship equipment to site	1 day	Fri 6/22/18	Fri 6/22/18
1144	Microwave equipment installation	2 days	Mon 6/25/18	Tue 6/26/18
1145	Microwave equipment alignment and test	1 day	Wed 6/27/18	Wed 6/27/18
1146	FNE Equipment installation	5 days	Thu 6/28/18	Thu 7/5/18
1147	FNE Equipment program & configure	2 days	Fri 7/6/18	Mon 7/9/18
1148	Site Equipment test and baseline	2 days	Tue 7/10/18	Wed 7/11/18
1149	Broward County Site Audit	1 day	Thu 7/12/18	Thu 7/12/18
1150	**Broward County Site Approved**	0 days	Thu 7/12/18	Thu 7/12/18
1151				
1152	**EMS SITE EQUIPMENT INSTALLATION**	**14 days**	**Fri 6/29/18**	**Thu 7/19/18**
1153	Ship equipment to site	1 day	Fri 6/29/18	Fri 6/29/18
1154	Microwave equipment installation	2 days	Mon 7/2/18	Tue 7/3/18
1155	Microwave equipment alignment and test	1 day	Thu 7/5/18	Thu 7/5/18
1156	FNE Equipment installation	5 days	Fri 7/6/18	Thu 7/12/18
1157	FNE Equipment program & configure	2 days	Fri 7/13/18	Mon 7/16/18
1158	Site Equipment test and baseline	2 days	Tue 7/17/18	Wed 7/18/18
1159	Broward County Site Audit	1 day	Thu 7/19/18	Thu 7/19/18
1160	**Broward County Site Approved**	0 days	Thu 7/19/18	Thu 7/19/18

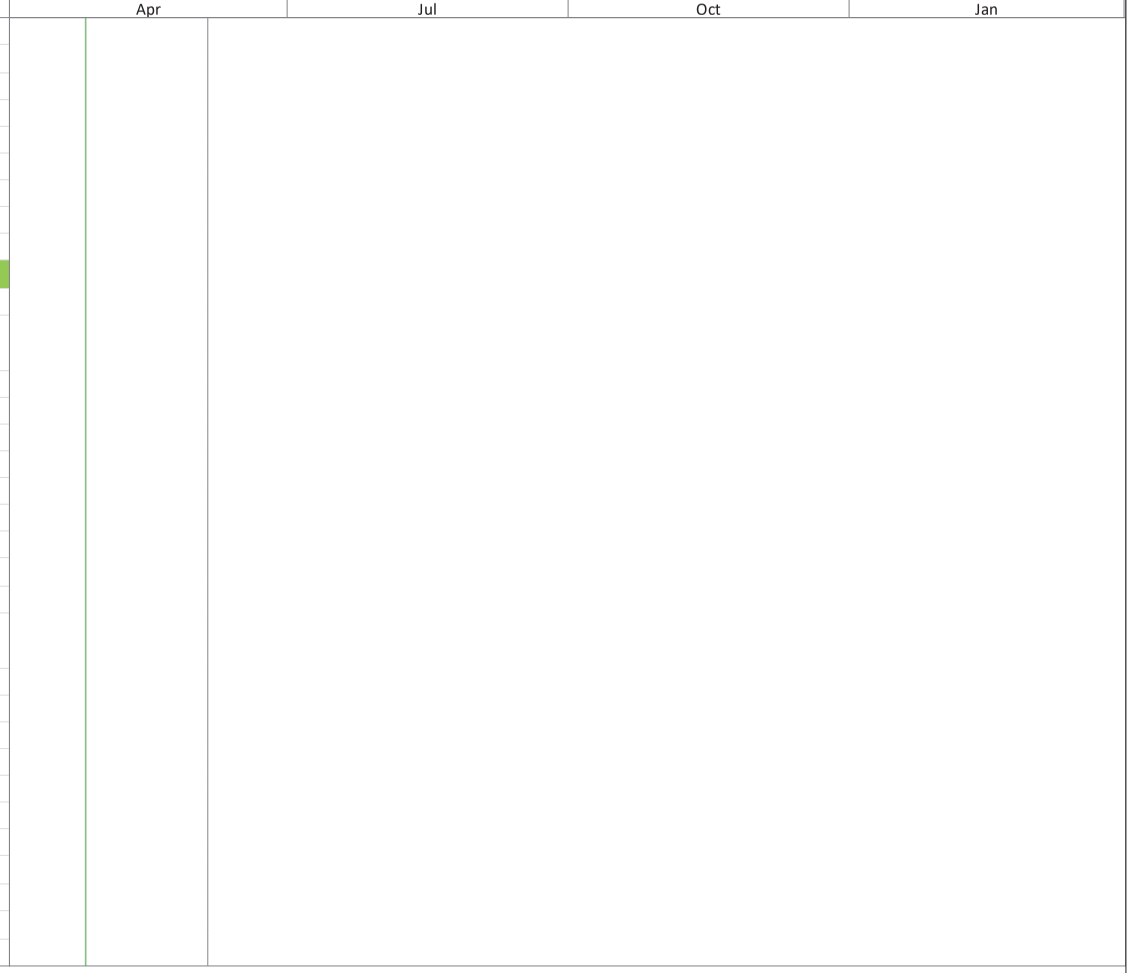


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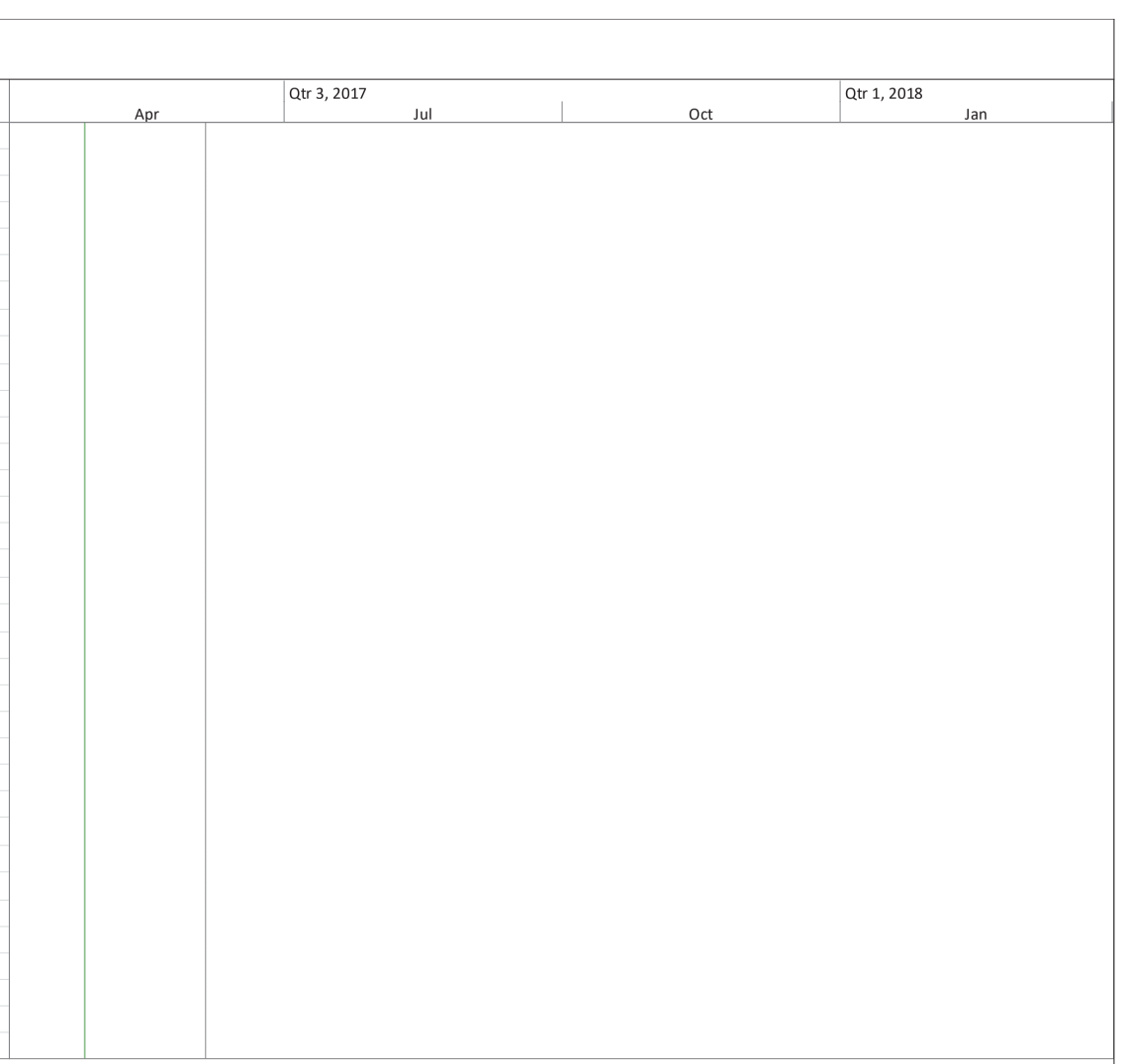
ID	Task Name	Duration	Start	Finish
1161				
1162	**EOC SITE EQUIPMENT INSTALLATION**	**35 days**	**Wed 4/11/18**	**Wed 5/30/18**
1163	Ship equipment to site	1 day	Wed 4/11/18	Wed 4/11/18
1164	Microwave equipment installation	2 days	Thu 4/12/18	Fri 4/13/18
1165	Microwave equipment alignment and test	1 day	Mon 4/16/18	Mon 4/16/18
1166	FNE Equipment installation	10 days	Tue 4/17/18	Mon 4/30/18
1167	FNE Equipment program & configure	10 days	Tue 5/1/18	Mon 5/14/18
1168	Site Equipment test and baseline	10 days	Tue 5/15/18	Tue 5/29/18
1169	Broward County Site Audit	1 day	Wed 5/30/18	Wed 5/30/18
1170	**Broward County Site Approved**	**0 days**	**Wed 5/30/18**	**Wed 5/30/18**
1171				
1172	**POMPANO BEACH CLUB SITE EQUIPMENT INSTALLATION**	**14 days**	**Mon 7/16/18**	**Thu 8/2/18**
1173	Ship equipment to site	1 day	Mon 7/16/18	Mon 7/16/18
1174	Microwave equipment installation	2 days	Tue 7/17/18	Wed 7/18/18
1175	Microwave equipment alignment and test	1 day	Thu 7/19/18	Thu 7/19/18
1176	FNE Equipment installation	5 days	Fri 7/20/18	Thu 7/26/18
1177	FNE Equipment program & configure	2 days	Fri 7/27/18	Mon 7/30/18
1178	Site Equipment test and baseline	2 days	Tue 7/31/18	Wed 8/1/18
1179	Broward County Site Audit	1 day	Thu 8/2/18	Thu 8/2/18
1180	**Broward County Site Approved**	0 days	Thu 8/2/18	Thu 8/2/18
1181				
1182	**POINTS OF AMERICA SITE EQUIPMENT INSTALLATION**	**14 days**	**Mon 7/30/18**	**Thu 8/16/18**
1183	Ship equipment to site	1 day	Mon 7/30/18	Mon 7/30/18
1184	Microwave equipment installation	2 days	Tue 7/31/18	Wed 8/1/18
1185	Microwave equipment alignment and test	1 day	Thu 8/2/18	Thu 8/2/18
1186	FNE Equipment installation	5 days	Fri 8/3/18	Thu 8/9/18
1187	FNE Equipment program & configure	2 days	Fri 8/10/18	Mon 8/13/18
1188	Site Equipment test and baseline	2 days	Tue 8/14/18	Wed 8/15/18
1189	Broward County Site Audit	1 day	Thu 8/16/18	Thu 8/16/18
1190	**Broward County Site Approved**	0 days	Thu 8/16/18	Thu 8/16/18
1191				
1192	**PLAYA SITE EQUIPMENT INSTALLATION**	**14 days**	**Mon 8/13/18**	**Thu 8/30/18**
1193	Ship equipment to site	1 day	Mon 8/13/18	Mon 8/13/18



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1194	Microwave equipment installation	2 days	Tue 8/14/18	Wed 8/15/18
1195	Microwave equipment alignment and test	1 day	Thu 8/16/18	Thu 8/16/18
1196	FNE Equipment installation	5 days	Fri 8/17/18	Thu 8/23/18
1197	FNE Equipment program & configure	2 days	Fri 8/24/18	Mon 8/27/18
1198	Site Equipment test and baseline	2 days	Tue 8/28/18	Wed 8/29/18
1199	Broward County Site Audit	1 day	Thu 8/30/18	Thu 8/30/18
1200	**Broward County Site Approved**	0 days	Thu 8/30/18	Thu 8/30/18
1201				
1202	**MIRAMAR SITE EQUIPMENT INSTALLATION**	**14 days**	**Mon 7/30/18**	**Fri 8/17/18**
1203	Ship equipment to site	1 day	Mon 7/30/18	Tue 7/31/18
1204	Microwave equipment installation	2 days	Tue 7/31/18	Thu 8/2/18
1205	Microwave equipment alignment and test	1 day	Thu 8/2/18	Fri 8/3/18
1206	FNE Equipment installation	5 days	Fri 8/3/18	Fri 8/10/18
1207	FNE Equipment program & configure	2 days	Fri 8/10/18	Tue 8/14/18
1208	Site Equipment test and baseline	2 days	Tue 8/14/18	Thu 8/16/18
1209	Broward County Site Audit	1 day	Thu 8/16/18	Fri 8/17/18
1210	**Broward County Site Approved**	0 days	Fri 8/17/18	Fri 8/17/18
1211				
1212	**CH2 SITE EQUIPMENT INSTALLATION**	**14 days**	**Mon 4/16/18**	**Fri 5/4/18**
1213	Ship equipment to site	1 day	Mon 4/16/18	Tue 4/17/18
1214	Microwave equipment installation	2 days	Tue 4/17/18	Thu 4/19/18
1215	Microwave equipment alignment and test	1 day	Thu 4/19/18	Fri 4/20/18
1216	FNE Equipment installation	5 days	Fri 4/20/18	Fri 4/27/18
1217	FNE Equipment program & configure	2 days	Fri 4/27/18	Tue 5/1/18
1218	Site Equipment test and baseline	2 days	Tue 5/1/18	Thu 5/3/18
1219	Broward County Site Audit	1 day	Thu 5/3/18	Fri 5/4/18
1220	**Broward County Site Approved**	0 days	Fri 5/4/18	Fri 5/4/18
1221				
1222	**DEERFIELD SITE EQUIPMENT INSTALLATION**	**14 days**	**Mon 4/30/18**	**Fri 5/18/18**
1223	Ship equipment to site	1 day	Mon 4/30/18	Tue 5/1/18
1224	Microwave equipment installation	2 days	Tue 5/1/18	Thu 5/3/18
1225	Microwave equipment alignment and test	1 day	Thu 5/3/18	Fri 5/4/18
1226	FNE Equipment installation	5 days	Fri 5/4/18	Fri 5/11/18
1227	FNE Equipment program & configure	2 days	Fri 5/11/18	Tue 5/15/18
1228	Site Equipment test and baseline	2 days	Tue 5/15/18	Thu 5/17/18

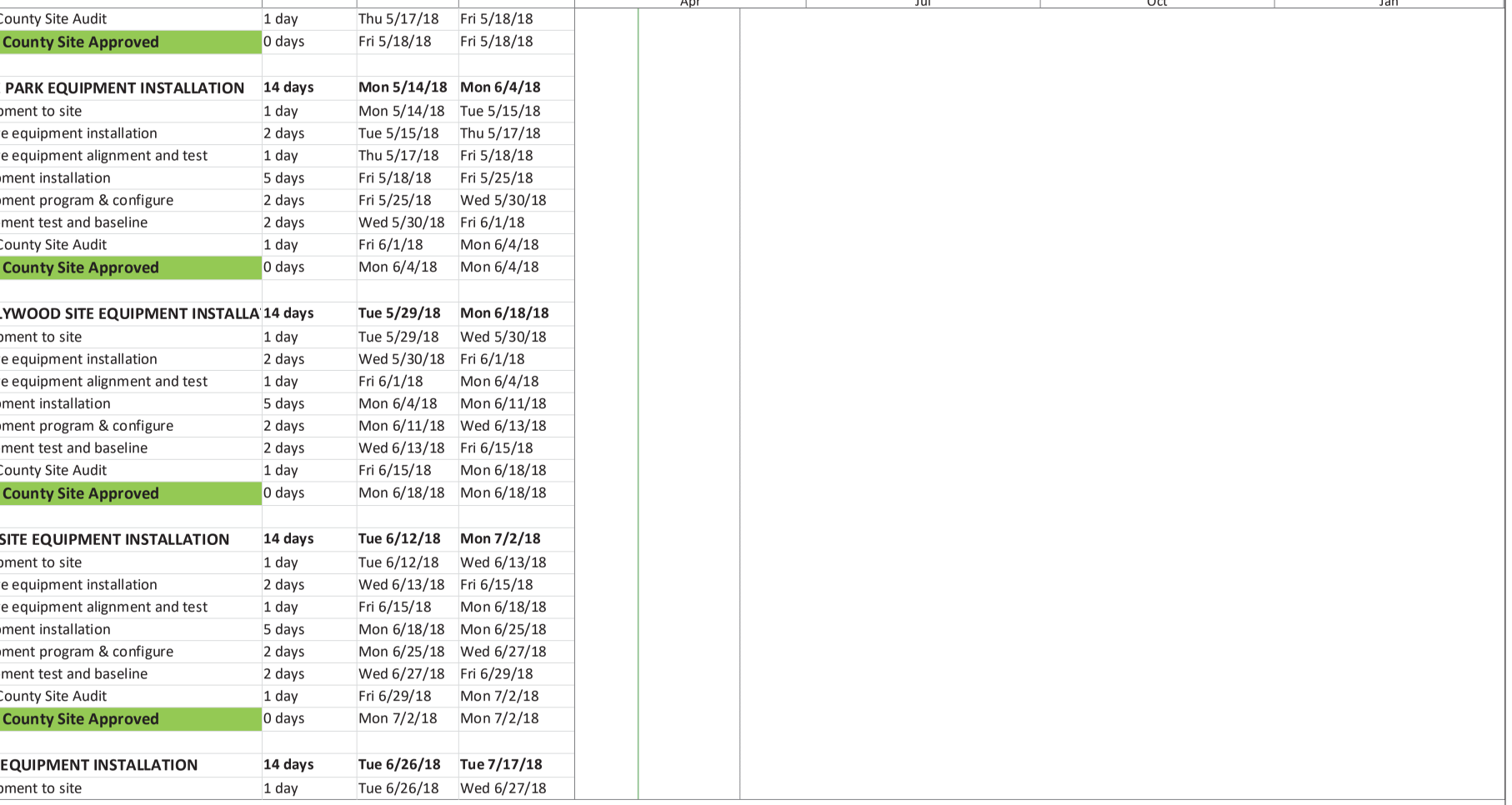


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1229	Broward County Site Audit	1 day	Thu 5/17/18	Fri 5/18/18
1230	**Broward County Site Approved**	0 days	Fri 5/18/18	Fri 5/18/18
1231				
1232	**WEST LAKE PARK EQUIPMENT INSTALLATION**	**14 days**	**Mon 5/14/18**	**Mon 6/4/18**
1233	Ship equipment to site	1 day	Mon 5/14/18	Tue 5/15/18
1234	Microwave equipment installation	2 days	Tue 5/15/18	Thu 5/17/18
1235	Microwave equipment alignment and test	1 day	Thu 5/17/18	Fri 5/18/18
1236	FNE Equipment installation	5 days	Fri 5/18/18	Fri 5/25/18
1237	FNE Equipment program & configure	2 days	Fri 5/25/18	Wed 5/30/18
1238	Site Equipment test and baseline	2 days	Wed 5/30/18	Fri 6/1/18
1239	Broward County Site Audit	1 day	Fri 6/1/18	Mon 6/4/18
1240	**Broward County Site Approved**	0 days	Mon 6/4/18	Mon 6/4/18
1241				
1242	**WEST HOLLYWOOD SITE EQUIPMENT INSTALLA**	**14 days**	**Tue 5/29/18**	**Mon 6/18/18**
1243	Ship equipment to site	1 day	Tue 5/29/18	Wed 5/30/18
1244	Microwave equipment installation	2 days	Wed 5/30/18	Fri 6/1/18
1245	Microwave equipment alignment and test	1 day	Fri 6/1/18	Mon 6/4/18
1246	FNE Equipment installation	5 days	Mon 6/4/18	Mon 6/11/18
1247	FNE Equipment program & configure	2 days	Mon 6/11/18	Wed 6/13/18
1248	Site Equipment test and baseline	2 days	Wed 6/13/18	Fri 6/15/18
1249	Broward County Site Audit	1 day	Fri 6/15/18	Mon 6/18/18
1250	**Broward County Site Approved**	0 days	Mon 6/18/18	Mon 6/18/18
1251				
1252	**TAMARAC SITE EQUIPMENT INSTALLATION**	**14 days**	**Tue 6/12/18**	**Mon 7/2/18**
1253	Ship equipment to site	1 day	Tue 6/12/18	Wed 6/13/18
1254	Microwave equipment installation	2 days	Wed 6/13/18	Fri 6/15/18
1255	Microwave equipment alignment and test	1 day	Fri 6/15/18	Mon 6/18/18
1256	FNE Equipment installation	5 days	Mon 6/18/18	Mon 6/25/18
1257	FNE Equipment program & configure	2 days	Mon 6/25/18	Wed 6/27/18
1258	Site Equipment test and baseline	2 days	Wed 6/27/18	Fri 6/29/18
1259	Broward County Site Audit	1 day	Fri 6/29/18	Mon 7/2/18
1260	**Broward County Site Approved**	0 days	Mon 7/2/18	Mon 7/2/18
1261				
1262	**FS106 SITE EQUIPMENT INSTALLATION**	**14 days**	**Tue 6/26/18**	**Tue 7/17/18**
1263	Ship equipment to site	1 day	Tue 6/26/18	Wed 6/27/18

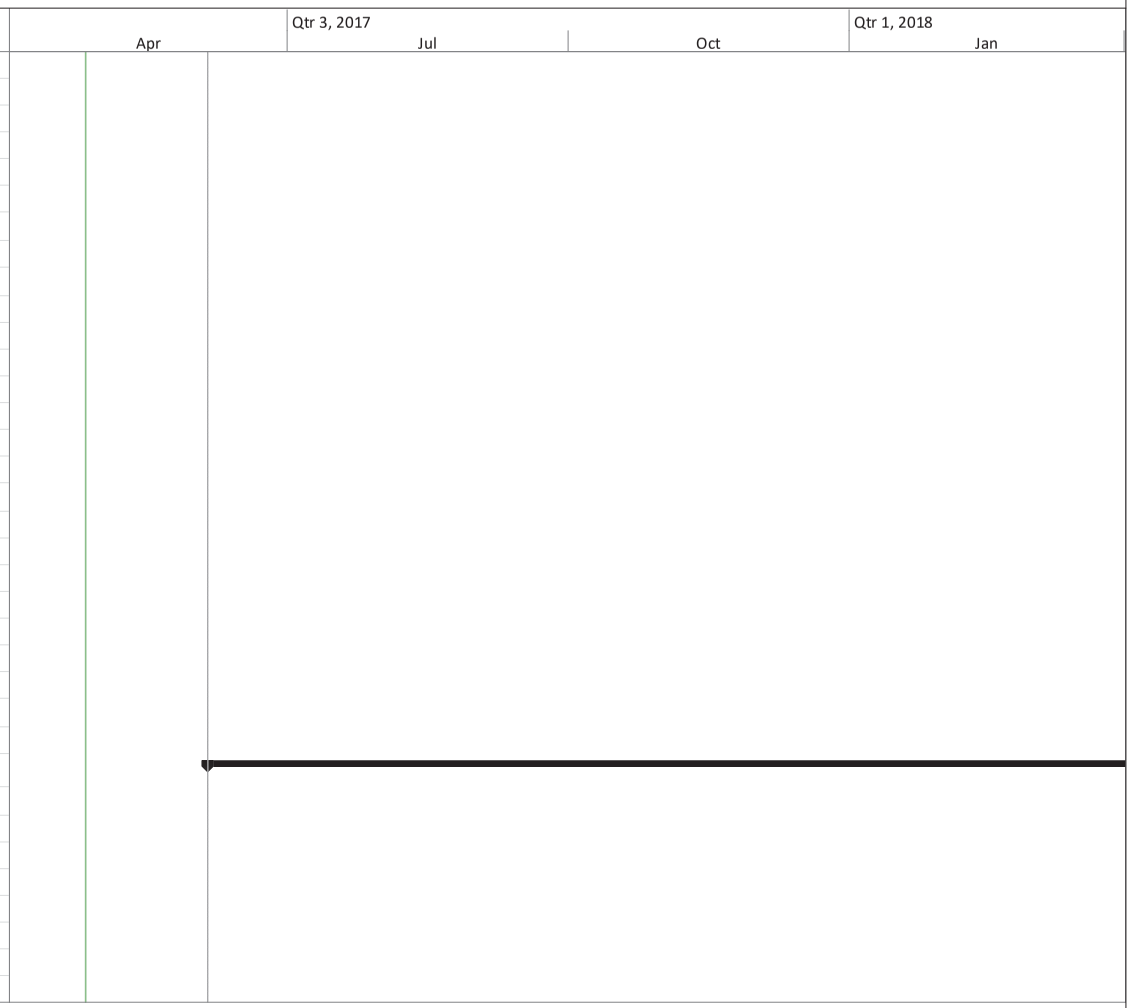


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Broward County, FL
Preliminary Project Schedule

ID	Task Name	Duration	Start	Finish
1264	Microwave equipment installation	2 days	Wed 6/27/18	Fri 6/29/18
1265	Microwave equipment alignment and test	1 day	Fri 6/29/18	Mon 7/2/18
1266	FNE Equipment installation	5 days	Mon 7/2/18	Tue 7/10/18
1267	FNE Equipment program & configure	2 days	Tue 7/10/18	Thu 7/12/18
1268	Site Equipment test and baseline	2 days	Thu 7/12/18	Mon 7/16/18
1269	Broward County Site Audit	1 day	Mon 7/16/18	Tue 7/17/18
1270	**Broward County Site Approved**	0 days	Tue 7/17/18	Tue 7/17/18
1271				
1272	**PARKLAND SITE EQUIPMENT INSTALLATION**	**14 days**	**Wed 7/11/18**	**Tue 7/31/18**
1273	Ship equipment to site	1 day	Wed 7/11/18	Thu 7/12/18
1274	Microwave equipment installation	2 days	Thu 7/12/18	Mon 7/16/18
1275	Microwave equipment alignment and test	1 day	Mon 7/16/18	Tue 7/17/18
1276	FNE Equipment installation	5 days	Tue 7/17/18	Tue 7/24/18
1277	FNE Equipment program & configure	2 days	Tue 7/24/18	Thu 7/26/18
1278	Site Equipment test and baseline	2 days	Thu 7/26/18	Mon 7/30/18
1279	Broward County Site Audit	1 day	Mon 7/30/18	Tue 7/31/18
1280	**Broward County Site Approved**	0 days	Tue 7/31/18	Tue 7/31/18
1281				
1282	**MOBILE COMMUNICATIONS TRAILER**	**11 days**	**Tue 7/31/18**	**Wed 8/15/18**
1283	Ship equipment to trailer	1 day	Tue 7/31/18	Wed 8/1/18
1284	FNE Equipment installation	5 days	Wed 8/1/18	Wed 8/8/18
1285	FNE Equipment program & configure	2 days	Wed 8/8/18	Fri 8/10/18
1286	Trailer Equipment test and baseline	2 days	Fri 8/10/18	Tue 8/14/18
1287	Broward County Site Audit	1 day	Tue 8/14/18	Wed 8/15/18
1288	**Broward County Trailer Approved**	0 days	Wed 8/15/18	Wed 8/15/18
1289				
1290	**DISPATCH CENTER INSTALLATIONS**	**337 days**	**Mon 6/5/17**	**Tue 10/2/18**
1291	**Broward County Notice to Proceed**	0 days	Thu 8/30/18	Thu 8/30/18
1292	**SUNRISE REGIONAL DISPATCH CENTER**	**22 days**	**Fri 8/31/18**	**Tue 10/2/18**
1293	Remove Sunrise RDC from service to HMS	1 day	Fri 8/31/18	Fri 8/31/18
1294	Ship equipment to Sunrise RDC	1 day	Tue 9/4/18	Tue 9/4/18
1295	Test & Verify new ethernet circuits	5 days	Wed 9/5/18	Tue 9/11/18
1296	Install new equipment	10 days	Wed 9/12/18	Tue 9/25/18
1297	Program, configure and test new equipment	5 days	Wed 9/26/18	Tue 10/2/18
1298	Sunrise RDC ready for FATP & CATP Testing	0 days	Tue 10/2/18	Tue 10/2/18

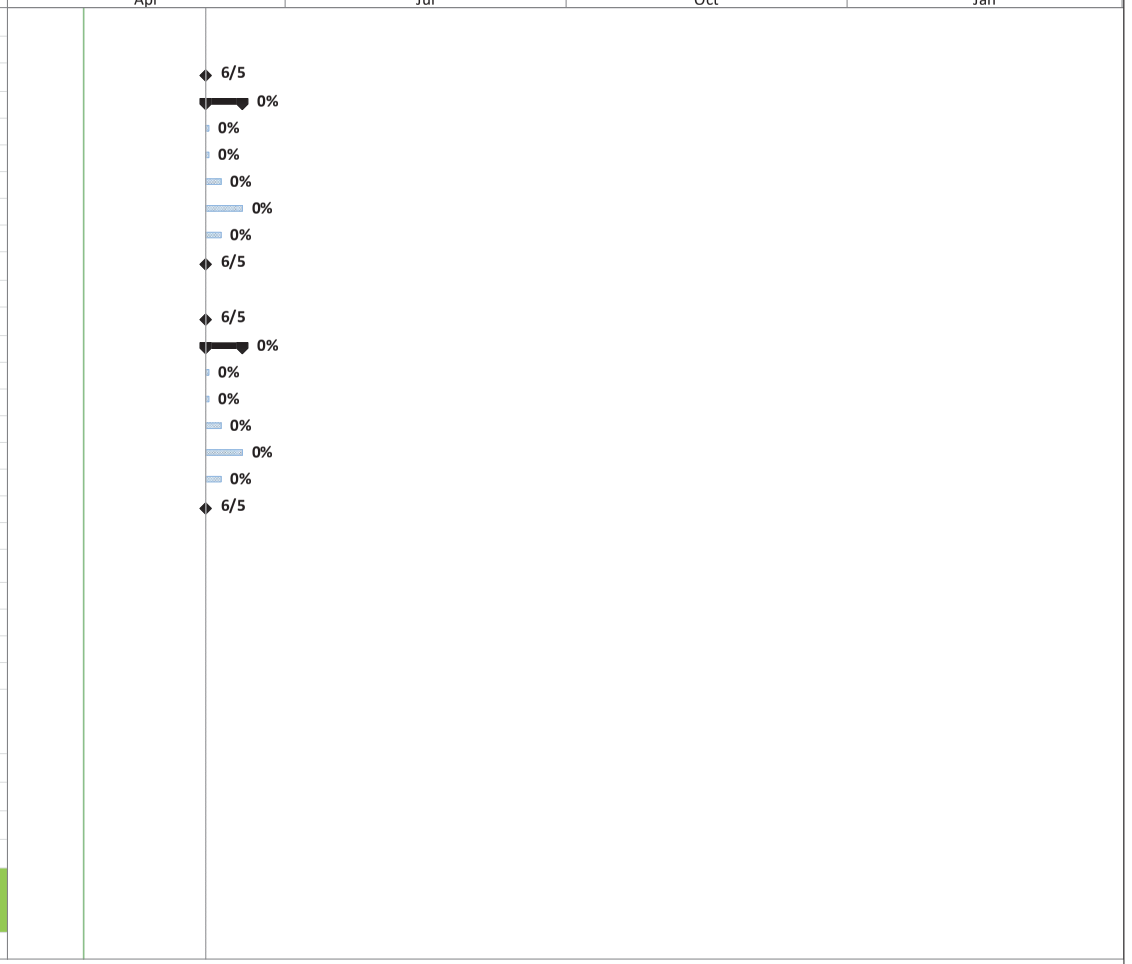


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Broward County, FL
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1299	**Sunrise RDC ready for Cutover**	0 days	Tue 10/2/18	Tue 10/2/18
1300				
1301	**Broward County Notice to Proceed**	0 days	Mon 6/5/17	Mon 6/5/17
1302	**COCONUT CREEK REGIONAL DISPATCH CENTER**	**10 days**	**Mon 6/5/17**	**Fri 6/16/17**
1303	Remove Coconut Creek RDC from service to HMS	1 day	Mon 6/5/17	Mon 6/5/17
1304	Ship equipment to Coconut Creek RDC	1 day	Mon 6/5/17	Mon 6/5/17
1305	Test & Verify new ethernet circuits	5 days	Mon 6/5/17	Fri 6/9/17
1306	Install new equipment	10 days	Mon 6/5/17	Fri 6/16/17
1307	Program, configure and test new equipment	5 days	Mon 6/5/17	Fri 6/9/17
1308	**Coconut Creek RDC ready for Cutover**	0 days	Mon 6/5/17	Mon 6/5/17
1309				
1310	**Broward County Notice to Proceed**	0 days	Mon 6/5/17	Mon 6/5/17
1311	**PEMBROKE PINES REGIONAL DISPATCH CENTER**	**10 days**	**Mon 6/5/17**	**Fri 6/16/17**
1312	Remove Pembroke Pines RDC from service to HMS	1 day	Mon 6/5/17	Mon 6/5/17
1313	Ship equipment to Pembroke Pines RDC	1 day	Mon 6/5/17	Mon 6/5/17
1314	Test & Verify new ethernet circuits	5 days	Mon 6/5/17	Fri 6/9/17
1315	Install new equipment	10 days	Mon 6/5/17	Fri 6/16/17
1316	Program, configure and test new equipment	5 days	Mon 6/5/17	Fri 6/9/17
1317	Pembroke Pines RDC ready for Cutover	0 days	Mon 6/5/17	Mon 6/5/17
1318				
1319	**SYSTEM OPTIMIZATION**	**10 days**	**Wed 10/3/18**	**Tue 10/16/18**
1320	Master Site, Prime Site and Remote Sites Optimizatio	10 days	Wed 10/3/18	Tue 10/16/18
1321	Optimization of Dispatch Consoles	5 days	Wed 10/3/18	Tue 10/9/18
1322	System Ready for ATP and CATP Testing	0 days	Tue 10/9/18	Tue 10/9/18
1323				
1324	**ACCEPTANCE TESTING AND SYSTEM ACCEPTANCE**	**50 days**	**Wed 10/10/18**	**Thu 12/20/18**
1325	**Field ATP**	10 days	Wed 10/10/18	Tue 10/23/18
1326	**Microwave ATP**	10 days	Wed 10/10/18	Tue 10/23/18
1327	**Coverage ATP**	20 days	Wed 10/24/18	Tue 11/20/18
1328	**30 Day operational Test (Burn-in)**	20 days	Wed 11/21/18	Thu 12/20/18
1329	**BROWARD COUNTY SYSTEM READY FOR CUTOVER**	0 days	**Thu 12/20/18**	**Thu 12/20/18**
1330				



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Preliminary Project Schedule

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1331	**TECHNICAL TRAINING CLASS**	**20 days**	**Wed 11/21/18**	**Thu 12/20/18**
1332	Technical training classes	20 days	Wed 11/21/18	Thu 12/20/18
1333				
1334	**FINALIZE**	**6 days**	**Fri 12/21/18**	**Mon 12/31/18**
1335	**Resolve Punchlist**	6 days	Fri 12/21/18	Mon 12/31/18
1336	**Finalize Documentation**	6 days	Fri 12/21/18	Mon 12/31/18
1337	**FINAL ACCEPTANCE**	**0 days**	**Mon 12/31/18**	**Mon 12/31/18**



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