

Communications System Agreement

Motorola Solutions, Inc. ("Motorola") and the City of Riverside, California ("Customer") enter into this "Agreement," pursuant to which Customer will purchase and Motorola will sell the System, as described below. Motorola and Customer may be referred to individually as a "Party" and collectively as the "Parties." For good and valuable consideration, the Parties agree as follows:

Section 1 EXHIBITS

The exhibits listed below are incorporated into and made a part of this Agreement. In interpreting this Agreement and resolving any ambiguities, the main body of this Agreement takes precedence over the exhibits and any inconsistency between Exhibits A through D will be resolved in their listed order.

Exhibit A	Motorola "Software License Agreement"
Exhibit B	"Payment Schedule"
Exhibit C	The Motorola Proposal dated July 28, 2016, entitled "Design and Installation of Land Mobile Radio"
C-1	"System Description"
C-2	"Equipment List"
C-3	"Statement of Work"
C-4	"Acceptance Test Plan" or "ATP"
C-5	"Performance Schedule"
Exhibit D	Service Statement(s) of Work and "Service Terms and Conditions" (if applicable)

Section 2 DEFINITIONS

Capitalized terms used in this Agreement have the following meanings:

- 2.1. "Acceptance Tests" means those tests described in the Acceptance Test Plan.
- 2.2. "Administrative User Credentials" means an account that has total access over the operating system, files, end user accounts and passwords at either the System level or box level. Customer's personnel with access to the Administrative User Credentials may be referred to as the Administrative User.
- 2.3. "Beneficial Use" means when Customer first uses the System or a Subsystem for operational purposes (excluding training or testing).
- 2.4. "Confidential Information" means any information that is disclosed in written, graphic, verbal, or machine-recognizable form, and is marked, designated, or identified at the time of disclosure as being confidential or its equivalent; or if the information is in verbal form, it is identified as confidential at the time of disclosure and is confirmed in writing within thirty (30) days of the disclosure. Confidential Information does not include any information that: is or becomes publicly known through no wrongful act of the receiving Party; is already known to the receiving Party without restriction when it is disclosed; is or becomes, rightfully and without breach of this Agreement, in the receiving Party's possession without any obligation restricting disclosure; is independently developed by the receiving Party without breach of this Agreement; or is explicitly approved for release by written authorization of the disclosing Party.
- 2.5. "Contract Price" means the price for the System, excluding applicable sales or similar taxes and freight charges.
- 2.6. "Effective Date" means that date upon which the last Party executes this Agreement.
- 2.7. "Equipment" means the equipment that Customer purchases from Motorola under this Agreement. Equipment that is part of the System is described in the Equipment List.

2.8. "Force Majeure" means an event, circumstance, or act of a third party that is beyond a Party's reasonable control (e.g., an act of God, an act of the public enemy, an act of a government entity, strikes or other labor disturbances, hurricanes, earthquakes, fires, floods, epidemics, embargoes, war, and riots).

2.9. "Infringement Claim" means a third party claim alleging that the Equipment manufactured by Motorola or the Motorola Software directly infringes a United States patent or copyright.

2.10. "Motorola Software" means Software that Motorola or its affiliated company owns.

2.11. "Non-Motorola Software" means Software that another party owns.

2.12. "Open Source Software" (also called "freeware" or "shareware") means software with either freely obtainable source code, license for modification, or permission for free distribution.

2.13. "Proprietary Rights" means the patents, patent applications, inventions, copyrights, trade secrets, trademarks, trade names, mask works, know-how, and other intellectual property rights in and to the Equipment and Software, including those created or produced by Motorola under this Agreement and any corrections, bug fixes, enhancements, updates or modifications to or derivative works from the Software whether made by Motorola or another party.

2.14. "Software" means the Motorola Software and Non-Motorola Software, in object code format that is furnished with the System or Equipment.

2.15. "Specifications" means the functionality and performance requirements that are described in the Technical and Implementation Documents.

2.16. "Subsystem" means a major part of the System that performs specific functions or operations. Subsystems are described in the Technical and Implementation Documents.

2.17. "System" means the Equipment, Software, and incidental hardware and materials that are combined together into an integrated system; the System is described in the Technical and Implementation Documents.

2.18. "System Acceptance" means the Acceptance Tests have been successfully completed.

2.19. "Warranty Period" means one (1) year from the date of System Acceptance or Beneficial Use, whichever occurs first. For non-system purchase and sale transactions (such as the purchase and sale of products only or products plus incidental services), the "Warranty Period" means one (1) year from the date of shipment.

Section 3 SCOPE OF AGREEMENT AND TERM

3.1. SCOPE OF WORK. Motorola will provide, install and test the System, and perform its other contractual responsibilities, all in accordance with this Agreement. Customer will perform its contractual responsibilities in accordance with this Agreement.

3.2. CHANGE ORDERS. Either Party may request changes within the general scope of this Agreement. If a requested change causes an increase or decrease in the cost or time required to perform this Agreement, the Parties will agree to an equitable adjustment of the Contract Price, Performance Schedule, or both, and will reflect the adjustment in a change order. Neither Party is obligated to perform requested changes unless both Parties execute a written change order. The change order shall be on the City's standard form, unless the City determines in its sole discretion that another change order form is acceptable or that a written contract amendment is needed for the increase/decrease.

3.3. TERM. Unless terminated in accordance with other provisions of this Agreement or extended by mutual agreement of the Parties, the term of this Agreement begins on the Effective Date and continues

until the date of expiration of (i) the Warranty Period or (ii) the rights under Section 3.4 below, whichever occurs last.

3.4. ADDITIONAL EQUIPMENT OR SOFTWARE. For three (3) years after the Effective Date, Customer may order additional Equipment or Software if it is then available and related services. Each order must refer to this Agreement and must specify the pricing and delivery terms. Notwithstanding any additional or contrary terms in the order, the applicable provisions of this Agreement (except for pricing, delivery, passage of title and risk of loss to Equipment, warranty commencement, and payment terms) will govern the purchase and sale of the additional Equipment or Software. Motorola will hold its Equipment pricing valid through the date of System Acceptance. Title and risk of loss to additional Equipment will pass at shipment, warranty will commence upon delivery, and payment is due within thirty (30) days after the invoice date. Motorola will send Customer an invoice as the additional Equipment is shipped or Software is licensed. Alternatively, Customer may register with and place orders through Motorola Online ("MOL"), and this Agreement will be the "Underlying Agreement" for those MOL transactions rather than the MOL On-Line Terms and Conditions of Sale. MOL information may be found at <https://businessonline.motorolasolutions.com> and the MOL telephone number is (800) 814-0601.

3.5. MAINTENANCE SERVICE. During the Warranty Period, in addition to warranty services, Motorola will provide maintenance services for the Equipment and support for the Motorola Software pursuant to the Statement of Work set forth in Exhibit D. Those services and support are included in the Contract Price. If Customer wishes to purchase additional maintenance and support services for the Equipment during the Warranty Period, or any maintenance and support services for the Equipment either during the Warranty Period or after the Warranty Period, the description of and pricing for the services will be set forth in a separate document. If Customer wishes to purchase extended support for the Motorola Software after the Warranty Period, it may do so by ordering software maintenance or upgrade services. Unless otherwise agreed by the Parties in writing, the terms and conditions applicable to the maintenance, support or software services will be Motorola's standard Service Terms and Conditions, together with the appropriate statements of work.

3.6. MOTOROLA SOFTWARE. Any Motorola Software, including subsequent releases, is licensed to Customer solely in accordance with the Software License Agreement. Customer hereby accepts and agrees to abide by all of the terms and restrictions of the Software License Agreement.

3.7. NON-MOTOROLA SOFTWARE. Any Non-Motorola Software is licensed to Customer in accordance with the standard license, terms, and restrictions of the copyright owner on the Effective Date unless the copyright owner has granted to Motorola the right to sublicense the Non-Motorola Software pursuant to the Software License Agreement, in which case it applies and the copyright owner will have all of Licensor's rights and protections under the Software License Agreement. Motorola makes no representations or warranties of any kind regarding Non-Motorola Software. Non-Motorola Software may include Open Source Software. All Open Source Software is licensed to Customer in accordance with, and Customer agrees to abide by, the provisions of the standard license of the copyright owner and not the Software License Agreement.

3.8. SUBSTITUTIONS. At no additional cost to Customer, Motorola may substitute any Equipment, Software, or services to be provided by Motorola, if the substitute meets or exceeds the Specifications and is of equivalent or better quality to the Customer. Any substitution will be reflected in a change order.

Section 4 PERFORMANCE SCHEDULE

The Parties will perform their respective responsibilities in accordance with the Performance Schedule. By executing this Agreement, Customer authorizes Motorola to proceed with contract performance.

Section 5 CONTRACT PRICE, PAYMENT AND INVOICING

5.1. CONTRACT PRICE. The Contract Price in U.S. dollars is \$2,313,975.00, excluding estimated sales tax. Motorola has priced the services, Software, and Equipment as an integrated system. A

reduction in Software or Equipment quantities, or services, may affect the overall Contract Price, including discounts if applicable.

5.2. **INVOICING AND PAYMENT.** Motorola will submit invoices to Customer according to the Payment Schedule. Except for a payment that is due on the Effective Date, Customer will make payments to Motorola within thirty (30) days after the date of each invoice. Customer will make payments when due in the form of a wire transfer, check, or cashier's check from a U.S. financial institution. Overdue invoices will bear simple interest at the maximum allowable rate. For reference, the Federal Tax Identification Number for Motorola Solutions, Inc. is 36-1115800.

5.3. **FREIGHT, TITLE, AND RISK OF LOSS.** Motorola will pre-pay and add all freight charges to the invoices. Title to the Equipment will pass to Customer upon shipment. Title to Software will not pass to Customer at any time. Risk of loss will pass to Customer upon delivery of the Equipment to the Customer. Motorola will pack and ship all Equipment in accordance with good commercial practices.

5.4. **INVOICING AND SHIPPING ADDRESSES.** Invoices will be sent to the Customer at the following address: Riverside Public Utilities, 3900 Main Street, Riverside, California 92522, Attention: Darlene Elliot

The address which is the ultimate destination where the Equipment will be delivered to Customer is: Riverside Public Utilities, 3900 Main Street, Riverside, California 92522, Attention: Darlene Elliot

The Equipment will be shipped to the Customer at the following address (insert if this information is known): Riverside Public Utilities, 3900 Main Street, Riverside, California 92522, Attention: Darlene Elliot

Customer may change this information by giving written notice to Motorola.

Section 6 SITES AND SITE CONDITIONS

6.1. **ACCESS TO SITES.** Customer will provide a designated project manager; all necessary construction and building permits, zoning variances, licenses, and any other approvals that are necessary to develop or use the sites and mounting locations; and access to the work sites or vehicles identified in the Technical and Implementation Documents as reasonably requested by Motorola so that it may perform its duties in accordance with the Performance Schedule and Statement of Work. Motorola may assist Customer in the local building permit process.

6.2. **SITE CONDITIONS.** Customer will ensure that all work sites it provides will be safe, secure, and in compliance with all applicable industry and OSHA standards. To the extent applicable and unless the Statement of Work states to the contrary, Customer will ensure that these work sites have adequate: physical space; air conditioning and other environmental conditions; adequate and appropriate electrical power outlets, distribution, equipment and connections; and adequate telephone or other communication lines (including modem access and adequate interfacing networking capabilities), all for the installation, use and maintenance of the System. Before installing the Equipment or Software at a work site, Motorola may inspect the work site and advise Customer of any apparent deficiencies or non-conformities with the requirements of this Section. This Agreement is predicated upon normal soil conditions as defined by the version of E.I.A. standard RS-222 in effect on the Effective Date.

6.3. **SITE ISSUES.** If a Party determines that the sites identified in the Technical and Implementation Documents are no longer available or desired, or if subsurface, structural, adverse environmental or latent conditions at any site differ from those indicated in the Technical and Implementation Documents, the Parties will promptly investigate the conditions and will select replacement sites or adjust the installation plans and Specifications as necessary. If change in sites or adjustment to the installation plans and Specifications causes a change in the cost or time to perform, the Parties will equitably amend the Contract Price, Performance Schedule, or both, by a change order.

Section 7 TRAINING

Any training to be provided by Motorola to Customer will be described in the Statement of Work. Customer will notify Motorola immediately if a date change for a scheduled training program is required. If Motorola incurs additional costs because Customer reschedules a training program less than thirty (30) days before its scheduled start date, Motorola may recover these additional costs.

Section 8 SYSTEM ACCEPTANCE

8.1. COMMENCEMENT OF ACCEPTANCE TESTING. Motorola will provide to Customer at least ten (10) days notice before the Acceptance Tests commence. System testing will occur only in accordance with the Acceptance Test Plan.

8.2. SYSTEM ACCEPTANCE. System Acceptance will occur upon successful completion of the Acceptance Tests. Upon System Acceptance, the Parties will memorialize this event by promptly executing a System Acceptance Certificate. If the Acceptance Test Plan includes separate tests for individual Subsystems or phases of the System, acceptance of the individual Subsystem or phase will occur upon the successful completion of the Acceptance Tests for the Subsystem or phase, and the Parties will promptly execute an acceptance certificate for the Subsystem or phase. If Customer believes the System has failed the completed Acceptance Tests, Customer will provide to Motorola a written notice that includes the specific details of the failure. If Customer does not provide to Motorola a failure notice within thirty (30) days after completion of the Acceptance Tests, System Acceptance will be deemed to have occurred as of the completion of the Acceptance Tests. Minor omissions or variances in the System that do not materially impair the operation of the System will not postpone System Acceptance or Subsystem Acceptance, but will be corrected according to a mutually agreed punch list schedule.

8.3. BENEFICIAL USE. Motorola's ability to perform its implementation and testing responsibilities may be impeded if Customer begins using the System before System Acceptance. Therefore, Customer will not commence Beneficial Use before System Acceptance without Motorola's prior written authorization, which will not be unreasonably withheld. Motorola is not responsible for System performance deficiencies that occur during unauthorized Beneficial Use. Upon commencement of Beneficial Use, Customer assumes responsibility for the use and operation of the System.

8.4 FINAL PROJECT ACCEPTANCE. Final Project Acceptance will occur after System Acceptance when all deliverables and other work have been completed. When Final Project Acceptance occurs, the Parties will promptly memorialize this final event by means of a Final Project Acceptance Certificate.

Section 9 REPRESENTATIONS AND WARRANTIES

9.1. SYSTEM FUNCTIONALITY. Motorola represents that the System will perform in accordance with the Specifications in all material respects. Upon System Acceptance or Beneficial Use, whichever occurs first, this System functionality representation is fulfilled. Motorola is not responsible for System performance deficiencies that are caused by ancillary equipment not furnished by Motorola which is attached to or used in connection with the System or for reasons or parties beyond Motorola's control, such as natural causes; the construction of a building that adversely affects the microwave path reliability or radio frequency (RF) coverage; the addition of frequencies at System sites that cause RF interference or intermodulation; or Customer changes to load usage or configuration outside the Specifications.

9.2. EQUIPMENT WARRANTY. During the Warranty Period, Motorola warrants that the Equipment under normal use and service will be free from material defects in materials and workmanship.

9.3. MOTOROLA SOFTWARE WARRANTY. Unless otherwise stated in the Software License Agreement, during the Warranty Period, Motorola warrants the Motorola Software in accordance with the terms of the Software License Agreement and the provisions of this Section 9 that are applicable to the Motorola Software.

9.4. **EXCLUSIONS TO EQUIPMENT AND MOTOROLA SOFTWARE WARRANTIES.** These warranties do not apply to: (i) defects or damage resulting from: use of the Equipment or Motorola Software in other than its normal, customary, and authorized manner; accident, liquids, neglect, or acts of God; testing, maintenance, disassembly, repair, installation, alteration, modification, or adjustment not provided or authorized in writing by Motorola; Customer's failure to comply with all applicable industry and OSHA standards; (ii) breakage of or damage to antennas unless caused directly by defects in material or workmanship; (iii) Equipment that has had the serial number removed or made illegible; (iv) batteries (because they carry their own separate limited warranty) or consumables; (v) freight costs to ship Equipment to the repair depot; (vi) scratches or other cosmetic damage to Equipment surfaces that does not affect the operation of the Equipment; and (vii) normal or customary wear and tear.

9.5. **WARRANTY CLAIMS.** To assert a warranty claim, Customer must notify Motorola in writing of the claim before the expiration of the Warranty Period. Upon receipt of this notice, Motorola will investigate the warranty claim. If this investigation confirms a valid warranty claim, Motorola will (at its option and at no additional charge to Customer) repair the defective Equipment or Motorola Software, replace it with the same or equivalent product, or refund the price of the defective Equipment or Motorola Software. That action will be the full extent of Motorola's liability for the warranty claim. Repaired or replaced product is warranted for the balance of the original applicable warranty period. All replaced products or parts will become the property of Motorola.

9.6. **ORIGINAL END USER IS COVERED.** These express limited warranties are extended by Motorola to the original user purchasing the System for commercial, industrial, or governmental use only, and are not assignable or transferable.

9.7. **DISCLAIMER OF OTHER WARRANTIES.** THESE WARRANTIES ARE THE COMPLETE WARRANTIES FOR THE EQUIPMENT AND MOTOROLA SOFTWARE PROVIDED UNDER THIS AGREEMENT AND ARE GIVEN IN LIEU OF ALL OTHER WARRANTIES. MOTOROLA DISCLAIMS ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Section 10 DELAYS

10.1. **FORCE MAJEURE.** Neither Party will be liable for its non-performance or delayed performance if caused by a Force Majeure. A Party that becomes aware of a Force Majeure that will significantly delay performance will notify the other Party promptly (but in no event later than fifteen days) after it discovers the Force Majeure. If a Force Majeure occurs, the Parties will execute a change order to extend the Performance Schedule for a time period that is reasonable under the circumstances.

10.2. **PERFORMANCE SCHEDULE DELAYS CAUSED BY CUSTOMER.** If Customer (including its other contractors) delays the Performance Schedule, it will make the promised payments according to the Payment Schedule as if no delay occurred; and the Parties will execute a change order to extend the Performance Schedule and, if requested, compensate Motorola for all reasonable charges incurred because of the delay. Delay charges may include costs incurred by Motorola or its subcontractors for additional freight, warehousing and handling of Equipment; extension of the warranties; travel; suspending and re-mobilizing the work; additional engineering, project management, and standby time calculated at then current rates; and preparing and implementing an alternative implementation plan.

Section 11 DISPUTES

The Parties will use the following procedure to address any dispute arising under this Agreement (a "Dispute").

11.1. **GOVERNING LAW.** This Agreement will be governed by and construed in accordance with the laws of the State in which the System is installed.

11.2. **NEGOTIATION.** Either Party may initiate the Dispute resolution procedures by sending a notice of Dispute ("Notice of Dispute"). The Parties will attempt to resolve the Dispute promptly through good

faith negotiations, including timely escalation of the Dispute to executives who have authority to settle the Dispute and who are at a higher level of management than the persons with direct responsibility for the matter and direct communication between the executives. If the Dispute has not been resolved within ten (10) days from the Notice of Dispute, the Parties will proceed to mediation.

11.3 **MEDIATION.** The Parties will choose an independent mediator within thirty (30) days of a notice to mediate from either Party ("Notice of Mediation"). A Party may not unreasonably withhold consent to the mediator selection. If the Parties are unable to agree upon a mediator, either Party may request that American Arbitration Association nominate a mediator. Each Party will bear its own costs of mediation, but the Parties will share the cost of the mediator equally. Each Party will participate in the mediation in good faith and will be represented at the mediation by an executive with authority to settle the Dispute.

11.4. **LITIGATION, VENUE AND JURISDICTION.** If a Dispute remains unresolved for sixty (60) days after the Notice of Mediation, either Party may submit the Dispute to a court of competent jurisdiction in the state in which the System is installed. Each Party agrees to submit to the exclusive jurisdiction of the courts in such state over any claim or matter arising under or in connection with this Agreement.

11.5. **CONFIDENTIALITY.** All communications pursuant to subsections 11.2 and 11.3 will be treated as compromise and settlement negotiations for purposes of applicable rules of evidence and any additional confidentiality protections provided by applicable law. The use of these Dispute resolution procedures will not be construed under the doctrines of laches, waiver or estoppel to affect adversely the rights of either Party.

Section 12 DEFAULT AND TERMINATION

12.1 **DEFAULT BY A PARTY.** If either Party fails to perform a material obligation under this Agreement, the other Party may consider the non-performing Party to be in default (unless a Force Majeure causes the failure) and may assert a default claim by giving the non-performing Party a written and detailed notice of default. Except for a default by Customer for failing to pay any amount when due under this Agreement which must be cured immediately, the defaulting Party will have thirty (30) days after receipt of the notice of default to either cure the default or, if the default is not curable within thirty (30) days, provide a written cure plan. The defaulting Party will begin implementing the cure plan immediately after receipt of notice by the other Party that it approves the plan. If Customer is the defaulting Party, Motorola may stop work on the project until it approves the Customer's cure plan.

12.2. **FAILURE TO CURE.** If a defaulting Party fails to cure the default as provided above in Section 12.1, unless otherwise agreed in writing, the non-defaulting Party may terminate any unfulfilled portion of this Agreement. In the event of termination for default, the defaulting Party will promptly return to the non-defaulting Party any of its Confidential Information. If Customer is the non-defaulting Party, terminates this Agreement as permitted by this Section, and completes the System through a third Party, Customer may as its exclusive remedy recover from Motorola reasonable costs incurred to complete the System to a capability not exceeding that specified in this Agreement less the unpaid portion of the Contract Price. Customer will mitigate damages and provide Motorola with detailed invoices substantiating the charges.

Section 13 INDEMNIFICATION

13.1. **GENERAL INDEMNITY BY MOTOROLA.** Motorola will indemnify and hold Customer harmless from any and all liability, expense, judgment, suit, cause of action, or demand for personal injury, death, or direct damage to tangible property which may accrue against Customer to the extent it is caused by the negligence of Motorola, its subcontractors, or their employees or agents, while performing their duties under this Agreement, if Customer gives Motorola prompt, written notice of any the claim or suit. Customer will cooperate with Motorola in its defense or settlement of the claim or suit. This section sets forth the full extent of Motorola's general indemnification of Customer from liabilities that are in any way related to Motorola's performance under this Agreement.

13.2. **GENERAL INDEMNITY BY CUSTOMER.** Customer will indemnify and hold Motorola harmless from any and all liability, expense, judgment, suit, cause of action, or demand for personal injury, death,

or direct damage to tangible property which may accrue against Motorola to the extent it is caused by the negligence of Customer, its other contractors, or their employees or agents, while performing their duties under this Agreement, if Motorola gives Customer prompt, written notice of any the claim or suit. Motorola will cooperate with Customer in its defense or settlement of the claim or suit. This section sets forth the full extent of Customer's general indemnification of Motorola from liabilities that are in any way related to Customer's performance under this Agreement.

13.3. PATENT AND COPYRIGHT INFRINGEMENT.

13.3.1. Motorola will defend at its expense any suit brought against Customer to the extent it is based on a third-party claim alleging that the Equipment manufactured by Motorola or the Motorola Software ("Motorola Product") directly infringes a United States patent or copyright ("Infringement Claim"). Motorola's duties to defend and indemnify are conditioned upon: Customer promptly notifying Motorola in writing of the Infringement Claim; Motorola having sole control of the defense of the suit and all negotiations for its settlement or compromise; and Customer providing to Motorola cooperation and, if requested by Motorola, reasonable assistance in the defense of the Infringement Claim. In addition to Motorola's obligation to defend, and subject to the same conditions, Motorola will pay all damages finally awarded against Customer by a court of competent jurisdiction for an Infringement Claim or agreed to, in writing, by Motorola in settlement of an Infringement Claim.

13.3.2. If an Infringement Claim occurs, or in Motorola's opinion is likely to occur, Motorola may at its option and expense: (a) procure for Customer the right to continue using the Motorola Product; (b) replace or modify the Motorola Product so that it becomes non-infringing while providing functionally equivalent performance; or (c) accept the return of the Motorola Product and grant Customer a credit for the Motorola Product, less a reasonable charge for depreciation. The depreciation amount will be calculated based upon generally accepted accounting standards.

13.3.3. Motorola will have no duty to defend or indemnify for any Infringement Claim that is based upon: (a) the combination of the Motorola Product with any software, apparatus or device not furnished by Motorola; (b) the use of ancillary equipment or software not furnished by Motorola and that is attached to or used in connection with the Motorola Product; (c) Motorola Product designed or manufactured in accordance with Customer's designs, specifications, guidelines or instructions, if the alleged infringement would not have occurred without such designs, specifications, guidelines or instructions; (d) a modification of the Motorola Product by a party other than Motorola; (e) use of the Motorola Product in a manner for which the Motorola Product was not designed or that is inconsistent with the terms of this Agreement; or (f) the failure by Customer to install an enhancement release to the Motorola Software that is intended to correct the claimed infringement. In no event will Motorola's liability resulting from its indemnity obligation to Customer extend in any way to royalties payable on a per use basis or the Customer's revenues, or any royalty basis other than a reasonable royalty based upon revenue derived by Motorola from Customer from sales or license of the infringing Motorola Product.

13.3.4. This Section 13 provides Customer's sole and exclusive remedies and Motorola's entire liability in the event of an Infringement Claim. Customer has no right to recover and Motorola has no obligation to provide any other or further remedies, whether under another provision of this Agreement or any other legal theory or principle, in connection with an Infringement Claim. In addition, the rights and remedies provided in this Section 13 are subject to and limited by the restrictions set forth in Section 14.

Section 14 LIMITATION OF LIABILITY

Except for personal injury or death or damage to tangible property, Motorola's total liability, whether for breach of contract, warranty, negligence, strict liability in tort, indemnification, or otherwise, will be limited to the direct damages recoverable under law, but not to exceed the Contract Price. **ALTHOUGH THE PARTIES ACKNOWLEDGE THE POSSIBILITY OF SUCH LOSSES OR DAMAGES, THEY AGREE THAT MOTOROLA WILL NOT BE LIABLE FOR ANY COMMERCIAL LOSS; INCONVENIENCE; LOSS OF USE, TIME, DATA, GOOD WILL, REVENUES, PROFITS OR SAVINGS; OR OTHER SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES IN ANY WAY RELATED TO OR ARISING FROM THIS AGREEMENT, THE SALE OR USE OF THE EQUIPMENT OR SOFTWARE, OR THE**

PERFORMANCE OF SERVICES BY MOTOROLA PURSUANT TO THIS AGREEMENT. This limitation of liability provision survives the expiration or termination of the Agreement and applies notwithstanding any contrary provision. No action for contract breach or otherwise relating to the transactions contemplated by this Agreement may be brought more than one (1) year after the accrual of the cause of action, except for money due upon an open account.

Section 15 CONFIDENTIALITY AND PROPRIETARY RIGHTS

15.1. CONFIDENTIAL INFORMATION. During the term of this Agreement, the Parties may provide each other with Confidential Information. Subject to the requirements of any applicable public records law including the California Public Records Act (California Government Code sections 6252 et seq.), each Party will: maintain the confidentiality of the other Party's Confidential Information and not disclose it to any third party, except as authorized by the disclosing Party in writing or as required by a court of competent jurisdiction or by the California Public Records Act; restrict disclosure of the Confidential Information to its employees who have a "need to know" and not copy or reproduce the Confidential Information; take necessary and appropriate precautions to guard the confidentiality of the Confidential Information, including informing its employees who handle the Confidential Information that it is confidential and is not to be disclosed to others, but these precautions will be at least the same degree of care that the receiving Party applies to its own confidential information and will not be less than reasonable care; and use the Confidential Information only in furtherance of the performance of this Agreement. Confidential Information is and will at all times remain the property of the disclosing Party, and no grant of any proprietary rights in the Confidential Information is given or intended, including any express or implied license, other than the limited right of the recipient to use the Confidential Information in the manner and to the extent permitted by this Agreement.

15.2. PRESERVATION OF MOTOROLA'S PROPRIETARY RIGHTS. Motorola, the third party manufacturer of any Equipment, and the copyright owner of any Non-Motorola Software own and retain all of their respective Proprietary Rights in the Equipment and Software, and nothing in this Agreement is intended to restrict their Proprietary Rights. All intellectual property developed, originated, or prepared by Motorola in connection with providing to Customer the Equipment, Software, or related services remain vested exclusively in Motorola, and this Agreement does not grant to Customer any shared development rights of intellectual property. Except as explicitly provided in the Software License Agreement, Motorola does not grant to Customer, either directly or by implication, estoppel, or otherwise, any right, title or interest in Motorola's Proprietary Rights. Customer will not modify, disassemble, peel components, decompile, otherwise reverse engineer or attempt to reverse engineer, derive source code or create derivative works from, adapt, translate, merge with other software, reproduce, distribute, sublicense, sell or export the Software, or permit or encourage any third party to do so. The preceding sentence does not apply to Open Source Software which is governed by the standard license of the copyright owner.

Section 16 GENERAL

16.1. TAXES. The Contract Price does not include any excise, sales, lease, use, property, or other taxes, assessments or duties, all of which will be paid by Customer except as exempt by law. If Motorola is required to pay any of these taxes, Motorola will send an invoice to Customer and Customer will pay to Motorola the amount of the taxes (including any interest and penalties) within twenty (20) days after the date of the invoice. Customer will be solely responsible for reporting the Equipment for personal property tax purposes, and Motorola will be solely responsible for reporting taxes on its income or net worth.

16.2. ASSIGNABILITY AND SUBCONTRACTING. Except as provided herein, neither Party may assign this Agreement or any of its rights or obligations hereunder without the prior written consent of the other Party, which consent will not be unreasonably withheld. Any attempted assignment, delegation, or transfer without the necessary consent will be void. Notwithstanding the foregoing, Motorola may assign this Agreement to any of its affiliates or its right to receive payment without the prior consent of Customer. In addition, in the event Motorola separates one or more of its businesses (each a "Separated Business"), whether by way of a sale, establishment of a joint venture, spin-off or otherwise (each a "Separation Event"), Motorola may, without the prior written consent of the other Party and at no additional cost to Motorola, assign this Agreement such that it will continue to benefit the Separated Business and its

affiliates (and Motorola and its affiliates, to the extent applicable) following the Separation Event. Motorola may subcontract any of the work, but subcontracting will not relieve Motorola of its duties under this Agreement.

16.3 WAIVER. Failure or delay by either Party to exercise a right or power under this Agreement will not be a waiver of the right or power. For a waiver of a right or power to be effective, it must be in a writing signed by the waiving Party. An effective waiver of a right or power will not be construed as either a future or continuing waiver of that same right or power, or the waiver of any other right or power.

16.4 SEVERABILITY. If a court having jurisdiction finds any part of this Agreement to be invalid or unenforceable, that part will be severed and the remainder will continue in full force and effect.

16.5 INDEPENDENT CONTRACTORS. Each Party will perform its duties under this Agreement as an independent contractor. The Parties and their personnel will not be considered to be employees or agents of the other Party. Nothing in this Agreement will be interpreted as granting either Party the right or authority to make commitments of any kind for the other. This Agreement will not constitute, create, or be interpreted as a joint venture, partnership or formal business organization of any kind.

16.6 HEADINGS AND SECTION REFERENCES. The section headings in this Agreement are inserted only for convenience and are not to be construed as part of this Agreement or as a limitation of the scope of the particular section to which the heading refers. This Agreement will be fairly interpreted in accordance with its terms and conditions and not for or against either Party.

16.7 ENTIRE AGREEMENT. This Agreement, including all Exhibits, constitutes the entire agreement of the Parties regarding the subject matter of the Agreement and supersedes all previous agreements, proposals, and understandings, whether written or oral, relating to this subject matter. This Agreement may be executed in multiple counterparts, each of which shall be an original and all of which shall constitute one and the same instrument. A facsimile copy or computer image, such as a PDF or tiff image, or a signature shall be treated as and shall have the same effect as an original signature. In addition, a true and correct facsimile copy or computer image of this Agreement shall be treated as and shall have the same effect as an original signed copy of this document. This Agreement may be amended or modified only by a written instrument signed by authorized representatives of both Parties. The preprinted terms and conditions found on any Customer purchase order, acknowledgment or other form will not be considered an amendment or modification of this Agreement, even if a representative of each Party signs that document.

16.8 NOTICES. Notices required under this Agreement to be given by one Party to the other must be in writing and either personally delivered or sent to the address shown below by certified mail, return receipt requested and postage prepaid (or by a recognized courier service, such as Federal Express or UPS), or by facsimile with correct answerback received, and will be effective upon receipt:

Motorola Solutions, Inc.

Attn: _____

fax: _____

Customer

City of Riverside Public Utilities Department

Attn: Pat Hohl, Assistant General Manager Energy Delivery

3900 Main Street, Riverside, California 92522

16.9 COMPLIANCE WITH APPLICABLE LAWS. Each Party will comply with all applicable federal, state, and local laws, regulations and rules concerning the performance of this Agreement or use of the System. Customer will obtain and comply with all Federal Communications Commission ("FCC") licenses and authorizations required for the installation, operation and use of the System before the scheduled installation of the Equipment. Although Motorola might assist Customer in the preparation of its FCC

license applications, neither Motorola nor any of its employees is an agent or representative of Customer in FCC or other matters.

16.10. **AUTHORITY TO EXECUTE AGREEMENT.** Each Party represents that it has obtained all necessary approvals, consents and authorizations to enter into this Agreement and to perform its duties under this Agreement; the person executing this Agreement on its behalf has the authority to do so; upon execution and delivery of this Agreement by the Parties, it is a valid and binding contract, enforceable in accordance with its terms; and the execution, delivery, and performance of this Agreement does not violate any bylaw, charter, regulation, law or any other governing authority of the Party.


16.11. **ADMINISTRATOR LEVEL ACCOUNT ACCESS.** Motorola will provide Customer with Administrative User Credentials . Customer agrees to only grant Administrative User Credentials to those personnel with the training or experience to correctly use the access. Customer is responsible for protecting Administrative User Credentials from disclosure and maintaining Credential validity by, among other things, updating passwords when required. Customer may be asked to provide valid Administrative User Credentials when in contact with Motorola System support. Customer understands that changes made as the Administrative User can significantly impact the performance of the System. Customer agrees that it will be solely responsible for any negative impact on the System or its users by any such changes. System issues occurring as a result of changes made by an Administrative User may impact Motorola's ability to perform its obligations under the Agreement or its Maintenance and Support Agreement. In such cases, a revision to the appropriate provisions of the Agreement, including the Statement of Work, may be necessary. To the extent Motorola provides assistance to correct any issues caused by or arising out of the use of or failure to maintain Administrative User Credentials , Motorola will be entitled to bill Customer and Customer will pay Motorola on a time and materials basis for resolving the issue .

16.12. **SURVIVAL OF TERMS.** The following provisions will survive the expiration or termination of this Agreement for any reason: Section 3.6 (Motorola Software); Section 3.7 (Non-Motorola Software) ; if any payment obligations exist, Sections 5.1 and 5.2 (Contract Price and Invoicing and Payment); Subsection 9.7 (Disclaimer of Implied Warranties); Section 11 (Disputes); Section 14 (Limitation of Liability); and Section 15 (Confidentiality and Proprietary Rights); and all of the General provisions in Section 16.


The Parties hereby enter into this Agreement as of the Effective Date.

Motorola Solutions, Inc.

Customer, City of Riverside

By: 
Name: Travis Boettcher
Title: Vice President
Date: 8/16/2016

By:
Name:
Title:
Date:

By: _____
By: 
Name: David Little
Title: Asst Secretary

MARK W. ANTHONY

Approved
MWA

APPROVED AS TO FORM:

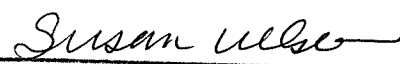
BY: 
ASSISTANT CITY ATTORNEY

Exhibit A

SOFTWARE LICENSE AGREEMENT

This Exhibit A Software License Agreement ("Agreement") is between Motorola Solutions, Inc., ("Motorola"), and the City of Riverside, California ("Licensee").

For good and valuable consideration, the parties agree as follows:

Section 1 DEFINITIONS

1.1 "Designated Products" means products provided by Motorola to Licensee with which or for which the Software and Documentation is licensed for use.

1.2 "Documentation" means product and software documentation that specifies 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).

1.3 "Open Source Software" means software with either freely obtainable source code, license for modification, or permission for free distribution.

1.4 "Open Source Software License" means the terms or conditions under which the Open Source Software is licensed.

1.5 "Primary Agreement" means the agreement to which this exhibit is attached.

1.6 "Security Vulnerability" means 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.

1.7 "Software" (i) means proprietary software in object code format, and adaptations, translations, de-compilations, disassemblies, emulations, or derivative works of such software; (ii) means any modifications, enhancements, new versions and new releases of the software provided by Motorola; and (iii) may contain one or more items of software owned by a third party supplier. The term "Software" does not include any third party software provided under separate license or third party software not licensable under the terms of this Agreement.

Section 2 SCOPE

Motorola and Licensee enter into this Agreement in connection with Motorola's delivery of certain proprietary Software or products containing embedded or pre-loaded proprietary Software, or both. This Agreement contains the terms and conditions of the license Motorola is providing to Licensee, and Licensee's use of the Software and Documentation.

Section 3 GRANT OF LICENSE

3.1. Subject to the provisions of this Agreement and the payment of applicable license fees, Motorola grants to Licensee a personal, limited, non-transferable (except as permitted in Section 7) and non-exclusive license under Motorola's copyrights and Confidential Information (as defined in the Primary Agreement) embodied in the Software to use the Software, in object code form, and the Documentation solely in connection with Licensee's use of the Designated Products. This Agreement does not grant any rights to source code.

3.2. If the Software licensed under this Agreement contains or is derived from Open Source Software, the terms and conditions governing the use of such Open Source Software are in the Open Source Software Licenses of the copyright owner and not this Agreement. If there is a conflict between the terms

and conditions of this Agreement and the terms and conditions of the Open Source Software Licenses governing Licensee's use of the Open Source Software, the terms and conditions of the license grant of the applicable Open Source Software Licenses will take precedence over the license grants in this Agreement. If requested by Licensee, Motorola will use commercially reasonable efforts to: (i) determine whether any Open Source Software is provided under this Agreement; (ii) identify the Open Source Software and provide Licensee a copy of the applicable Open Source Software License (or specify where that license may be found); and, (iii) provide Licensee a copy of the Open Source Software source code, without charge, if it is publicly available (although distribution fees may be applicable).

Section 4 LIMITATIONS ON USE

4.1. Licensee may use the Software only for Licensee's internal business purposes and only in accordance with the Documentation. Any other use of the Software is strictly prohibited. Without limiting the general nature of these restrictions, Licensee will not make the Software available for use by third parties on a "time sharing," "application service provider," or "service bureau" basis or for any other similar commercial rental or sharing arrangement.

4.2. Licensee will not, and will not allow or enable any third party to: (i) reverse engineer, disassemble, peel components, decompile, reprogram or otherwise reduce the Software or any portion to a human perceptible form or otherwise attempt to recreate the source code; (ii) modify, adapt, create derivative works of, or merge the Software; (iii) copy, reproduce, distribute, lend, or lease the Software or Documentation to any third party, grant any sublicense or other rights in the Software or Documentation to any third party, or take any action that would cause the Software or Documentation to be placed in the public domain; (iv) remove, or in any way alter or obscure, any copyright notice or other notice of Motorola's proprietary rights; (v) provide, copy, transmit, disclose, divulge or make the Software or Documentation available to, or permit the use of the Software by any third party or on any machine except as expressly authorized by this Agreement; or (vi) use, or permit the use of, the Software in a manner that would result in the production of a copy of the Software solely by activating a machine containing the Software. Licensee may make one copy of Software to be used solely for archival, back-up, or disaster recovery purposes; *provided* that Licensee may not operate that copy of the Software at the same time as the original Software is being operated. Licensee may make as many copies of the Documentation as it may reasonably require for the internal use of the Software.

4.3. Unless otherwise authorized by Motorola in writing, Licensee will not, and will not enable or allow any third party to: (i) install a licensed copy of the Software on more than one unit of a Designated Product; or (ii) copy onto or transfer Software installed in one unit of a Designated Product onto one other device. Licensee may temporarily transfer Software installed on a Designated Product to another device if the Designated Product is inoperable or malfunctioning, if Licensee provides written notice to Motorola of the temporary transfer and identifies the device on which the Software is transferred. Temporary transfer of the Software to another device must be discontinued when the original Designated Product is returned to operation and the Software must be removed from the other device. Licensee must provide prompt written notice to Motorola at the time temporary transfer is discontinued.

4.4. When using Motorola's Radio Service Software ("RSS"), Licensee must purchase a separate license for each location at which Licensee uses RSS. Licensee's use of RSS at a licensed location does not entitle Licensee to use or access RSS remotely. Licensee may make one copy of RSS for each licensed location. Licensee shall provide Motorola with a list of all locations at which Licensee uses or intends to use RSS upon Motorola's request.

4.5. Licensee will maintain, during the term of this Agreement and for a period of two years thereafter, accurate records relating to this license grant to verify compliance with this Agreement. Motorola or an independent third party ("Auditor") may inspect Licensee's premises, books and records, upon reasonable prior notice to Licensee, during Licensee's normal business hours and subject to Licensee's facility and security regulations. Motorola is responsible for the payment of all expenses and costs of the Auditor. Any information obtained by Motorola and the Auditor will be kept in strict confidence by Motorola and the Auditor and used solely for the purpose of verifying Licensee's compliance with the terms of this Agreement.

Section 5 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 Licensee under this Agreement by implication, estoppel or otherwise, except for those rights which are expressly granted to Licensee in this Agreement. All intellectual property developed, originated, or prepared by Motorola in connection with providing the Software, Designated Products, Documentation or related services, remains vested exclusively in Motorola, and Licensee will not have any shared development or other intellectual property rights.

Section 6 LIMITED WARRANTY; DISCLAIMER OF WARRANTY

6.1. Except for Motorola Software that is provided as part of the original System transaction, the commencement date and the term of the Software warranty will be a period of ninety (90) days from Motorola's shipment of the Software (the "Warranty Period"). If Licensee is not in breach of any of its obligations under this Agreement, Motorola warrants that the unmodified Software, when used properly and in accordance with the Documentation and this Agreement, will be free from a reproducible defect that eliminates the functionality or successful operation of a feature critical to the primary functionality or successful operation of the Software. Whether a defect occurs will be determined by Motorola solely with reference to the Documentation. Motorola does not warrant that Licensee's use of the Software or the Designated Products will be uninterrupted, error-free, completely free of Security Vulnerabilities, or that the Software or the Designated Products will meet Licensee's particular requirements. Motorola makes no representations or warranties with respect to any third party software included in the Software.

6.2 Motorola's sole obligation to Licensee and Licensee's exclusive remedy under this warranty is to use reasonable efforts to remedy any material Software defect covered by this warranty. These efforts will involve either replacing the media or attempting to correct significant, demonstrable program or documentation errors or Security Vulnerabilities. If Motorola cannot correct the defect within a reasonable time, then at Motorola's option, Motorola will replace the defective Software with functionally-equivalent Software, license to Licensee substitute Software which will accomplish the same objective, or terminate the license and refund the Licensee's paid license fee.

6.3. Warranty claims are described in the Primary Agreement.

6.4. The express warranties set forth in this Section 6 are in lieu of, and Motorola disclaims, any and all other warranties (express or implied, oral or written) with respect to the Software or Documentation, including, without limitation, any and all implied warranties of condition, title, non-infringement, merchantability, or fitness for a particular purpose or use by Licensee (whether or not Motorola knows, has reason to know, has been advised, or is otherwise aware of any such purpose or use), whether arising by law, by reason of custom or usage of trade, or by course of dealing. In addition, Motorola disclaims any warranty to any person other than Licensee with respect to the Software or Documentation.

Section 7 TRANSFERS

Licensee will not transfer the Software or Documentation to any third party without Motorola's prior written consent. Motorola's consent may be withheld at its discretion and may be conditioned upon transferee paying all applicable license fees and agreeing to be bound by this Agreement. If the Designated Products are Motorola's radio products and Licensee transfers ownership of the Motorola radio products to a third party, Licensee may assign its right to use the Software (other than RSS and Motorola's FLASHport® software) which is embedded in or furnished for use with the radio products and the related Documentation; *provided* that Licensee transfers all copies of the Software and Documentation to the

transferee, and Licensee and the transferee sign a transfer form to be provided by Motorola upon request, obligating the transferee to be bound by this Agreement.

Section 8 TERM AND TERMINATION

8.1 Licensee's right to use the Software and Documentation will begin when the Primary Agreement is signed by both parties and will continue for the life of the Designated Products with which or for which the Software and Documentation have been provided by Motorola, unless Licensee breaches this Agreement, in which case this Agreement and Licensee's right to use the Software and Documentation may be terminated immediately upon notice by Motorola.

8.2 Within thirty (30) days after termination of this Agreement, Licensee must certify in writing to Motorola that all copies of the Software have been removed or deleted from the Designated Products and that all copies of the Software and Documentation have been returned to Motorola or destroyed by Licensee and are no longer in use by Licensee.

8.3 Licensee acknowledges that Motorola made a considerable investment of resources in the development, marketing, and distribution of the Software and Documentation and that Licensee's breach of this Agreement will result in irreparable harm to Motorola for which monetary damages would be inadequate. If Licensee breaches this Agreement, Motorola may terminate this Agreement and be entitled to all available remedies at law or in equity (including immediate injunctive relief and repossession of all non-embedded Software and associated Documentation unless Licensee is a Federal agency of the United States Government).

Section 9 UNITED STATES GOVERNMENT LICENSING PROVISIONS

This Section applies if Licensee is the United States Government or a United States Government agency. Licensee's use, duplication or disclosure of the Software and Documentation under Motorola's copyrights or trade secret rights is subject to the restrictions set forth in subparagraphs (c)(1) and (2) of the Commercial Computer Software-Restricted Rights clause at FAR 52.227-19 (JUNE 1987), if applicable, unless they are being provided to the Department of Defense. If the Software and Documentation are being provided to the Department of Defense, Licensee's use, duplication, or disclosure of the Software and Documentation is subject to the restricted rights set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013 (OCT 1988), if applicable. The Software and Documentation may or may not include a Restricted Rights notice, or other notice referring to this Agreement. The provisions of this Agreement will continue to apply, but only to the extent that they are consistent with the rights provided to the Licensee under the provisions of the FAR or DFARS mentioned above, as applicable to the particular procuring agency and procurement transaction.

Section 10 CONFIDENTIALITY

Licensee acknowledges that the Software and Documentation contain Motorola's valuable proprietary and Confidential Information and are Motorola's trade secrets, and that the provisions in the Primary Agreement concerning Confidential Information apply.

Section 11 LIMITATION OF LIABILITY

The Limitation of Liability provision is described in the Primary Agreement.

Section 12 NOTICES

Notices are described in the Primary Agreement.

Section 13 GENERAL

13.1. COPYRIGHT NOTICES. 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.

13.2. COMPLIANCE WITH LAWS. Licensee acknowledges that the Software is subject to the laws and regulations of the United States and Licensee will comply with all applicable laws and regulations, including export laws and regulations of the United States. Licensee will not, without the prior authorization of Motorola and the appropriate governmental authority of the United States, in any form export or re-export, sell or resell, ship or reship, or divert, through direct or indirect means, any item or technical data or direct or indirect products sold or otherwise furnished to any person within any territory for which the United States Government or any of its agencies at the time of the action, requires an export license or other governmental approval. Violation of this provision is a material breach of this Agreement.

13.3. ASSIGNMENTS AND SUBCONTRACTING. Motorola may assign its rights or subcontract its obligations under this Agreement, or encumber or sell its rights in any Software, without prior notice to or consent of Licensee.

13.4. GOVERNING LAW. This Agreement is governed by the laws of the United States to the extent that they apply and otherwise by the internal substantive laws of the State to which the Software is shipped if Licensee is a sovereign government entity, or the internal substantive laws of the State of Illinois if Licensee is not a sovereign government entity. The terms of the U.N. Convention on Contracts for the International Sale of Goods do not apply. In the event that the Uniform Computer Information Transaction Act, any version of this Act, or a substantially similar law (collectively "UCITA") becomes applicable to a party's performance under this Agreement, UCITA does not govern any aspect of this Agreement or any license granted under this Agreement, or any of the parties' rights or obligations under this Agreement. The governing law will be that in effect prior to the applicability of UCITA.

13.5. THIRD PARTY BENEFICIARIES. This Agreement is entered into solely for the benefit of Motorola and Licensee. No third party has the right to make any claim or assert any right under this Agreement, and no third party is deemed a beneficiary of this Agreement. Notwithstanding the foregoing, any licensor or supplier of third party software included in the Software will be a direct and intended third party beneficiary of this Agreement.

13.6. SURVIVAL. Sections 4, 5, 6.3, 7, 8, 9, 10, 11 and 13 survive the termination of this Agreement.

13.7. ORDER OF PRECEDENCE. In the event of inconsistencies between this Exhibit and the Primary Agreement, the parties agree that this Exhibit prevails, only with respect to the specific subject matter of this Exhibit, and not the Primary Agreement or any other exhibit as it applies to any other subject matter.

13.8 SECURITY. Motorola uses reasonable means in the design and writing of its own Software and the acquisition of third party Software to limit Security Vulnerabilities. While no software can be guaranteed to be free from Security Vulnerabilities, if a Security Vulnerability is discovered, Motorola will take the steps set forth in Section 6 of this Agreement.

Exhibit B

PAYMENT SCHEDULE

Except for a payment that is due on the Effective Date, Customer will make payments to Motorola within thirty (30) days after the date of each invoice. Customer will make payments when due in the form of a check, cashier's check, or wire transfer drawn on a U.S. financial institution and in accordance with the following milestones.

1. 25% of the Contract Price due upon contract execution;
2. 60% of the Contract Price due upon shipment of equipment;
3. 5% of the Contract Price due upon installation of equipment;
4. 5% of the Contract Price upon system acceptance or start of beneficial use; and
5. 5% of the Contract Price due upon Final Acceptance.

Overdue invoices will bear simple interest at the rate of ten percent (10%) per annum, unless such rate exceeds the maximum allowed by law, in which case it will be reduced to the maximum allowable rate. Motorola reserves the right to make partial shipments of equipment and to request payment upon shipment of such equipment. In addition, Motorola reserves the right to invoice for installations or civil work completed on a site-by-site basis, when applicable.

PROPOSAL TO
CITY OF RIVERSIDE

EXHIBIT C-1

SYSTEM

DESCRIPTION AND

BLOCK DIAGRAMS

DESIGN AND INSTALLATION OF LAND MOBILE RADIO

JULY 28, 2016

RFP NO. 1558



The design, technical, pricing, and other information ("Information") furnished with this submission is proprietary information of Motorola Solutions, Inc. ("Motorola") and is submitted with the restriction that it is to be used for evaluation purposes only. To the fullest extent allowed by applicable law, the Information is not to be disclosed publicly or in any manner to anyone other than those required to evaluate the Information without the express written permission of Motorola.

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SYSTEM DESCRIPTION AND BLOCK DIAGRAMS

C1.1 SYSTEM OVERVIEW

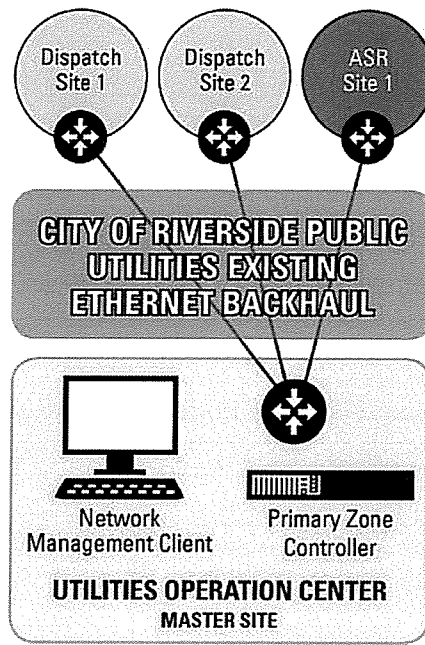
To meet the City of Riverside Public Utilities need for an integrated state-of-the-art wide area voice radio network, Motorola proposes a complete, turnkey solution that will provide a secure network, improved coverage, and offer new capabilities beyond those available with the current system. The proposed design for the City of Riverside Public Utilities is an FDMA ASTRO 25 700MHz Trunked Communications system specifically designed to comply with the RFP's requirement for a Project 25 radio system.

Solution Overview

The proposed system includes the following features and benefits to the City of Riverside Public Utilities and its users:

- Mission critical communications 700 MHz Project 25 Phase 1 FDMA compliant system that is highly-reliable, fault tolerant, spectrally efficient, flexible and encrypted for secure communications.
- The proposed Project 25 Phase 1 FDMA system is an efficient package that enables future expansion to Project 25 Phase 2 TDMA without the need to replace major equipment elements.
- Global Positioning System (GPS) location tracking – Using Motorola's Outdoor Location Solution dispatchers would be able to see the position of field units throughout the system.
- End-to-end encryption throughout the network – Implementing Project 25-standard AES encryption, link encryption and encryption integrated data will protect all communications from subscribers to dispatch consoles.
- Information Assurance (IA) enhances the confidentiality, integrity, and availability of the Radio Network Infrastructure (RNI). The proposed IA includes intrusion detection sensor, central event logging, log correlation audit manager and two factor authentication.
- Radio Authentication – Prevents unwanted radios on the system and from being cloned.
- Over the Air Provisioning (OTAP) – System administrators would be able to easily update fleet of mobiles and portables, changing their programming without having to bring them in from the field.
- Northbound Interface – Allows the forwarding of alarms from the Unified Event Manager (UEM) application to a high level Manager of Managers (MOM).

Motorola's solution is based on ASTRO 25 platform technology. This platform meets the requirements of the RFP for a highly-available Project 25 standards-based solution that is completely scalable to accommodate future growth.



The City of Riverside Public Utilities proposed ASTRO 25 700 MHz Trunked Communication System consists of a master site that will be located at the Utilities Operation Center (UOC) equipped with a wide area controller and network transport equipment. The system will provide radio coverage to the City of Riverside Public Utilities through one (1) ASTRO Site Repeater (ASR) equipped with eleven (11) channels located at Box Springs. The ASR site will be equipped with an encrypted site gateway (IP network router), providing a link to the master site.

In addition, the ASTRO 25 700MHz Trunked Communications system will include five (5) MCC 7100 Dispatch consoles which will be located at two (2) Dispatch site locations, Utilities Operation Center (UOC) and the Riverside Energy Resource Center (RERC). Both dispatch site locations will employ an encrypted site gateway to provide a link back to the master site location.

The RF network will utilize an Ethernet backhaul provided by the City of Riverside Public Utilities.

C1.2 ASTRO 25 SOLUTION

ASTRO® 25 is the most widely used Project 25, Mission-Critical, Integrated Voice and Data (IV&D) communication network for public safety agencies. Installed worldwide, ASTRO 25 solutions meet and exceed IV&D requirements for day-to-day operations, as well as emergency response in the most demanding situations. ASTRO 25 is a wireless platform that combines uncompromising, real-world performance and the legendary reliability of Motorola Solutions, Inc. (Motorola).



A PLATFORM WITH UNPARALLELED FLEXIBILITY

From single-site to nationwide deployments, ASTRO 25 is a flexible, modular network with advanced call processing capabilities designed to meet the needs of public safety. ASTRO 25 can adapt to accommodate additional users, increased geographic coverage, enhanced data applications, and connectivity to other networks—all to ensure an efficient and cost-effective solution for decades to come.

ASTRO 25 is optimized for the rigorous demands of public safety, providing reliable communications. When an emergency involves multiple agencies, first responders can share voice and data communication among their teams. In addition, centralized command and control can deploy resources efficiently, maintain communication security, and track personnel effectively.

**RELIABLE
VOICE & DATA
INTEGRATED
AS ONE**

C1.3 THE BENEFITS OF ASTRO 25 IP TECHNOLOGY

STANDARDS-BASED IP MODULAR SOLUTION FOR FIRST RESPONDERS

Motorola's proposed solution for City of Riverside Public Utilities is our ASTRO 25 platform with IV&D, the foundation of the Mission-Critical portfolio. ASTRO offers a Project 25, standards-based Internet Protocol (IP) modular solution, providing your users with:

- **Cost savings** – ASTRO 25 reduces costs by integrating your voice and data needs into a single solution.
- **Interoperability** – ASTRO 25 is compliant with APCO Project 25 standards, offering seamless interoperability with other compliant systems and radios, putting the highest level of interoperability in the end-users' hands, without the need of gateways or console patches.
- **Reliability** – Pre-release software and upgrade testing, third-party hardware and software certification process, fault-tolerant architecture with multiple fallback modes, multiple levels of redundancy, and real-time network and security monitoring provide Mission-Critical reliability.
- **Enhanced productivity** – Easy and intuitive interfaces to critical, real-time information is delivered to users when and where they need it.

**ASTRO 25
WHEN MISSION
CRITICAL
COMMUNICATIONS
DEMAND PROJECT 25
INTEROPERABILITY
& IP FLEXIBILITY**

A description of the features, benefits, system architecture, and hardware components are provided in this document.

C1.4 FDMA CAPABILITY WITH TDMA AS A FUTURE OPTION

SEAMLESS INTEGRATION FDMA AND TDMA

The City of Riverside Public Utilities proposed system uses P25 FDMA technology. Motorola has included the necessary software as an option for P25 TDMA. This section describes the differences between FDMA and TDMA technology.

It is important to note that Motorola's P25 TDMA operation compliments P25 FDMA operation on the ASTRO 25 platform; it does not replace it. While the proposed system includes FDMA operation the channels can be selectively configured to operate as either TDMA-only or FDMA-only if TDMA technology is implemented. Talkgroups configured in TDMA mode will operate on the TDMA-configured channels; likewise, talkgroups configured in FDMA mode will operate on the FDMA-configured channels. With TDMA operation enabled, voice calling capacity is increased over FDMA alone, without having to abandon FDMA operational stations and subscribers.

Motorola is committed to user-driven standards to support interoperability, and is providing City of Riverside Public Utilities an ASTRO 25 system with Project 25 FDMA. The proposed ASTRO 25 system infrastructure is capable of P25 TDMA operation when City of Riverside Public Utilities chooses to move forward with a TDMA system.

**ENJOY CONTINUOUS
COVERAGE BETWEEN FDMA
AND TDMA BANDWIDTHS**

The proposed solution is built upon the proven ASTRO 25 platform. If TDMA is implemented, the ASTRO 25 system leverages 2:1 TDMA channel efficiency to double voice path capacity (Figure 1-1), as compared to a P25 FDMA channel (Figure 1-2). This enhanced capacity improves the Grade of Service (GoS), leading to fewer busied calls and faster callbacks during busy situations, relative to a standard P25 FDMA system.

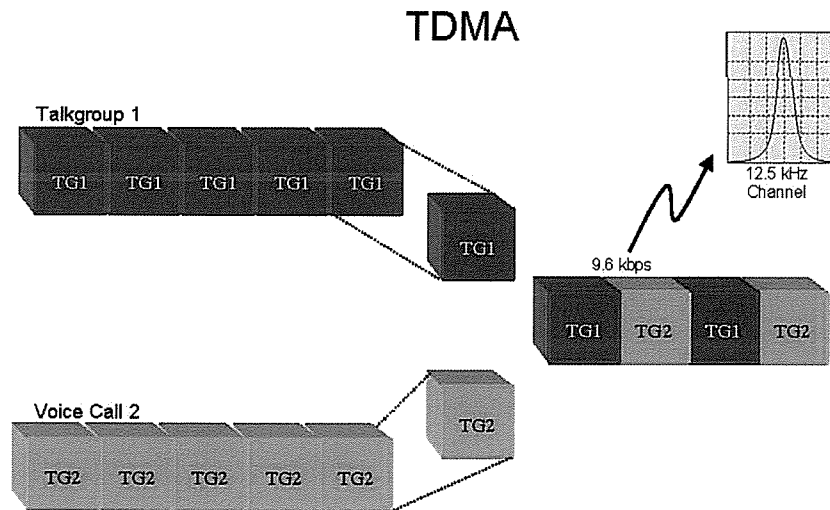


Figure 1-1: TDMA Operation divides a radio frequency into time slots and then allocates slots to calls.



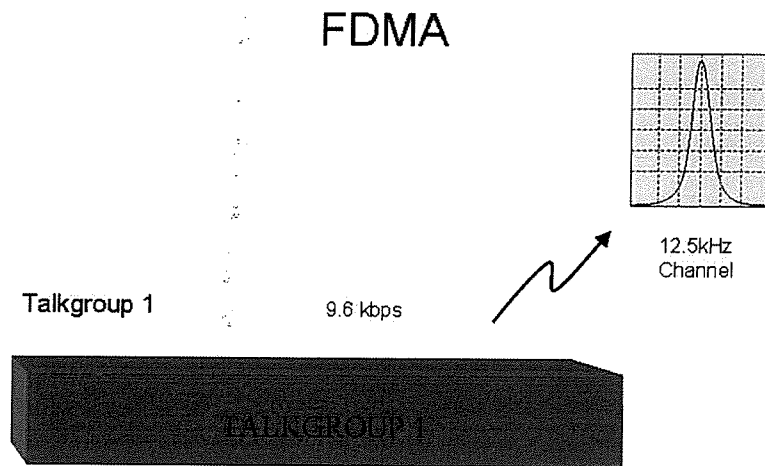


Figure 1-2: FDMA Operation divides spectrum into frequencies, which are then assigned to calls.

This improvement is due to the fact that TDMA provides double the talk path capacity in the same RF bandwidth allocation. Having this additional capacity improves GoS by reducing channel busies. Furthermore, callbacks are faster due to the greater availability of talk paths in the TDMA solution. If more voice path capacity is not required, the RF spectrum can be redeployed for packet data services at the same site, or be redeployed at another site that needs more voice path capacity.

P25 TDMA provides the further advantage of increasing the potential voice path capacity of your system. An ASTRO 25 system utilizing P25 TDMA and implicitly defined channels (channels in 700 or 800 MHz bands) can provide up to 30 voice paths at a site.

If City of Riverside Public Utilities migrates to P25 TDMA, only software upgrades are necessary. There will be no hardware changes migrating from P25 FDMA to P25 TDMA.

C1.5 AVAILABILITY

AVAILABILITY SOLUTIONS TO OPTIMIZE RESILIENCY AND FUNCTIONALITY

System Reliability and Availability

An ASTRO 25 IP system provides a wide variety of design options to achieve 99.999% availability. Motorola recognizes that one solution does not fit all customers. That is why ASTRO 25 systems have an extensive range of designs that allow customers to tailor their system to meet their resiliency needs. These options allow customers to customize the solutions which optimize resiliency, functionality, and budget for their specific environment. For certain parts of the system redundant components at the same location may be sufficient. Other parts of the system that are more critical or more vulnerable may require distributed redundancy. Motorola has included a non-redundant solution for the City of Riverside Public Utilities.

**OPTIMIZE RESILIENCY,
FUNCTIONALITY AND
SAVINGS FOR YOUR SPECIFIC
ENVIRONMENT**

C1.5.1 Fallback Operations

Motorola's ASTRO 25 trunking networks have three modes of operation for increased reliability. The normal mode of operation is wide-area trunking. In the event of multiple

**MAINTAIN SYSTEM
COMMUNICATIONS IN
CRITICAL EVENTS**

component failures that lead to system disruption, the system is equipped to continue operation in two reduced feature operational modes: site trunking and failsoft.

Wide-Area Trunking

Wide-area trunking is the ASTRO 25 system's normal mode of operation. Wide-area trunking implies that the Fixed Network Equipment is operating properly. All simulcast cells and ASTRO 25 repeater sites are communicating with the Master Site. Subscriber units automatically roam between the various network RF cells. Talkgroup calls occur in the appropriate RF cells if users are distributed throughout multiple cells. Data applications are properly assigned channels for communication between the subscriber units and the host application.

Site Trunking

Site trunking is the first failover mode of operation. Site trunking impacts individual RF cells within a network. In multiple RF cell systems, one RF cell can be in site trunking, while the rest of the system remains in wide-area trunking. Site trunking implies that the simulcast prime site controller or the ASTRO 25 repeater site has lost connectivity with the Master Site. Talkgroup calls initiated in the RF cell that is in site trunking will only be broadcast in that RF Cell. Dispatch consoles use control stations, or the operators use portable radios to communicate on a site trunking RF cell. Console priority is not available in site trunking. Data applications are not available on a site in site trunking and will have to be reinitiated once the system reverts to wide-area trunking.

Radios detect if a site is in wide-area trunking or site trunking. Radio models with a display will indicate to the user when the site is operating in site trunking. The radio alternately displays the selected talkgroup and "Site Trunking." Depending on how the system and user equipment are programmed, subscriber units will try to roam to an RF cell that is in wide-area trunking.

Failsoft by Talkgroup

Subsystem/site failsoft is the final fallback means of communication if a site no longer maintains wide-area or site trunking operation. Multiple failures have to occur for the system to enter failsoft. Failsoft impacts individual RF cells within a network. In multiple RF cell systems, one RF cell can be in failsoft, while the rest of the system remains in wide-area trunking. The subsystem goes into failsoft mode in any of these scenarios:

- The site controllers are not functioning properly
- When all control channels are disabled or malfunctioned
- When only one channel is enabled

Failsoft operation provides communications in conventional mode via repeaters/base radios in order to maintain vital communications.

The subscriber's operation in failsoft mode is determined by the subscriber's programming. A subscriber can be programmed to behave in the following manner:

- **Failsoft by control channel operation** – The subscriber first scans for alternate control channels outside the multi-site subsystem, then scans the control channel frequencies for failsoft data.
- **Failsoft by working group** – The subscriber looks for Failsoft data on a pre-programmed frequency after a scan for alternate control channels outside the multi-site subsystem is unsuccessful. If the subscriber cannot decode failsoft data on the pre-programmed frequency, the subscriber then scans the control channels in the simulcast subsystem for failsoft data.

Subscriber units in an RF cell that is in failsoft will try to roam to an RF cell that is in either wide-area trunking or site trunking. Dispatch consoles use control stations or the operators use portable radios to communicate on a site trunking RF cell. Console priority is not available in site trunking.



Data applications are not available on a site in failsoft and will have to be reinitiated once the system reverts back to wide-area trunking.

C1.6 SECURE OPERATIONS

C1.6.1 Encryption

PROTECT YOUR NETWORK AND USERS

When it is absolutely critical that communications not be monitored by unauthorized parties, radio systems can be configured with encryption. Encryption ensures only authorized units in the system can listen to transmissions being made. Encrypted calls are protected end-to-end throughout the network.

Project 25 Encryption Algorithms

ASTRO systems can be equipped with current Project 25 algorithms and are fully compliant with all Federal Information Processing Standards (FIPS). The following encryption is available: DES-OFB, DVI-XL, DVP-XL, DES-XL, AES, and ADP. The City of Riverside Public Utilities is equipped with AES encryption.

Gateway Site Link Encryption

The Gateway Site Link Encryption feature uses an Advanced Encryption Standard (AES) 256-bit encryption algorithm for all voice and data packets between:

- RF sites and the zone core.
- Network management/dispatch sites and the zone core.
- GGSN and border router.

Encrypted links use the Pre-Shared Key (PSK) to authenticate each peer Gateway. This PSK can be periodically changed to enhance the network security in accordance with City of Riverside Public Utilities security policy. This policy includes who is authorized to change the PSK, how often the PSK must be changed, the current PSK being used for each link, etc.

A PSK can be 1 to 111 octets in length. FIPS 140-2 compliance recommends a minimum of 10 octets. Each octet in a PSK can be of any ASCII characters. Once the PSK is setup for a link (one Gateway to another Gateway that terminates a WAN link) the link can be brought up to go “Secure.” Once the link is secured, it can also be directed to go “Clear” for maintenance or for some other purpose at City of Riverside Public Utilities discretion. This operational state change also belongs within City of Riverside Public Utilities security policy in terms of when it can be set to “Clear” vs. “Secure.”

Common Criteria / FIPS 140-2

IP Networking links, such as Radio Network Infrastructure (RNI), Customer Enterprise Network (CEN), and subscriber radio encryption modules are certified to National Institute of Standards and Technology FIPS 140. This Federal standard assures that cryptographic modules are effectively designed to meet specific security requirements and standards for cryptography modules that include both hardware and software components.

Encrypted Integrated Data

The Encrypted Integrated Data (EID) feature provides data encryption services to ASTRO 25 IV&D IP Bearer services between the Customer Enterprise Network (CEN) and subscriber radios. The encryption service provides data encryption, decryption and authentication between each EID enabled

subscriber radio and a new device in the CEN called a PDEG Encryption Unit by using IPsec. The encryption algorithm used is Advanced Encryption Standard (AES). The PDEG and subscriber radio encryption modules are certified to National Institute of Standards and Technology FIPS 140. This Federal standard assures that cryptographic modules are effectively designed to meet specific security requirements and standards for cryptography modules that include both hardware and software components.

The subscriber radio and PDEG data encryption keys can be centrally managed using a Key Management Facility server (KMF) in the CEN. The KMF is available, but has not been purchased by RPU.

Using the EID feature, City of Riverside Public Utilities can encrypt data sent using the ASTRO 25 IP bearer service between the CEN and subscriber radio, including data sent between CEN applications and subscriber radio's internal or external applications. Data remains encrypted between the IPsec endpoint within the subscriber radio and the IPsec endpoint within the PDEG located in the CEN.

The PDEG essentially provides two network interfaces, which effectively splits the CEN into two subnets: the CEN red subnet and the CEN black subnet. The CEN's red subnet is considered the trusted subnet and the black subnet is considered untrusted. Thus, data is encrypted when passing through the black subnet. The PDEG is therefore a multi-homed device in that it supports two unique IP addresses for its red subnet interface and on its black subnet interface for EID services.

C1.6.2 Information Assurance (IA)

Motorola's commitment to Information Assurance begins with designing leading edge technology and extends throughout the entire lifecycle with our support and service capabilities. It integrates the feature-rich and robust capabilities of world-class Motorola RF engineering with the most comprehensive approach for addressing the complex compliance and risk issues outlined in the City of Riverside Public Utilities Network Security and Information Assurance requirements documentation.

Motorola Solutions is a leader in the application of Information Assurance to Land Mobile Radio (LMR) systems. We provide widespread support to IA teams across a wide base of ASTRO 25 customers including Federal, State, and Local governments and energy sector commercial organizations. These capabilities lend themselves to critical infrastructure organizations such as the City of Riverside Public Utilities.

U.S. Military and other Federal Government agencies must comply with recognizably stringent Cybersecurity requirements. Working closely with Department of Defense Military Branches and other U.S. Federal agencies, Motorola has developed a comprehensive understanding of Cybersecurity requirements as applicable to Land Mobile Radio systems. This understanding is based on knowledge of and compliance with Federal Government and Industry Best Practices Information Assurance documents noted in the City of Riverside Network Security and Information Assurance requirements. Motorola's Federal Government Cybersecurity team has many years of experience providing engineering and IA certification support to U.S. Federal Government customers. This understanding has yielded a solution that applies applicable STIG-based technical controls to the system as practically allowable without affecting system functionality or performance, enables compliance with policy controls, supports Cybersecurity documentation requirements. Most importantly, Motorola's approach provides an LMR system determined by federal government Designated Approval Authorities to present an LMR system Cybersecurity posture with acceptable levels of residual information security risk.



Following are several U.S. Federal Government Information Assurance programs and documents that the Motorola LMR system complies with:

- DoD Directive (DoDD) 5000.1, The Defense Acquisition System (ref (a), (j), and (k)).
- DoDD 8500.01E, Information Assurance.
- DoD Instruction (DoDI) 8500.2, Information Assurance Implementation.
- DODI 8510.01, Department of Defense Information Assurance Certification and Accreditation Process (DIACAP).
- DODI 8570.01-M, Information Assurance Workforce Improvement Program.
- 10 U.S.C. Section 2224, Defense Information Assurance Program.
- Office of Management and Budget Circular A-130, Appendix III, Management of Federal Information Resources.
- NIST SP 800-53 and other NIST Special Publications
- Department of Homeland Security (DHS) 4300A Sensitive Systems Handbook
- Defense Information Systems Agency (DISA) Security Technical Implementation Guidelines (STIGs)

Motorola recognizes that the information security landscape evolves constantly. As such, Motorola continues to develop and apply security controls aligned with DoD and NIST requirements with each system release. The goal of Motorola's defense-in-depth, layered security, risk-based approach to Information Assurance for Land Mobile Radio is aimed squarely at addressing and maintaining an appropriate level of confidentiality, integrity, authentication, non-repudiation, and availability that reflects a balance among the importance and sensitivity of the information and information assets; documented threats and vulnerabilities, the trustworthiness of users and interconnecting systems; the impact of impairment or destruction to the DoD information system; and cost effectiveness. Beyond the application of applicable technical controls, Motorola's IA development process and support incorporates or enables policy and procedural controls and provides appropriate system documentation.

Below are listed several of the key COTS-based capabilities and features that are provided in our LMR Information Assurance Solution package.

- Systems Hardened in accordance with applicable STIG requirements.
- McAfee ePolicy Orchestrator and Anti-Malware.
- Router Access Control List.
- SSH (Secure Shell).
- Hardened Passwords.
- Network Based Firewalls.
- Network-Based Intrusion Detection.
- Centralized Backup Service.
- Centralized Event Logging (System Core and Remote Sites).
- Centralized Authentication Service.



- Port Security (MAC Port Lockdown).
- Secure Network Management SNMPv3.
- AES-256 FIPS 140-2 certified Router Link Encryption.
- Two-factor authentication for Service Access Architecture (Secure Service Access).
- Network Interface Barrier.
- Servers and workstations hardened using STIG-based Active Directory Group Policy Objects and configuration scripts.
- Security Log correlation and management.
- Local security management and support for Security Information and Event Management through “Northbound Interface”.
- Patch Management via “Motopatch” (with available Security Update Service (SUS)).

Authentication, Authorization and Accountability

The proposed ASTRO 25 700MHz Trunked Communications system supports Authentication, Authorization and Accountability requirements as stated in the RFP. The objectives are achieved through the following:

- Active Directory-based Centralized Authentication and local authentication.
- Role-base authentication
- Centralized event logging

The centralized Authentication, Authorization and Accounting (AAA) feature starts with the Active Directory (AD) for all Windows servers and workstations and remote authentication dial-in user service (RADIUS) services already in the radio network for infrastructure devices. The feature extends the ASTRO 25 architecture for Active Directory (AD) to Solaris and Linux platforms.

A single user account can be used to access all devices in the system, as oppose to creating and managing accounts for a user across multiple devices. The user’s authorization level can be centrally defined and managed, and allows confirmation of the identity of users and controlled access to the objects on the network and the operations they may perform. Records of logins are stored and managed for auditing purposes. Centrally managing this information provides a more efficient way to oversee the network. Network administrators can more effectively enforce security policies and can also remotely administer the network.

In addition, Federated Identification has been implemented between the customer’s Radio Network Infrastructure (RNI) and the System Support Center (SSC). This allows SSC users to access devices in customer’s systems using their own user accounts defined in the SSC domain based on Federated ID management, in order to more effectively service systems.

Furthermore, the centralized event logging feature logs security events of interest as reported by client devices such as log-in failures, changes made to the hardware and software, and failures in security elements. Information about these events is recorded on a central server so it can be retrieved and analyzed helping a network technician detect, diagnose and respond to possible security breaches. Also, Central event logging enables archiving of audit information. Examples of some of the information that may be stored include login successes and failures, elevation of privileges, configuration changes and hardware failures.



Identity Assurance

The proposed ASTRO 25 700MHz Trunked Communications system supports the Identity Assurance requirements as stated in the RFP. The objectives are achieved through the following:

- Service Access Architecture utilizing token base authentication.
- Active Directory-based Centralized Authentication and local authentication
- Role-base authentication
- Centralized event logging

In addition to the Active Directory-based Centralized Authentication and local authentication, role-base authentication and centralized event logging features as described in the section of above (Authentication, Authorization and Accountability), Motorola's solution provides the Service Access Architecture feature utilizing token base authentication. The Service Access Architecture feature provides secured communications access between the radio network infrastructure (RNI) and service users. Included with the Service Access Architecture is two factor authentication to allow service users to be authenticated with a six-digit number randomly generated by a token (in possession of the service user) in addition to the users' normal Active Directory login credentials. This authentication service is housed inside the radio network infrastructure-demilitarized zone firewall and does not require an additional authentication server to be purchased.

Operational Security

The proposed ASTRO 25 700MHz Trunked Communications system supports the Operational Security requirements as stated in the RFP. The objectives are achieved through the following:

- Active Directory-based Centralized Authentication and local authentication
- Role-base authentication
- Centralized event logging
- Log Correlation Audit Manager (LCAM)
- Northbound Interface

The Active Directory-based Centralized Authentication and local authentication, role-base authentication and centralized event logging features are described in the section of above (Authentication, Authorization and Accountability)

The Log Correlation and Audit Manager (LCAM) is a security tool that empowers customers to monitor their system more effectively. LCAM retrieves ASTRO 25 syslog information from the central event logging feature and indexes and correlates that information in real time. Administrators then have fast and easy access to critical information in simple GUI formats. Predesigned dashboards provide the most common information that security professionals need to be effective from day one. Those dashboards allow drill-downs to the actual list of events and search capabilities from there. LCAM additionally enables customized dashboards, searches and event triggers that can be used for immediate notification or triggering automatic scripts to respond to threats.

In addition, the Northbound Interface feature will allow the forwarding of alarms from the Unified Event Manager application to a higher level Manager of Managers (MOM) utilizing an industry standard protocol (SNMPv3). This feature allows the integration of the alarms into the overall information system of the organization for the City of Riverside Public Utilities.

Interoperability

Motorola can provide the following interoperability services (which are in some respect different from the RFP requirements):

- Centralized event logging
- Log Correlation Audit Manager (LCAM)
- Northbound Interface
- Network firewall between the City of Riverside radio system and “foreign” radio system for ISSI-based interoperability (The ISSI feature is available, but has not been purchased by RPU.)

Continuity and Disaster Recovery

The proposed ASTRO 25 700MHz Trunked Communications system supports the continuity and disaster recovery requirements as stated in the RFP. The objectives are achieved through the following:

- Backup and Recovery (BAR)

Motorola’s backup and recovery feature backs up the backup and recovery clients. This feature eliminates the need to perform local backups on individual system devices, by providing a centralized location for the management of data backup and restore operations. The data can be used to quickly return the system to a functional state following any event which causes a failure or interruption of normal service. In addition, the backup and restore server allows for the creation of media that can be stored off site, which is a common requirement in standard IT disaster recovery plans.

Computer Security

The proposed ASTRO 25 700MHz Trunked Communications system supports the computer security requirements as stated in the RFP. The objectives are achieved through the following:

- DISA STIG based server and workstation hardening
- Active Directory Group Policy Objects-based enforcement for Windows OS machines
- Role-based authentication

Patch Management

The proposed ASTRO 25 700MHz Trunked Communications system supports the computer security requirements as stated in the RFP. The objectives are achieved through the following:

- Available subscription-based Security Update Service (details of the Security Update Service – Remote Security Patch Installation are in Section 7 – Warranty and Maintenance Plan)

Motorola’s Security Update Service supports the security and integrity of the proposed ASTRO 25 radio system network components. Motorola tests the latest commercial security software updates as they are released by the software vendors and validates them for safe deployment with our radio networks. Security Update Service ensures that antivirus definitions for both Microsoft and Linux platforms, operating system software patches, and Intrusion Detection System (IDS) signature files for Motorola-provided IDS are compatible and will not interfere with ASTRO 25 network functionality. The Security Update Service releases the patches to a web link, from which the customer can download and manually apply tested and compatible patches to its system. Motorola can also implement applicable updates on the City of Riverside system and provide update activity reports.



Security Policies

The proposed ASTRO 25 700MHz Trunked Communications system supports the security policies requirements as stated in the RFP. The objectives are achieved through the following:

- Role-based authentication
- DISA STIG-based server and work station hardening
- Active Directory Group Policy Objects-based enforcement for Windows OS machines
- Available Windows STIG Backporting service

Host-based Security

Motorola can provide the following host based security services (which are in some respect different from the RFP requirements):

- Network Firewalls
- Router/Gateway Access Control Lists
- AES-256 FIPS 140-2 certified Link Encryption
- Intrusion Detection Sensor
- Available Security Update Service
- McAfee ePolicy Orchestrator – based anti-malware management and client.

McAfee ePolicy Orchestrator is the foundation of Motorola's host-based security solution. The initial HBSS support utilizes the anti-malware module. These services will be provided during the warranty period. Additional host based security modules are available for purchase after the warranty period.

Network Security/Firewalls/Network Intrusion Detection and Prevention/Link Encryption

The proposed ASTRO 25 700MHz Trunked Communications system supports the network security, firewalls, link encryption, and network intrusion detection and prevention requirements as stated in the RFP. The objectives are achieved through the following:

- Network Firewalls
- Router/Gateway Access Control Lists
- AES-256 FIPS 140-2 certified link encryption
- Intrusion Detection Sensor
- McAfee ePolicy based anti-malware management and client.

Radio Authentication

The proposed ASTRO 25 700MHz Trunked Communications system prevents access to unauthorized devices through the Radio Authentication feature. The radio authentication feature prevents illegitimate radios from gaining access to the radio network. This feature uses the P25 link layer authentication standard (TIA 102.AACE). The radio authentication implementation allows the gradual activation across the subscriber base until all subscribers are provisioned for authentication.

Systems without the radio authentication feature are susceptible to cloned and otherwise unwanted radios on the system. Radio authentication prevents these unwanted P25 radios from successfully unit



registering, thus preventing them from using the services of the system. Unregistered radios cannot listen to calls, place calls or otherwise disrupt customer operations.

In addition to the system level licenses for radio authentication, the subscriber must also be provisioned for radio authentication.

C1.7 USEABILITY

C1.7.1 System Access Features

EFFICIENT AND INTUITIVE ACCESS

To ensure system access, simplify radio operation, and limit operator involvement, the ASTRO 25 platform has many access features, as described below.

Busy Queuing/Call Back

This system has been designed to maximize availability to the end-user. In the unlikely event that all the channels are busy, a user depressing the Push-To-Talk (PTT) will be given a busy signal, and placed into a busy queue. When a channel becomes available, the system assigns the users to a channel via pre-assigned priority levels. Once a channel is assigned, the system notifies the user with a call back tone. This feature makes it unnecessary for the radio operator to waste valuable time rekeying the radio in order to gain channel access.

Automatic Retry

If a channel request is not received at the Zone Controller, the individual radio unit continues sending channel requests until the Controller acknowledges the request, or until a total of 16 automatic retries occur. This feature eliminates the need for the operator to continually key and de-key the radio, or to keep the radio keyed in order to gain system access.

Recent User Priority

To ensure uninterrupted communications, a recent radio user priority provides those users who have been recently assigned a voice channel priority over the other system users. Recent user priority ensures that a talkgroup engaged in a conversation receives priority system access for up to 10 seconds between transmissions.

Misdirected Radio Protection

To ensure a radio from one talkgroup cannot accidentally be assigned to a voice channel being used by a different talkgroup, the system utilizes embedded signaling. If a unit from a different talkgroup is accidentally assigned the same channel, the radio will recognize that it has been assigned incorrectly, and will automatically revert to the control channel.

Continuous Assignment Updating

Once a talkgroup is assigned a voice channel, the control channel continues to transmit the channel assignment for as long as that talkgroup is using the channel. This ensures a radio just coming into service will be sent to the appropriate voice channel to join the rest of its talkgroup.

Talk Prohibit Tones

In the event a user attempts to perform an unauthorized function as defined by system permissions, a talk prohibit tone is given.



User Talkgroup Features

To enhance user functionality, the ASTRO 25 platform has many talkgroup features, also known as group call, as described below. These features are configurable by the System Administrator.

Emergency Alarm/Call

Emergency alarm/call provides users the capability to inform dispatch personnel of a life-threatening situation. By pressing the radio's emergency alarm button, an audible and visible alarm and the user's ID is sent to the dispatcher and, potentially, other talkgroup members.

In emergencies, the dispatch center is notified immediately, regardless of whether the system is busy. If one or more voice channels are available, one of those channels will be assigned immediately to the emergency call when the user presses the PTT switch. The duration of the emergency call can be defined by the system administrator.

In the event that the system is busy, two alternatives are provided for handling emergency traffic:

- **Top of the Queue**— When an emergency is initiated and no channel is available, the emergency user is put at the top of the busy queue. As soon as the first user on any channel de-keys, the emergency caller is assigned that channel. The major advantage to this approach is that there is no contention for the channel.
- **Ruthless Preemption**— When an emergency is initiated and no channel is available, the Zone Controller selects the channel assigned to the lowest priority user and assigns it to the emergency caller—a feature unique to Motorola trunking systems.

Multiple Priority Levels

The system provides 10 priority levels, allowing administrators to segment their users according to their communications needs. Priority 1 is always reserved for emergencies. Priorities 2 through 10 can be assigned by the System Manager on a per radio or talkgroup basis. These priorities are only applicable when the system is busy.

Multi-Group Call

Multi-group call is used to make a simultaneous call to multiple talkgroups, and allows all units to be configured for talk back capability. The System Manager can program this call to operate in one of two ways:

- The requesting user waits for all requested talkgroups to finish all calls in progress.
- The requested call immediately interrupts other conversations in progress without waiting for active users to de-key. Radio users who are transmitting on a voice channel will not hear the call until they de-key.

Priority Monitor

Priority monitor allows the radio user to scan talkgroups in their system, and mark up to two talkgroups in their scan list as Priority. A non-priority conversation will be interrupted by Priority 1 or Priority 2 talkgroup activity.

Dispatch Console/Talkgroup Merge

Talkgroup merge is a dispatch function that allows multiple talkgroups to operate together on one voice channel, improving channel efficiency. This is a standard feature of Motorola wireline consoles.



C1.7.2 Individual Call Features

ASTRO 25 OFFERS POPULAR AND VALUABLE FEATURES

In addition to user talkgroup features, the ASTRO 25 platform has individual call features, as described below. These features are configurable by the system administrator.

Call Alert

A dispatcher or radio user can page another dispatch position or individual's radio. When the Call Alert is delivered, the initiating radio receives an acknowledgement.

If the receiving radio is not in a voice call, a tone sounds on the receiving radio. If the receiving unit has a display, it will show and store the sending unit's ID.

Call Alert signaling uses the control channel and does not affect voice channel capacity.

In-Call User Alert

In-Call User Alert builds on Call Alert. When In-Call User Alert is enabled on the system, radios are able to receive Call Alerts even when involved in voice and data services. The alert tone sounds in the background, so the voice message comes through clearly.

Radio Talkgroup Muting

Radio Talkgroup Muting allows the radio user to mute all voice traffic for the currently selected talkgroup, including emergency voice received.

The radio can be automatically un-muted by the console dispatcher or another radio user by sending the muted radio a Call Alert.

Private Call

Private Call allows a radio user or console dispatcher to selectively call and carry on a private conversation with another individual radio, as long as that unit is not already engaged in another Private Call. The calling unit will receive an acknowledgment of a successful Private Call. If the receiving radio has a display, it will show the calling party's unit ID.

To protect channel availability for mainstream operations, Private Call management can control how many resources are dedicated for private calls at a trunking RF site. The system manager can pre-configure and limit the number of simultaneous private calls that are active at a particular site, or even disallow private calls entirely.



C1.7.3 Site Selectable Alerts

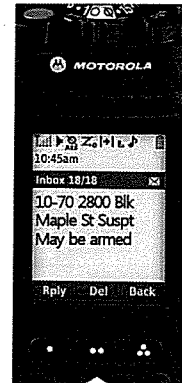
ONLY P25 VENDOR TO SUPERIMPOSE TONES OVER VOICE TRANSMISSIONS

ASTRO 25 trunking systems can provide alert tones or voice messages to all APX subscriber radios at selected RF sites or zones. The alert sounds in the background of an active call and on idle radios. Subscribers display a short message.

Up to 15 alerts can be configured in advance, and then selected by subscriber to be broadcast once or repeated at a specified cadence.

Preconfigured notifications are ideal for alerting team members to:

- Vacate the Area.
- Move to Stage 3.
- Return to the Command Post.



APX Radio Screen

C1.7.4 Data Applications

The Project 25—compliant Integrated Voice and Data (IV&D) operation allows data traffic to seamlessly utilize your existing ASTRO 25 stations, improving in-field efficiency. Voice is prioritized, allowing Mission-Critical traffic to always take precedence over data transmissions. The IV&D service creates a data transport layer capable of supporting both industry-standard IP and customer-developed applications, including:

- Outdoor Location.
- Over the Air Provisioning.

Users can achieve a number of important benefits, including:

- Conservation of valuable airtime.
- Increased communications accuracy.
- Allows users in the field to perform queries without dispatch.
- Better return on investment—same assets for multiple functions.
- Utilizes common radio units for both voice and data applications.

**MAXIMIZING USER BENEFIT
AND EASE OF USE**

C1.7.4.1 Outdoor Location Solution

A MAP-BASED LOCATION APPLICATION

Motorola's ASTRO 25 Outdoor Location Solution is offered on the ASTRO 25 IV&D system using 700 MHz. It uses Global Positioning System (GPS) satellites to provide the location of personnel and vehicles; these locations can be fed to a map-based location application, providing 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.

**KNOW THE LOCATION OF
YOUR FLEET IN A MISSION
CRITICAL SITUATION**

Figure 1-3 shows an example of the main components for the Outdoor Location Solution.

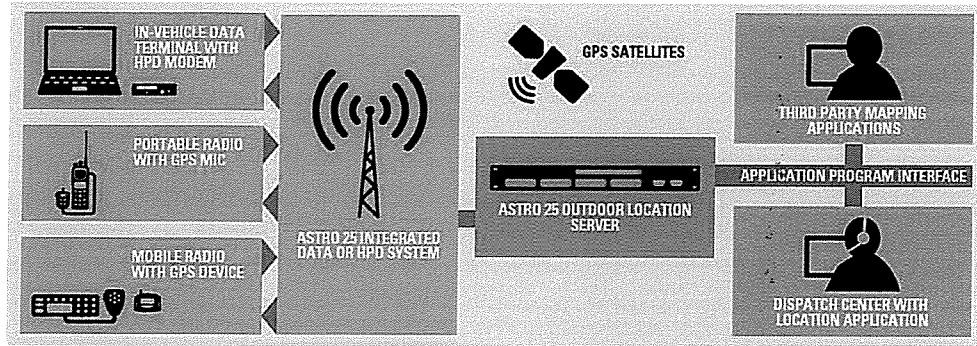


Figure 1-3: ASTRO 15 Outdoor Location Solution

C1.7.4.2 Over-the-Air Provisioning

SEND WIRELESS UPDATES TO LMR RADIOS

Motorola can provide a powerful Over-the-Air Provisioning (OTAP) tool called Programming over P25 (POP25), which allows simple, wireless updates of LMR radios. This is an alternative to the standard method of programming, which is to connect a PC with a cable to the radio in order to read/write the programming changes. POP25 allows end-users and radio users to stay in the field during the reconfiguration process, thus saving valuable time and resources.

**SAVE TIME AND RESOURCES
WITH OVER-THE-AIR
PROGRAMMING**

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.

One of the key features of POP25 is being able to make and receive calls during the process:

- Retain full use of the radio during the configuration data transfer without interrupting communication
- Voice always takes priority over POP25 data transfers
- When a voice call ends, POP25 starts where it paused programming; there's no need to restart
- Users do not have to switch to a non-busy channel
- Users do not have to stay in an area with high signal strength during the download
- All radio functions and capabilities are accessible and enabled

POP25 allows for scheduled batch programming and can make specific programming changes instead of requiring a full code plug rewrite. The system will automatically generate a report, showing which radios were successfully programmed. An overview of the OTAP process is shown in Figure 1-4.



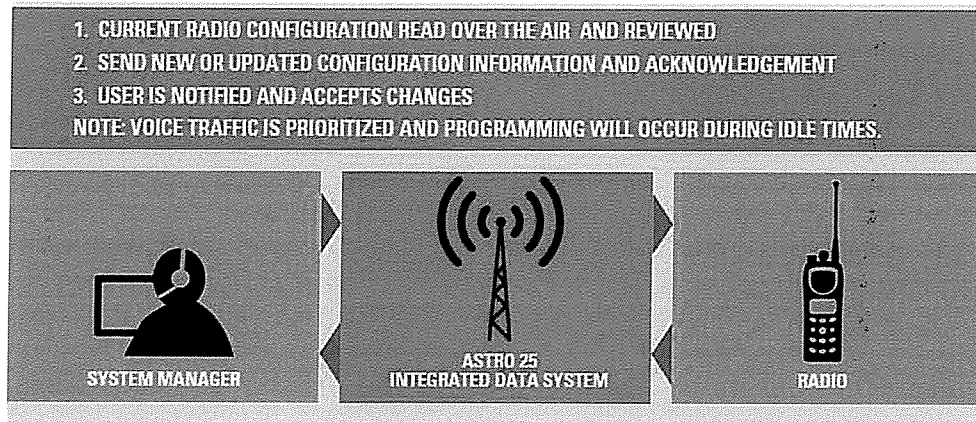


Figure 1-4: Overview Of The OTAP Process

C1.7.5 User Accessibility

OPTIMIZING THE USER EXPERIENCE FOR EASE OF USE AND PERFORMANCE

Affiliation Display

The Affiliation Display provides a dynamic view of the sites to which all operating units are currently affiliated, making it easy to track and troubleshoot radios in the system. Specifically, it provides a dynamic view of:

- Sites.
- Talkgroups.
- Individual radios.

This allows a manager to understand the loading characteristics of their system in real-time. Graphing capabilities are also included. 7 provides a selected site graph example.

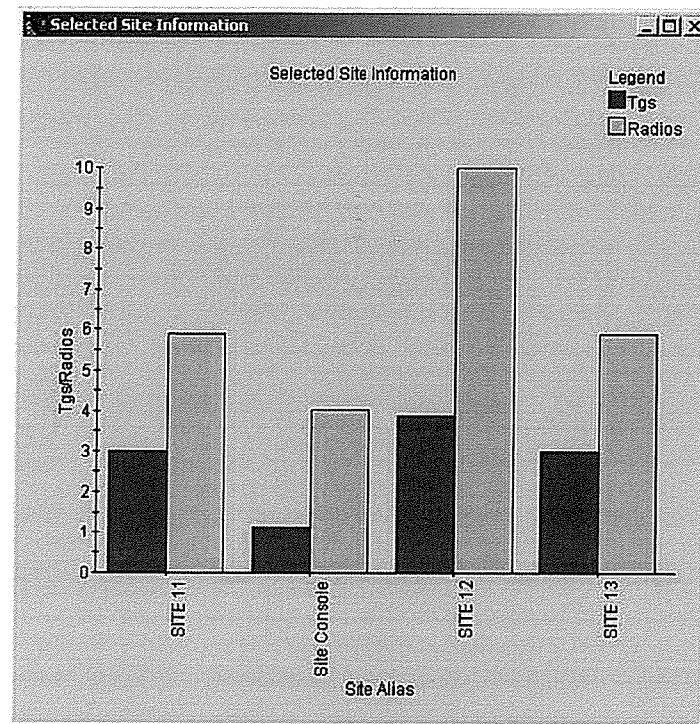


Figure 1-5: Selected Site Graph Example

SNMP Trap Forwarding

SNMP trap forwarding allows for the forwarding of alarms from the UEM application to an external third party application utilizing an industry standard protocol (SNMP v3 management system). This feature permits your existing network to actively monitor alarm conditions within the radio network; a developer's guide is provided.

Northbound Interface

Forwards alarms from the Unified Event Manager (UEM) application, allowing your existing network to actively monitor alarm conditions within the radio network.



C1.8 NETWORK MANAGEMENT SYSTEM

MANAGEMENT OF YOUR NETWORK OF SERVERS

The Network Management System (NMS) can be viewed as 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:

- **Fault Management** – The capability is provided to manage the health of all devices that are part of the communication network and the system environment.
- **Configuration Management** – The necessary tools are provided for entering and maintaining the operational parameters of the infrastructure components and user devices (i.e., the mobile and portable radios).
- **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. (Available for purchase if desired)
- **Performance Management** – Standard applications are available for monitoring, reporting, controlling, and optimizing the use of system resources.

MANAGE YOUR SERVERS AT
THE ZONE AND SYSTEM
LEVEL

The Network Management subsystem will include the following servers at the zone and system levels of the ASTRO 25 system.

- **NMS Zone-level Servers (one each per zone)** – Air Traffic Router (ATR), Zone Database Server (ZDS), Unified Event Manager (UEM), and Zone Statistics Server (ZSS).
- **NMS System-level Servers** – User Configuration Server (UCS).

C1.8.1 Fault Management

This section provides information about the applications that provide fault management capabilities within the ASTRO 25 network. These devices are the Unified Event Manager (UEM).

C1.8.1.1 Unified Event Manager

MANAGE LMR SYSTEM DEVICES FROM A SINGLE SCREEN

The Unified Event Manager (UEM) application allows system management personnel to manage LMR system devices from a single screen. Historical and real-time traffic screens give users access to radio events, radio status, and any device alarms. Other features include:

- Graphical views/maps.
- Active alarms and summary views.
- External notification flexibility.
- Remote site control.
- Fault reporting capabilities.
- Device inventory.
- External notification.
- Customized views.
- Role-based access.

HISTORICAL AND REAL-TIME
TRAFFIC SCREENS TO GIVE
ACCESS TO ALL RADIO
EVENTS AND ALARMS

The UEM provides a customized discovery process for optimization and deep discovery of subcomponents reported on by a device. The application also allows for automatic registration of the devices without pre-configuration. Interpreting and displaying events in an easy-to-understand and meaningful format—along with a topology of the network and devices tailored for the ASTRO 25 network—will ease navigation and present the network in a manner that is intuitive to a system operator.

Health of services is provided in addition to device-based alarms, including rules for determining the overall status of services in a separate view (e.g., redundant controller is down – service is still up; both views are represented). Rules have been developed for calculating alarms based on interpreting incoming events. Security procedures are in place to roll SNMPv3 keys and maintain the ability to receive SNMP inform requests through the key role of an entire network. Device commands are presented in a manner specific to each device type. During discovery, a complete device inventory with specific rules to identify service and proxied components is accomplished for all individual devices. Table 1-1 outlines features and benefits of the UEM.

Table 1-1: Unified Event Manager (UEM) Features and Benefits

Feature	Benefit
Optimized Discovery Based on System Design	UEM supports subnet discovery of the IP addresses which are designated for radio system devices. This translates to an efficient device discovery process.
Discovery of Fault Managed Devices	Based on the device type the UEM has pre-determined rules for discovery of the custom entities supported on the device. Additional rules are used for event translation and alarm generation.
Fault Manager Registration	Procedures are in place to register the manager's IP address as a trap/inform destination.
Centralized View of the Communications Network	System Managers can view the ASTRO 25 system status and quickly isolate problems to the board level.
Intuitive Graphical User Interface (GUI)	System Managers are quickly notified of failures on the system and can diagnose device problems. Summary and Detail maps provide a graphical display of site status in their geographical location within the system.
Active Alarms View and Alarm Summary	Persistent single view of all failure conditions ("What's Inoperable") in the network and a quick reference summary of alarms by severity, allowing users to quickly pinpoint the highest priority failures.
Secure Device Access	SNMPv3 protocol with SHA and AES 128-bit encryption to prevent security breach attempts.
Role-Based Access Control	Assignment of user privileges for access to views and operational capabilities.
Fault Reporting Capabilities	Event history data is auto-archived and exported for further analysis and reporting.
Remote Command Operation	Remote state change capability helps to service remote devices and avoid unnecessary trips to the sites for troubleshooting.
Network Inventory	Tabular view of the devices and their associated status.
Audit Trail and Job Status	Traceability and status for commands and actions executed.



The UEM is optimized to quickly discover the devices in our network—making installation and setup quick and error-free. The UEM has a built-in capability to identify the type of device it is discovering; it will activate the pre-determined rules for discovery of the devices, which results in faster event translation and alarm generation in the manager. Each device, via its various entities (i.e., fan, power supply, etc.), will quickly inform the manager what it needs to monitor. Procedures built into the UEM will configure the IP address in the device to give the correct path for sending its information during operation.

Quick and accurate interpretation of the system activity is crucial in effective management of the devices. The UEM translates the events into intuitive information, which will inform the user of either the severity of the failure or implication of the event.

UEM translates the events into active alarms, which make the user aware which events require immediate attention versus more minor events/alarms. The alarm view dynamically updates based on the condition of the reported device (i.e., the alarm will be cleared from the alarm view when a device sends a clear event to the UEM).

The Reliable Communication design in the UEM provides Supervision and Synchronization services:

- **Supervision** – Provides periodic SNMP Polling to ensure communication is established with each device on the network. The UEM generates communication failure alarms/events when communication between the agent and the manager fails.
- **Synchronization** – Used to ensure the accuracy of the state that the device is reporting. If the connection between the UEM and the device is lost, the device will queue up the missed fault events and re-send when the connection is re-established. These Motorola-defined procedures were put in place to enhance the reliability of basic SNMPv3 trap messaging. These procedures manage the re-synchronization of missed failures. The UEM utilizes SNMPv3 informs to enable the device to detect whether the connection has been interrupted.
- **Northbound Interface (NBI)** – A real-time event stream using a standard industry protocol that can escalate events to a higher-level management application for added flexibility. NBI is provided for customers who prefer to manage their network with existing tools. The UEM handles the custom/proprietary interfaces to the network elements. The NBI provides a published fault event API to the customer's manager, which allows them to manage both Motorola and non-Motorola devices. The NBI agent supports SNMPv3 and uses a SNMPv3 User-based Security Model (USM) for secure communications with the UEM. The Fault Management Services provided with NBI are: Quick Synchronization – Manager of Managers (MOM) requests more recent activity to update on health; File-Based Synchronization – request to generate a file for missed information; and UEM-NMS Communication Link Supervision to notify of any interruption.

Motorola's MOSCAD Network Fault Management (NFM) system and Graphics Master Central (GMC) client capabilities have been integrated into the UEM, providing full system alarm and performance into a single, customizable solution. A separate GMC computer is no longer required.



SDM 3000 Site RTU

The heart of the MOSCAD NFM solution is the SDM 3000 site Remote Terminal Unit (RTU), where RF components and environmental equipment are alarmed and controlled. The SDM 3000 interfaces to IP devices via SNMP and FSP, to monitor alarms and capture values such as RSSI, RF Power, and BER. The SDM 3000 interfaces to remote site devices, allowing the SDM unit to control, collect alarms, configure, and change parameters of the device (Figure 1-6). The SDM 3000 collects alarms and initiates controls through the various inputs, outputs, and analog signals via the onboard Input and Output (I/O).

The SDM 3000 consists of a CPU, input/output interfaces, LEDs and is designed for 19-inch rack mounting. The SDM 3000 unit includes the following discrete connections:

- 48 discrete Wet or Dry digital inputs.
- 16 electrically energized digital outputs.
- Eight analog inputs (-5 VDC to +5 VDC).

The SDM 3000 unit capacities can be expanded by connecting up to six expansion units.

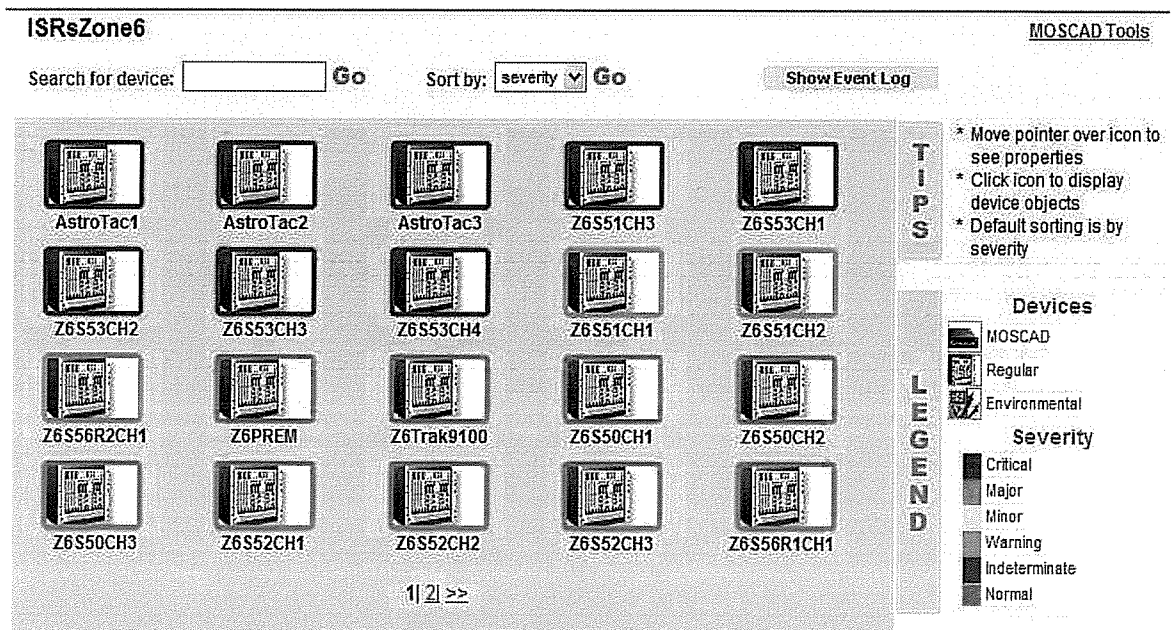


Figure 1-6: Sample SDM 3000 Screen.

The SDM 3000 units take advantage of inherent communications capabilities to securely communicate via encrypted SNMP v3 from the remote sites to the UEM.

A built-in Web Server on the SDM 3000 allows Service Technologists to use a browser to view alarms from all equipment and devices, while they are on site or remote over the ASTRO network infrastructure.

Features and benefits of the MOSCAD NFM as part of the UEM system are outlined in Table 1-2.



Table 1-2: MOSCAD NFM System Features and Benefits on the UEM

Feature	Benefit
Collection of Environmental Alarms	A single SDM3000 supports data interfaces and digital alarm inputs to site equipment such as doors, tower lights, UPS, security, and third-party devices.
Data Interfaces to Site Equipment	The SDM3000 collects alarms and values from a wide range of Motorola stations, Microwave Radios, Channel Banks, Frequency Standards, and more via RS232, SNMP V1 & V3, and IP.
Collection of Analog Information	The SDM3000 interfaces to site equipment with analog outputs such as temperature sensors, fuel sensors, RF Power sensors, etc.
Initiation of Site Controls	The SDM3000 interfaces to site equipment which can be controlled, such as doors, generators, security, equipment switching, etc.
Local Web Server	The SDM3000 incorporates a built-in Web Server so that Service Technologists can view alarms of equipment and devices while on site or over the ASTRO network infrastructure.
Reliable Communications	The SDM3000 provides reliable communications to the GMC and UEM via encrypted SNMP V3.
Intuitive Drill Down Display of Alarms	The GMC incorporates an intuitive "Drill Down" display of alarms: Multi-Zone level, Zone level Map Screen, Site level, Device level, and Alarm level.
Intuitive Representation of Equipment	Chassis view graphics of the equipment are displayed on the GMC and GWS GUI, giving System Technologists an immediate understanding of the equipment and subcomponent which is in alarm.
Analog Display Screen	Graphical meters display the analog information of the site (i.e., Generator Fuel Level).
Equipment Control Screen	Equipment and devices can be controlled (turned On/Off, Open/Closed) from the control screen.
Immediate Update of Alarm Status	A combination of polling from the GMC and event reporting from the SDM3000 ensure alarm information is displayed on the GMC/GWS as quickly as possible.
Auto Archive of Alarms	Alarm information is automatically archived on the GMC server for future access by the Historical Alarm Report tool.
User-Defined Historical Alarm Reports	Historical Alarm data in the SQL database on the GMC can be easily accessed to produce reports with the Report Generator function.
Multiple User Levels	Up to 8 user levels, ranging from Administrator to Guest, allow definition of operational capabilities from system configuration through system control to viewing and acknowledgment of alarms.
Alarm Summary Window	The Alarm Summary Window lists all time stamped alarms and can be sorted by Zone, Site, and Equipment, and by acknowledged/un-acknowledged alarms. This allows users to quickly identify any issues with their system.
Station Values Displayed	Station and Microwave values such as RSSI, BER, RF Power, and VSWR are displayed on the GMC/GWS, providing System Technologists with analytical information on the site they are troubleshooting.
Remote Configuration	A terminal window on the GMC/GWS allows remote configuration of analog QUANTARs and TeNSr Channel Banks.

Feature	Benefit
Alphanumeric Paging of Alarms	The GMC/GWS can send specified descriptive alarm messages to alphanumeric-capable pagers over paging networks such as SkyPager or Skytel.
Client View of Multi-Zone System	Each GWS client can view alarms from each zone level GMC server, which minimizes the total number of clients needed in the system.

The MOSCAD Network Fault Management (NFM) Server software and client applications are integrated with the UEM. The NFM application graphic screens depict current system status; the user can easily navigate from a macroscopic system view down to the details of each individual site. RF site alarms are time stamped, stored in the alarm history database, and accessed by the Report Generator utility, which helps the user to filter alarms and events, then displaying, printing, and exporting them.

The NFM application has been developed to provide several layers of screens. The first layer is the System Overview Screen: a map showing the site locations with each site location icon selectable. The second screen layer is the individual site screen (Figure 1-7), graphically showing the exact equipment at each site with selectable equipment graphic icons. A third layer of screens is the individual site component hardware, such as GTR, Microwave, Rubidium standard, and other site support equipment, including environmental alarms. Alarm icons on the site equipment graphic show which module (i.e., Power Supply) is in alarm; selecting that icon provides a list of the alarms for that module. All alarms are also shown on the alarm summary screen.

The graphic screens are customizable to allow for customization for the system.

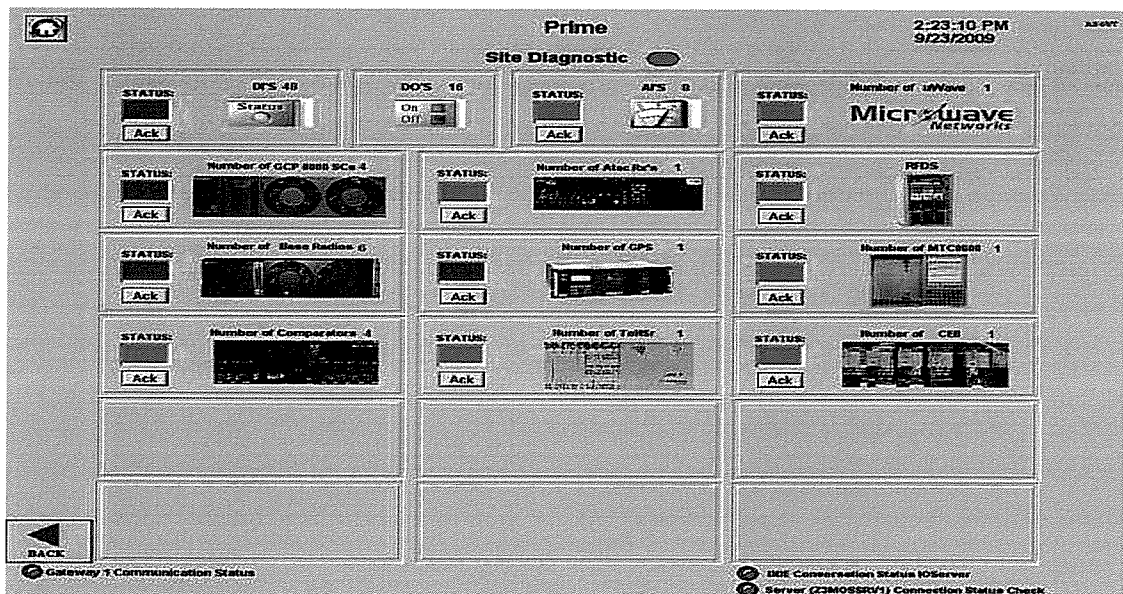


Figure 1-7: Sample Individual Site Screen.



C1.8.2 Configuration Management Applications

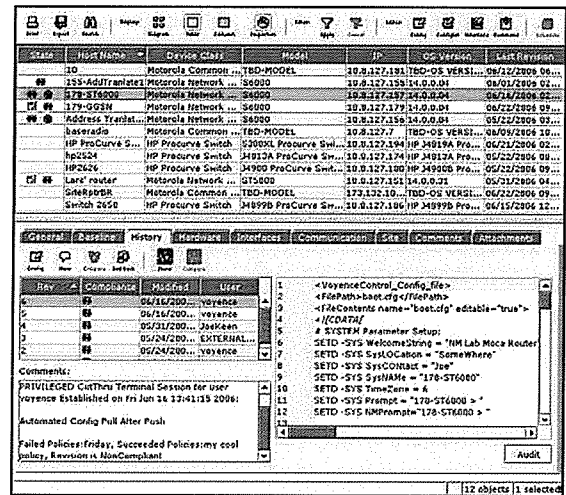
MANAGE YOUR NETWORKS AND DEVICES IN THE ASTRO 25 SYSTEM

This section provides information about the applications that provide configuration management capabilities within the ASTRO 25 network. These devices are the Unified Network Configurator (UNC) and Provisioning Manager (PM).

C1.8.2.1 Unified Network Configurator

The Unified Network Configurator (UNC) is a network change and configuration management tool that enables users to efficiently manage the configurations of networks and devices in an ASTRO 25 system. The UNC is built on VoyenceControl, which is an automated compliance, change, and configuration management system. The UNC provides a single application for the configuration of all radio system and transport devices. Some of the key features that the UNC provides include:

- Efficient, role-based user setup
- Auto discovery of devices/configurations, reducing configuration errors and initial configuration time by providing minimal data entry



Sample UNC Screen

Historical configuration information is easily accessible, along with forensic information and the ability to roll back to previous versions. A valuable tool that the application provides is the ability to create a configuration and not implement it immediately. The UNC allows another user to approve and implement changes, which can help distribute those changes during off hours when system loading is minimal.

The UNC application allows system management personnel to see planned and current configurations simultaneously for quick comparison. This application offers easy editing screens and configuration “wizards” to reduce data entry.

Benefits of the UNC are outlined in Table 1-3.

Table 1-3: UNC Benefits

Feature	Benefit
Built-in Network Tool kit to enable features	Tools provide a methodical process to enable features in the system with minimal labor and chance of error. Examples of these are: turning on authentication on a set of protocols within the Gateways; locking Ethernet switch ports; setting delay; and jitter alarm thresholds.
Auto Discovery of Devices	Components are automatically discovered, and their configurations are added to the database without the need for any manual entry of data.
Scheduled Distribution	Users can determine the time of day when they would like configurations to be sent to the devices, or delay the distribution of a configuration change until approved.

Feature	Benefit
Distribution Monitoring	Allows users to view the status of configuration changes, such as whether the change is in progress, has successfully completed, or has failed.
Change Logging/Audit Trail	Maintains a log of various user interactions with the configuration system that can be used to help diagnose issues.
Configuration Versioning	Constantly tracks and logs versions that have changed and provides the ability to view or compare versions.
Management of Credentials	SSH and SNMP passwords can be managed. Automated mechanism allows seamless password and passphrase rolling, which can be performed automatically if desired.
Wizards for Common Operations	Radio system administrators can perform common operations using a simple web-based interface specifically developed for ASTRO 25 users. Provides an intuitive guide to assist in easy-to-follow setup procedures.
Rollback to Previous Version	Immediately reverts the device configuration to a previously created version.

C1.8.3 Provisioning Manager

CENTRALIZED INTERFACE FOR USER AND SYSTEM CONFIGURATION

The Provisioning Manager provides a friendly and intuitive graphical user interface which allows an easy method to provision the infrastructure and devices utilized on the ASTRO 25 network.

These applications allow for configuration by authorized users, which adds a level of security. An integrated database enables you to enter data only once, helping to save time and keeping data integrity sound by reducing errors.

- **Streamlined and intuitive web-based graphic user interface**—Utilizes less key strokes to manage critical information. Provides a central point for the configuration of operational parameters: Radio System Subscribers, Console Operator positions, and Management Users.
- **Batch creation of radios and talkgroups**—Allows for previous capability referred to as “Multi-Instance Creation”; which offers convenient mechanisms to minimize data entry and reuse configuration information.
- **Advanced Security Features**—Centralized user authentication, single sign on, and role based access controls are supported to provide enhanced Network Security to the system by enabling confidentiality, availability, and integrity of critical data.
- **Provisioning Manager Audit**—Enables stricter enforcement of system policies and provides an efficient way of troubleshooting when identifying misconfiguration issues. The administrator can navigate from an audit record to the corresponding configuration record and vice versa.
- **Radio and Radio User fields have been combined into one window**—Efficient management of subscriber provisioning by reducing the need to enter device information multiple times. Estimated time spent in maintaining subscriber configurations would be significantly reduced.
- **Import/Export Capabilities**—Offers a convenient mechanism to export and import data from external applications via .csv protocol.



C1.8.4 Performance Management Applications

MONITOR, MANAGE AND REPORT ON SYSTEM PERFORMANCE

The Motorola performance suite enables a customer to monitor, manage, and report on system performance in near real-time. The applications empower system managers to proactively plan for expansion. The performance suite is composed of both Motorola and third-party solutions that are all certified, sold, and supported by Motorola. Each application has a unique set of features and benefits to facilitate efficient and effective system management. Together, these applications complete the big picture: how the system is performing, operating, and being used, by providing insight into the activity of each zone, site, subscriber, or talkgroup.

Motorola offers Performance Management as a standard feature of ASTRO 25 systems. Standard features include Zone Watch, Historical Reports, and Dynamic Reports and enable customers to manage their communications system business more efficiently. Zone Watch displays real-time communications activity, while Dynamic and Historical reports collect traffic statistics over predetermined intervals for report generation. These applications are used to monitor, collect, log, and evaluate network performance and resource utilization; they collect statistics about radio resource usage for radio units, talkgroups, channels, sites, zones, and system-wide activity report generation. Dynamic and Historical Reports have archival and export features for saving reports for offline data analysis. Statistics are aggregated into detailed and summarized reports on both an individual zone and system-wide basis.

Additionally, Motorola offers enhanced Performance Management features for ASTRO 25 systems, which are described below. Enhanced Performance Management features are available to provide further insight into system performance. Applications perform a variety of tasks, such as polling system resources, detailed reporting, long-term archiving and logging, and data stream collection.

C1.8.4.1 Affiliation Display

Affiliation Display provides a dynamic view of the sites to which all operating units are currently affiliated; it suggests the area in which a unit may currently be operating based on its last affiliation and the site's radio coverage (Figure 1-8). The application enables system managers to monitor how radio users travel between different sites in a zone, and to monitor how they communicate with assigned talkgroup members and those outside of their talkgroup. Affiliation Display is used to trace a state/location of a single subscriber, and also to monitor location and affiliation information organized by site, console site, radio, channel, or talkgroup.

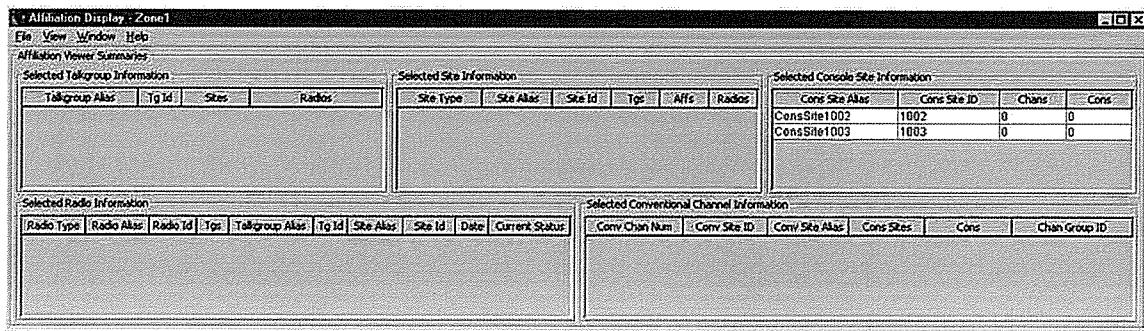


Figure 1-8: Sample Affiliation Display Screen

Table 1-4 outlines benefits of Affiliation Display.

Table 1-4: Affiliation Display Features and Benefits

Feature	Benefit
Real-Time Display	Monitor selected radios, sites, talkgroups, consoles, and conventional channels to track how radios are roaming between sites, and how traffic moves within sites in a zone. Display sites and console sites where each talkgroup is currently operating.
Graphing	Display graphs of the site, console site, and talkgroup data to see how radio usage is distributed across sites and talkgroups, to help determine if system resources are deployed to maximize system performance.

C1.8.4.2 Air Traffic Information Access

The Flexible Air Traffic Information Access (ATIA) interface provides an access point for air traffic call information on the system. Whenever significant events occur in call processing, call information will be provided through ATIA. For non-call activity, the Flexible ATIA interface will provide call information in unique data packet formats. Benefits of ATIA are outlined in Table 1-5.

Table 1-5: Air Traffic Information Access Features and Benefits

Feature	Benefit
Integration Flexibility	ATIA stream data can be integrated with third-party applications to produce detailed reports custom built to a system manager's needs.
All Call Control Information	Information can be used to understand what is happening on the system, e.g., who called, where they called from, and type of call, to monitor the system's operation.

C1.8.4.3 Dynamic Reports

Dynamic Reports monitor and report usage trends in order to improve radio and talkgroup system management. System managers can closely examine what happens during a shift or set period of time: for example, checking the busy count to see if calls are being missed. Dynamic Report recommendations can be made on system expansion and design to improve communication.

C1.8.4.4 Historical Reports

Historical Reports generate reports on system-wide activity as well as individual zone activity. The reports contain statistical data gathered at specific, predefined time intervals. They monitor and analyze information about zones, sites, channels, talkgroups, and users to assist a system manager in understanding how the system is performing; they are utilized to more efficiently manage resources. Individual reports cannot exceed 16,000 objects (radio users, talkgroups, etc.). Reports can be exported to CSV, HTML, PDF, and XML formats. Table 1-6 outlines the features and benefits of Historical Reports.

Table 1-6: Historical Reports Features and Benefits

Feature	Benefit
Real-Time Display	Monitor and analyze information about zones, sites, channels, talkgroups, and users to understand how the system is performing and utilized to more efficiently manage resources.



Feature	Benefit
Reports	Create various types of reports at the zone or system level, organized by system resources to analyze activity and performance.
Data Intervals	Historical data is stored in time-based intervals. For each interval type, the oldest interval in storage is removed as a new interval is added to storage. The timed intervals are defined as follows: <ul style="list-style-type: none"> ▪ Every 15 minutes for 100 intervals (approximately one day; zone level only) ▪ Hourly for 241 intervals (approximately 10 days; system and zone level) ▪ Daily for 62 intervals (approximately 2 months; system and zone level) ▪ Monthly for 36 months (3 years; system and zone level)
Accessing Data/Data Exporting	Users can utilize the Report Scheduler window to schedule zone-wide and system-wide reports to occur at specified times, with an output to a printer or data file. Reports can be exported to one of the following formats: <ul style="list-style-type: none"> ▪ Comma Separated Values (CSV) ▪ HTML ▪ Adobe Portable Document Format (PDF) ▪ Extensible Markup Language (XML)
Data Storage	Statistics are aggregated into detailed and summarized reports on both an individual zone and system-wide basis; they are available on an hourly basis for 10 days, daily for 62 days, and monthly for 1 year.

C1.8.4.5 Radio Control Manager

The Radio Control Manager (RCM) is used primarily by dispatchers to monitor and manage radio events, issue and monitor commands, and make informational queries of the system database. The RCM runs on a local PC client and, depending upon the configuration in the Provisioning Manager (PM), can access multiple zones. Features and benefits are outlined in Table 1-7.

Table 1-7: Radio Control Manager Features and Benefits

Feature	Benefit
Radio Commands	<ul style="list-style-type: none"> ▪ Regroup ▪ Cancel Regroup ▪ Selector Lock ▪ Cancel Lock ▪ Regroup and Lock ▪ Cancel Regroup and Lock ▪ Selective Inhibit ▪ Cancel Inhibit ▪ Storm Plan
Status Commands	<ul style="list-style-type: none"> ▪ Radio check ▪ Snapshot ▪ Zone Status
Events	<ul style="list-style-type: none"> ▪ Emergency Alarms ▪ ChangeMe Requests ▪ Status Events

Feature	Benefit
Reports	<p>The RCM Reports tool is used to create, view, print, schedule, and export standard reports from RCM. These reports use a common format so the data can be used in spreadsheets.</p> <p>The report information reflects the actual RCM server database information, except the Emergency Alarms. RCM Reports enables you to present and analyze data showing RCM activity on the system.</p>

C1.8.4.6 Zone Watch

Zone Watch is a performance management tool that has customizable displays and grids to monitor real-time communications activity in a single zone (11). The information displayed can help system managers become proactive in making better resource planning decisions, such as when additional channels need to be added.

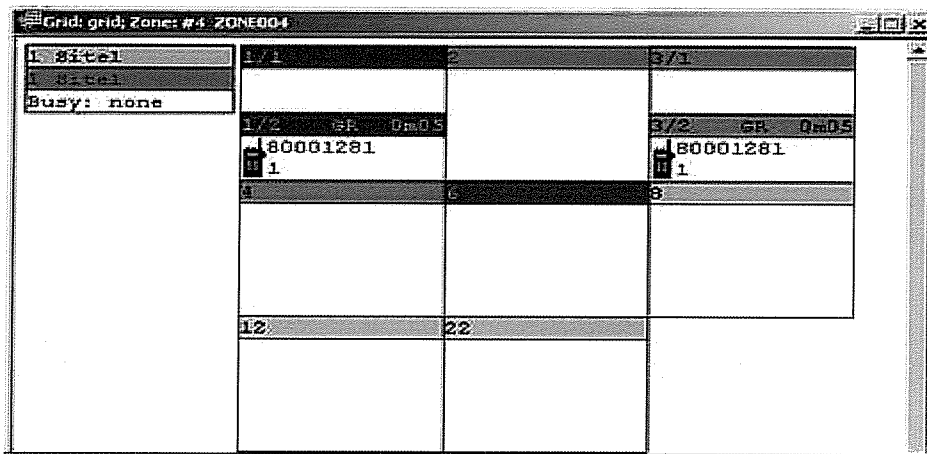


Figure 1-9: Sample Zone Watch Screen

Zone Watch also receives fault information related to repeater sites, console sites, and the zone controller from the UEM. Zone Watch is used to monitor call traffic and allows the system manager to organize displayed information using various criteria.

Single Site View, Channel View, and Multisite view display all important radio call information. This provides the manager with insight about radio call activity, channel usage activity, and busy activity, to more efficiently manage the radio system.

C1.8.5 Software License Manager

MANAGE LICENSE USEAGE FROM A SINGLE LOCATION

Software License Manager reduces the time, effort, and complexity of software and license management by using a central point to manage both zone- and system-level network management licenses. With a single user interface, users can:

- View current licenses.
- Purchase new features and capabilities.
- Determine underutilized licenses.

Software License Manger manages system capacity, system

AN ENHANCED USER
EXPERIENCE FROM A
CENTRAL POINT



features, application user sessions, trial licenses, and provides a consolidated view and status of software licenses in the system.

[User Login / Settings](#)

LICENSE MANAGER - ZONE 35 BACKUP CORE
?

AA

Licenses

Sessions

[Export](#)
[Print](#)
[Upload Licenses](#)

+ Capacity Licenses

+ Feature Licenses

- Session Licenses

License Categories

License Properties

Actions / Help

License ID	Option Name	System/Zone	Purchased Quantity	Used Quantity	Maximum Quantity	Expiration Date
UA00151	Activation Display Service User Sessions	Zone1	1	1	1	permanent

LICENSE MANAGER - ZONE 36 BACKUP CORE
user@ucs.astro (Admin User)

AA

Licenses

Sessions

[Export](#)
[Print](#)

+ Capacity Licenses

+ Feature Licenses

- Session Licenses

Session License List & User Login Info

License Repurposing

License ID	Option Name	Host Name	User Name	License In Use	Release
UA00151	Activation Display Service User Sessions	z001nmc02 zone1	joe@ucs.astro	01 d / 06 h / 18 m	Release
UA00150	Dynamic Reports Service User Sessions	z001nmc01 zone1	adnan@ucs.astro	01 d / 15 h / 20 m	Release

Software License Manager User Interface

C1.9 SYSTEM STRUCTURE AND COMPONENTS

UNDERSTANDING THE ASTRO 25 CORE AND COMPONENTS

Motorola's ASTRO 25 has a solution for all public safety organizations. Rather than providing out-of-the-box technology, ASTRO 25 offers several options to customize cutting-edge, industry standard communication tools for your organizational needs.

Beginning with your Master Site and Network Transport Subsystem, ASTRO 25 is configured in RF Sites. From there, your sales person will guide you through the selection of system components that best suit your business needs. With Motorola's ASTRO 25, you have access to the very best in public safety technology to improve efficiency and ensure the safety of your first responders.

The system is comprised of:

- Master Site
- Network Transport Subsystem
- ASTRO 25 Sites
- Components

C1.9.1 Master Site

CALL PROCESSING & SYSTEM MANAGEMENT

The master site is the central point for all system traffic in each ASTRO 25 zone. Call processing and system management occur at the master site. The Voice and Data call processing for each zone is performed by the Zone Controller. The Zone Controller(s) maintain constant communication between the RF Sites and Network Management (NM) subsystems via the Network Transport Subsystem.

**MAINTAIN CONSTANT
COMMUNICATION BETWEEN
ALL SITES & NETWORK**

A zone has a master site that contains the computing backbone for that zone. The master site contains all the components necessary for controlling calls within a zone and for communicating with other zones to manage InterZone calls in a multi-zone system. In addition, the master sites provide the hardware and software components that are used for Network Management and system configuration.

All the components that communicate over Ethernet are connected through a central switch called the master site Ethernet LAN switch. This switch provides two separate internal LANs which are integrated to provide redundant links for critical network traffic.

The zone controller is used to process system-wide commands and handle call processing and mobility management functions for the system. The LAN switch connection allows each zone controller to communicate with the gateway routers/Core Gateways.

C1.9.1.1 Network Transport Subsystem

The ASTRO 25 transport core is engineered to meet the performance requirements of a real-time system transporting voice, call control, network management, and ancillary network services. The Transport Network is a closed network. Only Motorola-supplied equipment, applications, and services can be used on the network.

Ethernet Switch

The Enterprise Ethernet Switch (LAN Switch) is used to aggregate all the Ethernet interfaces for all servers, clients, and gateways.

Cooperative WAN Routing

The Motorola Cooperative WAN Routing (CWR) solution allows core and exit routers to interface directly with RF sites, network management sites, console sites, and inter-zone links.

The CWR solution has the following advantages:

- Provides redundant router failover capabilities
- Allows for easy configuration, testing, and maintenance
- Minimizes downtime during upgrades



The CWR consists of:

- **Core Gateways**—perform the routing control of audio and data in and out of the zone, while achieving the fast access levels required by real-time voice systems.
- **Gateway Routers**—used for devices that are multicasting beyond their local LAN, such as to IV&D packet data gateways.

C1.9.2 ASTRO 25 RF Sites

ASTRO 25 RF sites provide communications for radio users and dispatch operators on the ASTRO 25 network. RF Sites include ASTRO 25 repeater sites.

The RF Site types applicable to this system design are described briefly in this section.

C1.9.2.1 ASTRO 25 Repeater Site

An ASTRO 25 Repeater Site consists of a single site with up to 28 channels and two site controllers (in a redundant configuration), which can be standalone or housed in a GTR 8000 Expandable Site Subsystem (ESS). City of Riverside Public Utilities proposed ASTRO 25 Repeater Site consists of eleven (11) channels.

The GTR 8000 Expandable Site Subsystem in a repeater site is set up in a single trunked site, with one active control channel and a number of voice channels at the site. If packet data services are supported at the site, a number of voice channels can be configured with packet data channel capability. Voice traffic is routed from each of the base radios to the system for distribution to other sites and is repeated by the base radios to support other local subscribers. However, data traffic is routed to the GCP 8000 Site Controller. The site controller routes these packets upstream to the zone controller for further processing and routing.

**UP TO 28 CHANNELS AND 2
SITE CONTROLLERS
MANAGED FROM A SINGLE
LOCATION**

The ASTRO 25 Repeater Site consists of the following components, described in the Component Descriptions section of this System Description.

- GTR 8000 Expandable Site Subsystem (ESS)
- GTR 8000 Repeater/Base Radio
- GCP 8000 Site Controller
- Radio Frequency Distribution System (RFDS)
- GGM 8000 Site Gateway

C1.9.3 Components

Each site type in an ASTRO 25 system contains various components. Components included in this system design are described in this section.

Zone Controller

The Zone Controller provides trunking call processing for ASTRO 25 system operation. The Zone Controller forms the heart of a wide-area radio system by providing the central processor for the zone, with the necessary hardware and software capabilities to provide call processing and mobility management.

The Zone Controller builds upon the strength and experience of Motorola wide-area trunking systems to deliver multiple layers of reliability for business-critical, Mission-Critical and life-critical applications.

GTR 8000 Expandable Site Subsystem

The GTR 8000 Expandable Site Subsystem (ESS) enclosure can contain GTR 8000 base stations, site LAN switches, and GCP 8000 controllers, along with the Radio Frequency Distribution System (RFDS).

Voice traffic is routed from each of the site base stations to the system for distribution all sites associated with the call. Benefits of the ESS include:

- Integrated design provides a smaller footprint at the site.
- Front/top access design and minimized cabling reduces install and service labor.
- Increased power supply redundancy through common power bus.

GCP 8000 Site Controller

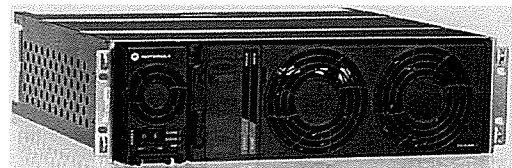
The GCP 8000 Site Controller (GCP 8000) is the control interface between the transmitter/receiver subsystem and the Zone Controller. The GCP 8000 Site Controller comprises redundant site controller modules; one site controller module acts as the active module, and the second module acts as a standby. The redundancy minimizes the possibility of a single point of failure at the site.

The GCP 8000 provides the following functions:

- Manages the channels to maximize throughput and channel availability
- Administers registration and context activation requests
- Monitors base stations and RF distribution equipment and interacts with the MOSCAD site device manager to facilitate centralized alarm and control monitoring
- Provides redundant site control

GTR 8000 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).



Radio Frequency Distribution System

The Radio Frequency Distribution System (RFDS) provides interconnect between the base radios and antennas, allowing for a completely contained and more compact installation footprint. For the transmitters, this can include isolators, combiners, TX filters, diplexers, and power monitors.



For the receivers, this can include duplexers, site preselectors, and multicouplers. Various RFDS options exist for each of the GTR 8000 Base Radio, GTR 8000 Site Subsystem, and GTR 8000 Expandable Site Subsystem.

RF Site Gateway

The Site Gateway provides an interface that handles all of the IP Network Management traffic between the Core Site and the RF Site. The Site Gateway provides the following:

- Media conversion – the gateway converts Ethernet to the selected transport medium.
- Traffic prioritization – the gateway applies a prioritization marking to the packets leaving the site.
- Fragmentation – the gateway fragments large IP packets per industry standards.

Site LAN Switch

The site LAN Switch provides a LAN interface for site equipment and a LAN port for the site gateway. Through the switch, the service technicians gain access to service the site, and also access the system's Graphical User Interface (GUI).

Packet Data Gateway

The Packet Data Gateway (PDG) is a modular platform designed to link the wireline IP Data Network to Motorola's ASTRO 25 network.

The PDG software platform manages IP message traffic to and from the wireless network, supporting wide-area roaming. With wide-area roaming, data radios can roam seamlessly throughout the coverage area of the ASTRO 25 system without the need to select a different channel or have any specific knowledge of the RF network.

The PDG supports SNMP-based network management by providing detailed statistics and alarm information to monitor system activity and performance. These statistics and alarms allow you to monitor system operation and loading to support audit, diagnostic, and optimization activities using the SNMP-based standard. The information can be viewed directly via the PDG local console or through the Network Management System.

GGSN Router

Motorola's General Packet Radio Service (GPRS) Gateway Service Node (GGSN) router provides for the internetworking between the customer's network and the ASTRO 25 data system, allowing for independent management of IP addresses across networks.

The GGSN router handles the IP routing services in support of end-to-end IP data messaging. These services include Static and Dynamic IP addressing, IP fragmentation, and ICMP error reporting messaging for diagnostics and troubleshooting.

C1.10 MCC7100 DISPATCH CONSOLE

Motorola's proposed dispatch solution for City of Riverside Public Utilities is our MCC 7100 Dispatch Console, offering IP-based seamless connectivity between City of Riverside Public Utilities dispatch operators and field personnel.

The MCC 7100 Dispatch Console will provide City of Riverside Public Utilities with a scalable, flexible system architecture, sophisticated network management and security, and an easy migration to future capabilities.



Cost Savings and Ease of Use

The MCC 7100 series consoles are designed to help reduce the total cost of owning an IP-based, feature-rich dispatch system without compromising quality and reliability. Specific benefits of the MCC 7100 series consoles include the following:

- The intuitive, easy to use Graphical User Interface (GUI) *enhances dispatchers' efficiency and accuracy.*
- Robust API *allows CAD systems to have complete access to console status and features* for further improvements in efficiency and accuracy.
- *Software-based upgrades* facilitate system and feature expansion.
- Installation is simplified and site costs are reduced because *console positions function without backroom electronics.*
- Console *configuration is performed at centralized Network Management clients, and changes are automatically distributed,* which saves valuable technician and administrator time.
- Offers *robust service logs that contain real-time information* to facilitate maintenance activities.
- Consoles within the ASTRO 25 dispatch site are *integrated into the ASTRO 25 fault management system,* which uses industry-standard event monitoring protocols, resulting in fewer dispatch site visits.
- *Flexible bandwidth requirements* minimize operating costs for remote console sites.
- *Conventional audio can be transported over the IP network,* which eliminates the need for channel banks or a separate circuit-switched network.

MCC 7100 Console Configuration for City of Riverside Public Utilities

The proposed solution offers City of Riverside Public Utilities five (5) MCC 7100 Dispatch Consoles to interface with City of Riverside Public Utilities ASTRO 25 system.

C1.10.1 The MCC7100 Series Dispatch Experience

The MCC 7100 series standard features offer City of Riverside Public Utilities state-of-the-art communications, console management and configuration functionality, dispatch operation, and communications security.

C1.10.1.1 Integration with the ASTRO 25 Network

The MCC 7100 IP Dispatch Console will be seamlessly integrated into City of Riverside Public Utilities ASTRO 25 system, without interface boxes, digital voice gateways or backroom electronics for an integrated mission critical network. This tight union between radio infrastructure and dispatch console equipment has several operational benefits to City of Riverside Public Utilities.



This modular IP approach substantially reduces the amount of space needed for backroom electronics. All dispatch activity is performed over IP. The physical space needed to accommodate the MCC 7100 console position is comparable to that required for a personal computer.

Both trunked talkgroups and conventional radio channels can be accessed and controlled from one MCC 7100 IP Dispatch Console over the same network. This reduces overall transport costs and the need for duplicate fixed network equipment. Table 1-8 outlines the benefits of the MCC 7100's seamless integration to the ASTRO 25 network.

THE MCC 7000 SERIES CONSOLES' IMPROVED USE OF BANDWIDTH ENSURES THAT EMERGENCY CALLS WILL MAKE IT THROUGH TO THE DISPATCH OPERATOR, REGARDLESS OF SYSTEM TRAFFIC.

Table 1-8: Benefits of Seamless Integration of the MCC 7100 IP Console with City of Riverside Public Utilities ASTRO 25 Network

Feature	Benefits
Tight coordination between the IP network and IP console eliminates the potential for audio degradation.	Subscribers and console operators will be able to communicate without loss of information.
Emergency calls are prioritized for successful delivery regardless of network traffic.	Console operators will always be able to hear emergency calls from users in the field.
Inherent access to all system resources within the network provides dispatch priority to reach any user when needed.	Console operators will always be able to reach out to users in the field.
Rapid call set up times and quality of service, regardless of the size of the system.	The ability to scale the system to handle future capacity, while maintaining efficient dispatch operations.
True end-to-end encryption capable from the subscriber to the console operator position, enhancing operational security	Assurance that sensitive, private communications will remain secure, from the user in the field to the console dispatch operator.
Improved bandwidth efficiencies reduce transport costs.	Ongoing cost savings for City of Riverside Public Utilities.

C1.10.1.2 Connection to ASTRO 25 System

Details on the connectivity between the MCC 7100 series dispatch console and the ASTRO 25 system are described below.

Site Gateway

The console site has one logical connection to the core site. Each console site gateway provides an interface that handles all of the IP Network Management traffic between the MCC 7100 series console center and City of Riverside Public Utilities ASTRO 25 system's core site. The site gateway fragment large IP packets according to industry standards, prioritize packets, and convert Ethernet data to the desired transport medium. City of Riverside is responsible for providing Ethernet site links for the system.

LAN Switch

The site LAN switch provides LAN interfaces for dispatch site equipment and a LAN port for the link to the core site. Through the switch, service technicians can access the system's configuration manager and service the equipment.

C1.10.1.3 Voice Encryption

The MCC 7100 provides true end-to-end encryption from the subscriber to the console operator position, enhancing operational security. This assures that sensitive, private communications will remain secure, from the user in the field to the console dispatch operator. The following encryption is available: DES-OFB, AES, and ADP on the MCC 7100 console. City of Riverside Public Utilities is provided with AES encryption.

C1.10.1.4 Conventional Base Station Interfaces

The MCC 7100 series consoles are capable of accessing and controlling City of Riverside Public Utilities analog and digital conventional base stations through the use of conventional channel gateways (CCGW). This capability lowers City of Riverside Public Utilities cost of ownership in two ways:

- It uses the same transport network, reducing the requirements for dedicated backhaul.
- 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.

The low density and the high density versions of the Enhanced GGM 8000-based router can support up to 16 IP interfaced base stations.

Using the high density version of the Enhanced GGM 8000-based CCGW, up to 16 additional conventional channels can be connected to the analog and V.24 ports. These 16 channels can be a mixture of analog, MDC 1200, ACIM link, digital, or mixed mode operation.

Motorola will provide 4-wire port to connect the existing conventional legacy channels via CCGW.

C1.10.2 Console Operations



**RELIABLE
AUDIO IN
REAL TIME**

The MCC 7100 series dispatch console is designed to provide mission-critical audio between the dispatch console and users in the field. It is optimized for real-time audio, prioritizing emergency calls over other traffic, minimizing voice queuing, and transmitting calls in 450 milliseconds or less.

Using robust error mitigation to maintain call quality even when the system is heavily loaded, the MCC 7100 series console reduces communication errors that may force dispatch console operators to repeat their transmissions.



C1.10.2.1 Dispatch Interface

The MCC 7100 series console's graphical user interface (GUI) optimizes user efficiency. It is designed to display the maximum number of resources a dispatch operator is able to easily view and control. City of Riverside Public Utilities can customize the MCC 7100 series GUI by agency or by individual user to meet their dynamic needs and requirements.

Elite Dispatch Graphical User Interface

The MCC 7100 series Elite Dispatch GUI is an enhanced version of Motorola's Gold Elite Dispatch GUI. For existing Gold Elite users, the GUI allows a smooth transition and minimal training for radio dispatch operators. For new users, the graphical icons and customization options make the MCC 7100 series console GUI easy to learn and operate.

An example of the MCC 7100 series GUI is shown in Figure 1-10.

**EASY TO USE,
FLEXIBLE, AND
CUSTOMIZABLE
USER INTERFACE**

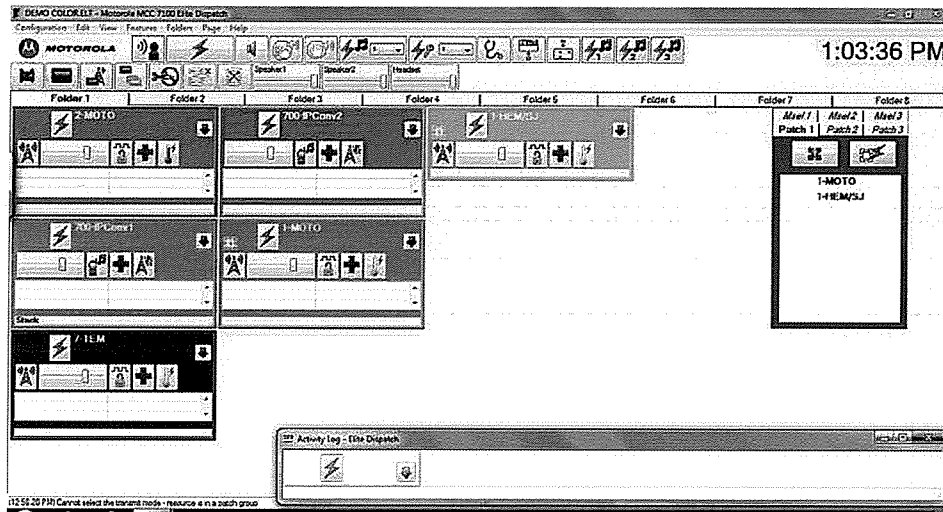


Figure 1-10: The MCC 7100 series GUI delivers critical real-time information is delivered to the console operator when and where they need it

Based on operator preference, the MCC 7100 series GUI can be customized to show details of trunked and conventional RF channels on a per-channel basis. Various controls can be highlighted, such as patch status, frequency select, coded/clear select, and individual volume control. Per-channel controls can be fully or partially shown, or hidden to save space on the screen. Busy dispatch operators 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. The status of auxiliary inputs and outputs can be conveniently interpreted from the GUI with the use of familiar graphical icons, such as a door shown open or closed.

C1.10.2.2 Standard Radio Transmission and Reception

A typical MCC 7100 series console has two speakers, one for selected audio and the second for all remaining unselected audio. Additional speakers can be added to the console, allowing dispatch operators to configure a specific speaker for a set of designated audio sources. This simplifies multitasking between multiple audio sources, allowing flexibility in the way the audio is presented to the dispatch operator.

Receiving Calls from the Field and Other Dispatch Operators

Dispatch operators have great flexibility as to how to hear calls from field radio users and other dispatch operators. Each console dispatch operator can define his or her own audio reception profile. They can select a single audio source, whether conventional or talkgroup, to be heard on a selected speaker (“Single Select”). The dispatcher can also define groups of radio resources that can all be heard on a selected speaker (“Multi-Select”).

Initiating Calls to the Field and Other Dispatch Operators

The dispatch operator has several different ways of initiating a call. In most circumstances, a “General Transmit” is appropriate. With the general transmit, the dispatch operator selects a resource on the console and activates the transmission through a footswitch, headset transmit button, or a microphone transmit button.

If the dispatch operator needs to quickly transmit on a resource, they use the “Instant Transmit” function, which activates the resource regardless of whether it is selected. To prevent accidental activation of “Instant Transmit,” it can be limited through an “Instant Transmit Safety Switch,” which must be pressed prior to activation of “Instant Transmit.”

Making Calls to the Field and Other Dispatch Operators

The dispatch operator can transmit audio in different ways, depending on who they need to speak with and how important that communication is. Most basically, they can make calls to all users listening to a specific conventional radio resource or a specific trunking talkgroup. When multiple resources are required, the operator can select additional talkgroups and/or conventional channels as needed for the call using the multi-select feature.

The MCC 7100 console enables dispatch operators to make private calls to individual field radio users or dispatch operators. Once this private call is established, it can be patched in with another resource at the dispatch operator’s discretion.

Controlling Console Audio

The MCC 7100 series consoles offer the operator several different ways of controlling or muting the audio on their console. The operator can change the audio volume of any specific resource routed to a selected speaker and, if they desire, can mute and un-mute all non-selected resources on the console (“All Mute”) for 30 seconds.

The console enables the dispatcher to transmit on a resource while receiving audio from other resources. It also can prevent acoustic feedback when a co-located operator position transmits by muting the transmitting operator position’s audio on a shared resource.

Controlling Network Audio

Dispatch operators can control the audio on the ASTRO 25 network. Using the console, the operator can enable or disable radio users in order to compartmentalize traffic, reduce interruptions, and maintain communications between dispatch and the field. When this function 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.

Based on operator preference, the MCC 7100 series GUI can be customized to show details of RF resources on a per-channel basis. Various controls can be highlighted, such as patch status, frequency select, coded/clear select, and individual volume control. Per-channel controls can be fully or partially shown, or hidden to save space on the screen. Busy dispatch operators 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. The status of auxiliary inputs and outputs can be conveniently interpreted from the GUI with the use of familiar graphical icons, such as a door shown open or closed.

C1.10.2.3 Dispatch Audio Experience

Emergency Alarms

The MCC 7100 series dispatch console is capable of monitoring radio subscribers for user initiated emergency activations. On subscriber radios that are equipped and programmed to transmit an emergency alarm, the MCC 7100 series console detects that this emergency has occurred and displays the emergency on operator positions that are preprogrammed to receive the emergency notification.

Operator positions can be programmed to either receive the emergency or to completely ignore it. In the event of an emergency condition from a radio user, all programmed consoles will give both an audible and visual indication of the event. The dispatch operator can then silence the emergency leaving the visual indication on the screen indicating information on the initiating radio allowing the call to be handled and dispatched appropriately.

Once an emergency is received all programmed operator positions will give the audible and visual indication of the event. Any one of these operator positions has the ability to silence the emergency at only their position or for all operator positions on the system.

In the event of a system that all channels are busy at the RF site that receives the emergency, that event is automatically given a Priority Level 1. This is the highest priority possible, putting the emergency call at the top of any busy queue. The emergency call will be given the next available voice channel at that site bumping all non-emergency calls in the queue.

Desktop Speakers

Each dispatch console is capable of supporting up to eight audio speakers. In this design, two speakers are included per position. These speakers supply audio for select/unselect, as well as pre-determined audio sources to specific monitor speakers, each of which transmits unique audio—that is, an audio source cannot appear in multiple speakers at a single dispatch console. Monitor speakers – can tie specific talkgroups to a certain speaker, such as all fire resources to speaker 3.

Each speaker has individual volume controls, and contains an amplifier that provides a maximum of 2 Watts of power output. Speakers are self-contained units, and can be placed on a desktop, mounted in a rack/furniture, mounted on a wall, or mounted on a computer monitor.

Headset Jack

Each 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. Each headset can either be connected to the console for supervisory applications, or to a desk telephone. The equipment design proposed includes two headset jack(s) per operator position.



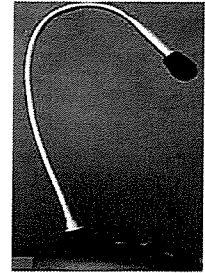
The headset jack contains two volume controls: one for adjusting the level of received radio audio and one for adjusting the level of received telephone audio.

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).

Gooseneck Microphone

The VPM is capable of supporting a desktop microphone. The desktop microphone contains a microphone cartridge on a flexible shaft and two buttons in its base. One button controls the General Transmit feature. The other button controls the Monitor feature. Figure below shows Microphone.

The desk microphone is permanently fastened down, or it is left loose so the dispatch console user can pick it up while using it. The 18-inch long, flexible shaft allows the base to be placed behind a keyboard or writing area and still be able to position the microphone head within a few inches of the speaker's mouth.



**Gooseneck
Microphone**

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, 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.

The microphone head is compatible for use with CRT monitors.

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 a telephone system (i.e. a 911 system).

When a telephone call occurs at a dispatch position, radio audio is directed from the headset to the appropriate console speaker. The headset microphone audio is routed to the telephone, allowing the dispatch console user to communicate hands-free on the telephone set. When the dispatch operator ends their call, the headset reverts back to full radio operation.

When the dispatch operator transmits on a radio resource during a telephone call, the headset microphone is re-routed to the radio system for the duration of the transmission. Once the transmission is completed, the headset microphone is routed back to the telephone. During the transmission, the dispatch operator continues to hear the telephone audio through the headset.

C1.10.2.4 Emergency Radio Transmission and Reception

As part of a mission-critical communications network, the MCC 7100 series console facilitates immediate prioritization and resolution of emergency communications between City of Riverside Public Utilities dispatch and users in the field. This enables dispatch operators and users to focus on their mission, not their equipment—especially during critical situations.

When a field user or another dispatch operator initiates an emergency call, the console emits both visual and audible indications ("Emergency Alarm"). The operator can then "recognize" the emergency call, which ends the audible emergency indication and notifies all console operators that the emergency is being addressed ("Emergency Recognize"). The audible emergency indication may



also be muted by a console operator without recognizing the emergency alarm (“Mute Tones at a Single Op”). When an emergency is over, the dispatch console user can end the Emergency Alarm. The emergency mode remains active on the initiating radio unit until it is ended (reset) by the radio user.

Receiving an Emergency Call

When a field user or another dispatch operator initiates an emergency call, the console emits both visual and audible indications (“Emergency Alarm”). The audible indication works to alert the dispatch operator that an emergency is underway; the visual indication directs the dispatch operator’s attention to the specific resource on which the emergency call is being made. The dispatch operator can immediately reserve a voice channel for the duration of the emergency.

The audible indication for an emergency is generated at the maximum level of the received audio, regardless of what volume the console has set that resource to. This is to ensure that the console operator does not miss the call. When the emergency call has been acknowledged, the volume for that resource is returned to its previous level.

Responding to an Emergency Call

When a console operator wishes to respond to an emergency call, they can bypass the standard console interface to auto-open a quick list, which contains specific controls for recognizing an emergency call, initiating an emergency call, and ending an emergency call (“Auto-Open of Quick List”). The operator can then “recognize” the emergency call, which ends the audible emergency indication and notifies all console operators that the emergency is being addressed (“Emergency Recognize”).

The audible emergency indication may also be muted by a console operator without recognizing the emergency alarm (“Mute Tones at a Single Op”). 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.

Ending an Emergency Call

When an emergency is over, the dispatch console user can end the Emergency Alarm. The visual indication on the console GUI is removed, and the console informs the other operator positions that the emergency is over (“Emergency End/Knockdown”).

The emergency mode remains active on the initiating radio unit until it is ended (reset) by the radio user.

C1.10.2.5 Radio Patch Control

MCC 7100 console users can patch communication between trunked and/or conventional radios that are normally unable to communicate with each other due to different features, programming, or even different frequency bands. A patch group is a group of linked resources that can both receive messages from a console and transmit to all other members of the patch group. The MCC 7100 supports a maximum of 4 active patch groups.

Setting up a Standard Patch

A dispatch operator can set up a standard patch between trunked resources and/or conventional resources. After the patch is created, the dispatch console transmits all audio on one resource to all other resources in the patch group.



Patched radio users see the ID or alias of the other patched radio(s), as opposed to that of the console, provided that the radio subscriber is capable of displaying IDs. This minimizes confusion and the need for the dispatch operator to intervene in the call. Patches are automatically re-established if interrupted so the MCC 7100 user can concentrate on continuing operations.

Pre-Defined Patches

Patches can also be pre-defined, and be automatically re-initiated each time a dispatch console computer is restarted ("Patch Auto-Start").

Using 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. Resources can be added or removed from a Multi-Select group while it is open or while it is closed.

The Multi-Select feature:

- Selects multiple resources simultaneously.
- Defines and stores groups of resources so that multiple resources can be conveniently selected and deselected.

C1.10.2.6 Call Management and Control

Automatic Prioritization of Calls

Calls on the MCC 7100 series console are prioritized through a transmission hierarchy. Calls from primary supervisors take priority over those from secondary supervisors, which in turn take priority over non-supervisors. Instant Transmit or All-Points Bulletin (APB) transmissions, regardless of whether they are from a supervisor, will take priority over general or patch transmissions.

Multiple dispatch console operators can be designated as primary supervisors on the same system, which is useful when multiple agencies share one system, each with their own primary supervisor.

Console supervisors have the capability to disable and enable operator console functionality as necessary.

Manual Prioritization of Calls

"System Access Priority Select" allows a dispatch operator to prioritize trunked resources on the system as either "normal" or "tactical." A dispatch operator can change the priority of a trunked resource to tactical in order to give the resource a better chance of gaining communication access on a busy system. 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.

Standard Call Indications

The MCC 7100 series console indicates the availability of any given resource, whether or not it is being transmitted on at the moment. It will also give an inbound call indication that provides the console operator with a visual cue of audio activity on a radio resource. This functionality makes it easy for an operator to see at a glance what the status of a resource is at any moment.

Resource Identification

To identify a resource, the console reads its unit ID, a string of digits that uniquely represent that resource. The console makes it easy for operators to read unit IDs by replacing them with user-



friendly 16-character aliases. These aliases, which are defined during the configuration of the console system, can replace the unit IDs of the following resources:

- Trunking Talkgroup Resource.
- Trunking Announcement Group Resource.
- Trunking Individual Call Resource.
- Conventional Channel Resource.
- Conventional Channel Frequency Selection Control.
- Conventional Channel PL Selection Control.
- Unit ID.
- Aux I/O Resource.

Call Alerting

When an operator needs to reach a radio user or dispatch operator and they are not near their radio or console, the dispatch operator can “page” the unattended radio or console through a series of beeps and an indication of the sender’s ID. When the radio user or dispatch operator becomes available, they will see the unit ID of the calling dispatch operator’s console or radio ID, and be able to return the call. Console System Security

The MCC 7100 series dispatch console enables end-to-end encryption from the operator position to the ASTRO 25 network, so that at no point will City of Riverside Public Utilities communications be undermined by unencrypted transmissions. Each dispatch operator will be able to fully participate in secure communications while being confident that sensitive, vital information will not be heard by unauthorized individuals.

Secure Access to the Console

To use the dispatch console, an operator must enter a valid radio system user account name and password. The dispatch console validates that information 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.

Secure Communications at the Console

The console itself encrypts and decrypts radio voice messages. Thus, radio voice messages are encrypted end-to-end, from the field radio user to the dispatch console. The console operator can choose whether or not to encrypt their transmissions on a particular trunked resource. Console operators can interface with agencies that have different encryption configurations without any manual intervention or delay. The MCC 7100 Console can support up to 20 calls simultaneously, using up to three different algorithms and multiple encryption keys.

To help reduce potential errors when managing encrypted communications, the MCC 7100 interface provides alerts when the console mode does not match that of a received call, and when a patch or multi-select group is being set up between a mix of clear and secure channels. The set of alerts available on the console are in Table 1-9, below.



Table 1-9: Security Indications

Indication/Alert	Indication/Alert Description
Receive Cross-Mode Indication	Indicates when an inbound call's secure mode does not match the console's outbound mode, so that the console operator can respond in the correct mode.
Clear Audio Alert	Provides visual and audible indication that a trunked radio transmission or reception is unencrypted.
Multi-Select Cross-Mode Alert	Indicates that different trunked resources in a multi-select group have different secure modes, preventing console operators from transmitting audio in both secure and non-secure modes.
Patch Cross-Mode Alert	Indicates that different trunked resources in a patch group have different secure modes, preventing console operators from transmitting audio that is intended to be secure in an unencrypted state.
Key Fail Indication	Indicates that a console cannot decrypt or encrypt a call due to a problem with an encryption key.
Panic Key Zeroizing	Erases all encryption keys at a specific console or AIS at the push of a button. The button is recessed in a panel to reduce the chance of accidentally pressing it.
Keypad/Index set Selection via GUI	Enables the dispatch operator to manually select the keypad/index set the dispatch console uses.

C1.10.3 Console Configuration and Management

The MCC 7100 series console system is configured and managed by the same configuration manager, fault manager, and performance reporting applications as the radio system. The user can define exactly which resources are available and how they are presented to the dispatch console user. This provides City of Riverside Public Utilities with a single point for configuring and managing the entire ASTRO 25 system. Changes are automatically distributed throughout the system. This centralized approach saves valuable time and effort for system administrators and technicians, and reduces the errors that can occur when radio IDs and other data are entered at multiple locations.

In addition, call traffic and performance reports for each console can be generated from the system's network manager. This enables administrators to quickly and easily ensure optimal effectiveness and efficiency.

C1.10.4 MCC 7100 Dispatch Console Component Description

An MCC 7100 Dispatch IP Console consists of the following elements:

- Operator position computer.
- Audio Interface Module (AIM)
- Network equipment.
- Conventional Channel Interface equipment.

This section discusses the various components that make up the proposed MCC 7100 Dispatch Console system, Figure 1-11. These components are connected together and to the rest of the ASTRO 25 system on an IP network via console site routers and switches. The MCC 7100 Dispatch Console functions as an integrated component of the total radio system, fully participating in system level features such as end-to-end encryption.



Since the network is IP-based, the system's interfaces and components can be distributed physically throughout the network. Logging components can be centrally located at the zone core or distributed at console sites. CCGWs can be located at conventional-only RF sites, at trunking RF sites, the master site, or at console sites with conventional stations. Aux I/O Servers can be placed anywhere in the zone, closest to where they are needed.

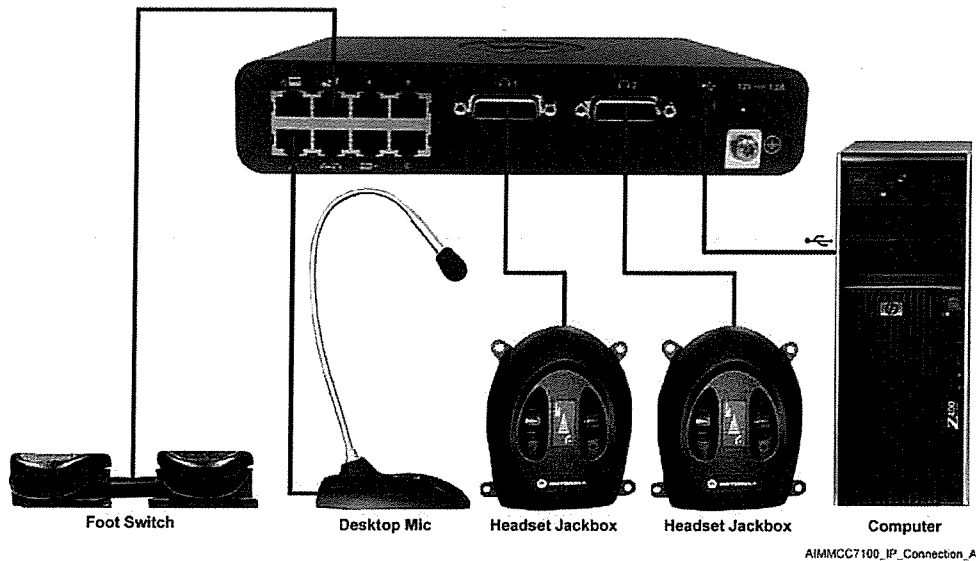


Figure 1-11: Motorola MCC 7100 Dispatch Console Hardware Architecture

C1.10.5 Operator Position Components

MCC 7100 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 are performed within each software-based operator position, without additional centralized electronics.

An MCC 7100 operator position consists of a computer, an Audio Interface Module (AIM), one select speaker, one unselect speaker, a desktop gooseneck microphone and/or headset jack box with in-line PTT amplifier.

Audio Interface Module (AIM)

The Audio Interface Module supports audio routing between the dispatch operator and Motorola-standard peripherals. It functions as an interface between analog devices and the console position and as a general-purpose input/output module. The AIM connects to the MCC7100 Dispatch console with a USB cable.

The AIM has connections for the following devices (as applicable):

- Two headset jacks.
- One desktop gooseneck microphone.
- One local logging recorder.
- One external telephone headset.
- One footswitch.
- Support for four private Aux I/O's

Personal Computer (PC)

The dispatch console uses a customized Motorola-certified PC running the Microsoft Windows operating system, containing a Motorola-designed voice card and a Motorola-designed secure card. The PCs used in ASTRO 25 systems have a mini-tower form factor.

The PCs are processed through Motorola factories in Schaumburg so that the application software, voice cards, and secure cards can be installed and tested to ensure they are operating properly.

C1.10.6 Conventional Channel Gateway Equipment

Conventional Channel Gateways (CCGWs) are used to interface analog and ASTRO 25 conventional channels to the ASTRO 25 radio system infrastructure. CCGWs provide 4-wire analog interfaces for analog channels and V.24 and IP digital interfaces for ASTRO 25 conventional channels. The platform that is hosting a CCGW may be solely dedicated to that task or it may also be used as a console site router or an RF site router, provided the WAN link is not redundant.

The enhanced GGM 8000-based CCGW is available for interfacing to conventional channels. The enhanced CCGW can support combinations of analog, MDC 1200, ACIM Link, digital and mixed mode channels simultaneously. Low density and high density versions of the enhanced CCGW are available.

- The low density version contains four analog ports and four V.24 ports plus an Ethernet port. Up to eight conventional channels can be connected to the analog and V.24 ports. The eight channels can be mixtures of analog, MDC 1200, ACIM Link, digital or mixed mode. In addition to the eight channels connected to ports, up to 16 IP based channels can be supported. This brings the total number of channels supported on the low density version to 24.
- The high density version contains eight analog ports and eight V.24 ports plus an Ethernet port. Up to 16 conventional channels can be connected to the analog and V.24 ports. The 16 channels can be mixtures of analog, MDC 1200, ACIM Link, digital or mixed mode. In addition to the 16 channels connected to ports, up to 16 IP based channels can be supported. This brings the total number of channels supported on the high density version to 32.

Analog Configuration

The enhanced GGM 8000-based CCGW provides two sets of ports that are used with analog channels. One set (called the Analog Ports) contains the analog inputs and outputs for the channels along with a COR/Coded/Clear input and a PTT Relay output. The other set (called the Supplemental I/O Ports) contain analog logging recorder outputs and various inputs that can be used with the analog channel.

Each analog port contains the following inputs and outputs:

- **2-Wire Input/output** – When the channel is configured for 2-wire operation, this input/output is used to send console transmit audio to the channel and to accept radio audio from the channel
- **4-Wire Input** – When the channel is configured for 4-wire operation, this input is used to accept radio audio from the channel.
- **COR or CIU Coded/Clear Input** – If the channel is configured for clear (non-secure) operation with COR (Carrier Operated Relay), then this input is used to accept the COR output from the channel. When used as a COR input, the input uses contact closure detection.
- **PTT Relay Output** – The PTT relay output provides a relay contact closure capable of supporting up to 1 Amp at 24 volts DC.



- **VOX and COR Operation** – A clear (non-secure) analog port must be configured to support either VOX or COR operation. The CCGW will not pass audio to the dispatch consoles or logging recorders unless there is an active VOX or COR condition.
- **LOBL (Line Operated Busy Light) Detectors** – The LOBL detector on the 2 or 4 wire inputs can be used to detect when a parallel non-MCC 7100 series dispatch console is transmitting on the channel via tone remote control.
- **AGC, DLM and Fixed Gain Operation** – When configured for AGC operation, the gain of the audio input is constantly adjusted to provide a constant output level to the dispatch consoles and logging recorders. When configured for DLM operation, the gain of the audio input is constantly adjusted to provide a constant output level to the dispatch consoles and logging recorders. When configured for fixed gain operation, the gain of the audio input is fixed and does not change.

The enhanced GGM 8000-based CCGW provides four (low density version CCGW) or eight (high density version CCGW) ports containing supplemental I/Os which can be used to provide additional functionality on analog channels:

- **LOBL (Line Operated Busy Light) Input** – The LOBL input provides an alternative method to the software LOBL detector for detecting when a parallel non-MCC 7100 series dispatch console is transmitting on an analog channel. This input can be configured for either voltage operation or contact closure operation.
- **High Speed Mute Input** – When the mute input is active, all audio at the configured audio input(s) will be muted.
- **Analog Logging Output** – The analog logging output provides 600 Ohm balanced analog audio consisting of the summed transmit and received audio from the channel connected to the paired analog port.
- **Coded/Clear Call Input** – The coded/clear call input provides certain legacy analog secure conventional channels a means of informing the MCC 7100 series dispatch consoles about the mode (coded or clear) of a call.

IP Conventional Gateway

Both the low density and high density enhanced GGM 8000-based CCGWs can support up to 16 G-Series-based ASTRO 25 conventional channels via the radio system's IP network. The IP interface uses the same Ethernet cable that the enhanced CCGW uses for everything else. The 16 IP-connected channels are in addition to any analog or V.24 channels that may also be connected to the enhanced CCGW. Two (2) enhanced conventional channel gateways are included in the design for the City of Riverside Public Utilities.

Conventional Site Controllers

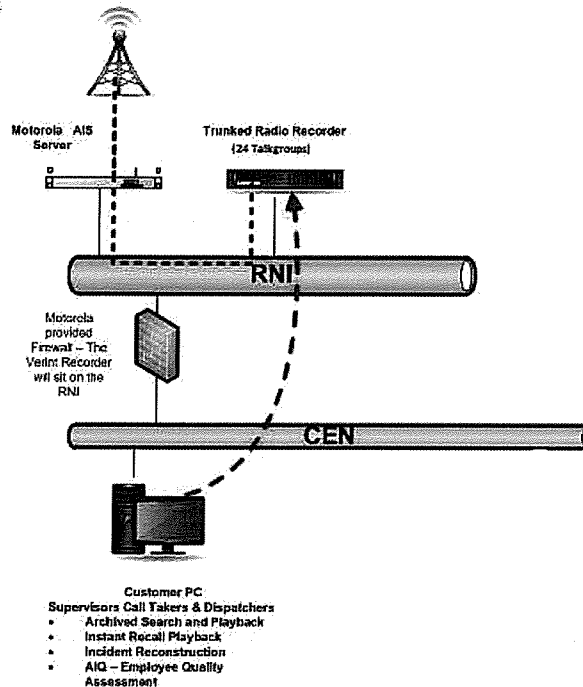
The conventional site controller allows dispatch console users to continue to access and control local conventional channels if connectivity to the radio system's controller is lost. This mode of operation is often called "fallback operation" or "site conventional operation". The conventional site controller is comprised of the GCP 8000 site controller hardware with different software to provide the conventional capabilities. When used as a conventional site controller, the GCP 8000 site controller is outfitted with a single site controller module rather than two site controller modules.

Only one conventional site controller is required per console site or conventional subsystem. This single conventional site controller is capable of supporting the full set of dispatch consoles, archiving interface servers and CCGWs that can be placed in a console site or conventional subsystem. One conventional site controller has been included in the design for the City of Riverside Public Utilities located at the UOC Dispatch site.



C1.11 LOGGING RECORDER

Motorola has partnered with Verint to provide a highly-reliable, robust logging solution that is tailored to meet the demanding needs of the City of Riverside Public Utilities. A simplified diagram representing the solution concept is shown below.



The Audiolog Trunked Logging Recorder (TLR) developed by Verint is fully integrated and a certified IP radio recording and replay solution for Motorola ASTRO 25 systems. The trunked logging recorder works in conjunction with the Archiving Interface Server (AIS) to provide a mission critical IP-based digital logging solution for ASTRO 25 systems. It provides a reliable and robust solution for customer audio recording requirements.

The Audiolog TLR is designed to record 24 talkgroups and capture radio metadata with each recorded transmission. This metadata is provided by the Motorola Archive Interface Server (AIS) and includes such information as Radio ID, Radio Alias, Talkgroup ID and Talkgroup Alias. This will enable users to search and retrieve recorded radio communications based upon Talkgroup and/or Radio information.

Search and Playback

The Search and Retrieval of recorded communications can be done by two methods: 1. Verint's Web Based Application, "Insight Center" or 2 Verint's Audiolog Client software. Both search and replay applications are available to the City of Riverside Public Utilities to use at their discretion. Verint's Insight Center application provides a powerful, browser-based, set of tools to search for and play the recordings stored on your Audiolog servers from your desktop PC. With an easy-to-use browser interface, you can easily search for recordings by recorded channel, date, time, duration, user reference tags, and other captured metadata from the ASTRO radio system. Playback audio is delivered via the local area network to the speakers of the client PC.



Call Storage

Audiolog's open architecture provides maximum storage flexibility, with internal RAID 5 storage, automatic call archiving to blu-ray removable media. Based on the City of Riverside Public Utilities trunking profile, the TLR server has sufficient storage to retain call for the retention period of 60 days as indicated on the RFP.

The heart of the integrated radio logging solution begins with the AIS (Archiving Interface Server). The AIS performs many of the same operations as the MCC7100 console—and in the case of logging—the AIS is where the audio from the radio system is decrypted (if necessary) and sent out of the traditional “radio” realm to the logging recorder. The logging recorder is sized based upon the number of talkgroups, which are required to be recorded simultaneously. The proposed logging solution is sized for 24 simultaneous conversations with 60 days retention based on the talkgroup profile. Please note that encrypted talkgroups may consume more logging recorder resources than clear (or unencrypted) calls.

In order to accomplish this connection between the logging system and the playback stations, Motorola has included its secure Customer Network Interface (CNI). The CNI is a perimeter-based security methodology that provides IP address translation and firewall services to protect the ASTRO radio network from malicious traffic from outside networks.

C1.11.1 Archiving Interface Server (AIS)

The Archiving Interface Server (AIS) provides an interface between the radio system and the IP logging recorder. This allows calls on the radio system to be recorded together with information associated with the calls. The user can configure the logging recorder to monitor and record a set of radio system resources (trunked or conventional). The AIS monitors the identified resources, passes call-control information to the logging sub-system via an API, and redirects audio for those monitored channels to the logging sub-system via the LAN. The logging recorder then records this information to its storage media.

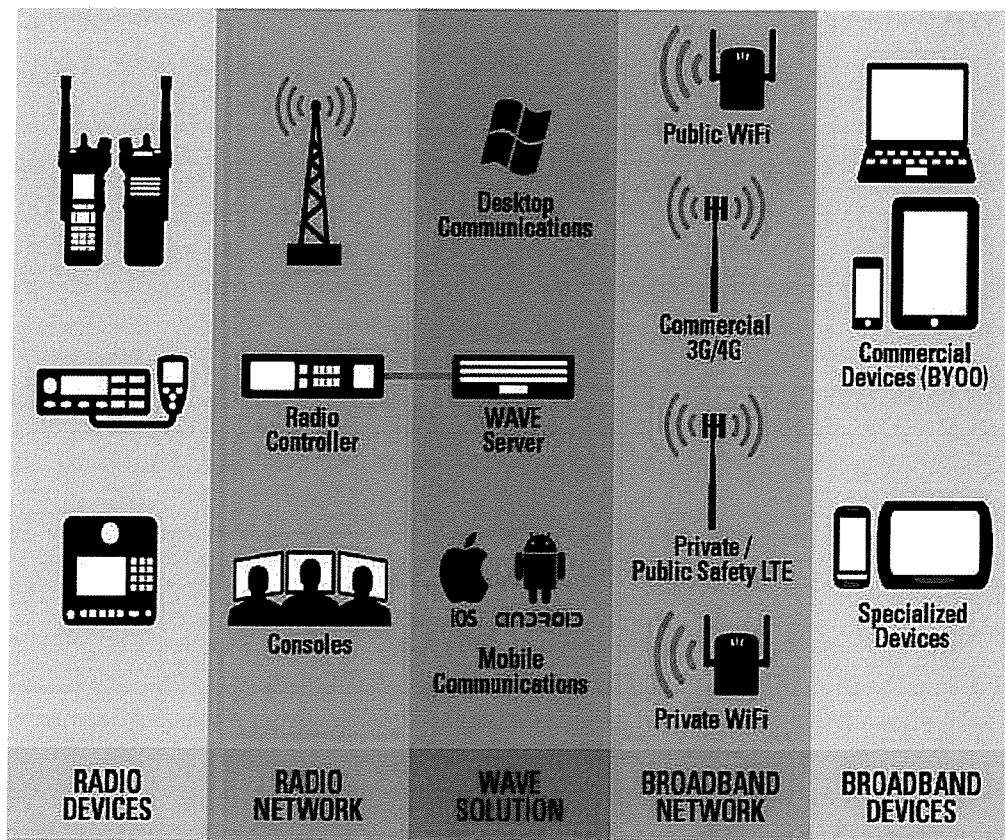
C1.12 INTEROPERABILITY

C1.12.1 Wide Area Voice Environment (WAVE)

INTEROPERABILITY

Wide Area Voice Environment (WAVE) Motorola's Workgroup Communications interoperability solution, an innovative Voice and Radio over IP (VoIP)/RoIP) platform that will integrate your land mobile radio (LMR) network with commercial and private 3G, 4G, LTE, and WiFi broadband networks. WAVE is already being used by many local, state and federal government agencies to provide critical interoperability functionality and extend the reach of their radio networks. The U.S. Department of Defense is one of the largest users of WAVE technology. The following licenses have been included:

- Ten (10) WAVE Communication Channel – with radio system integration
- Ten (10) WAVE Desktop Communicator License
- Twenty (20) WAVE Web Communicator License
- Twenty (20) WAVE Mobile Communicator License
- Two (2) WAVE Voice Ports
- Two (2) WAVE Recording Session



C1.12.2 WAVE Solution Overview

WAVE enables users to communicate on land mobile radio (LMR) systems using their Android iOS mobile devices and laptop/desktop computers, through a suite of software clients installed on those devices. These LMR/ broadband communications include secure, high-performance push-to-talk (PTT) services that extend communications beyond the coverage provided by an LMR system itself — a capability useful in a variety of circumstances:

- Command personnel and administrators will be able to monitor events and stay in touch with their colleagues on their broadband devices, even when they are not in range of their ASTRO 25 system.
- Users will be able to communicate even within large buildings that are too dense for radio coverage to penetrate.
- Officials and agency personnel who typically are not everyday users of the radio system (such as schools and administrative officials) will be able to use WAVE on their standard mobile devices to communicate on the radio network during an emergency or major event.
- Your ASTRO 25 radio systems can use WAVE to connect to other radio networks (analog or conventional), providing true interoperability to address the most complex communications challenges and requirements.

The following capabilities are included with the proposed solution:

- **Group Call:** Users can make group calls with each other using any of the WAVE applications. Talkgroup participants can include both LMR and WAVE users, WAVE-only users, and



LMR-only users. Users select the talkgroup they wish to use and PTT just like a radio. All users on a talkgroup hear the speaker's transmission and can reply. Talkgroups and their assigned participants are created and managed by the WAVE Management Server module.

- **Individual Private Call (One-to-One):** Individual private calls can be made between two WAVE users using the Mobile Communicator and/or the Desktop and Advanced Desktop applications (private calls are not yet available between WAVE and LMR users). A user selects the person they wish to call from a contact list available within the application. Users communicate back and forth with one another by pressing and releasing the PTT button in their application. When they are finished they can press a hang-up button or just wait for the call to time-out and disconnect.
- **Late Call Entry:** Users can join in-progress talkgroup calls if they happen to miss the start of the call.
- **Text Messaging:** WAVE users on the Mobile, Desktop and Advanced Desktop Communicators can send and receive group text messages with other WAVE users in a talkgroup.
- **Status, Presence & Location:** WAVE users can see the current status, presence, and location of other WAVE users using any of the WAVE Communicators. Whether a user shares their location data with other users is configurable in the applications.
- **Short Term and Long Term Recording:** the WAVE Media Server module supports audio recording for instant recall playback and long-term archival recording. Instant recall playback is currently available with the Desktop and Advanced Desktop Communicators. Playback is being added to the Mobile Communicators and is scheduled to be available in late 2015.
- **System Management:** the WAVE Management server module provides the interface to create and manage users and talkgroups and turn on/off the ability to make private calls on an individual basis.

All communication between broadband and ASTRO 25 users are group calls; one-to-one private calls between broadband and LMR users currently are not supported for LMR networks. Because the WAVE server is an add-on to LMR radio infrastructure, it provides separate management and alarming functionality.

C1.12.3 Elements of the Wave Solution

The proposed WAVE solution consists of the following elements:

- A server that runs a set of WAVE software modules that provides an interface to the LMR system. Mobile Communicator apps for Android and iOS devices.
- Web Communicator application that runs within modern Windows browsers.
- Web Communicator plug-ins for Microsoft information management systems (e.g. Lync, SharePoint). Desktop Communicator applications that run on Windows PCs.

Together, these elements provide a common PTT environment across both radio and broadband networks, enabling users on those networks to send group text messages and transmit user status, presence, and location information.

Each major element of the solution is described at a high level, below.

WAVE Server

The WAVE Server includes several software modules that provide the interface to the ASTRO 25 system and integrate WAVE Mobile Communicators and PC clients to the WAVE system.



These software modules include the WAVE Proxy, Media, and Management servers and the WAVE Radio Gateway (WRG). The WAVE Server supports PTT communications using commercially available Android and iOS smart devices running over 3G/4G/LTE public/private carrier networks and public/private Wi-Fi networks, and PC clients connecting over WAN/LAN networks. The single WAVE Server to be provided as part of this proposal will host the Management, Media, Proxy and WRG server modules required for system operation.

WAVE Communicator Applications

WAVE Communicator applications enables users to access any authorized talkgroups from their device using a suitable data connection (cellular service or Wi-Fi). Using a mobile device, laptop, or desktop PC with the appropriate WAVE communicator installed, users can listen/talk on broadband-only talkgroups and talkgroups interconnected to LMR systems, as well as make and receive private calls with other WAVE users from literally anywhere they have network access (local, regional, or global).

Versions of the WAVE Mobile Communicator are available for installation on Apple devices (iPhone, iPad, iPod), Android phones and tablets, as well as custom devices like the Motorola LEX L10. The WAVE Mobile Communicator for iOS and Android is optimized for operation over wireless networks, switching between cellular and Wi-Fi networks to ensure the best possible network connection between the mobile device and the WAVE server.

The WAVE Web Communicator is a plug-in that runs in modern Windows web browsers (e.g., Internet Explorer, Chrome, Firefox, etc.; Apple Safari is not currently supported), allowing users to connect to a WAVE system from virtually anywhere they have an internet connections. The client supports groups calls and provides status, presence and location information, with mapping functionality to show the locations of WAVE users registered on a talkgroup.

The WAVE Lync Communicator has the same look, feel and functionality of the Web Communicator and extends access to WAVE channels from Microsoft Lync systems. This client can be used by agencies that have implemented Microsoft's Unified Communications solution and want to take advantage of Active Directory, which supports single sign-on.

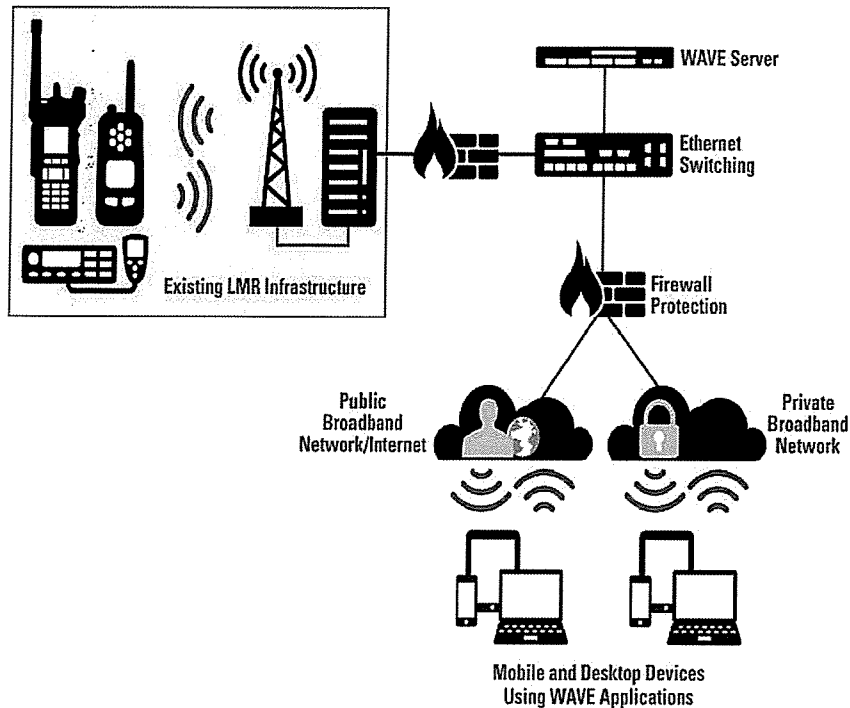
The WAVE SharePoint Communicator has the same look, feel and functionality of the Web Communicator and extends access to WAVE channels from Microsoft SharePoint deployments. This client can be used by agencies who have implemented Microsoft SharePoint to manage their assets, activities and internal communications and want to have direct access to a WAVE system from within a SharePoint site/page.

The WAVE Desktop Communicator is a PTT software client that enables users to monitor/talk on talkgroups and make private calls, and has features such as SimulSelect, instant playback, talkgroup text messaging, status/ presence information, location mapping, telephony integration, and call history.

The WAVE Advanced Desktop Communicator provides expanded dispatch functionality that allows users to monitor/talk on WAVE talkgroups, perform patching, make/take phone calls with full PBX integration and functionality (speed dials, transfer/hold, etc.), talkgroup text messaging, respond to alarms, broadcast on multiple channels (SimulSelect), etc., all through a unified software interface that can run on virtually any Windows-based computer.



LMR INTEGRATION



The proposed WAVE solution will extend City of Riverside Public Utilities ASTRO 25 radio system to broadband-enabled devices, enabling users of those devices to securely communicate with users of the ASTRO 25 users via an easy-to-use application. In the case of the City of Riverside Public Utilities, this integration will be achieved through a wireline interface with the ASTRO 25 system's Project 25 Inter RF Subsystem Interface (ISSI). This integration leverages the protocols of Project 25 ISSI and the unique value-added features of Motorola's ISSI 8000 platform, enabling WAVE Mobile Communicators to connect with the WAVE Server via 3G/4G/LTE cellular connections and/or public/private Wi-Fi networks. PC clients can connect to WAVE via wireline or wireless networking (Wi-Fi). The WAVE Server and WAVE clients support fully-encrypted media traffic across local networks, cellular networks, and the Internet.

C1.13 BANDWIDTH REQUIREMENTS

The proposed City of Riverside Public Utilities ASTRO 25 Digital Trunked Communication System requires Ethernet site links. Motorola has developed the bandwidth requirements in Table 1-10 that identifies the P25 site link connectivity and Committed Information Rate (CIR) for the RF Site and Dispatch sites. Motorola will work with the City of Riverside Public Utilities during the design review to develop a Quality of Service (QoS) Plan which includes the proper QoS priority levels, tagging and CIR information. Motorola recommends four QoS levels for the P25 system, but requires a minimum of two with either a Layer 2 or Layer 3 Ethernet backhaul.

Table 1-11: Bandwidth Requirements

Site A	Site B	Link Description	Priority	CIR kbps
ASTRO 25 Site Repeaters (ASR)				
UOC Master Site	Box Springs Remote Site	Primary Master Site to Remote Site	QoS Level 4	944
Utilities Operation Center (UOC) Dispatch Site				
UOC Master Site	UOC Dispatch Site	Primary Master Site to Dispatch Site	QoS Level 4	3680
Riverside Energy Resource Center (RERC) Dispatch Site				
UOC Master Site	RERC Dispatch Site	Primary Master Site to Dispatch Site	QoS Level 4	3680

C1.14 COVERAGE

This section describes the coverage modeling methodology that was used to predict and design coverage for the City of Riverside Public Utilities ASTRO 25 Trunked Communications System. It includes a description of parameters used to define and model the system and a description of Motorola's coverage prediction tool, Hydra, which was used to predict coverage for the design. Finally, a description of the coverage maps supplied with this analysis is provided in this section.

System Coverage Parameters

Coverage parameters used in the system design are discussed and defined below. These parameters include the following:

- Modulation.
- Service area.
- Delivered Audio Quality (DAQ).
- Reliability.
- Frequency.
- Subscriber parameters.
 - Portable.
 - Mobile.
- RF Site parameters.
 - Antenna model and heights.
 - Fixed station parameters.

Modulation

City of Riverside Public Utilities has requested that Motorola utilize P25 Phase 1 FDMA modulation. In addition, the City of Riverside Public Utilities has requested a P25 Phase 2 TDMA modulation for this coverage design to determine if any changes are necessary when migrating to a P25 Phase 2 TDMA system. The primary design is for P25 Phase 1 FDMA which will be tested.

Service Area

The service area is the geographic area over which RF coverage is to be provided. For this system, the service area is shown in on the coverage maps in Section 10.

Delivered Audio Quality (DAQ) and Reliability

Coverage is defined as a collection of locations (points) within the defined Service Area that achieve a specified performance criterion. The performance criterion for a voice system is Delivered Audio



Quality (DAQ). A value of DAQ 3.4 was used for all provided coverage predictions. Table 1-12 below shows various DAQ values and their corresponding descriptions.

Table 1-12: DAQ Descriptions.

DAQ Delivered Audio Quality	Faded Subjective Performance Description	Static SINAD equivalent intelligibility *
1	Unusable, Speech present but unreadable	<8 dB
2	Understandable with considerable effort. Frequent repetition due to Noise/Distortion	12 ± 4 dB
3	Speech understandable with slight effort. Occasional repetition required due to Noise/Distortion	17 ± 5 dB
3.4	Speech understandable with repetition only rarely required. Some Noise/Distortion	20 ± 5 dB
4	Speech easily understood. Occasional Noise/Distortion	25 ± 5 dB
4.5	Speech easily understood. Infrequent Noise/Distortion	30 ± 5 dB
5	Speech easily understood.	>33 dB

Reliability

Reliability is defined as the probability of achieving the specified DAQ within the painted coverage map. For all the provided coverage predictions, the (Covered Area) Reliability was defined to be 95%.

Frequency

The frequencies used for the City of Riverside Public Utilities coverage design were in the 700 MHz band. This means the subscribers, base stations and antennas were chosen to operate within this frequency band.

Subscriber Parameters

Subscriber parameters define a variety of aspects of the subscriber to be used in the system modeling. These parameters define whether the subscriber is a mobile or portable, the transmit power of the unit, and antenna characteristics such as gain and model. Antenna characteristics also include the location of the antenna, i.e. where it is mounted either on a person or a vehicle. These parameter selections can alter the overall system coverage footprint noticeably. For the City of Riverside Public Utilities, both mobile and portable subscribers were modeled, and the resulting coverage maps are provided with this analysis in Section 10.

Portable Radio Parameters

For City of Riverside Public Utilities, the APX 4000, 3 watt portable radio with a half wave “flex whip” antenna was chosen to model the recommended coverage design. According to the RFP, the location of the antenna is required to be on the hip for both transmitting and receiving, with a remote speaker microphone attachment used with the radio.

Mobile Radio Parameters

For the mobile radio parameters, Motorola used the APX 4500 mobile radio, utilizing a unity gain antenna mounted on the roof of the vehicle at a height of 4.9 feet with a 15 watt transmit power.

RF Site Parameters

Accurate site locations, base stations settings, antenna model and mounting heights contribute to the final coverage prediction. The following sections provide a description of the parameters and assumptions used to model coverage with respect to site coverage parameters.

Site Locations

The existing and recommended site location was supplied by the City of Riverside Public Utilities. The address of the site location was supplied, which was then verified in Google Earth to ensure the coordinates accurately represented the location of the tower or building that supported the antennas.

Site Antenna Information

The type of antenna model, gain, down-tilt and mounting height all contribute to the coverage design in various ways. Both transmit and receive antenna choices focused on using the best antenna pattern and downtilt for the surrounding terrain.

Tower Heights

Motorola has conducted site walks during the pre-proposal conference at the RF site located at Box Springs to determine antenna space availability. Based on Addendum1, Motorola has predicted the receive antennas at 70ft and transmit antennas as 50 ft.

Tower Top Amplifiers

This system is inbound limited, meaning that the outbound coverage is better than the inbound. Ideally, trunking systems should be balanced. In order to improve the inbound coverage, a tower top amplifier has been included in the design.

Tower top amplifiers are mounted directly below the receive antenna on the tower and add gain to the received signal coming from the tower receive antenna.

Fixed Station Parameters

Parameters for fixed stations include the model of the station and the transmit power used. For this design Motorola used the G-series GTR 8000 base radio, which is housed in an expandable site subsystem-- a space-efficient, single rack design that integrates up to six GTR 8000 base radios, site controllers, transmit combiners, receive multicouplers and other devices. Gains and losses associated with this equipment were modeled appropriately and contribute to the final coverage prediction.

The transmitter power at Box Springs is set to 100W, which is the maximum output power for 700-800 MHz base radios.



Results

Motorola will test the “painted” area on the FDMA maps to verify that it meets the guaranteed 95% Reliability. In the provided coverage maps, the “painted” area covers the percentage of the political boundary as indicated in the Table 1-13 below.

Table 1-13: FDMA maps meet the guaranteed 95% Reliability.

Subscriber	Direction	FDMA
Portable	Inbound (Talk-In)	96.44%
	Outbound (Talk-Out)	96.97%
Mobile	Inbound (Talk-In)	99.94%
	Outbound (Talk-Out)	99.82%

In designing the coverage for the City of Riverside Public Utilities, only one ASTRO 25 Site Repeater was needed to provide coverage in the service areas of City of Riverside and a portion of San Bernardino as indicated on the coverage maps in Section 10 of the proposal. Motorola designed the system to provide balanced coverage between portable talk-out and portable talk-in. The system is inbound limited in which the talk-out coverage is better than the talk-in coverage. In order to balance the system, a tower top amplifier has been included in the design. Therefore, as a result, the portable talk-out and portable talk-in coverage has been designed to be within 1dB to meet the RFP requirement. There were terrain limitations in the east of the service area located in San Bernardino between Waterman Ave and the San Bernardino Airport up to the 210 freeway as indicated on the coverage maps. All the coverage maps included in the proposal account for simulcast interference.

Further coverage analysis was done to produce maps for TDMA. In comparing the FDMA to TDMA maps, there were no differences in coverage. The mobile and portable coverage maps did not change in a TDMA system. Therefore, no additional equipment was needed to enhance the coverage of the system if a Phase 2 TDMA system was implemented.

C1.14.1 Description of Propagation Model

The coverage analysis was completed using Motorola’s proprietary coverage design and prediction tool, Hydra. Motorola’s Hydra coverage modeling tool, which is based on the current TSB-88 guidelines, enables coverage modeling and predictions. Hydra has been tested and proven in thousands of implemented systems. It uses a modified propagation prediction model based on the Okamura prediction model to model coverage and voice traffic. Hydra is also used to analyze interference, plan channel re-use, and perform other design tasks for Motorola’s diverse and customized portfolio of radio networks.

Variables in Coverage Modeling

Hydra takes into account the many elements that must be considered in order to create an accurate picture of predicted radio coverage. System factors affecting coverage include the operating frequency, transmitter power, receiver sensitivity, antenna height, and antenna gain. Environmental factors vary according to the path taken by the radio signal and the area 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. Currently accepted propagation models, such as Okumura, Longley-Rice, and TIA, provide excellent portrayals of radio coverage when used within their respective ranges of applicability.



This level of analysis used to be adequate for the radio systems available in the past. However, today's complex technologies, such as digital voice, and packet data systems require a much deeper analysis. It is necessary to select the appropriate coverage model, accurately represent the environmental factors throughout the service area, and then apply the coverage analysis method to a very high number of locations within the service area. The Hydra prediction tool does this.

Computational Techniques

Built on the knowledge gained from Motorola's many years of practical experience and coverage testing, Hydra provides a superior means for predicting system coverage. This program employs a technique of computing coverage on tiles throughout a service area rather than on points along radials. Coverage calculations computed on a tile-by-tile basis show a more accurate prediction of coverage than a prediction using the radial method. This is due to the fact that a program using radials results in data points that get further and further apart as distance from the transmitter increases.

Motorola is constantly searching to improve our coverage model predictions. An important step in this process is the incorporation of empirical data into the Hydra model. This process starts with lab and real-world measurements of the performance of our subscribers and systems, along with the accessories available to the user. This constant improvement and testing is continued with each Coverage Acceptance Test Procedure (CATP) performed by our field teams for our customers. These CATP results are brought back to our coverage design team and analyzed against the predicted coverage from the Hydra tool. Leveraging the results of CATP test runs conducted each year allows Motorola to continue to assess and improve the accuracy of our predicted coverage models and guard against variances between predicted and measured coverage levels.

Inputs and Outputs

Inputs to Hydra's simulations include system architecture, equipment characteristics, service area boundaries, areas of various building losses, subscriber unit distribution density for Traffic analysis, etc. Hydra's coverage map outputs are created and displayed using ESRI's shapefiles, an industry-standard GIS file format. Shapefiles from many sources (GIS vendors, the Internet, your own GIS department, etc.) can be loaded, displayed, and used in Hydra to enhance mapping, and to define service area polygons. Hydra's coverage analyses can be limited to specified service area polygons (e.g., a county, an APS, or a dispatch territory), so coverage reliability can be analyzed exclusively within the boundaries of your operating area. In addition to showing coverage reliability, Hydra maps can display terrain, land cover, roads and boundaries, signal field strength, and interference predictions.

Tile Method

Hydra uniformly divides the entire geographical area to be analyzed into small, distinct areas called tiles. The resolution (size) of the tiles can be as fine as one arc-second (approximately 100 feet at U.S. latitudes). At each tile, Hydra models propagation from each site in the system. The tile method is of particular importance in the calculation of interference analysis.

Radial methods determine performance only at the locations where radials from all sites cross, leaving many areas where coverage performance is not calculated. With the tile method, the information from every site and all datasets is available in every tile; this provides the most accurate results for Multi-site analyses (simulcast, voting, interference, best server, etc.).

Datasets

For propagation prediction, Hydra uses two types of geophysical datasets:

- Hypsographic (terrain elevations)—To determine shadow loss and elevation.
- Morphological (land use)—For environmental clutter loss.



With the proper datasets, Hydra produces accurate results. Because propagation prediction accuracy is directly dependent on the quality of the digitized datasets, Motorola uses high-quality datasets for its analysis. These datasets originate from commercial or government sources such as the U.S. Geological Survey in the United States and equivalent geodata providers worldwide.

Even the best datasets contain a certain amount of errors, caused by a number of factors that are difficult to completely overcome due to the massive amount of data involved. Dataset errors can originate in the source information or in the dataset development process. Old datasets can also contribute to errors due to physical changes that have taken place since the development of the dataset.

Hydra, like all terrain-based propagation tools, provides coverage predictions that are only as accurate as the available datasets permit. In the U.S., Motorola uses high-quality terrain and land cover data derived from USGS 30-meter DEM and NLCD 2006 sources. Other datasets which Hydra can use include the following:

- Planimetric (Mapping)—roads, water features, political boundaries, feature names, etc.
- U.S. Radio Site Locations—coordinates of existing radio sites, including FCC Wireless Licenses, FCC Antenna Site Registry, and some commercial site providers.
- U.S. Frequencies—potentially available channels in geographic areas, per FCC Wireless Licenses.

Coverage Reliability

Hydra predicts area reliability, defined as the probability of achieving a specified performance criterion within a geographical area of interest. The area of interest is either the covered area (the painted area on a Hydra coverage map), or the entire service area. Possible criteria include voice Delivered Audio Quality (DAQ), data throughput or data Message Success Rate (MSR).

Since system coverage can never be one-hundred percent reliable, there will always be particular times and locations where the signal strength or BER does not meet that needed to reach the performance criterion. These locations of unsatisfactory performance are often predictable in a coverage study. However, there are also areas of unsatisfactory coverage that cannot be predicted due to unknown circumstances such as unusual structures, tree density, ambient noise, atmospheric conditions, dataset errors, and interference from co-channel or adjacent channel units operating outside their normal service area. Because these conditions exist and signals fade due to these environmental and terrain factors, coverage must be described statistically in terms of a percentage of locations that exhibit the minimum acceptable criterion.

Voice Systems

Hydra's coverage models use proven Okumura-based prediction methods and Monte Carlo simulation techniques to provide coverage reliability maps. Voice coverage models in an ASTRO 25 system provide system wide coverage maps, as well as subsystem maps when applicable, (e.g., for simulcast cells and receiver voting), and individual site maps.

C1.14.2 Coverage Maps

Motorola has included, as required by the RFP, the coverage maps listed in the table (Table 1-14:below). All coverage maps referenced in this proposal indicate areas where a minimum 95% reliability exists of achieving a Delivered Audio Quality (DAQ) of 3.4. Both the FDMA and TDMA coverage maps have been included in this proposal, but only the FDMA maps will perform a coverage acceptance test.

Maps are provided for both the mobile and portable subscriber configurations. The mobile configuration assumes a unity gain mobile antenna mounted in the center of the vehicle roof at a height of 4.9 feet. The portable radio configuration assumes a swivel case at hip level with ½ wave antenna and a remote speaker microphone.

Table 1-14: RFP required coverage maps list.

Phase	Subscriber	Direction	Type
Phase 1 FDMA	Portable	Outbound	On Street
Phase 1 FDMA	Portable	Inbound	On Street
Phase 1 FDMA	Mobile	Outbound	On Street
Phase 1 FDMA	Mobile	Inbound	On Street
Phase 2 TDMA	Portable	Outbound	On Street
Phase 2 TDMA	Portable	Inbound	On Street
Phase 2 TDMA	Mobile	Outbound	On Street
Phase 2 TDMA	Mobile	Inbound	On Street

C1.15 LOADING ANALYSIS

Modeling voice traffic is required to determine the appropriate number of voice channels which will provide a required Grade of Service (probability of blocked calls), for a specified number of users and talkgroups, which generate a defined amount of voice traffic. Radio system coverage and capacity are inter-dependent. Radio systems are designed to provide reliable RF coverage within defined area (s); users will be distributed throughout the coverage area(s), generating voice traffic loading on the system.

Motorola has modeled the expected traffic on the City of Riverside Public Utilities network utilizing the trunking profile provided on the RFP which includes the number of messages per hour, number of PTT's during a message, length of PTT spurt and hang time.

Methodology

Two methods can be used to model traffic within a system:

- Analytical modeling, using general mathematical formulas
- Simulation, using a computer program which models the behavior of a specific system

The analytical method provides simple-to-use formulas; however, the applicability and limitations of these formulas must be understood to avoid misusing them. Simulation can be somewhat more complex, but is specifically applicable to the system to be modeled, and therefore provides the most accurate results (when given accurate inputs). Because of the statistical information provided in the RFP, the analytical method was used in order to obtain the number of active units during busy hour as requested on the RFP.

The formula used to derive the active units during busy hour is as follows:

ErlangsTALKGROUP =

Active Units in Talkgroup x Call Rate x (Message Length + Repeater Hang Time + Tear Down Time
3600



Parameters

To account for the time between calls and the final hang time, four seconds was added to message length. In addition, one second was included to account for the channel not being immediately available. An additional two seconds was assumed between the number of PTTs where the hang time does not elapse.

Results

Based on the Motorola's talkgroup setting, message trunking mode, and the trunking profile provided on the RFP, the number of active users and the number of talkpaths required for the system during the busy hour are shown in Table 1-15: Loading Analysis. For instance, with 6 talkpaths or 7 channels in the system, the system can have 250 active users during the busy hour with 1.74% erlangs and a Grade of Service (GOS) of 1%. Additionally, with 9 talkpaths or 10 channels, the system can have 500 active users during the hour with 3.47 erlangs and a 1.02% GOS.

Table 1-15: Loading Analysis

NUMBER OF USERS	TALKPATHS	CHANNELS	ERLANGS	% GRADE OF SERVICE
250	6	7	1.74	1.00
500	9	10	3.47	1.02
750	11	12	5.20	1.90
1000	14	15	6.90	1.26

C1.16 POWER REQUIREMENTS

The power consumption for each piece of equipment at a particular location is provided in the following table Table 4-15. Per the RFP requirement, all equipment deployed is AC. However, the RF site equipment is capable of both AC and DC.

Table 1-16: Power Requirements

UTILITIES OPERATION CENTER MASTER SITE								
CABINET 1								
DESCRIPTION	AC/DC	WATTS	BTU/HR	AMPS	VAC	TOTAL WATTS	TOTAL AMPS	TOTAL BTU/HR
OUT OF BAND MANAGEMENT	AC	120	410	1.00	120	120	1.00	410
CORE LAN SWITCH (PS1)	AC	720	2457	6.00	120	720	6.00	2457
CORE LAN SWITCH (PS2)	AC	720	2457	6.00	120	720	6.00	2457
CORE ROUTER	AC	48	164	0.40	120	48	0.40	164
GATEWAY ROUTER	AC	48	164	0.40	120	48	0.40	164
EXIT ROUTER	AC	48	164	0.40	120	48	0.40	164
VMS (PS1)	AC	800	2730	6.67	120	800	6.67	2730
VMS (PS2)	AC	800	2730	6.67	120	800	6.67	2730
NAS	AC	90	307	0.75	120	90	0.75	307
NAS	AC	90	307	0.75	120	90	0.75	307
BORDER ROUTER	AC	48	164	0.40	120	48	0.40	164
DMZ SWITCH	AC	28	96	0.23	120	28	0.23	96
CEN SWITCH	AC	28	96	0.23	120	28	0.23	96
CEN Firewall	AC	50	171	0.42	120	50	0.42	171
GGSN	AC	28	96	0.23	120	28	0.23	96
BACKHAUL SWITCH	AC	48	164	0.40	120	0	0.00	0
ISGW (PS1)	AC	800	2730	6.67	120	800	6.67	2730

ISGW (PS2)	AC	800	2730	6.67	120	800	6.67	2730
ENABLEMENT SERVER (PS1)	AC	800	2730	6.67	120	800	6.67	2730
ENABLEMENT SERVER (PS2)	AC	800	2730	6.67	120	800	6.67	2730
FIREWALL	AC	50	171	0.42	120	50	0.42	171
MONITOR/KEYBOARD/MOUSE	AC	24	82	0.20	120	24	0.20	82
KVM	AC	48	164	0.40	120	48	0.40	164
TOTALS						6988	58	23850

CABINET 2

DESCRIPTION	AC/DC	WATTS	BTU/HR	AMPS	VAC	TOTAL WATTS	TOTAL AMPS	TOTAL BTU/HR
AIS	AC	700	2389	5.83	120	700	5.83	2389
VPM	AC	50	171	0.42	120	50	0.42	171
VERINT LOGGING RECORDER (PS1)	AC	750	2560	6.25	120	750	6.25	2560
VERINT LOGGING RECORDER (PS2)	AC	750	2560	6.25	120	750	6.25	2560
NAS	AC	90	307	0.75	120	90	0.75	307
COMPASS SERVER	AC	800	2730	6.67	120	800	6.67	2730
LCAM	AC	460	1570	3.83	120	460	3.83	1570
PDEG	AC	60	205	0.50	120	60	0.50	205
IDS	AC	595	2031	4.96	120	595	4.96	2031
IDS SWITCH	AC	28	96	0.23	120	28	0.23	96
TOTALS						4283	36	14618

DESCRIPTION	AC/DC	WATTS	BTU/HR	AMPS	VAC	TOTAL WATTS	TOTAL AMPS	TOTAL BTU/HR
NM CLIENT	AC	700	2389	5.83	120	700	5.83	2389
MONITOR	AC	18	61	0.15	120	18	0.15	61
TOTALS						718	5.98	2451

BOX SPRINGS ASTRO SITE REPEATER

DESCRIPTION	AC/DC	WATTS	BTU/HR	AMPS	VAC	TOTAL WATTS	TOTAL AMPS	TOTAL BTU/HR
SITE ROUTER	AC	48	164	0.40	120	48	0.40	164
SDM3000	AC	25	85	0.21	120	25	0.21	85
TOTALS						73	0.61	249

DESCRIPTION	AC/DC	WATTS	BTU/HR	AMPS	VAC	TOTAL WATTS	TOTAL AMPS	TOTAL BTU/HR
GTR8000 POWER SUPPLY #1	AC	1200	4096	10.00	120	1200	10.00	4096
GTR8000 POWER SUPPLY #2	AC	1200	4096	10.00	120	1200	10.00	4096
GTR8000 POWER SUPPLY #3	AC	1200	4096	10.00	120	1200	10.00	4096
GTR8000 POWER SUPPLY #4	AC	1200	4096	10.00	120	1200	10.00	4096
GTR8000 POWER SUPPLY #5	AC	1200	4096	10.00	120	1200	10.00	4096
GTR8000 POWER SUPPLY #6	AC	1200	4096	10.00	120	1200	10.00	4096
TOTALS						7200	60	24574

DESCRIPTION	AC/DC	WATTS	BTU/HR	AMPS	VAC	TOTAL WATTS	TOTAL AMPS	TOTAL BTU/HR
GTR8000 POWER SUPPLY #7	AC	1200	4096	10.00	120	1200	10.00	4096
GTR8000 POWER SUPPLY #8	AC	1200	4096	10.00	120	1200	10.00	4096
GTR8000 POWER SUPPLY #9	AC	1200	4096	10.00	120	1200	10.00	4096
GTR8000 POWER SUPPLY #10	AC	1200	4096	10.00	120	1200	10.00	4096
GTR8000 POWER SUPPLY #11	AC	1200	4096	10.00	120	1200	10.00	4096
TOTALS						6000	50	20478

July 28, 2016
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City of Riverside
Design and Installation of Land Mobile Radio



UTILITIES OPERATION CENTER DISPATCH SITE

RACK

DESCRIPTION	AC/DC	WATTS	BTU/HR	AMPS	VAC	TOTAL WATTS	TOTAL AMPS	TOTAL BTU/HR
SITE ROUTER	AC	20	68	0.17	120	20	0.17	68
SITE SWITCH	AC	28	96	0.23	120	28	0.23	96
CONVENTIONAL SITE CONTROLLER	AC	150	512	1.25	120	150	1.25	512
ECCGW	AC	48	164	0.40	120	48	0.40	164
ECCGW	AC	48	164	0.40	120	48	0.40	164
TOTALS						294	2.45	1003

MCC 7100 Op 1

DESCRIPTION	AC/DC	WATTS	BTU/HR	AMPS	VAC	TOTAL WATTS	TOTAL AMPS	TOTAL BTU/HR
DISPATCH CONSOLE PC	AC	700	2389	5.83	120	700	5.83	2389
AIM	AC	6	20	0.05	120	6	0.05	20
SPEAKERS	AC	6	20	0.05	120	12	0.10	41
22" MONITOR	AC	18	61	0.15	120	18	0.15	61
TOTALS						736	6.13	2512

MCC 7100 Op 2

DESCRIPTION	AC/DC	WATTS	BTU/HR	AMPS	VAC	TOTAL WATTS	TOTAL AMPS	TOTAL BTU/HR
DISPATCH CONSOLE PC	AC	700	2389	5.83	120	700	5.83	2389
AIM	AC	6	20	0.05	120	6	0.05	20
SPEAKERS	AC	6	20	0.05	120	12	0.10	41
22" MONITOR	AC	18	61	0.15	120	18	0.15	61
TOTALS						736	6.13	2512

MCC 7100 Op 3

DESCRIPTION	AC/DC	WATTS	BTU/HR	AMPS	VAC	TOTAL WATTS	TOTAL AMPS	TOTAL BTU/HR
DISPATCH CONSOLE PC	AC	700	2389	5.83	120	700	5.83	2389
AIM	AC	6	20	0.05	120	6	0.05	20
SPEAKERS	AC	6	20	0.05	120	12	0.10	41
22" MONITOR	AC	18	61	0.15	120	18	0.15	61
TOTALS						736	6.13	2512

RIVERSIDE ENERGY RESOURCE CENTER DISPATCH SITE

RACK

DESCRIPTION	AC/DC	WATTS	BTU/HR	AMPS	VAC	TOTAL WATTS	TOTAL AMPS	TOTAL BTU/HR
SITE ROUTER	AC	20	68	0.17	120	20	0.17	68
SITE SWITCH	AC	28	96	0.23	120	28	0.23	96
TOTALS						48	0.40	164

MCC 7100 Op 1

DESCRIPTION	AC/DC	WATTS	BTU/HR	AMPS	VAC	TOTAL WATTS	TOTAL AMPS	TOTAL BTU/HR
DISPATCH CONSOLE PC	AC	700	2389	5.83	120	700	5.83	2389
AIM	AC	6	20	0.05	120	6	0.05	20
SPEAKERS	AC	6	20	0.05	120	12	0.10	41
22" MONITOR	AC	18	61	0.15	120	18	0.15	61
TOTALS						736	6.13	2512

MCC 7100 Op 2

DESCRIPTION	AC/DC	WATTS	BTU/HR	AMPS	VAC	TOTAL WATTS	TOTAL AMPS	TOTAL BTU/HR
DISPATCH CONSOLE PC	AC	700	2389	5.83	120	700	5.83	2389
AIM	AC	6	20	0.05	120	6	0.05	20
SPEAKERS	AC	6	20	0.05	120	12	0.10	41
22" MONITOR	AC	18	61	0.15	120	18	0.15	61
TOTALS						736	6.13	2512

C1.17 FAILURE MODE ANALYSIS

The proposed radio system includes several modes of degraded operation, automatically falling over to each mode through a graceful switchover process. The failure mode analysis contained here is comprehensive, representing each fallback process with a detailed discussion of the failure, the result, and the impact to user operation. The following scenarios are described:

- **Master site failures:**
 - Zone controller.
 - Network Management Client.
 - Main Master site.
- **ASTRO 25 Site Repeater (ASR) Sites.**
 - Main gateway (or site link).
 - Main site controller.
 - Single control channel or voice channel.
- **Dispatch site failures:**
 - Dispatch operator position.
 - Main site gateway (or site link).



Zone Controller Failure

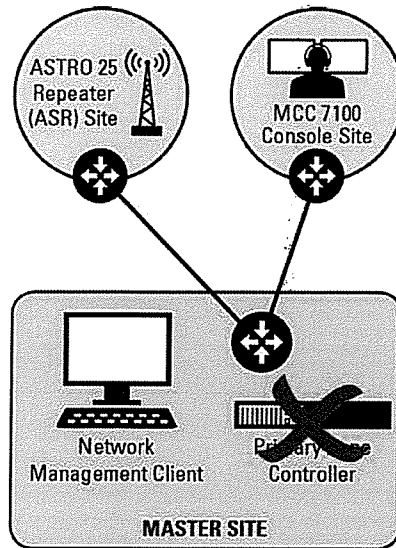


Figure 1-12: Failure of Zone Controller.

Scenario:	Failure of Zone controller at the Master Site.
Result:	In the unlikely event that the master site experiences a catastrophic failure and becomes unavailable, the ASTRO 25 Site Repeater will enter site trunking mode where affiliated subscribers can continue to communicate with other subscribers and resources on the entire cell. Wireline console, data services, and network management services are suspended.
Protection:	Backup communications can be performed through the proposed MCC 7100 dispatch consoles via control stations. Although not an RFP requirement, geographically redundant master site equipment is an available option from Motorola.
Detection:	Alarm on NMS Terminal, site trunking indication

Network Management Client Failure

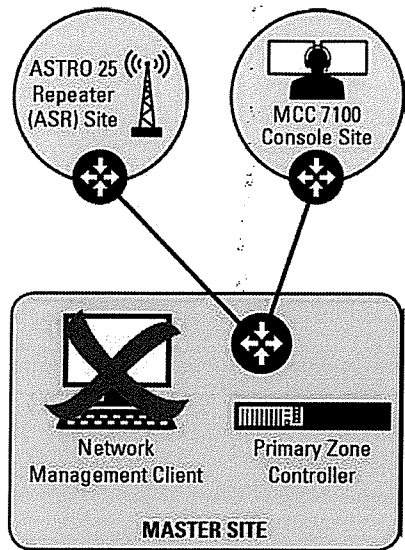


Figure 1-13: Failure of Network Management Client.

Scenario:	Failure of Network Management Client computer at the Master Site.
Result:	The failure of the Network Management at the master site will result in loss of the management function associated with the Network Management computer, while the entire system will remain in the wide area trunking mode. The failure is transparent to all radio and dispatch console users. The failure will affect the Network Management system user.
Protection:	A second Network Management Client computer is proposed in the design.
Detection:	Alarm on NMS Terminal

Main Master Site Failure

Failure of Entire Main System Controller Core

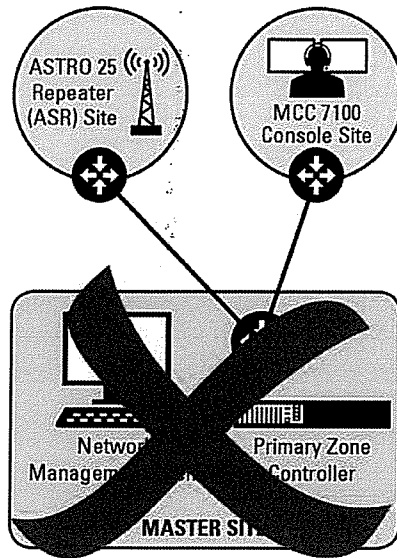


Figure 1-14: Failure of Main System Controller Site

Scenario:	Failure of entire Main System Controller Site.
Result:	In the unlikely event that the master site experiences a catastrophic failure and becomes unavailable, the ASTRO 25 Site Repeater will enter site trunking mode where affiliated subscribers can continue to communicate with other subscribers and resources on the entire cell. Wireline console, data services, and network management services are suspended.
Protection:	Backup communications can be performed through the proposed MCC 7100 dispatch consoles via control stations. Although not an RFP requirement, geographically redundant master site equipment is an available option from Motorola.
Detection:	Alarm on NMS Terminal, site trunking indication

Standalone Trunked Repeater Site Failure Scenarios

Failure of ASTRO Site Repeater (ASR) Gateway (or Site Link)

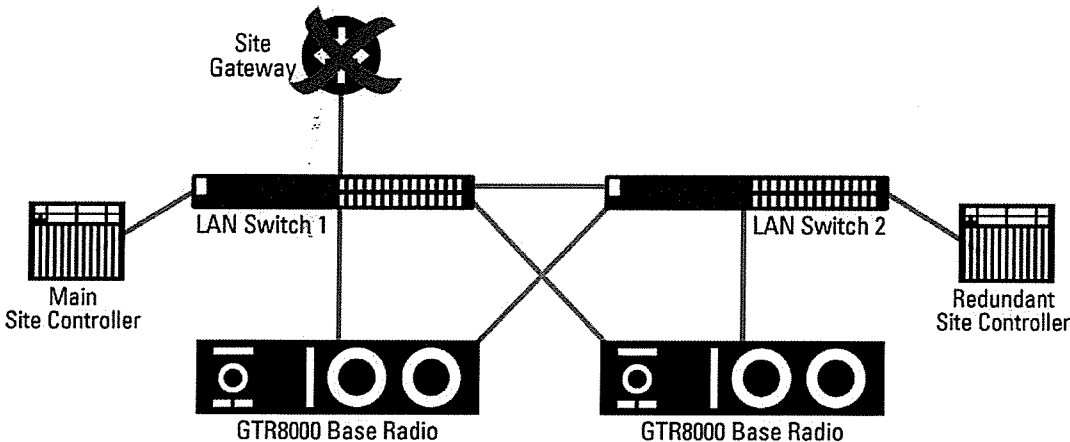


Figure 1-15: Failures of either ASR gateways (or site links).

Scenario:	Failure of ASTRO Site Repeater (ASR) Gateway or Site Link.
Result:	<p>In the unlikely event that the ASR gateway or site link fails, the ASR will revert to site trunking mode of operation. The ASR will continue to operate in site trunking mode until the wide area connection is restored by replacing the failed site gateway with a fully functional spare.</p> <p>Subscriber radio units in the field affiliated to the ASR will go into site trunking mode of operation. If the subscriber units are programmed for use only on the ASR, they will remain in site trunking until the ASR is restored to wide area trunking operation. Subscriber units affiliated to the ASR and in site trunking mode can communicate to each other. They can communicate with the dispatch operators, if the dispatch operators have a backup control station affiliated to the ASR.</p>
Protection:	Spare Site Gateway, Backup Control Stations at Dispatch Locations.
Detection:	Alarm on Manager Terminal.



Failure of ASTRO Site Repeater (ASR) Main Site Controller

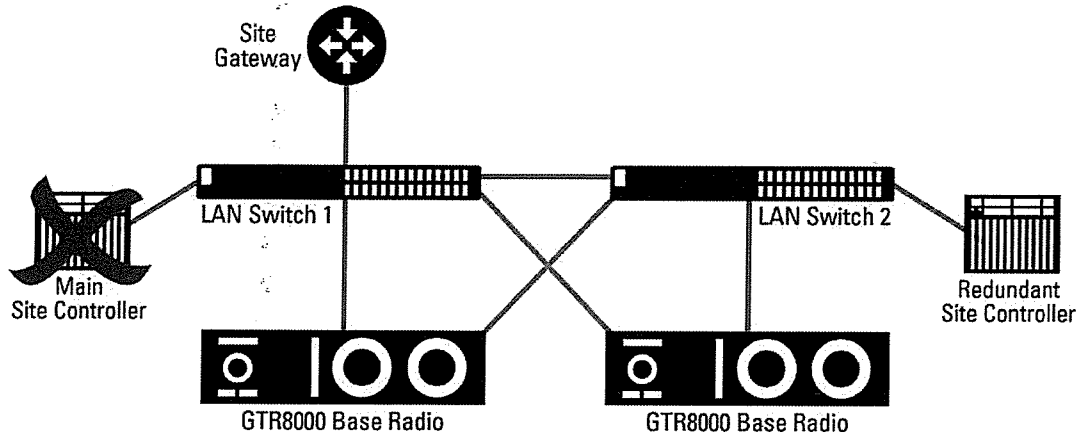


Figure 1-16: Failure of ASTRO Site Repeater (ASR) main site controller.

Scenario:	Failure of ASTRO Site Repeater (ASR) Main Site Controller.
Result:	Motorola has provided redundant site controllers at the ASR sites. Failure of the active controller will result in automatic switchover to the redundant site controller. The site remains in wide area trunking mode. The failure is transparent to all voice system users. Dispatch console operation remains unaffected.
Protection:	Redundant ASR Controller.
Detection:	Alarm on Manager Terminal.

Failure of ASTRO Site Repeater (ASR) Single Control Channel or Voice Channel

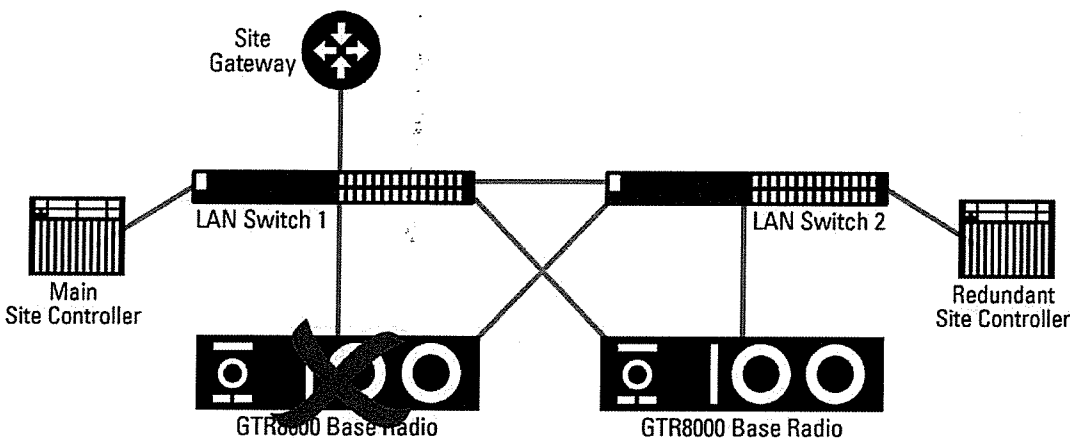


Figure 1-17: Failure of single control channel or voice channel.

Scenario:	Failure of a Single Control Channel or Voice Channel.
Result:	<p>Motorola trunking systems provide up to four possible control channels in an ASR. If the currently active control channel fails, another channel automatically takes over and the failed control channel is automatically taken out of service. All other channels at the ASR remain unaffected. The ASR remains in the wide-area trunking mode. The failure is transparent to all system users. Dispatch console operation remains unaffected. In a trunking system, multiple channels inherently provide redundancy for ASR.</p> <p>The failure of one voice channel will be transparent to all system users. The failure of a voice channel base station will result in the zone controller removing that channel from service, resulting in some reduced channel capacity. Any calls in progress on the failed channel will be lost, and on the next push-to-talk, radio traffic will be restored on another channel. All other channels in the ASR remain unaffected. The entire system remains in the wide area trunking mode. Dispatch console operation remains unaffected.</p>
Protection:	Multiple potential control channels.
Detection	Alarm on NMS Terminal.



Dispatch Site Failure Scenarios

Failure of a Dispatch Operator Position

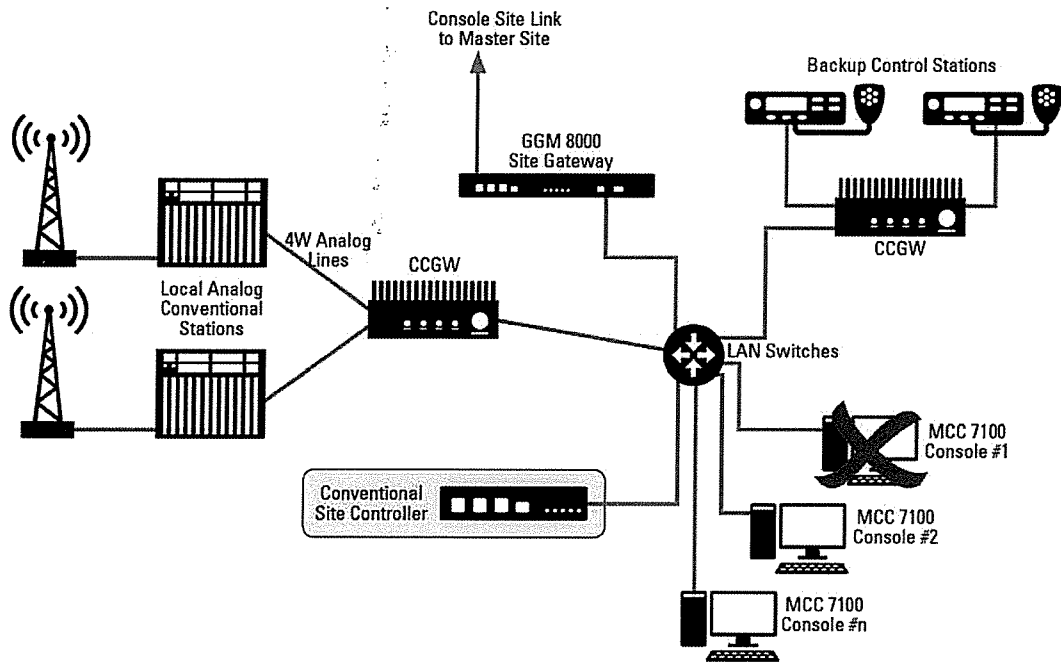


Figure 1-18: Failure of single MCC7100 console position.

Scenario:	Failure of a Single Dispatch Operator Position.
Result:	The failure of a dispatch operator position would result in that particular dispatcher moving to another operator position or reverting to a fallback control station or portable radio. All other dispatch terminals operate normally and remain unaffected. The entire system remains in the wide area trunking mode.
Protection:	Multiple Consoles, Backup Control Stations.
Detection:	Console User Detection, Console Diagnostics.

Failure of Site Gateway or Site Link at Dispatch Site

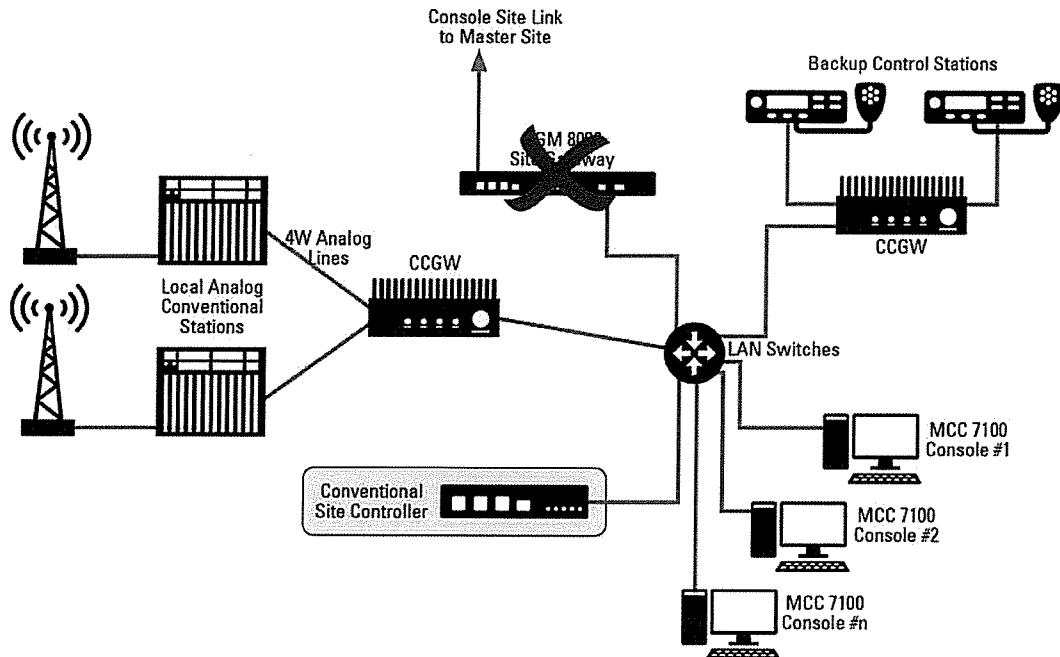


Figure 1-19: Failure of main & redundant dispatch site gateways.

Scenario:	Failure of Dispatch Site Gateway or Site Link.
Result:	In the unlikely event that the Site Gateway and Site Link should fail, the dispatch site would lose wide area connectivity through the System Controllers. But trunking operations would continue via backup control stations within the coverage footprint of the trunking site, connected to the console dispatch position. Conventional system communications would continue unaffected through conventional stations that are connected to the local console network LAN, as the conventional site controller takes over site operation.
Protection:	Spare Site Gateway, Backup Control Stations, Conventional Site Controller.
Detection	Alarm on Network Management Terminal (UEM).



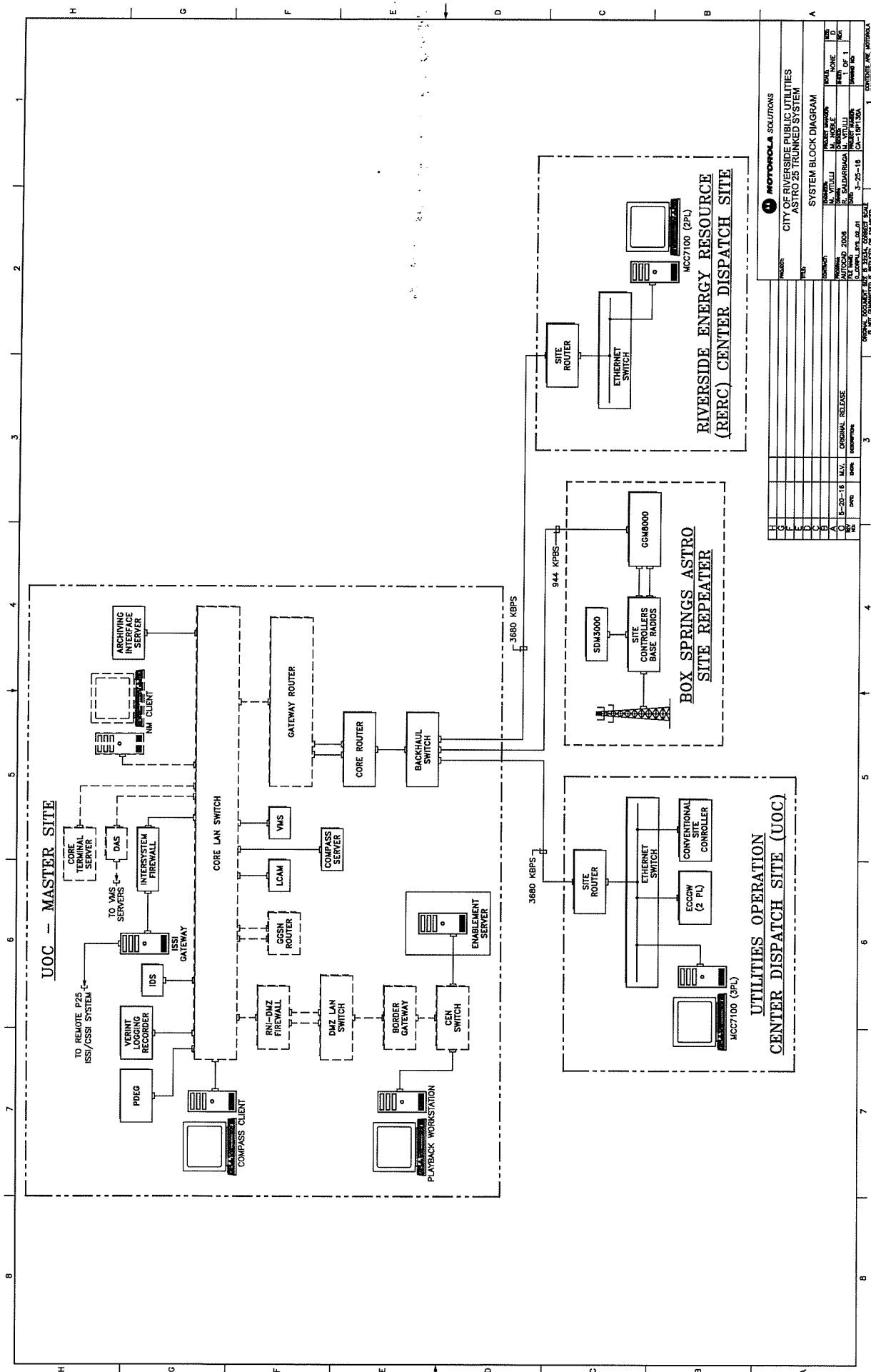
C1.18 SYSTEM BLOCK DIAGRAMS

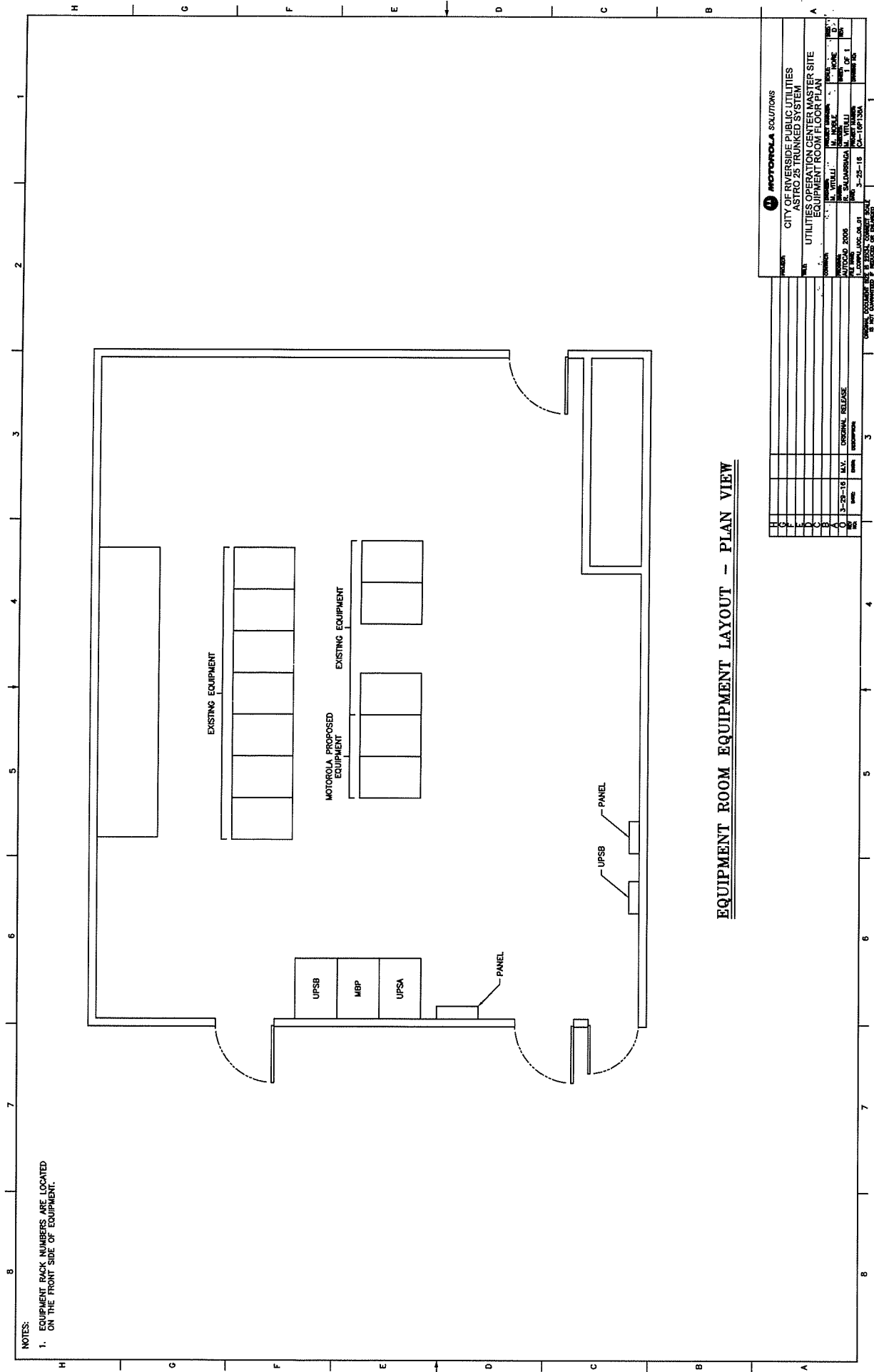
Motorola has provided the following System Block Diagrams.



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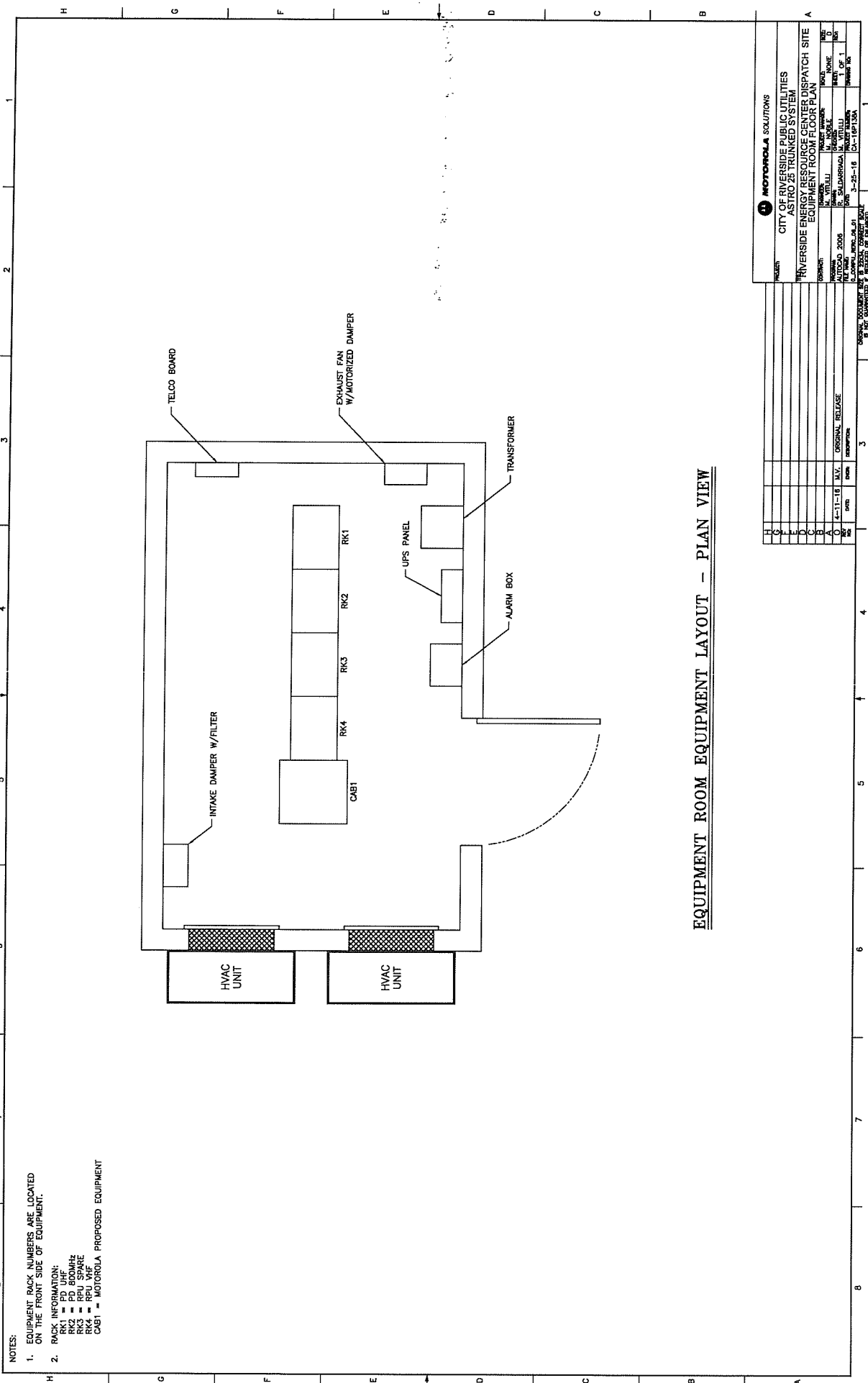
NOTES:
 1. EQUIPMENT RACK NUMBERS ARE LOCATED ON THE FRONT SIDE OF EQUIPMENT.

EQUIPMENT ROOM EQUIPMENT LAYOUT - PLAN VIEW

MOTOROLA SOLUTIONS CITY OF RIVERSIDE PUBLIC UTILITIES ASTRO 25 TRUNKED SYSTEM UTILITIES OPERATION CENTER MASTER SITE EQUIPMENT ROOM FLOOR PLAN	
DATE	3-22-16
BY	W. VITELLI
CHECKED BY	W. VITELLI
APPROVED BY	W. VITELLI
DATE OF REVIEW	3-22-16
REVISION NO.	1

NO.	DESCRIPTION	DATE	BY	CHKD.	APPD.
1	ORIGINAL RELEASE	3-22-16	W. VITELLI		
2	REVISION				
3					
4					
5					
6					
7					
8					

ORIGINAL DOCUMENT IS TO BE KEPT ON FILE
 IF NOT CURRENTLY IN FILE



EQUIPMENT ROOM EQUIPMENT LAYOUT - PLAN VIEW

PROPOSAL TO
CITY OF RIVERSIDE

EXHIBIT C-2

EQUIPMENT LIST

DESIGN AND INSTALLATION OF LAND MOBILE RADIO

JULY 28, 2016

RFP NO. 1558



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TABLE OF CONTENTS

Section C- 2

Equipment List	2-1
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EQUIPMENT LIST

QTY	MODEL NUMBER	DESCRIPTION	MANUFACTURER
1	SQM01SUM0274	SINGLE ZONE TRUNKED L CORE	MOTOROLA
1	CA02881AA	ADD: NON REDUNDANT CORE	MOTOROLA
1	CA01664AB	ADD: CABINET	MOTOROLA
1	UA00156AA	ADD: MCC7500 CONSOLE LICENSES (QTY 5)	MOTOROLA
1	UA00165AA	ADD: RADIO AUTH 500 USER LIC	MOTOROLA
1	CA01741AE	ADD: SECURITY BUNDLE	MOTOROLA
1	CA02472AC	ADD:RADIO AUTHENTICATION	MOTOROLA
1	CA01786AD	ADD:TRUNKED INTEGRATED DATA	MOTOROLA
1	UA00138AA	ADD: FLEXIBLE ATIA	MOTOROLA
1	ZA00103AA	ENH: TECHNICAL ASSISTANCE, TEN HOURS	MOTOROLA
1	UA00139AA	ADD: NORTHBOUND INTERFACE	MOTOROLA
1	UA00225AA	ADD: UEM ENHANCED NAVIGATION	MOTOROLA
1	UA00227AA	ADD: UEM SNMP ELEMENT MANAGEMENT TOOLKIT (QTY 10)	MOTOROLA
1	CA01750AA	ADD: TERMINAL SERVER	MOTOROLA
4	CA02087AA	ADD: ENCRYPTION (7.12 OR LATER)	MOTOROLA
4	CA02134AA	ADD: COMMON CRITERIA	MOTOROLA
13	CA02193AA	ADD: ANTI-MALWARE DEF UPDATE LIC	MOTOROLA
1	UA00150AA	ADD: DYNAMIC REPORTS	MOTOROLA
1	UA00151AA	ADD: AFFLIATION USER RPTS	MOTOROLA
2	DSSTCU8000100	SEAGATE : 8TB BUSINESS STORAGE 4-BAY NAS	SEAGATE
1	TT2912	3YR 25U LICS 25 SID700 AND 25 SW TO	RSA
1	TT05699	RSA ACE SERVER MAINTENANCE FOR 25 CLIENT ACCESS LICENSES	RSA
7	T7885	MCAFFEE WINDOWS AV CLIENT	MCAFFEE
1	TT2833	COMPUTER, Z440 WORKSTATION WINDOWS 7 (NON RETURNABLE)	HEWLETT PACKARD
1	T8206	ASTRO CLIENT APPL SW 7.16	MOTOROLA
1	DSTG221	TECH GLOBAL EVOLUTION SERIES 22INCH NON TOUCH	TECH GLOBAL
1	DDN9657	CRYSTAL REPORTS	SYNNEX
1	T8122	ASTRO 7.15 RADIO AUTHENTICATION CLIENT SOFTWARE	MOTOROLA
1	TT2833	COMPUTER, Z440 WORKSTATION WINDOWS 7 (NON RETURNABLE)	HEWLETT PACKARD
1	DSTG221	TECH GLOBAL EVOLUTION SERIES 22INCH NON TOUCH	TECH GLOBAL



QTY	MODEL NUMBER	DESCRIPTION	MANUFACTURER
1	DDN1933	PURCHASED SOFTWARE,FORTITOKEN PACK	FORTINET
1	TT2022	MRV - LX4000T 8 PORT TERMINAL SERVER, NO DIAL-UP MODEM INCLD.	MRV
1	DSNEYW1	NCP SECURE ENTRY CLIENT/VPN FOR WINDOWS (WIN32-64)	NCP
1	DSTEL6209548200010	ANALOG MODEM V3600 110 120VAC SA UI	RAYMAR
1	L3612	IDS: PROVENTIA GX4004V2 SERIES COMPLETE SYSTEM (12 MONTHS MNT)	IBM
1	CLN1856	2620-24 ETHERNET SWITCH	MOTOROLA
1	SQM01SUM0257	UNIFIED NETWORK SERVICES	MOTOROLA
1	CA02384AB	ADD: UNIFIED NETWORK SERVICES SOFTWARE	MOTOROLA
1	CA02354AA	ADD: ASTRO NETWORK APPLICATION INTERFACE	MOTOROLA
1	UA00014AA	ADD: 401-500 DEVICES FOR LOCATION	MOTOROLA
1	UA00055AA	ADD: 401-500 DEVICES FOR PRESENCE	MOTOROLA
1	CA03061AA	ADD: LOW CAPACITY/GEO REDUNDANT	MOTOROLA
1	DSCCOMPASSLDE	COMPASSLDE SERVER SOFTWARE	MOTOROLA
1	DSCCASTROLOCATIO N	COMPASSLDE ASTRO OUTDOOR LOCATION SERVER INTERFACE	COMPASS COM
273	DSCCASTRORADIO	COMPASSLDE PER ASTRO RADIO WITH INTERNAL GPS NO SENSOR SUPPORT	COMPASS COM
1	DSCCWKSTESRI	COMPASSTRAC V6 JAVASCRIPT (BROWSER) WITH ESRI ELA	COMPASS COM
1	DDN1588	DL380 G8 HIGH TIER WINDOWS 8 EMB	HEWLETT PACKARD
20	DSCCMAPPINGSUPPO RT	COMPASSCOM MAPPING SUPPORT PER HOUR	COMPASS COM
5	DSCCONSITESUPPOR T	COMPASSCOM ONSITE SUPPORT PER DAY	COMPASS COM
40	DSCCREMOTESUPPO RT	COMPASSCOM REMOTE SUPPORT PER HOUR	COMPASS COM
1	TT2833	COMPUTER, Z440 WORKSTATION WINDOWS 7 (NON RETURNABLE)	HEWLETT PACKARD
1	DSTG221	TECH GLOBAL EVOLUTION SERIES 22INCH NON TOUCH	TECH GLOBAL
1	DSTRAK88353M	GPS CLOCK, 10MHZ, RUBIDIUM, 48V INCL ANT AND 100' COAX W/DONGLE SNMPV3	TRAK
1	DSTRAKP001134	AC POWER SUPPLY FOR 8835 GPS CLOCK	TRAK
1	DSTRAK4008245101	MOUNTING SHELF FOR 8835 GPS CLOCK	TRAK
1	CLN1856	2620-24 ETHERNET SWITCH	MOTOROLA
1	DQWQ46260537	REPL BY: DQOPSOCSEVER (HP PROLIANT ML310E GEN8 V2)	HEWLETT PACKARD
1	DQ417705B21	HP TOWER TO RACK CONV TRAY UNIVERSAL KIT	HEWLETT PACKARD

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City of Riverside
Design and Installation of Land Mobile Radio



QTY	MODEL NUMBER	DESCRIPTION	MANUFACTURER
1	DSLCA2GB	LOG CORRELATION AUDIT MANAGER - 2GB DAILY LOGGING	CORRELOG INC
1	B1905	MCC 7500 ASTRO 25 SOFTWARE	MOTOROLA
1	B1933	MOTOROLA VOICE PROCESSOR MODULE	MOTOROLA
1	CA00288AB	ADD: MCC 7500 ARCHIVING INTERFACE SERVER SOFTWARE LICENSE	MOTOROLA
1	CA00147AF	ADD: MCC 7500 SECURE OPERATION	MOTOROLA
1	CA00182AB	ADD: AES ALGORITHM	MOTOROLA
1	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN	MOTOROLA
1	T7885	MCAFFEE WINDOWS AV CLIENT	MCAFFEE
1	TT2833	COMPUTER, Z440 WORKSTATION WINDOWS 7 (NON RETURNABLE)	HEWLETT PACKARD
1	BLN1297	VPM POWER SUPPLY MOUNTING KIT	HEWLETT PACKARD
1	DQRIVERSIDEPUVER	VERINT RECORDING FOR CITY OF RIVERSIDE PUBLIC UTILITY	VERINT
1	DSSTCU8000100	SEAGATE : 8TB BUSINESS STORAGE 4-BAY NAS	SEAGATE
1	TT2833	COMPUTER, Z440 WORKSTATION WINDOWS 7 (NON RETURNABLE)	HEWLETT PACKARD
1	DSTG221	TECH GLOBAL EVOLUTION SERIES 22INCH NON TOUCH	TECH GLOBAL
1	CDN6673	CREATIVE LABS INSPIRE A60	CREATIVE LABS
1	DDN2092	17 IN LCD DRAWER WITH KEYBOARD AND MOUSE, KVM 16 PORTS, CABLES	NICE
1	DSTG1A220CB	CHATSWORTH GLOBAL FRAME CABINET 24IN W 79IN H 39IN D BLACK	CHATSWORTH
2	DS12086719	CHATSWORTH 19W INCH ADJUSTABLE TIE-DOWN TOWER BRACKET-BLACK	CHATSWORTH
2	DDN9748	19 INCH BLACK SHELF	CHATSWORTH
1	T7539	ASTRO 25 PDEG ENCRYPTION UNIT	MOTOROLA
1	CA00182AT	ADD: AES DATA ENCRYPTION	MOTOROLA
1	CA01483AA	ADD: ASTRO 25 EID OPERATION	MOTOROLA
1	TKN9282	RACK SUPPORT BRACKET	MOTOROLA
1	TKN9283	RACK MOUNTING PLATE	MOTOROLA
1	DLN6693	RS232 CABLE FOR CRYPTOR	MOTOROLA
8	DSRMP420B	SPD, TYPE 3, 120V RACK MOUNT, 20A STD PLUG-IN INPUT W/ 4 OUTLETS PER	TRANSTECTOR SYSTEMS
1	T7537B	KVL 4000 PDA SNAP-ON	MOTOROLA
1	U239AD	ADD: ASTRO 25 MODE	MOTOROLA
1	QA01767AA	ADD: KVL RADIO AUTHENTICATION	MOTOROLA
1	CA01598AA	ADD: AC LINE CORD US	MOTOROLA
1	CA00182AP	ADD: AES ENCRYPTION SOFTWARE	MOTOROLA
1	C543	ADD: CABLE FOR RNC, DIU, MGE	MOTOROLA



QTY	MODEL NUMBER	DESCRIPTION	MANUFACTURER
1	C724	CABLE, KEYLOAD	MOTOROLA
1	CA01603AA	ADD: USB COMM/CHARGE CABLE W/ CUP	MOTOROLA
1	HKN6182	KEYLOADING CABLE ADAPTER (GCAI)	MOTOROLA
1	C725AA	ADD: KEYLOAD CABLE FOR APX PORTABLE	MOTOROLA
1	T7672	KVL 4000 OS HARDENING SW	MOTOROLA
1	TKN8209	CABLE KEYLOAD MX	MOTOROLA
1	DVN4046B	MASTER SYSTEM KEY STARTER KIT	MOTOROLA
1	DLN6972	FRU: DL380 G9 POWER SUPPLY	HEWLETT PACKARD
1	DLN6973	FRU: DL380 G9 FAN	HEWLETT PACKARD
1	DLN6971	FRU: DL380 G9 DVD DRIVE	HEWLETT PACKARD
1	DLN6880	DAS - CHASSIS ONLY	DOTHILL
1	DLN6878	DAS - 600 GB SAS HARD DRIVE	DOTHILL
1	DLN6978	FRU: DOTHILL 4524 RAID I/O CONTROLLER MODULE	DOTHILL
1	DLN6867	DAS POWER SUPPLY	DOTHILL
1	CKN6967	CABLE, DATA, MINI-SAS TO MINI-SAS HD, LENGTH 1M	MOTOROLA
1	SQM01SUM0205	GGM 8000 GATEWAY	MOTOROLA
1	CA01616AA	ADD: AC POWER	MOTOROLA
1	CA02087AA	ADD: ENCRYPTION (7.12 OR LATER)	MOTOROLA
1	CA02134AA	ADD: COMMON CRITERIA	MOTOROLA
1	CLN1856	2620-24 ETHERNET SWITCH	MOTOROLA
3	B1939	MCC 7100 IP Dispatch Position Main Model	MOTOROLA
3	CA01642AB	ADD: MCC 7100 BASIC CONSOLE FUNCTIONALITY SOFTWARE LICENSE	MOTOROLA
3	CA01644AA	ADD: MCC 7500 /MCC 7100 ADV CONVL OPERATION	MOTOROLA
3	CA02180AA	ADD: MCC 7100 SECURE OPERATION	MOTOROLA
3	CA01643AA	ADD: MCC 7500 / MCC 7100 TRUNKING OPERATION	MOTOROLA
3	CA02092AA	ADD: SOFTWARE AES, DES-OFB, ADP ENCRYPT KEY FILE MGMT	MOTOROLA
1	B1940	MCC 7100 DVD	MOTOROLA
3	DSEV221	TECH GLOBAL EVOLUTION SERIES 22INCH WITH TOUCH	TECH GLOBAL
3	TT2833	COMPUTER, Z440 WORKSTATION WINDOWS 7 (NON RETURNABLE)	HEWLETT PACKARD
3	CDN6673	CREATIVE LABS INSPIRE A60	CREATIVE LABS
3	B1941	USB AUDIO INTERFACE MODULE	MOTOROLA
3	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE	MOTOROLA
6	B1913	MCC SERIES HEADSET JACK	MOTOROLA
3	RLN6099A	HDST MODULE BASE W/PTT, 25' CBL	MOTOROLA

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QTY	MODEL NUMBER	DESCRIPTION	MANUFACTURER
3	T7885	MCAFFEE WINDOWS AV CLIENT	MCAFFEE
1	B1942	MCC7100 SOFTWARE LICENSING	MOTOROLA
3	UA00251AA	ADD: 15 CHANNEL SW LICENSE	MOTOROLA
3	UA00253AA	ADD: MCC 7100 INSTANT RECALL RECORDER LICENSE	MOTOROLA
1	CLN1856	2620-24 ETHERNET SWITCH	MOTOROLA
1	SQM01SUM0205	GGM 8000 GATEWAY	MOTOROLA
1	CA01616AA	ADD: AC POWER	MOTOROLA
1	CA02087AA	ADD: ENCRYPTION (7.12 OR LATER)	MOTOROLA
1	CA02134AA	ADD: COMMON CRITERIA	MOTOROLA
1	T7038	GCP 8000 SITE CONTROLLER	MOTOROLA
1	CA00303AA	ADD: QTY (1) SITE CONTROLLER	MOTOROLA
1	X153AW	ADD: RACK MOUNT HARDWARE	MOTOROLA
1	CA01136AA	MCC 7500 CONVEN SITE OPER	MOTOROLA
1	SQM01SUM0205	GGM 8000 GATEWAY	MOTOROLA
1	CA01616AA	ADD: AC POWER	MOTOROLA
1	CA02087AA	ADD: ENCRYPTION (7.12 OR LATER)	MOTOROLA
1	CA02134AA	ADD: COMMON CRITERIA	MOTOROLA
1	CA02086AA	ADD: HIGH DENSITY ENH CONV GATEWAY	MOTOROLA
1	SQM01SUM0205	GGM 8000 GATEWAY	MOTOROLA
1	CA01616AA	ADD: AC POWER	MOTOROLA
1	CA02087AA	ADD: ENCRYPTION (7.12 OR LATER)	MOTOROLA
1	CA02134AA	ADD: COMMON CRITERIA	MOTOROLA
1	CA02086AA	ADD: HIGH DENSITY ENH CONV GATEWAY	MOTOROLA
1	DS9130R27002036	UPS, 9130 RACKMT, 3000VA/2700W, 36 MINS RUNTIME	EATON
1	DSTLM615NC20	POWER STRIP, 6 OUTLET, 15 FT CORD, 20 AMP, METAL RECEPTACLE	TRIPP LITE
3	DSRMP420B	SPD, TYPE 3, 120V RACK MOUNT, 20A STD PLUG-IN INPUT W/ 4 OUTLETS PER	TRANSTECTOR SYSTEMS
1	DSTSJ100BT	SPD, RJ-48 8 PIN, 10/100 BASE T TSJ PROTECTS/PASSES ON ALL 8 PIN	TRANSTECTOR SYSTEMS
1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	TRANSTECTOR SYSTEMS
1	B1941	USB AUDIO INTERFACE MODULE	MOTOROLA
1	CDN6673	CREATIVE LABS INSPIRE A60	CREATIVE LABS
1	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE	MOTOROLA
1	B1913	MCC SERIES HEADSET JACK	MOTOROLA
1	TT2833	COMPUTER, Z440 WORKSTATION WINDOWS 7 (NON RETURNABLE)	HEWLETT PACKARD
2	B1939	MCC 7100 IP Dispatch Position Main Model	MOTOROLA

QTY	MODEL NUMBER	DESCRIPTION	MANUFACTURER
2	CA01642AB	ADD: MCC 7100 BASIC CONSOLE FUNCTIONALITY SOFTWARE LICENSE	MOTOROLA
2	CA01644AA	ADD: MCC 7500 /MCC 7100 ADV CONVL OPERATION	MOTOROLA
2	CA02180AA	ADD: MCC 7100 SECURE OPERATION	MOTOROLA
2	CA01643AA	ADD: MCC 7500 / MCC 7100 TRUNKING OPERATION	MOTOROLA
2	CA02092AA	ADD: SOFTWARE AES, DES-OFB, ADP ENCRYPT KEY FILE MGMT	MOTOROLA
1	B1940	MCC 7100 DVD	MOTOROLA
2	DSEV221	TECH GLOBAL EVOLUTION SERIES 22INCH WITH TOUCH	TECH GLOBAL
2	TT2833	COMPUTER, Z440 WORKSTATION WINDOWS 7 (NON RETURNABLE)	HEWLETT PACKARD
2	CDN6673	CREATIVE LABS INSPIRE A60	CREATIVE LABS
2	B1941	USB AUDIO INTERFACE MODULE	MOTOROLA
2	B1914	MCC SERIES DESKTOP GOOSENECK MICROPHONE	MOTOROLA
4	B1913	MCC SERIES HEADSET JACK	MOTOROLA
2	RLN6099A	HDST MODULE BASE W/PTT, 25' CBL	MOTOROLA
2	T7885	MCAFEE WINDOWS AV CLIENT	MCAFEE
1	B1942	MCC7100 SOFTWARE LICENSING	MOTOROLA
2	UA00251AA	ADD: 15 CHANNEL SW LICENSE	MOTOROLA
2	UA00253AA	ADD: MCC 7100 INSTANT RECALL RECORDER LICENSE	MOTOROLA
1	CLN1856	2620-24 ETHERNET SWITCH	MOTOROLA
1	SQM01SUM0205	GGM 8000 GATEWAY	MOTOROLA
1	CA01616AA	ADD: AC POWER	MOTOROLA
1	CA02087AA	ADD: ENCRYPTION (7.12 OR LATER)	MOTOROLA
1	CA02134AA	ADD: COMMON CRITERIA	MOTOROLA
1	DSTLM615NC20	POWER STRIP, 6 OUTLET, 15 FT CORD, 20 AMP, METAL RECEPTACLE	TRIPP LITE
1	DSRMP420B	SPD, TYPE 3, 120V RACK MOUNT, 20A STD PLUG-IN INPUT W/ 4 OUTLETS PER	TRANSTECTOR SYSTEMS
1	DSTG1A220CB	CHATSWORTH GLOBAL FRAME CABINET 24IN W 79IN H 39IN D BLACK	CHATSWORTH
1	DSTSJ100BT	SPD, RJ-48 8 PIN, 10/100 BASE T TSJ PROTECTS/PASSES ON ALL 8 PIN	TRANSTECTOR SYSTEMS
1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	TRANSTECTOR SYSTEMS
1	DS9130R27002036	UPS, 9130 RACKMT, 3000VA/2700W, 36 MINS RUNTIME	EASTON
1	SQM01SUM0205	GGM 8000 GATEWAY	MOTOROLA
1	CA01616AA	ADD: AC POWER	MOTOROLA
1	CA02087AA	ADD: ENCRYPTION (7.12 OR LATER)	MOTOROLA
1	CA02134AA	ADD: COMMON CRITERIA	MOTOROLA

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City of Riverside
Design and Installation of Land Mobile Radio



QTY	MODEL NUMBER	DESCRIPTION	MANUFACTURER
1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	MOTOROLA
1	CA00855AA	ADD: 700/800 MHZ	MOTOROLA
1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	MOTOROLA
6	X591AE	ENH: ASTRO 25 SITE REPEATER SW	MOTOROLA
1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILITY OF 7-24 BRS	MOTOROLA
1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER	MOTOROLA
1	CA00882AA	ADD: 700 MHZ TX FILTER W/PMU	MOTOROLA
1	CA02686AA	ADD: AC DC POWER DISTRIBUTION	MOTOROLA
2	CA00303AA	ADD: QTY (1) SITE CONTROLLER	MOTOROLA
2	CA02219AA	ADD: ASTRO 25 SITE REPEATER SITE CONTROLLER SOFTWARE IV&D	MOTOROLA
1	CA00293AA	ADD: 43RU SCHROFF CABINET	SCHROFF
1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	MOTOROLA
1	CA00855AA	ADD: 700/800 MHZ	MOTOROLA
1	X305AC	ADD: QTY (5) GTR 8000 BASE RADIOS	MOTOROLA
5	X591AE	ENH: ASTRO 25 SITE REPEATER SW	MOTOROLA
1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK	MOTOROLA
1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER	MOTOROLA
1	CA00882AA	ADD: 700 MHZ TX FILTER W/PMU	MOTOROLA
1	CA02686AA	ADD: AC DC POWER DISTRIBUTION	MOTOROLA
2	CA00884AA	ADD: QTY (1) XHUB	MOTOROLA
1	CA00293AA	ADD: 43RU SCHROFF CABINET	SCHROFF
1	DSAPM7487K2AC	ADVANCED POWER MONITOR, 740-870 MHZ, 90-246V AC (INC SINGLE COUPLER)	RFI
1	DSSP74964440DFF1RU	ANT LINE COUPLER 740-960MHZ 40DB 4-PORTS SUIT APM748 AND APM8796	RFI
1	DSTA798201001000	TTA01, FULLY REDUNDANT AMP, 796-824 MHZ (TTA ONLY)	RFI
1	DSRX699630013648N	RMC03, 2 PORT CMU WITH TTA CONTROL, 698-960 MHZ, -48 VDC	RFI
1	DSPF7982101831N	BANDPASS FILTER, RX, 18 MHZ BW, RANGE 796-824 MHZ	RFI
1	F4543	SITE MANAGER BASIC	MOTOROLA
1	VA00874	ADD: AUX I-O SERV FW CURR ASTRO REL	MOTOROLA
1	V266	ADD: 90VAC TO 260VAC PS TO SM	MOTOROLA
3	V592	AAD TERM BLCK & CONN WI	MOTOROLA
2	DSTSJ100BT	SPD, RJ-48 8 PIN, 10/100 BASE T TSJ PROTECTS/PASSES ON ALL 8 PIN	TRANSTECTOR SYSTEMS
2	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS	TRANSTECTOR SYSTEMS

QTY	MODEL NUMBER	DESCRIPTION	MANUFACTURER
1	DSRMP420B	SPD, TYPE 3, 120V RACK MOUNT, 20A STD PLUG-IN INPUT W/ 4 OUTLETS PER	TRANSTECTOR SYSTEMS
1	DLN6885	FRU: XCVR 7/800 MHZ V2	MOTOROLA
1	DLN6895	FRU: PA 7/800 MHZ	MOTOROLA
1	DLN6966	FRU: GCP 8000/GCM 8000/GPB 8000	MOTOROLA
1	DLN6781	FRU: POWER SUPPLY	MOTOROLA
1	DLN6677	FRU: G-SERIES XHUB	MOTOROLA
1	DLN6455	CONFIGURATION/SERVICE SOFTWARE	MOTOROLA
1	DLN6898	FRU: FAN MODULE	MOTOROLA
1	TRANSMITANT	TRANSMIT ANTENNA	SINCLAIR
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	COMMSCOPE
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	COMMSCOPE
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	COMMSCOPE
200	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORRUGATED CABLE (AVA5-50FX)/FOOT	COMMSCOPE
2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)	COMMSCOPE
5	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	COMMSCOPE
1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	COMMSCOPE
7	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	COMMSCOPE
1	DSTSXD FMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	TRANSTECTOR SYSTEMS
1	DSGSAKITD	GROUND STRAP KIT - DIN	TRANSTECTOR SYSTEMS
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	COMMSCOPE
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	COMMSCOPE
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	COMMSCOPE
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	COMMSCOPE
1	DSAPM7487K2AC	ADVANCED POWER MONITOR, 740-870 MHZ, 90-246V AC (INC SINGLE COUPLER)	RFI
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	COMMSCOPE
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	COMMSCOPE
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	COMMSCOPE
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	COMMSCOPE
1	TRANSMITANT	TRANSMIT ANTENNA	SINCLAIR



QTY	MODEL NUMBER	DESCRIPTION	MANUFACTURER
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	COMMSCOPE
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	COMMSCOPE
2	TDN9289	221213 CABLE WRAP WEATHERPROOFING	COMMSCOPE
200	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	COMMSCOPE
2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)	COMMSCOPE
5	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	COMMSCOPE
1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	COMMSCOPE
7	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	COMMSCOPE
1	DSTSXD FMBF	RF SPD, 698-2700MHZ DC BLOCK HIGH POWER, DIN FEMALE/MALE BIDIRECTIONAL	TRANSTECTOR SYSTEMS
1	DSGSAKITD	GROUND STRAP KIT - DIN	TRANSTECTOR SYSTEMS
25	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	COMMSCOPE
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	COMMSCOPE
10	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	COMMSCOPE
2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	COMMSCOPE
1	DSAPM7487K2AC	ADVANCED POWER MONITOR, 740-870 MHZ, 90-246V AC (INC SINGLE COUPLER)	RFI
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	COMMSCOPE
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	COMMSCOPE
10	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	COMMSCOPE
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	COMMSCOPE
1	RECEIVEANT	TRANSMIT ANTENNA	SINCLAIR
15	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	COMMSCOPE
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	COMMSCOPE
1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE	COMMSCOPE
5	TDN9289	221213 CABLE WRAP WEATHERPROOFING	COMMSCOPE
5	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	COMMSCOPE
2	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	COMMSCOPE
200	L3617	7/8IN HELIAX VIRTUAL AIR FOAM FILLED CORREGATED CABLE (AVA5-50FX)/FOOT	COMMSCOPE



QTY	MODEL NUMBER	DESCRIPTION	MANUFACTURER
2	DDN1079	78EZN-F N FEMALE MOT CONNECTOR (MOTOROLA SPECIFIC)	COMMSCOPE
5	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE	COMMSCOPE
1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP	COMMSCOPE
200	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	COMMSCOPE
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	COMMSCOPE
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	COMMSCOPE
5	DSSG1206B2A	SG12-06B2A 1/2IN SURE GROUND GROUNDING KIT	COMMSCOPE
1	DSL4SGRIP	L4SGRIP SUPPORT HOIST GRIP 1/2" LDF	COMMSCOPE
7	MDN6816	STD HANGERS FOR 1/2IN CABLE & EW180/EW220/EW-HANGER KIT STAINLESS-10PK	COMMSCOPE
7	MDN6817	42396A-5 7/8" CABLE HANGER STAINLESS, 10 PK	COMMSCOPE
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	TRANSTECTOR SYSTEMS
1	DS1090501WA	RF SPD, 700-1000MHZ BROADBAND 12 VDC PASS NM ANTENNA, NF EQUIPMENT	TRANSTECTOR SYSTEMS
25	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT	COMMSCOPE
2	DDN9769	F1PNM-HC 1/4" TYPE N MALE CONNECTOR FOR FSJ1-50A CABLE	COMMSCOPE
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	COMMSCOPE
2	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	COMMSCOPE
1	M22URS9PW1 N	APX4500 7/800	MOTOROLA
1	QA02756	ADD: 3600 OR 9600 TRUNKING BAUD SINGLE SYSTEM	MOTOROLA
1	GA00804	ADD: APX O2 CONTROL HEAD (Green)	MOTOROLA
1	G201	ADD:IMPACT GREEN COLOR HOUSING (O2)	MOTOROLA
1	G444	ADD: APX CONTROL HEAD SOFTWARE	MOTOROLA
1	G66	ADD: DASH MOUNT O2 WWM	MOTOROLA
1	G174	ADD: ANT 3DB LOW-PROFILE 762-870	MOTOROLA
1	W969	ADD: MULTIKEY	MOTOROLA
1	G843	ADD: AES ENCRYPTION APX	MOTOROLA
1	W382	ADD: CONTROL STATION DESK GCAI MIC	MOTOROLA
1	G24	ADD: 3 YEAR SERVICE FROM THE START LITE	MOTOROLA
1	G142	ADD: NO SPEAKER NEEDED	MOTOROLA
1	G91	ADD: CONTROL STATION POWER SUPPLY	MOTOROLA
1	W665	ADD: CONTROL STATION OPERATION	MOTOROLA
1	GA00235	ADD: NO GPS ANTENNA NEEDED	MOTOROLA
1	GA01767	ADD: APX MOBILE RADIO AUTHENTICAT	MOTOROLA

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QTY	MODEL NUMBER	DESCRIPTION	MANUFACTURER
1	G996	ADD: PROGRAMMING OVER P25 (OTAP)	MOTOROLA
1	HLN6042	MOBILE DESK TRAY	MOTOROLA
1	DS245173	245173 COLD SHRINK WEATHERPROOFKIT, 1/2 TO 1/2	COMMSCOPE
1	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	COMMSCOPE
100	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	COMMSCOPE
1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	COMMSCOPE
3	DSGKSUNV	GK-SUNV SMALL UNIVERSAL GROUNDING KIT	COMMSCOPE
1	DSISNEMPC2MA	RF SPD, 125MHZ-1.0GHZ, COAXIAL NUCLEAR EMP, NM ANT NF EQUIPMENT SIDE	TRANSECTOR SYSTEMS
1	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	COMMSCOPE
25	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	COMMSCOPE
1	DSF4NRHC	F4NR-HC 1/2" TYPE N MALE RIGHT ANGLE CONNECTOR	COMMSCOPE
1	M22URS9PW1 N	APX4500 7/800	MOTOROLA
1	QA02756	ADD: 3600 OR 9600 TRUNKING BAUD SINGLE SYSTEM	MOTOROLA
1	GA00804	ADD: APX O2 CONTROL HEAD (Green)	MOTOROLA
1	G444	ADD: APX CONTROL HEAD SOFTWARE	MOTOROLA
1	G67	ADD: REMOTE MOUNT O2 WWM	MOTOROLA
1	G174	ADD: ANT 3DB LOW-PROFILE 762-870	MOTOROLA
1	W20	ADD: KEYPAD MIC GCAI	MOTOROLA
1	B18	ADD: AUXILARY SPKR 7.5 WATT	MOTOROLA
1	GA01767	ADD: APX MOBILE RADIO AUTHENTICAT	MOTOROLA
1	GA00226	ADD: GPS ANTENNA	MOTOROLA
1	G996	ADD: PROGRAMMING OVER P25 (OTAP)	MOTOROLA
1	G843	ADD: AES ENCRYPTION APX	MOTOROLA
1	G24	ADD: 3 YEAR SERVICE FROM THE START LITE	MOTOROLA
2	H51UCH9PW7 N	APX 4000 7/800 MHZ MODEL 3 PORTABLE	MOTOROLA
2	QA04865	ADD: TWO KNOB CONFIGURATION	MOTOROLA
2	QA02756	ENH: 3600 OR 9600 TRUNKING BAUD SIN	MOTOROLA
2	G996	ADD: PROGRAMMING OVER P25 (OTAP)	MOTOROLA
2	QA01767	ADD: P25 LINK LAYER AUTHENTICATION	MOTOROLA
2	G996	ADD: PROGRAMMING OVER P25 (OTAP)	MOTOROLA
2	Q629	ENH: AES ENCRYPTION	MOTOROLA
2	QA04934	ALT: IMPRES LI-ION 2300MAH RUGGED UL BATTERY	MOTOROLA
2	H499	ENH: SUBMERSIBLE (DELTA T)	MOTOROLA
2	Q157	ADD: APX DATA CABLE	MOTOROLA
2	Q53	ADD: FRONT PANEL PROGRAMMING	MOTOROLA



QTY	MODEL NUMBER	DESCRIPTION	MANUFACTURER
2	QA00205	ADD: DATA LINK MANAGER APP CD- PORTABLES	MOTOROLA
2	h885bk	ADD: 3 YEAR SERVICE FROM THE START LITE	MOTOROLA
1	TT2789	NEW WAVE SYSTEM	MOTOROLA
1	TT2775	SOFTWARE,WAVE SERVER LICENSING	MOTOROLA
10	TT2777	WAVE COMMUNICATION CHANNEL-WITH RADIO SYSTEM INTEGRATION	MOTOROLA
5	TT2779	WAVE DESKTOP COMMUNICATOR-INCLUDES PLUG-IN-PANEL	MOTOROLA
25	TT2782	WAVE MOBILE COMMUNICATOR ANDROID & IOS	MOTOROLA
20	TT2784	WAVE WEB COMMUNICATOR	MOTOROLA
2	TT2787	WAVE VOICE PORT	MOTOROLA
2	TT2788	WAVE RECORDING SESSION	MOTOROLA
1	TT2820	SOFTWARE,WAVE RADIO GATEWAY SOFTWARE	MOTOROLA
3000	DSWAVESVEXPENSES	PER QUOTE - WAVE SERVICE AND INTEGRATION EXPENSES	MOTOROLA
8	DSWAVEPMSVC	PER HOUR - WAVE PROJECT MANAGEMENT SERVICES	MOTOROLA
69	DSWAVEENG SVC	PER HOUR - WAVE SYSTEM ENGINEERING AND PROFESSIONAL SERVICES	MOTOROLA
1	CVN7053	ASTRO 25 TO WAVE INTERFACE	MOTOROLA
1	DSWAVEARUS1	ANNUAL RELEASE AND UPDATE SUBSCRIPTION FOR 1 YEAR	MOTOROLA
3	M22URS9PW1 N	APX4500 7/800	MOTOROLA
3	QA02756	ADD: 3600 OR 9600 TRUNKING BAUD SINGLE SYSTEM	MOTOROLA
3	GA00804	ADD: APX O2 CONTROL HEAD (Green)	MOTOROLA
3	G201	ADD:IMPACT GREEN COLOR HOUSING (O2)	MOTOROLA
3	G444	ADD: APX CONTROL HEAD SOFTWARE	MOTOROLA
3	G66	ADD: DASH MOUNT O2 WWM	MOTOROLA
3	G174	ADD: ANT 3DB LOW-PROFILE 762-870	MOTOROLA
3	W969	ADD: MULTIKEY	MOTOROLA
3	G843	ADD: AES ENCRYPTION APX	MOTOROLA
3	W382	ADD: CONTROL STATION DESK GCAI MIC	MOTOROLA
3	G24	ADD: 3 YEAR SERVICE FROM THE START LITE	MOTOROLA
3	G142	ADD: NO SPEAKER NEEDED	MOTOROLA
3	G91	ADD: CONTROL STATION POWER SUPPLY	MOTOROLA
3	W665	ADD: CONTROL STATION OPERATION	MOTOROLA
3	GA00235	ADD: NO GPS ANTENNA NEEDED	MOTOROLA
3	GA01767	ADD: APX MOBILE RADIO AUTHENTICAT	MOTOROLA
3	G996	ADD: PROGRAMMING OVER P25 (OTAP)	MOTOROLA
3	HLN6042	MOBILE DESK TRAY	MOTOROLA

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QTY	MODEL NUMBER	DESCRIPTION	MANUFACTURER
3	DS245173	245173 COLD SHRINK WEATHERPROOFKIT, 1/2 TO 1/2	MOTOROLA
3	DDN1089	L4TNF-PSA TYPE N FEMALE PS FOR 1/2 IN CABLE	MOTOROLA
300	L1705	LDF4-50A CABLE: 1/2" LDF HELIAX POLY JKT PER FOOT	MOTOROLA
3	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE	MOTOROLA
6	DSGKSUNV	GK-SUNV SMALL UNIVERSAL GROUNDING KIT	MOTOROLA
3	DSISNEMPC2MA	RF SPD, 125MHZ-1.0GHZ, COAXIAL NUCLEAR EMP, NM ANT NF EQUIPMENT SIDE	MOTOROLA
3	DDN9682	F4PNMV2-HC 1/2" TYPE N MALE PLATED CONNECTOR	MOTOROLA
75	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT	MOTOROLA
3	DSF4NRHC	F4NR-HC 1/2" TYPE N MALE RIGHT ANGLE CONNECTOR	MOTOROLA
160	H51UCH9PW7 N	APX 4000 7/800 MHZ MODEL 3 PORTABLE	MOTOROLA
160	QA04865	ADD: TWO KNOB CONFIGURATION	MOTOROLA
160	QA02756	ENH: 3600 OR 9600 TRUNKING BAUD SIN	MOTOROLA
160	G996	ADD: PROGRAMMING OVER P25 (OTAP)	MOTOROLA
160	QA01767	ADD: P25 LINK LAYER AUTHENTICATION	MOTOROLA
160	Q629	ENH: AES ENCRYPTION	MOTOROLA
160	QA02749	IMPRES LI-ION 2300MAH	MOTOROLA
10	Q157	ADD: APX DATA CABLE	MOTOROLA
160	QA00205	ADD: DATA LINK MANAGER APP CD- PORTABLES	MOTOROLA
160	H885BK	ADD: 3 YEAR SERVICE FROM THE START LITE	MOTOROLA
134	NNTN8525A	ASSEMBLY, CHARGER, MOTOTRBO TRAVEL	MOTOROLA
24	WPLN4219B	ACCESSORY, ACCESSORY, CHARGER, IMPRES MUC W/DISPLAY - US/NA PLUG	MOTOROLA
23	WPLN4232A	CHARGER, SINGLE-UNIT, IMPRES, 1.25A, 115VAC, US/NA	MOTOROLA
1	H91TGD9PW7 N	APX 8000 ALL BAND PORTABLE MODEL 3.5	MOTOROLA
1	Q806	ADD: ASTRO DIGITAL CAI OPERATION	MOTOROLA
1	H38	ADD: SMARTZONE OPERATION	MOTOROLA
1	Q361	ADD: P25 9600 BAUD TRUNKING	MOTOROLA
1	Q58	ADD: 3 YEAR SERVICE FROM THE START LITE	MOTOROLA
1	G996	ADD: PROGRAMMING OVER P25 (OTAP)	MOTOROLA
1	QA01767	ADD: P25 LINK LAYER AUTHENTICATION	MOTOROLA
1	Q629	ENH: AES ENCRYPTION	MOTOROLA
1	Q53	ADD: FRONT PANEL PROGRAMMING (FPP)	MOTOROLA
1	QA00205	ADD: DATA LINK MANAGER APP CD- PORTABLES	MOTOROLA
1	WPLN7080	APX 7000 IMPRES CG SU APX7000 US/NA/CA/LA	MOTOROLA
1	RLN6434A	APX TRAVEL CHARGER	MOTOROLA



QTY	MODEL NUMBER	DESCRIPTION	MANUFACTURER
9	H91TGD9PW7 N	APX 8000 ALL BAND PORTABLE MODEL 3.5	MOTOROLA
9	Q806	ADD: ASTRO DIGITAL CAI OPERATION	MOTOROLA
9	H38	ADD: SMARTZONE OPERATION	MOTOROLA
9	Q361	ADD: P25 9600 BAUD TRUNKING	MOTOROLA
9	Q58	ADD: 3 YEAR SERVICE FROM THE START LITE	MOTOROLA
9	G996	ADD: PROGRAMMING OVER P25 (OTAP)	MOTOROLA
9	QA01767	ADD: P25 LINK LAYER AUTHENTICATION	MOTOROLA
9	Q629	ENH: AES ENCRYPTION	MOTOROLA
1	Q157	ADD: APX DATA CABLE	MOTOROLA
9	QA00205	ADD: DATA LINK MANAGER APP CD- PORTABLES	MOTOROLA
9	WPLN7080	APX 7000 IMPRES CG SU APX7000 US/NA/CA/LA	MOTOROLA
9	RLN6434A	APX TRAVEL CHARGER	MOTOROLA
5	HKVN4289A	SOFTWARE,APX CPS DOWNLOAD - CURRENT VERSION	MOTOROLA
100	M22URS9PW1 N	APX4500 7/800	MOTOROLA
100	QA02756	ADD: 3600 OR 9600 TRUNKING BAUD SINGLE SYSTEM	MOTOROLA
100	GA00804	ADD: APX O2 CONTROL HEAD (Green)	MOTOROLA
100	G444	ADD: APX CONTROL HEAD SOFTWARE	MOTOROLA
100	G67	ADD: REMOTE MOUNT O2 WWM	MOTOROLA
100	G174	ADD: ANT 3DB LOW-PROFILE 762-870	MOTOROLA
20	W20	ADD: KEYPAD MIC GCAI	MOTOROLA
80	W22	ADD: PALM MICROPHONE	MOTOROLA
100	G142	ADD: NO SPEAKER NEEDED	MOTOROLA
100	GA01767	ADD: APX MOBILE RADIO AUTHENTICAT	MOTOROLA
100	GA00226	ADD: GPS ANTENNA	MOTOROLA
100	G996	ADD: PROGRAMMING OVER P25 (OTAP)	MOTOROLA
100	G843	ADD: AES ENCRYPTION APX	MOTOROLA
100	G24	ADD: 3 YEAR SERVICE FROM THE START LITE	MOTOROLA
5	HKVN4289A	SOFTWARE,APX CPS DOWNLOAD - CURRENT VERSION	MOTOROLA
10	HKN6184C	CABLE CH, PROGRAMMING,USB	MOTOROLA
5	HK2064	LEX L10G HANDHELD NA REGION	MOTOROLA
5	HKLN4618A	CARRY ACCESSORY-HOLSTER,LEX HANDHELD HOLSTER	MOTOROLA



PROPOSAL TO
CITY OF RIVERSIDE

EXHIBIT C-3

STATEMENT OF WORK

DESIGN AND INSTALLATION OF LAND MOBILE RADIO

JULY 28, 2016

RFP NO. 1558



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STATEMENT OF WORK

C3.1 OVERVIEW

This Statement of Work (SOW) describes the deliverables to be furnished to the City of Riverside Public Utilities. The tasks described herein will be performed by Motorola, its subcontractors, and the City of Riverside Public Utilities (RPU) to implement the solution described in the System Description. It describes the actual work involved in installation, identifies the installation standards to be followed, and clarifies the responsibilities for both Motorola and Customer during the project implementation. Specifically, this SOW provides:

- A summary of the phases and tasks to be completed within the project lifecycle.
- A list of the deliverables associated with the project.
- A description of the responsibilities for both Motorola and Customer.
- The qualifications and assumptions taken into consideration during the development of this project.

This SOW provides the most current understanding of the work required by both parties to ensure a successful project implementation. In particular, Motorola has made assumptions of the sites to be used for the new system. Should any of the sites change, a revision to the SOW and associated pricing will be required. It is understood that this SOW is a working document, and that it will be revised as needed to incorporate any changes associated with contract negotiations, Contract Design Review (CDR), and any other change orders that may occur during the execution of the project.

Motorola Solutions will be providing a 700 MHz Project 25 Phase 1 system, with one eleven-channel ASTRO Site Repeater RF remote site, five MCC 7100 series consoles at two dispatch locations, four control stations, two enhanced conventional channel gateways, one logging recorder for 24 talkgroups, an Outdoor Location Solution for GPS, Wave Solution and encryption. Motorola has also included 5 LEX L10g, 162 APX 4000, 10 APX 8000, and 101 APX 4500 subscriber devices.

C3.2 ASSUMPTIONS

Motorola has based the system design on information provided by the City of Riverside Public Utilities and an analysis of their system requirements. All assumptions have been listed below for review. Should Motorola's assumptions be deemed incorrect or not agreeable to RPU, a revised proposal with the necessary changes and adjusted costs may be required. Changes to the equipment or scope of the project after contract may require a change order

- All work is to be performed during normal work hours, Monday through Friday 8:00 a.m. to 5:00 p.m.
- Motorola is not responsible for interference caused or received by the Motorola provided equipment except for interference that is directly caused by the Motorola-provided transmitter(s) to the Motorola-provided receiver(s). Should RPU's system experience interference, Motorola can be contracted to investigate the source and recommend solutions to mitigate the issue.
- All existing sites or equipment locations will have sufficient space available for the system described.
 - This includes available spaces for proposed cabinets, cables, and cable entry ports.



- All existing sites or equipment locations will have adequate electrical power and site grounding suitable to support the requirements of the system described.
 - It is assumed that RPU will provide AC and/or DC power distribution units.
 - RPU is responsible for providing open conduit space and to route and install CAT6 and ground cables.
 - RPU is responsible for providing open conduit space for Motorola to route and install RF cables.
 - Coring at any site is not included in this offering.
- All conventional RF audio to be integrated with the proposed system is assumed to be available at the Utilities Operation Center (UOC) site via one of the supported CCGW protocols discussed in this proposal.
- Where applicable, any tower stress analysis or tower upgrade requirements are the responsibility of RPU.
- Any site/location upgrades or modifications are the responsibility of RPU.
- Any necessary FCC licensing will be provided by RPU.
- Approved local, State, or Federal permits as may be required for the installation and operation of the proposed equipment, are the responsibility of RPU.
- All Ethernet and other necessary site connectivity will be provided by RPU.
 - RPU is responsible to meet the Ethernet site link specifications to be provided by Motorola during the design review.
- An internet connection will be required for Motorola System Support to monitor the proposed system. Providing this internet connection will be the responsibility of RPU.
- RPU will terminate all Power and Ethernet connections at the location of the proposed equipment racks.
- Adequate power and space is available at the Box Springs site for the proposed ASTRO25® and combiner equipment.
- All civil work at the proposed sites is the responsibility of RPU.
- Any required system interconnections not specifically outlined here will be provided by RPU.
- Motorola's MCC 7100 design is built with dedicated workstations for each MCC 7100 operator position. The Motorola provided computers will not be configured to share/support CAD, E911 network or any other third party applications.
- Motorola has included 5 LEX L10g, 162 APX 4000, 10 APX 8000, 101 APX 4500. No other subscriber or base radio upgrades have been included in this proposal.
- Subscriber fleetmapping services are included.
- Subscriber programming services include 100 APX 4500 Mobiles only.
- One subscriber template is included for each type of subscriber: APX 4000 Portables, APX 8000 Portables, APX 4500 Mobiles, and APX 4500 Control Stations. Additional template services require a change order.
- Mobile installations include 100 APX 4500 only. Services include standard dash mounting in standard vehicles. No specialty hardware or equipment removals are included.
- RPU is responsible for transporting and disposal of existing third party (non-Motorola) racks and equipment.



- The only exceptions are the two legacy consoles that will be removed by Motorola.

C3.3 CONTRACT

C3.3.1 Contract Award (Milestone)

- The Customer and Motorola execute the contract and both parties receive all the necessary documentation.
- Within 30 days of the Effective Date of the Communications System Agreement executed by Motorola and Customer, Motorola will furnish to the Customer, at the Customer's expense, a performance bond in the full amount of the Contract Price as security for the faithful performance of Motorola's obligations under the Communications System Agreement. The bond shall be on a form acceptable to Motorola's surety company.

C3.3.2 Contract Administration

Motorola Responsibilities:

- Assign a Project Manager, as the single point of contact with authority to make project decisions.
- Assign resources necessary for project implementation.
- Set up the project in the Motorola information system.
- Schedule the project kickoff meeting with the Customer.

Customer Responsibilities:

- Assign a Project Manager, as the single point of contact responsible for Customer-signed approvals.
- Assign other resources necessary to ensure completion of project tasks for which the Customer is responsible.

Completion Criteria:

- Motorola internal processes are set up for project management.
- Both Motorola and the Customer assign all required resources.
- Project kickoff meeting is scheduled.

C3.3.3 Project Kickoff

Motorola Responsibilities:

- Conduct a project kickoff meeting during the CDR phase of the project.
- Ensure key project team participants attend the meeting.
- Introduce all project participants attending the meeting.
- Review the roles of the project participants to identify communication flows and decision-making authority between project participants.
- Review the overall project scope and objectives with the Customer.
- Review the resource and scheduling requirements with the Customer.
- Review the Project Schedule with the Customer to address upcoming milestones and/or events.
- Review the teams' interactions (Motorola and the Customer), meetings, reports, milestone acceptance, and the Customer's participation in particular phases.



Customer Responsibilities:

- The Customer's key project team participants attend the meeting.
- Review Motorola and Customer responsibilities.

Completion Criteria:

- Project kickoff meeting completed.
- Meeting notes identify the next action items.

C3.4 CONTRACT DESIGN REVIEW

C3.4.1 Review Contract Design

Motorola Responsibilities:

- Meet with the Customer project team.
- Review the operational requirements and the impact of those requirements on various equipment configurations.
- Establish a defined baseline for the system design and identify any special product requirements and their impact on system implementation.
- Review the System Design, Statement of Work, Project Schedule, and Acceptance Test Plans, and update the contract documents accordingly.
- Discuss the proposed Cutover Plan and methods to document a detailed procedure.
- Submit design documents to the Customer for approval. These documents form the basis of the system, which Motorola will manufacture, assemble, stage, and install.
- Prepare equipment layout plans for staging.
- Provide minimum acceptable performance specifications for microwave, fiber, or copper links.
- Establish demarcation point (supplied by the Motorola system engineer) to define the connection point between the Motorola-supplied equipment and the Customer-supplied link(s) and external interfaces.
- Finalize site acquisition and development plan.
 - Conduct (updated) site evaluations to capture site details of the system design and to determine site readiness.
 - Determine each site's ability to accommodate proposed equipment based upon physical capacity.
 - Test existing equipment with which Motorola equipment will interface.
- Prepare Site Evaluation Report that summarizes findings of above-described site evaluations.

Restrictions:

- Motorola assumes no liability or responsibility for inadequate frequency availability or frequency licensing issues.
- Motorola is not responsible for issues outside of its immediate control. Such issues include, but are not restricted to, improper frequency coordination by others and non-compliant operation of other radios.
- Motorola is not responsible for co-channel interference due to errors in frequency coordination by APCO or any other unlisted frequencies, or the improper design, installation, or operation of systems installed or operated by others
- If, for any reason, any of the proposed sites cannot be utilized due to reasons beyond Motorola's control, the costs associated with site changes or delays including, but not limited to, re-engineering, frequency re-licensing, site zoning, site permitting, schedule delays, site



abnormalities, re-mobilization, etc., will be paid for by the Customer and documented through the change order process.

Customer Responsibilities:

- The Customer's key project team participants attend the meeting.
- Make timely decisions, according to the Project Schedule.
- Frequency Licensing and Interference:
 - As mandated by FCC, the Customer, as the licensee, has the ultimate responsibility for providing all required radio licensing or licensing modifications for the system prior to system staging. This responsibility includes paying for FCC licensing and frequency coordination fees.
 - Provide the FCC "call sign" station identifier for each site prior to system staging.

Completion Criteria:

- Complete Design Documentation, which may include updated System Description, Equipment List, system drawings, or other documents applicable to the project.
- Incorporate any deviations from the proposed system into the contract documents accordingly.
- The system design is "frozen" in preparation for subsequent project phases such as Order Processing and Manufacturing.
- A Change Order is executed in accordance with all material changes resulting from the Design Review to the contract.

C3.4.2 Design Approval (Milestone)

- The Customer executes a Design Approval milestone document.

C3.5 ORDER PROCESSING

C3.5.1 Process Equipment List

Motorola Responsibilities:

- Validate Equipment List by checking for valid model numbers, versions, compatible options to main equipment, and delivery data.
- Enter order into Motorola's Customer Order Fulfillment (COF) system.
- Create Ship Views, to confirm with the Customer the secure storage location(s) to which the equipment will ship. Ship Views are the mailing labels that carry complete equipment shipping information, which direct the timing, method of shipment, and ship path for ultimate destination receipt.
- Create equipment orders.
- Reconcile the equipment list(s) to the Contract.
- Procure third-party equipment if applicable.

Customer Responsibilities:

- Approve shipping location(s).

Completion Criteria:

- Verify that the Equipment List contains the correct model numbers, version, options, and delivery data.
- Trial validation completed.



- Bridge the equipment order to the manufacturing facility.

C3.6 MANUFACTURING AND STAGING

C3.6.1 Manufacture Motorola Fixed Network Equipment

Motorola Responsibilities:

- Manufacture the Fixed Network Equipment (FNE) necessary for the system based on equipment order.

Customer Responsibilities:

- None.

Completion Criteria:

- FNE shipped to either the field or the staging facility.

C3.6.2 Manufacture Motorola Subscribers

Motorola Responsibilities:

- Manufacture the Subscribers based on equipment order.
-

Customer Responsibilities:

- None.

Completion Criteria:

- Representative sample of Subscribers (mobile or portable radios) shipped to staging; remaining Subscribers shipped to the field.

C3.6.3 Manufacture Non-Motorola Equipment

Motorola Responsibilities:

- Procure non-Motorola equipment necessary for the system based on equipment order.

Customer Responsibilities:

- None.

Completion Criteria:

- Ship non-Motorola manufactured equipment to the field and/or the staging facility.

C3.6.4 Ship to Staging (Milestone)

- Ship all equipment needed for staging to Motorola's factory staging facility in Elgin, Illinois [Customer Center for Solutions Integration (CCSi)].



C3.6.5 Stage System

Motorola Responsibilities:

- Set up and rack the system equipment on a site-by-site basis, as it will be configured in the field at each of the transmitter/receiver sites.
- Cut and label cables according to the approved CDR documentation.
- Label the cables with to/from information to specify interconnection for field installation and future servicing needs.
- Complete the cabling/connecting of the subsystems to each other (“connectorization” of the subsystems).
- Assemble required subsystems to assure system functionality.
- Power up, program, and test all staged equipment.
- Confirm system configuration and software compatibility to the existing system.
- Load application parameters on all equipment according to input from Systems Engineering.
- Complete programming of the Fixed Network Equipment.
- Program the approved templates into a radio-programming template tool.
- Complete programming of sample Subscriber units.
- Inventory the equipment with serial numbers and installation references.
- Complete system documentation.
- Third party subsystems may be staged at the manufacturer’s facilities and integrated in the field.
- Provide a Factory Acceptance Test Plan.

Customer Responsibilities:

- Provide information on existing system interfaces as may be required.
- Provide information on room layouts or other information necessary for the assembly to meet field conditions.
- Review and approve proposed Factory Acceptance Test Plan.

Completion Criteria:

- System staging completed and ready for testing.

C3.6.6 Perform Staging Acceptance Test Procedures

Motorola Responsibilities:

- Test and validate system software and features.
- Functional testing of standard system features.
- Conduct site and system level testing.
- Power-up site equipment and perform standardized functionality tests.
- Perform system burn-in 24 hours a day during staging to isolate and capture any defects.
- Perform Customer-witnessed tests based upon Factory Acceptance Test Plan. (If desired)

Customer Responsibilities:

- Attend Factory Acceptance Testing. (If desired)
- Pay for travel, lodging, meals, and all incidental expenses for Customer personnel and representatives to witness the Factory Acceptance Testing.

Completion Criteria:

- Approve Factory Acceptance Testing.

C3.6.7 Ship Equipment to Field

Motorola Responsibilities:

- Pack system for shipment to final destination.
- Arrange for shipment to the field.

Customer Responsibilities:

- None.

Completion Criteria:

- Equipment ready for shipment to the field.

C3.6.8 CCSi Ship Acceptance (Milestone)

- All equipment shipped to the field.

C3.7 CIVIL WORK FOR THE CUSTOMER-PROVIDED FACILITIES

Motorola Responsibilities:

- Provide electrical requirements for each equipment rack to be installed in the Customer-provided facilities.
- Provide heat load for each equipment rack to be installed in the Customer-provided facilities.

Customer Responsibilities:

- If applicable and based on local jurisdictional authority, the Customer will be responsible for any installation or up-grades of the Critical Operation Power Systems in order to comply with NFPA 70, Article 708.
- Secure site lease/ownership, zoning, permits, regulatory approvals, easements, power, and Telco connections.
- Provide clear and stable access to the sites for transporting electronics and other materials. Sufficient site access must be available for trucks to deliver materials under their own power and for personnel to move materials to the facility without assistance from special equipment.
- Design and construct facilities for housing communications equipment such as shelters, towers, generators, fuel tanks, fenced compounds, etc.
- Supply adequately sized electrical service, backup power (UPS, generator, batteries, etc.) including the installation of conduit, circuit breakers, outlets, etc., at each equipment location.
- Provide AC power to the demarcation point(s) indicated in the documentation. Including the associated electrical service and wiring (conduit, circuit breakers, etc.).
- Extend customer provided electrical to Motorola equipment and terminate at the OP8 or Cabinet electric panel.
- Provide adequate HVAC, grounding, lighting, cable routing, and surge protection (also, among existing and Motorola-provided equipment) based upon Motorola's Standards and Guidelines for Communication Sites (R56). Ceiling (minimum 9 feet) and cable tray heights (minimum 8 feet) in the equipment rooms in order to accommodate 7-foot, 6-inch equipment racks.
- Provide floor space and desk space for the System equipment at the Customer-provided facilities. Each rack shall be provided a minimum of 24-inch x 24-inch footprint with 36-inch clearance in the front and back.



- Relocate existing equipment, if needed, to provide required space for the installation of Motorola-supplied equipment.
- Bring grounding system up to Motorola's R56 standards and supply a single point system ground, of 5 ohms or less, to be used on all FNE supplied under the Contract. Supply grounding tie point within 10 feet from the Motorola-supplied equipment.
- Provide all necessary wall or roof penetrations on existing buildings for antenna coax and microwave waveguide (if applicable) for main transmitter antennas, microwave radios, and control station Yagi antennas.
- Provide obstruction-free area for the cable run between the demarcation point and the communications equipment.
- All alarms to be integrated with the UEM must be in SNMP v3 format.
- Resolve any environmental issues including, but not limited to, asbestos, structural integrity (rooftop, water tank, tower, etc.) of the site, and any other building risks. (Resolve environmental or hazardous material issues).
- Arrange for space on the tower for installation of new antennas at the proposed heights.
- Perform structural analysis of existing tower and rooftops as required to confirm that the structure is capable of supporting proposed and future antenna loads.
- Supply all permits as contractually required.
- Supply interior building cable trays, raceways, conduits, and wire supports.
- Supply and install at CAT-6 cables between the console positions and the backroom electronics at each dispatch site.
- Supply engineering and drafting as required for modifications to existing building drawings for site construction.
- Pay for usage costs of power and generator fueling, both during the construction and installation effort, and on an ongoing basis.
- Complete all customer deliverables in accordance within the approved project schedule.

Completion Criteria:

- All sites are ready for equipment installations in compliance with Motorola's R56 standards.

C3.8 SYSTEM INSTALLATION

C3.8.1 Install Fixed Network Equipment

Motorola Responsibilities:

- Motorola will be responsible for the installation of all fixed equipment contained in the equipment list and outlined in the System Description based upon the agreed to floor plans, at the sites where the physical facility improvement is complete and the site is ready for installation. All equipment will be properly secured to the floor and installed in a neat and professional manner, employing a standard of workmanship consistent with its own R-56 installation standards and in compliance with applicable National Electrical Code (NEC), EIA, Federal Aviation Administration (FAA), and FCC standards and regulations.
- For installation of the fixed equipment at the various sites, Motorola will furnish all cables for power, audio, control, and radio transmission to connect the Motorola supplied equipment to the power panels or receptacles and the audio/control line connection point.



- During field installation of the equipment, any required changes to the installation will be noted and assembled with the final 'as-built' documentation of the system.
- Will not provide storage location for the Motorola-provided equipment.
- Receive and inventory all equipment.
- Bond the supplied equipment to the site ground system in accordance with Motorola's R56 standards.
- Will interface with the following network connections:
 - Ethernet or Fiber interface
- Will remove the two existing Zetron console equipment.
- Will not remove any other existing equipment.
- Will not relocate existing equipment to a location designated by the Customer.
- Will dispose of existing Zetron console equipment.
- Will not dispose of any other existing equipment.

Customer Responsibilities:

- Install CAT6 cabling at the dispatch centers between the MCC 7000 series console equipment and the backroom electronics equipment.
- Provide secure storage for the Motorola-provided equipment, at a location central to the sites. Motorola coordinates the receipt of the equipment with the Customer's designated contact, and inventory all equipment.
- Provide access to the sites, as necessary.

Completion Criteria:

- Fixed Network Equipment installation completed and ready for optimization.

C3.8.2 Fixed Network Equipment Installation Complete

- All fixed network equipment installed and accepted by the Customer.

C3.8.3 Console Installation

Motorola Responsibilities:

- Install the console in the space provided by the Customer.
- Connect the Customer-supplied, previously-identified circuits into the console, to a demarcation point located within 25 feet of the console interface.
- Terminate the audio outputs for the logged talkgroups onto a punchblock, and then terminate these outputs into the logging recorder.
- Connect the appropriate equipment to the Customer-supplied ground system in accordance with Motorola's R56 Site Installation standards.
- Perform the console programming, based on the console templates designed during the fleetmapping process.
- For consoles not located at the master site, additional network link resources will be required, as identified in the network diagram provided by Motorola.

Customer Responsibilities:

- Install a dedicated Local Area Network (LAN) at each dispatch center to connect the proposed console positions.
- Provide demarcation point located within 25 feet of the console interface.



Completion Criteria:

- Console installation is complete.

C3.8.4 Console Installation Complete

- Console installation completed and accepted by the Customer.

C3.8.5 Control Station Installation

Motorola Responsibilities:

- Properly connectorize and ground the cabling, which will be run to the outdoor antenna location using the least obtrusive method.
- Protect the cabling by providing and installing a bulkhead lightning surge protector.
- Survey the exact mounting locations and develop control station installation plan.
- Perform the following tasks for the local control stations installations:
 - Create installation plan.
 - Assist the Customer to determine the locations of control stations and desk sets at each site.
 - Install RF local control stations identified in the equipment list. Install line (not greater than 100 feet in length) and antenna system (connectors, coax grounding kit, antenna, and surge protection).
 - Connect to the Customer-supplied ground point.
- Program all control stations once, from the template (provided by the Customer) prior to delivery.

Customer Responsibilities:

- Provide cable entry into the building through wall feed-through and seal with silicone, or provide an entry plate and boot.
- Provide ground point within 6 cable feet of the control station. Provide necessary space for installation of the local control station. Supply, exterior or internal, vertical spaces for installation of the control station antenna with no more than a 100-foot cable run.
- Provide an elevated antenna mounting location.
- Supply a dedicated 115 VAC grounded electrical outlet rated at 15 A to power the control station and remote control device. Provide an outlet within 6 feet of the unit.
- Supply a ground point of 5 ohms or less located in the immediate vicinity (within 6 feet) of the finalized location of the antenna and control station.
- Provide antenna-mounting facilities at each of the RF control station points specified, while providing an adequate means of feed-line routing and support.

Completion Criteria:

- Completion of all the control station installations, and approval by the Customer.

C3.8.6 Control Station Complete

- Control Station installation completed and accepted by the Customer.

C3.8.7 System Installation Acceptance (Milestone)

- All equipment installations are completed and accepted by the Customer.



C3.9 SYSTEM OPTIMIZATION

C3.9.1 Optimize System FNE

Motorola Responsibilities:

- Motorola and its subcontractors optimize each subsystem.
- Verify that all equipment is operating properly and that all electrical and signal levels are set accurately.
- Verify that all audio and data levels are at factory settings.
- Check forward and reflected power for all radio equipment, after connection to the antenna systems, to verify that power is within tolerances.
- Check audio and data levels to verify factory settings.
- Verify communication interfaces between devices for proper operation.
- Test features and functionality are in accordance with manufacturers' specifications and that they comply with the final configuration established during the CDR/system staging.
- Integrate the consoles and RF sites into the system to ensure proper operation.
- Set up the consoles on the radio system to perform the dispatching operation.

Customer Responsibilities:

- Provide access/escort to the sites.
- Provide required radio ID and alias information to enable alias database setup for interface to console.
- Define the logging recorder tracks by talkgroup.
- Dispatchers to use the existing conventional system icons for dispatching until cutover.

Completion Criteria:

- System FNE optimization is complete.

C3.9.2 Link Verification

Motorola Responsibilities:

- Perform test to verify site link performance, prior to the interconnection of the Motorola-supplied equipment to the link equipment.

It should be noted that 900 MHz, 2.4 GHz, and 5.2/5.4/5.8 GHz bands are unlicensed. Therefore, Motorola has no control over signal emissions in these bands that may interfere with the desired signals. Although link surveys will identify possible existing interference sources, there is no guarantee that interference will not emerge after the survey. Motorola can assist the customer in assessing interference issues if they occur, however, the cost for the services and any additional equipment necessary to resolve the interference problem are beyond the scope of the generic link survey and installation.

Customer Responsibilities:

- Make available the required links which meet the specifications supplied by Motorola at the CDR.

C3.9.3 Completion Criteria:

- Link verification successfully completed.



C3.9.4 Optimization Complete

- System optimization is completed. Motorola and the Customer agree that the equipment is ready for acceptance testing.

C3.10 TRAINING

C3.10.1 Perform Training

Motorola Responsibilities:

- Finalize with the Customer Project Manager training schedules for courses purchased as part of this project.
- Conduct the training classes outlined in the Training Plan.

Customer Responsibilities:

- Comply with the prerequisites in the Training Plan.
- Attend training classes.

Completion Criteria:

- All training classes completed.

C3.10.2 Training Complete

- All training classes completed.

C3.11 AUDIT AND ACCEPTANCE TESTING

C3.11.1 Perform R56 Installation Audit

Motorola Responsibilities:

- Perform R56 site-installation quality audits, verifying proper physical installation and operational configurations.
- Create site evaluation report to verify site meets or exceeds requirements, as defined in Motorola's Standards and Guidelines for Communication Sites (R56).

Customer Responsibilities:

- Provide access/escort to the sites.
- Witness tests. (if desired)

Completion Criteria:

- All R56 audits completed successfully.

C3.11.2 Perform Equipment Testing

Motorola Responsibilities:

- Test individual components of the system to verify compliance to the equipment specifications.
- Repeat any failed test(s) once Motorola (or the Customer) has completed the corrective action(s).



- Prepare documentation of component tests to be delivered as part of the final documentation package.

Customer Responsibilities:

- Witness tests if desired.

Completion Criteria:

- Successful completion of equipment testing.

C3.11.3 Perform Functional Testing

Motorola Responsibilities:

- Verify the operational functionality and features of the individual subsystems and the system supplied by Motorola, as contracted.
- If any major task as contractually described fails, repeat that particular task after Motorola determines that corrective action has been taken.
- Document all issues that arise during the acceptance tests.
- Document the results of the acceptance tests and present to the Customer for review.
- Resolve any minor task failures before Final System Acceptance.

Customer Responsibilities:

- Witness the functional testing.

Completion Criteria:

- Successful completion of the functional testing.
- Customer approval of the functional testing.

C3.11.4 Perform Coverage Testing

Motorola Responsibilities:

- Motorola and the Customer determine the required number of test vehicles for simultaneous testing of multiple service areas.
- Perform coverage testing according to the Coverage Acceptance Test Plan (CATP), Submit test reports within the agreed period.
- If any area fails, re-test that particular area when Motorola determines that corrective action has been taken.
- Document all issues that arise during the coverage testing.
- Submit final test reports, according to the agreed period.

Customer Responsibilities:

- Provide the required number of test vehicles, drivers, and resources to witness the coverage testing.
- Review the test results in a timely manner.
- Timely approval of the test results, if the reports indicate compliance with the agreed requirements.

Completion Criteria:

- Successful completion of the coverage testing and approval by the Customer.



C3.11.5 System Acceptance Test Procedures (Milestone)

- Customer approves the completion of all the required tests.

C3.12 FINALIZE

C3.12.1 Cutover

Motorola Responsibilities:

- Motorola and the Customer develop a mutually agreed upon cutover plan based upon discussions held during the CDR.
- During cutover, follow the written plan and implement the defined contingencies, as required.
- Conduct cutover meeting(s) with user group representatives to address both how to mitigate technical and communication problem impact to the users during cutover and during the general operation of the system.

Customer Responsibilities:

- Attend cutover meetings and approve the cutover plan.
- Notify the user group(s) affected by the cutover (date and time).
- Conduct a roll call of all users working during the cutover, in an organized and methodical manner.
- Ensure that all Subscriber users are trained and the Subscribers have been activated on the system.
- Subscriber information should already be input into the system database, for activation. This task is outside of the scope of this proposal.

Completion Criteria:

- Successful migration from the old system to the new system.

C3.12.2 Resolve Punchlist

Motorola Responsibilities:

- Work with the Customer to resolve punchlist items, documented during the Acceptance Testing phase, in order to meet all the criteria for final system acceptance.

Customer Responsibilities:

- Assist Motorola with resolution of identified punchlist items by providing support, such as access to the sites, equipment and system, and approval of the resolved punchlist item(s).

Completion Criteria:

- All punchlist items resolved and approved by the Customer.

C3.12.3 Transition to Service/Project Transition Certificate

Motorola Responsibilities:

- Review the items necessary for transitioning the project to warranty support and service.



- Provide a Customer Support Plan detailing the warranty and post-warranty support, if applicable, associated with the Contract equipment.

Customer Responsibilities:

- Participate in the Transition Service/Project Transition Certificate (PTC) process.

Completion Criteria:

- All service information has been delivered and approved by the Customer.

C3.12.4 Finalize Documentation

Motorola Responsibilities:

- Provide an electronic as-built system manual on a Compact Disc (CD). The documentation will include the following:
 - System-Level Diagram
 - Site Floor Plans
 - Site Equipment Rack Configurations
 - Antenna Network Drawings for RF Site
 - Coverage ATP Results
 - Functional Acceptance Test Plan Test Sheets and Results
 - Equipment Inventory List
 - Console Programming Template
 - Maintenance Manuals (6 each, where applicable)
 - Technical Service Manuals (6 each, where applicable)

Drawings are created utilizing AutoCAD design software and will be delivered in Adobe PDF format. All other system manual documents converted from native format to Adobe PDF format to be included on the System Manual CD.

- Provide three console operator manuals at every dispatch center.

Customer Responsibilities:

- Receive and approve all documentation provided by Motorola.

Completion Criteria:

- All required documentation is provided and approved by the Customer.

C3.12.5 Final Acceptance (Milestone)

- All deliverables completed, as contractually required.
- Final System Acceptance received from the Customer.

C3.13 PROJECT ADMINISTRATION

C3.13.1 Project Status Meetings

Motorola Responsibilities:

- Once a month or as agreed, Motorola Project Manager, or designee, will attend all project status meetings with the Customer, as determined during the CDR.



- Record the meeting minutes and supply the report.
- The agenda will include the following:
 - Overall project status compared to the Project Schedule.
 - Product or service related issues that may affect the Project Schedule.
 - Status of the action items and the responsibilities associated with them, in accordance with the Project Schedule.
 - Any miscellaneous concerns of either the Customer or Motorola.

Customer Responsibilities:

- Attend meetings.
- Respond to issues in a timely manner.

Completion Criteria:

- Completion of the meetings and submission of meeting minutes.

C3.13.2 Progress Milestone Submittal

Motorola Responsibilities:

- Submit progress (non-payment) milestone completion certificate/documentation.

Customer Responsibilities:

- Approve milestone, which will signify confirmation of completion of the work associated with the scheduled task.

Completion Criteria:

- The Customer approval of the Milestone Completion document(s).

C3.13.3 Change Order Process

- Either Party may request changes within the general scope of this Agreement. If a requested change causes an increase or decrease in the cost, change in system configuration or adds time to the project's timeline required to perform this Agreement, the Parties will agree to an equitable adjustment of the Contract Price, Performance Schedule, or both, and will reflect the adjustment in a change order. Neither Party is obligated to perform requested changes unless both Parties execute a written change order.

The following is an example of the Change Order form:

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**MOTOROLA SOLUTIONS****CHANGE ORDER**

[type co# here]

Change Order No. Date: Project Name: Customer Name: Customer Project Mgr: The purpose of this Change Order is to: *(highlight the key reasons for this Change Order)*Contract# REQUIREDContract Date:

In accordance with the terms and conditions of the contract identified above between
[enter customer name] and Motorola Solutions, Inc., the following changes are approved:

Contract Price Adjustments

Original Contract Value:		\$
Previous Change Order amounts for Change Order numbers <input type="text"/> through <input type="text"/>		\$
This Change Order:		\$
New Contract Value:		\$

Completion Date Adjustments

Original Completion Date:	
Current Completion Date prior to this Change Order:	
New Completion Date:	



**MOTOROLA SOLUTIONS****CHANGE ORDER**

[type co# here]

Changes in Equipment: (additions, deletions or modifications) Include attachments if needed**Changes in Services:** (additions, deletions or modifications) Include attachments if needed

+

Schedule Changes: (describe change or N/A)**Pricing Changes:** (describe change or N/A)**Customer Responsibilities:** (describe change or N/A)**Payment Schedule for this Change Order;**
(describe new payment terms applicable to this change order)

Unless amended above, all other terms and conditions of the Contract shall remain in full force. If there are any inconsistencies between the provisions of this Change Order and the provisions of the Contract, the provisions of this Change Order will prevail.

IN WITNESS WHEREOF the parties have executed this Change Order as of the last date signed below.

Motorola Solutions, Inc.		Customer	
By:		By:	
Printed Name:		Printed Name:	
Title:		Title:	
Date:		Date:	

Reviewed by: _____
Motorola Solutions Project Manager

Date: _____



C3.13.4 Project Schedule

The attached Project Schedule will be modified, based on discussions in the Design Review, to include the additional training and mobile installation scope.



PROPOSAL TO
CITY OF RIVERSIDE

EXHIBIT C-4

FIELD AND FACTORY

ATP

DESIGN AND INSTALLATION OF LAND MOBILE RADIO

JULY 28, 2016

RFP NO. 1558



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FIELD AND FACTORY ATP

C4.1 WIDE AREA TRUNKING - FDMA ONLY SITES

C4.1.1 Auto Site Affiliation

1. DESCRIPTION

A Radio affiliation is a function that links a unique radio ID and unique talkgroup to a specific site. This information is stored in a affiliation table in the zone database.

Before resources are assigned, the affiliation table is accessed to know which sites need to be assigned to support the call. Only the sites that need to be assigned that have associated talkgroups will be assigned. If the site does not have that talkgroup affiliated to it will not be assigned. This allows for more calls to be processed with fewer resources.

SETUP

RADIO-1 - TALKGROUP 1
 RADIO-1 - SITE - SITE 1
 RADIO-2 - TALKGROUP 1
 RADIO-2 - SITE - SITE 1
 RADIO-3 - TALKGROUP 2
 RADIO-3 - SITE -
 RADIO-4 - TALKGROUP 2
 RADIO-4 - SITE -

This test requires the ZoneWatch feature.

Note: There are system settings which could affect the assignment of resources, such as required site.

2. TEST

- Step 1. Turn RADIO-1 off and on.
- Step 2. Verify via ZoneWatch that RADIO-1 sends in its affiliation.
- Step 3. Initiate a call using RADIO-1 on TALKGROUP 1.
- Step 4. Verify RADIO-2 can receive and respond to the call. Using ZoneWatch verify that no resources are assigned at as there are no subscribers affiliated to TALKGROUP 1 at .
- Step 5. Initiate a call on TALKGROUP 2 using RADIO-3.
- Step 6. Verify that RADIO-4 can receive and respond to the call. Using ZoneWatch verify that no resources are assigned at SITE 1 as there are no subscribers affiliated to TALKGROUP 2 at SITE 1.

Pass ____ Fail ____

VERSION #1.030

Wide Area Trunking - FDMA Only Sites

C4.1.2 Talkgroup Call

1. DESCRIPTION

The Talkgroup is the primary level of organization for communications on a trunked radio system. Radios with Talkgroup call capability will be able to communicate with other members of the same Talkgroup. This provides the effect of a private channel down to the Talkgroup level.

This test will demonstrate that a Talkgroup transmission initiated by a radio user will only be heard by system users, which have, the same Talkgroup selected. As with other types of calls, Talkgroup calls can take place from anywhere in the system.

SETUP

RADIO-1 - SITE 1 - TALKGROUP 1
RADIO-2 - - TALKGROUP 1
RADIO-3 - SITE 1 - TALKGROUP 2
RADIO-4 - - TALKGROUP 2

VERSION #1.040

2. TEST

- Step 1. Initiate a Wide Area Call with RADIO-1 in TALKGROUP 1.
- Step 2. Observe that only RADIO-2 will be able to monitor and respond to the call.
- Step 3. Initiate a Wide Area Call with RADIO-3 in TALKGROUP 2.
- Step 4. Observe that only RADIO-4 will be able to monitor and respond the call.

Pass ____ Fail ____



Wide Area Trunking - FDMA Only Sites

C4.1.3 Secure Operation

1. DESCRIPTION

Digital encryption is used to scramble a transmission so only properly equipped and configured radios can monitor the conversation. A "Key" is used to encrypt the transmit audio. Only radios with the same "Key" can decrypt the audio and listen to it.

SETUP

RADIO-1 - TALKGROUP 1 (SECURE TX MODE)
RADIO-2 - TALKGROUP 1 (SECURE TX MODE)
RADIO-3 - TALKGROUP 1 (SECURE MODE and no, or incorrect key)
RADIO-4 - TALKGROUP 1 (Clear TX Mode)

Note: The identical secure mode must be programmed into RADIO-1, RADIO-2, RADIO-4 and that RADIO-3 has no secure code loaded or has a unique secure code from the other testing radios.

VERSION #1.020

2. TEST

- Step 1. Initiate a secure wide area call with RADIO-1 on TALKGROUP 1. Keep this call in progress until instructed to end the call.
- Step 2. Observe that RADIO-2 will be able to monitor the call.
- Step 3. Observe that RADIO-3 does not receive the call.
- Step 4. Observe that RADIO-4 will also receive the call even with the secure switch set to the non-secure mode of operation.
- Step 5. End the call from RADIO-1.
- Step 6. Respond with RADIO-2 and verify that RADIO-1 receives the response audio but RADIO-3 cannot.

Pass_____ Fail_____



Wide Area Trunking - FDMA Only Sites

C4.1.4 Recent User Priority

1. DESCRIPTION

A recent user of the channel has priority over other users of equal priority of being assigned a channel when a busy queue exists. The maximum number of consecutive times that a user may be elevated to recent user priority is two.

Note: Timing is critical for this test, it is recommended that the test be read through and understood before attempting to complete.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 2
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 3
RADIO-3 - SITE - SITE 1

VERSION #1.030

2. TEST

- Step 1. Ensure that the priority level for all talkgroups is the same. Simulate a busy system by disabling all channels at SITE 1, with the exception of the control channel and one voice channel.
- Step 2. Press and hold the PTT switch of RADIO-1.
- Step 3. Press the PTT switch on RADIO-2. Verify that the radio receives a busy tone.
- Step 4. Press the PTT switch on RADIO-3. Verify that the radio receives a busy tone.
- Step 5. Release the PTT switch on RADIO-1.
- Step 6. As soon as RADIO-2 receives its callback tone, press and hold its PTT switch.
- Step 7. Within 2 seconds of callback, re-key RADIO-1. Verify that RADIO-1 receives a busy tone. Release the PTT switch on RADIO-1.
- Step 8. Release the PTT switch on RADIO-2. Verify that RADIO-1 receives a callback tone before RADIO-3.
- Step 9. Repeat Steps 2-8 for RADIO-1 and RADIO-2. Verify that the priority of RADIO-1 is once more elevated in the busy queue.
- Step 10. Repeat Steps 2-8 for RADIO-1 and RADIO-2 once more. Verify that in Step 9 that RADIO-3 receives the callback tone since RADIO-1 cannot be elevated in the busy queue more than two consecutive times.

Pass____ Fail____



Wide Area Trunking - FDMA Only Sites

C4.1.5 Call Alert

1. DESCRIPTION

Call Alert is a tone page that allows a user to selectively alert another radio unit. The initiating radio will receive notification from the trunked system as to whether or not the page was received by the target radio. Units receiving a Call Alert will sound an alert tone. As with other types of calls, Call Alerts can take place from anywhere in the system.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 2
RADIO-3 - TALKGROUP 3

VERSION #1.010

2. TEST

- Step 1. Using RADIO-1, press the page button.
- Step 2. Enter the unit ID of RADIO-2 with the keypad, or scroll to the location where this ID is stored
- Step 3. Press the PTT to initiate the call alert. Verify that the RADIO-1 user receives audible indication that the Call Alert was sent.
- Step 4. Verify that RADIO-2 user receives an audible indication of an incoming Call Alert was sent but RADIO-3 does not.
- Step 5. Verify RADIO-1 gets an audible indication that the Call Alert was successfully received at the target radio.
- Step 6. Turn off RADIO-2. Send a Call Alert from RADIO-1 to RADIO-2.
- Step 7. Verify that the RADIO-1 user receives audible indication that the Call Alert was sent.
- Step 8. Verify RADIO-1 receives a "No Acknowledgement" indication that the Call Alert was not received at the target radio.

Pass____ Fail____



Wide Area Trunking - FDMA Only Sites

C4.1.6 In Call User Alert (Enabled)

1. DESCRIPTION

In-Call User Alert enhances the Call Alert feature to allow Call Alerts to be received by radios that are currently involved in voice and data services. As part of this feature, the radio supports Talkgroup Muting where the radio user can mute all talkgroup voice received by the radio. The Console Dispatcher or another radio user can unmute the radio by sending the radio a Call Alert.

Note: Talkgroup Muting is a programmable option in the radio. There are also sub-options which will affect the time and operation of the Talkgroup muting.

SETUP

RADIO-1 - TALKGROUP 1

RADIO-2 - TALKGROUP 2

CONSOLE-1 - TALKGROUP 1

Verify that In-Call User Alert is enabled in the Unified Network Configurator Wizard.

VERSION #1.020

2. TEST

- Step 1. Verify that RADIO-1 and RADIO-2 have Talkgroup Muting (VMUT) disabled in the radios.
- Step 2. Enable Talkgroup Muting (VMUT) on RADIO-1.
- Step 3. Verify that there is a visual indication on RADIO-1 that Talkgroup Muting is enabled.
- Step 4. Initiate a talkgroup call on TALKGROUP 1 from CONSOLE-1.
- Step 5. Verify that no audio is heard by RADIO-1 and that RADIO-1 displays the ID of CONSOLE-1.
- Step 6. Send a Call Alert to RADIO-1 from RADIO-2. Verify that RADIO-1 receives a Call Alert and that RADIO-2 indicates success of Call Alert. Verify that CONSOLE-1 audio is now heard by RADIO-1.
- Step 7. End Console talkgroup call.
- Step 8. Acknowledge Call Alert by hitting home key on RADIO-1.

Pass____ Fail____

July 28, 2016

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4-8 Field and Factory ATP

City of Riverside
Design and Installation of Land Mobile Radio

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Wide Area Trunking - FDMA Only Sites

C4.1.7 Private Call

1. DESCRIPTION

Private Call is a selective calling feature that allows a radio user to carry on one-to-one conversation that is only heard by the 2 parties involved. Subscriber units receiving a private call will sound an alert tone. As with other types of calls, Private Calls can take place from anywhere in the system.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
RADIO-3 - TALKGROUP 1

VERSION #1.020

2. TEST

- Step 1. Using RADIO-1, press the Private Call (Call) button.
- Step 2. Enter the unit ID of RADIO-2 with the keypad, or scroll to the location where this ID is stored.
- Step 3. Press the PTT to initiate the Private Call.
- Step 4. Verify that RADIO-2 hears tones and the display indicates that a Private Call has been received, but RADIO-3 receives no indications.
- Step 5. Answer the call at RADIO-2 by pressing the Private Call (Call)/Respond button. If RADIO-2 has a display, verify it shows the ID number or Alias of the calling unit.
- Step 6. Press the PTT switch on RADIO-2 and respond to the Private Call. Note that if you do not press the Private Call button before pressing PTT, your audio will be heard by all members of the talkgroup, and not just by the radio initiating the Private Call.
- Step 7. Verify that RADIO-2 can communicate with RADIO-1.
- Step 8. Verify that RADIO-3 does not monitor the Private Call.
- Step 9. End the Private Call by pressing the "home" key and return to normal talkgroup operation.

Pass____ Fail____

Wide Area Trunking - FDMA Only Sites

C4.1.8 In Call User Alert (Disabled)

1. DESCRIPTION

In-Call User Alert enhances the Call Alert feature to allow Call Alerts to be received by radios that are currently involved in voice and data services. As part of this feature, the radio supports Talkgroup Muting where the radio user can mute all talkgroup voice received by the radio. The Console Dispatcher or another radio user can unmute the radio by sending the radio a Call Alert.

Note: Talkgroup Muting is a programmable option in the radio. There are also sub-options which will affect the time and operation of the Talkgroup muting.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 2
CONSOLE-1 - TALKGROUP 1

VERSION #1.010

2. TEST

- Step 1. Verify that In-Call User Alert is disabled. Verify that RADIO-1 and RADIO-2 have Talkgroup Muting (VMUT) disabled (Off) in the radios.
- Step 2. Enable Talkgroup Muting (VMUT) (Turn on) on RADIO-1.
- Step 3. Verify that there is a visual indication on RADIO-1 that Talkgroup Muting is enabled.
- Step 4. Initiate a talkgroup call on TALKGROUP 1 from CONSOLE-1.
- Step 5. Verify that no audio is heard by RADIO-1 and that RADIO-1 displays the ID of CONSOLE-1.
- Step 6. Send a Call Alert to RADIO-1 from RADIO-2. Verify that RADIO-1 does not receive a Call Alert and that RADIO-2 indicates failure of Call Alert. End Console talkgroup call.
- Step 7. Send a Call Alert to RADIO-1 from CONSOLE-1. Accept the Call Alert at RADIO-1 by pressing the Home key.
- Step 8. Initiate a talkgroup call on TALKGROUP 1 from CONSOLE-1.
- Step 9. Verify that audio is now heard by RADIO-1 and that RADIO-1 displays the ID of CONSOLE-1.
- Step 10. End Console talkgroup call.

Pass____ Fail____



Wide Area Trunking - FDMA Only Sites

C4.1.9 Audio Interrupt / Interrupt Never Mode

1. DESCRIPTION

A radio PTT request may be received for a group already active and currently being sourced by another radio unit. The talkgroup can be flagged to either allow or disallow the new PTT. If allowed, the latest PTT request will be granted and become the source of the call.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
RADIO-3 - TALKGROUP 1

VERSION #1.020

2. TEST

- Step 1. Verify TALKGROUP 1's template is set up as Audio Interrupt Never.
- Step 2. Using RADIO-1, initiate a call on TALKGROUP 1.
- Step 3. Verify both RADIO-2 and RADIO-3 monitor the audio.
- Step 4. Using RADIO-3, initiate a call on TALKGROUP 1.
- Step 5. Verify that RADIO-3 receives a reject and that RADIO-2 continues to listen to RADIO-1.
- Step 6. Dekey both Radios.

Pass____ Fail____



Wide Area Trunking - FDMA Only Sites

C4.1.10 Audio Interrupt On Priority

1. DESCRIPTION

The system manager has the ability to allow users to interrupt calls in progress. There are 3 different settings, "Never" prevents all audio interrupt requests, "Always" allows the system to automatically grant audio interrupt requests on the same talkgroup and "On Priority" allows the system to use Subscriber ID priority in order to interrupt other radios. A radio with higher individual priority will interrupt another radio with lower individual priority.

SETUP

RADIO-1 – TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 – TALKGROUP 1
RADIO-2 - SITE -
RADIO-3 – TALKGROUP 1
RADIO-3 - SITE - SITE 1

Note:
TALKGROUP 1 has been configured to
Audio_Interrupt = On_Priority

VERSION #1.030

2. TEST

- Step 1. Verify the radio user record for RADIO-2 has been configured for a higher priority level than RADIO-1.
- Step 2. Initiate a call using RADIO-1. Keep this call in progress until the completion of step 4. Verify RADIO-2 and RADIO-3 hear RADIO-1 audio.
- Step 3. Initiate a call using RADIO-2. Verify RADIO-3 hears RADIO-2 audio.
- Step 4. End the call on RADIO-2. Verify RADIO-2 and RADIO-3 hear RADIO-1 audio.

Pass____ Fail____



Wide Area Trunking - FDMA Only Sites

C4.1.11 Emergency Alarm and Call with Ruthless Preemption

1. DESCRIPTION

Users in life threatening situations can use the Emergency button on the radio to immediately send a signal to the dispatcher and be assigned the next available voice channel. An Emergency Call can be set to either Top of Queue or Ruthless Preemption operation. To demonstrate this, an Emergency Alarm and Call will be initiated from a subscriber which will be received by a subscriber, on the same talkgroup, affiliated at any site of any zone in the system.

NOTE : If the subscriber does not have the Display option, the Emergency ID will not be displayed. This test is not recommended for single site systems as RF contention will occur.

SETUP

RADIO-1 -
RADIO-1 - SITE - SITE 1
RADIO-2 -
RADIO-2 - SITE -
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 1
RADIO-4 - TALKGROUP 2
RADIO-4 - SITE -
CONSOLE-1 -

VERSION #1.030

2. TEST

- Step 1. Verify the emergency type for 's template is configured for Ruthless Preemption.
- Step 2. Simulate a busy system by disabling all channels at SITE 1 with the exception of the control channel and one voice channel.
- Step 3. Press the PTT on RADIO-4 to initiate a call on TALKGROUP 2 and hold the PTT switch until instructed to release. Verify RADIO-3 receives the call.
- Step 4. Key RADIO-1 and verify the radio receives a busy tone. Release the PTT switch on RADIO-1.
- Step 5. Using RADIO-1 send an Emergency Call by pressing the emergency switch and then the PTT switch.
- Step 6. Observe that RADIO-1 is granted the channel immediately and the Talkgroup Call is dropped for RADIO-3. Verify an Emergency Alarm is displayed at CONSOLE-1 on . Dekey RADIO-4.
- Step 7. Key RADIO-3 and verify the radio receives a busy tone. Release the PTT switch on RADIO-3.
- Step 8. End the Emergency Call by holding down the Emergency button on RADIO-1 until an alert tone sounds. Verify RADIO-1 returns to normal operation and that RADIO-3 receives a callback after the emergency hang time expires.
- Step 9. Enable the disabled channels at SITE 1 to return the system to normal operation.

Pass____ Fail____



Wide Area Trunking - FDMA Only Sites

C4.1.12 Emergency Alarm and Call with Top of Queue

1. DESCRIPTION

Users in life threatening situations can use the Emergency button on the radio to immediately send a signal to the dispatcher and be assigned the next available voice channel. An Emergency Call can be set to either Top of Queue or Ruthless Preemption operation. During an emergency call the Emergency ID will appear on the display of the subscribers. To demonstrate this, an Emergency Alarm and Call will be initiated from a subscriber which will be received by a subscriber on the same talkgroup, affiliated at any site of any zone in the system.

NOTE: If the subscriber does not have the Display option, the Emergency ID will not be displayed.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - Any Site
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 1
RADIO-4 - TALKGROUP 3
RADIO-4 - SITE - SITE 1

All radios and talkgroups should start with default priorities. Default is 10.

VERSION #1.010

2. TEST

- Step 1. Verify the emergency type for TALKGROUP 1's template is set up as Top of Queue.
- Step 2. Simulate a busy system by disabling all channels at SITE 1 with the exception of the control channel and one voice channel.
- Step 3. Press the PTT to initiate a call with RADIO-3 and hold the PTT switch until instructed to release.
- Step 4. Key RADIO-4 and verify the radio receives a busy tone. Release the PTT switch on RADIO-4.
- Step 5. Using RADIO-1 send an Emergency Call by depressing the emergency switch and then the PTT switch.
- Step 6. Observe that RADIO-1 cannot transmit due to the voice channel being busy.
- Step 7. Release the PTT switch on RADIO-3.
- Step 8. Observe that RADIO-1 receives the call back before RADIO-4 and is able to proceed with the call. Also observe that the display on RADIO-2 denotes an emergency and the unit ID or alias of RADIO-1.
- Step 9. Dekey RADIO-1 and end the Emergency Call by holding down the Emergency button on RADIO-1 until an alert tone sounds. Verify RADIO-1 returns to normal operation and that RADIO-4 receives a callback.
- Step 10. Return the system to normal operation by enabling all the channels at SITE 1.

Pass____ Fail____



Wide Area Trunking - FDMA Only Sites

C4.1.13 Priority Monitor/Non-Priority Scan

1. DESCRIPTION

This test will demonstrate that a subscriber unit can scan a pre-programmed list to find any Priority and Non-priority Talkgroups with assigned voice channels at that site. To demonstrate this, a call will be initiated from a subscriber at a remote site on a talkgroup monitored by a subscriber at the same site as the scanning radio. The scanning radio will scan from its selected talkgroup to the active talkgroup.

Note: Subscribers must be capable of supporting the Talkgroup scan.

SETUP

RADIO-1 - TALKGROUP 1 (SCANNING)
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 2
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 3
RADIO-3 - SITE - SITE 1
RADIO-4 - TALKGROUP 3
RADIO-4 - SITE -

* RADIO-1 needs to be set to a dial position configured to scan.

2. TEST

- Step 1. Verify that RADIO-1 is set to TALKGROUP 1 and in the scan mode of operation and programmed to scan TALKGROUP 1, TALKGROUP 2, and TALKGROUP 3.
- Step 2. Initiate a Talkgroup Call with RADIO-4 and observe that RADIO-1 scans to the talkgroup and receives the call. Keep the call in progress until completion of the following step.
- Step 3. Initiate a Talkgroup Call with RADIO-2 and observe that RADIO-1 does not receive the call since RADIO-1 is listening to TALKGROUP 3.

Pass____ Fail____

VERSION #1.010



Wide Area Trunking - FDMA Only Sites

C4.1.14 Priority Monitor/Priority Scan

1. DESCRIPTION

A subscriber unit can scan a pre-programmed list (in the radio) to find any Priority and Non-priority Talkgroups with assigned voice channels at that site. To demonstrate this, a call will be initiated from a portable at a remote site on a talkgroup monitored by a portable at the same site as the scanning radio. The scanning radio will scan from its selected talkgroup to the active talkgroup. The test will be repeated with an additional radio transmitting on the Priority Talkgroup while the scanning radio is scanning. This third radio will be on a remote site with a fourth radio on the Priority Talkgroup at the same site as the scanning radio.

SETUP

RADIO-1 - TALKGROUP 1 (SCANNING)
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 1
RADIO-3 - SITE -
RADIO-4 - TALKGROUP 2
RADIO-4 - SITE -
RADIO-5 - TALKGROUP 2
RADIO-5 - SITE - SITE 1

VERSION #1.010

2. TEST

- Step 1. Verify that RADIO-1 is set to TALKGROUP 1 and in the scan mode of operation and programmed to scan TALKGROUP 1 and TALKGROUP 2 with TALKGROUP 1 as its Priority Monitor Talkgroup.
- Step 2. Verify Priority Monitor and the Valid Site setting is set to yes for .
- Step 3. Initiate a Talkgroup Call with RADIO-4 to RADIO-5 and observe that RADIO-1 scans to the talkgroup and receives the call. Keep the call in progress until the completion of the following step.
- Step 4. Initiate a Talkgroup Call with RADIO-3 and observe that RADIO-1 reverts to the TALKGROUP 1 and receives the call.

Pass____ Fail____



Wide Area Trunking - FDMA Only Sites

C4.1.15 Emergency Interrupt Priority Enabled (FDMA only sites)

1. DESCRIPTION

The system manager has the ability to prevent non-emergency users from interrupting emergency transmissions in progress on the same talkgroup. If Emergency Interrupt Priority is enabled, a non-emergency radio transmission cannot interrupt an emergency radio transmission. However, the non-emergency radio transmission can interrupt another non-emergency radio transmission, if allowed according to the Audio Interrupt Mode. An emergency transmission can always interrupt another emergency transmission on the same talkgroup regardless of the Audio Interrupt Mode setting, or the Emergency Interrupt Priority setting.

SETUP

RADIO-1 – TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 – TALKGROUP 1
RADIO-2 - SITE - SITE 2
RADIO-3 – TALKGROUP 1
RADIO-3 - SITE - SITE 1

Note:

TALKGROUP 1 has been configured to
Audio_Interrupt = Always
TALKGROUP 1 has been configured to Emergency
Interrupt Priority = Enabled

VERSION #1.010

2. TEST

- Step 1. Demonstrate TALKGROUP 1's template is set up as Audio Interrupt Always, and Emergency Interrupt Priority Enabled.
- Step 2. Initiate an emergency call using RADIO-1. Keep this call in progress until the completion of step 5. Demonstrate RADIO-2 and RADIO-3 hear RADIO-1 audio.
- Step 3. Attempt to initiate a non-emergency call using RADIO-2. Demonstrate RADIO-2 receives a reject and RADIO-3 still hears RADIO-1 audio.
- Step 4. End the call on RADIO-2. Demonstrate RADIO-2 and RADIO-3 hear RADIO-1 audio.
- Step 5. Initiate an emergency transmission on RADIO-2. Demonstrate that RADIO-3 hears RADIO-2 audio.
- Step 6. End the call on RADIO-1 and RADIO-2.
- Step 7. Initiate a non-emergency call on RADIO-2. Demonstrate RADIO-1 and RADIO-3 hear RADIO-2 audio.
- Step 8. Initiate a non-emergency call on RADIO-3. Demonstrate RADIO-1 hears RADIO-3.
- Step 9. Dekey RADIO-2. Demonstrate that RADIO-1 and RADIO-2 hear RADIO-3.

Pass____ Fail____



C4.2 SITE TRUNKING - FDMA ONLY SITES

C4.2.1 Site Trunking Indication

1. DESCRIPTION

When a remote site loses its link or does not have a link to the Zone Controller, the affected site will enter "Site Trunking" mode of operation. Radios locked onto this site will be serviced locally within this site's coverage area.

NOTE: If the subscriber does not have the Display option, the "Site Trunking" indication will not be displayed.

SETUP

RADIO-1 - TALKGROUP 1

RADIO-1 - SITE - SITE 1

RADIO-2 - TALKGROUP 2

RADIO-2 - SITE - SITE 1

Lock the subscribers to SITE 1 if more than one site exists on the system.

2. TEST

- Step 1. Place SITE 1 into the Site Trunking mode.
- Step 2. Verify that RADIO-1 and RADIO-2 are displaying the "Site Trunking" indication.
- Step 3. Return the site to Wide Area Trunking unless the next test requires Site Trunking.

Pass____ Fail____

VERSION #1.010



Site Trunking - FDMA Only Sites

C4.2.2 Talkgroup Call (Single Site)

1. DESCRIPTION

When a site goes into Site Trunking, radios with Talkgroup Call capability will be able to communicate with other members of the same talkgroup at that same site. (Members of the same talkgroup at other sites will not be able to monitor those conversations.)

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 1
RADIO-4 - TALKGROUP 2
RADIO-4 - SITE - SITE 1

* All Radios should be "Site Locked"

VERSION #1.010

2. TEST

- Step 1. Place SITE 1 into the Site Trunking mode.
- Step 2. Initiate a Talkgroup Call with RADIO-1 on TALKGROUP 1 at SITE 1.
- Step 3. Observe that only RADIO-2 will be able to monitor and respond to the call. Note that RADIO-3 AND RADIO-4 are not able to monitor the call since they are on another Talkgroup.
- Step 4. Initiate a Talkgroup Call with RADIO-3 on TALKGROUP 2 at SITE 1.
- Step 5. Observe that only RADIO-4 will be able to monitor and respond to the call.
- Step 6. Return the site to Wide Area Trunking unless the next test requires Site Trunking.

Pass____ Fail____

Site Trunking - FDMA Only Sites

C4.2.3 Call Alert

1. DESCRIPTION

Call Alert is a tone page that allows a user to selectively alert another radio unit. When a site is in Site Trunking, Radios at the site will only be able to Call Alert other radios at the same site. The initiating radio will receive notification from the trunked system as to whether or not the page was received by the target radio.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 2
RADIO-2 - SITE - SITE 1

Note: All Radios should be "Site Locked"

VERSION #1.010

2. TEST

- Step 1. Place SITE 1 into the Site Trunking mode.
- Step 2. Using RADIO-1, press the page button.
- Step 3. Enter the Unit ID of RADIO-2 with the keypad, or scroll to the location where this ID is stored.
- Step 4. Press the PTT to initiate the Call Alert.
- Step 5. Verify that RADIO-2 received the Call Alert.
- Step 6. Exit the Call Alert mode and return to normal talkgroup mode.
- Step 7. Return the site to Wide Area Trunking unless the next test requires Site Trunking.

Pass____ Fail____



Site Trunking - FDMA Only Sites

C4.2.4 Private Call

1. DESCRIPTION

Private Call is a selective calling feature that allows a dispatcher or radio user to carry on one-to-one conversation that is only heard by the 2 parties involved. When a site is in Site Trunking, Radios at the site will only be able to Private Call other radios at the same site.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 1
RADIO-3 - SITE - SITE 1

Note: All Radios should be "Site Locked"

VERSION #1.020

2. TEST

- Step 1. Place SITE 1 into the Site Trunking mode.
- Step 2. Using RADIO-1, press the Private Call button.
- Step 3. Enter the Unit ID of RADIO-2 with the keypad, or scroll to the location where this ID is stored.
- Step 4. Press the PTT to initiate the call.
- Step 5. Verify that at RADIO-2 only tones are heard and the display indicates that a call has been received.
- Step 6. Answer the call at RADIO-2 by pressing the Private Call/Respond button. Verify its display shows the ID number or alias of the calling unit.
- Step 7. Press the PTT switch on RADIO-2 and respond to the call. Note that if you do not press the Private Call button before pressing PTT, your audio will be heard by all members of the talkgroup, and not by the radio initiating the Private Call.
- Step 8. Verify only RADIO-1 hears the audio from RADIO-2.
- Step 9. End the Private Call. Return the site to Wide Area Trunking unless the next test requires Site Trunking.

Pass____ Fail____

Site Trunking - FDMA Only Sites

C4.2.5 Emergency Call and Alarm

1. DESCRIPTION

Emergency Alarms and Calls can be initiated by subscribers when the registered site is in Site Trunking. With all subscribers registered on a Site Trunking site, a subscriber will initiate an Emergency Alarm by pressing the Emergency button. By pressing the PTT, an Emergency Call will be issued and the ID of the initiator will be displayed with an Emergency indication by the other subscribers on the same talkgroup.

Note that for site trunking, Emergency Call operation is always Top of Queue.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 1
RADIO-4 - TALKGROUP 3
RADIO-4 - SITE - SITE 1

Note: All Radios should be "Site Locked"

VERSION #1.010

2. TEST

- Step 1. Place SITE 1 into the Site Trunking mode.
- Step 2. Simulate a busy system by disabling all channels at SITE 1 with the exception of the control channel and one voice channel.
- Step 3. Press the PTT on RADIO-3 and hold the PTT switch until instructed to release.
- Step 4. Key RADIO-4 and observe that the radio receives a busy.
- Step 5. Using RADIO-1, initiate an emergency alarm followed by an emergency call.
- Step 6. Observe that RADIO-1 cannot transmit due to the voice channel being busy.
- Step 7. Release the PTT switch on RADIO-3.
- Step 8. Observe that RADIO-1 can now proceed with the call and RADIO-2 receives the call. Also observe that the display on RADIO-2 denotes an emergency and the ID or Alias of the unit sending the emergency.
- Step 9. End the emergency call and verify that RADIO-4 gets a callback.
- Step 10. Restore all channels to service and return the site to Wide Area Trunking unless the next test requires Site Trunking.

Pass____ Fail____



Site Trunking - FDMA Only Sites

C4.2.6 Wide Area Recovery

1. DESCRIPTION

A site in Site Trunking will transition to Wide Area Trunking when all failures have been cleared. All subscribers should transition from Site Trunking to Wide Area Trunking and continue to process calls.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 1
RADIO-3 - SITE -
RADIO-4 - TALKGROUP 1
RADIO-4 - SITE -
CONSOLE-1 - TALKGROUP 1

Note: All Radios should be "Site Locked"

VERSION #1.020

2. TEST

- Step 1. Set the status of SITE 1 to Wide Area and clear any system errors that may have placed SITE 1 into Site Trunking.
- Step 2. Verify that the status of SITE 1 has transitioned into Wide Area Trunking.
- Step 3. Verify that RADIO-1 and RADIO-2 no longer display Site Trunking.
- Step 4. Verify Wide Area communications between RADIO-1, RADIO-2, RADIO-3, RADIO-4 and CONSOLE-1.

Pass____ Fail____



C4.3 MCC 7100/7500 TRUNKED RESOURCES

C4.3.1 Instant Transmit

1. DESCRIPTION

The instant transmit switch provides immediate operator access to a channel, independent of its select status (selected or unselected). It provides priority over other dispatcher transmit bars or optional footswitches.

SETUP

RADIO-1 - TALKGROUP 1
CONSOLE-1 – TALKGROUP 1 (Selected),
TALKGROUP 2 (Unselect mode)

VERSION #1.010

2. TEST

- Step 1. Using CONSOLE-1, press the Instant Transmit button on TALKGROUP 1.
- Step 2. Verify that the Transmit indicator is lit.
- Step 3. Verify RADIO-1 can monitor and respond to the call on TALKGROUP 1.
- Step 4. On RADIO-1 change to TALKGROUP 2.
- Step 5. Using CONSOLE-1, press the Instant Transmit button on the TALKGROUP 2 radio resource.
- Step 6. Verify RADIO-1 can monitor and respond to the call on TALKGROUP 2.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

C4.3.2 Talkgroup Selection and Call

1. DESCRIPTION

The Talkgroup Call is the primary level of organization for communications on a trunked radio system. Dispatchers with Talkgroup Call capability will be able to communicate with other members of the same talkgroup. This provides the effect of an assigned channel down to the talkgroup level. When a Talkgroup Call is initiated from a subscriber unit, the call is indicated on each dispatch operator position that has a channel control resource associated with the unit's channel/talkgroup.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 2
RADIO-3 - TALKGROUP 1
RADIO-4 - TALKGROUP 2
CONSOLE-1 - TALKGROUP 1
CONSOLE-2 - TALKGROUP 2

VERSION #1.010

2. TEST

- Step 1. Initiate a wide area call from CONSOLE-1 on TALKGROUP 1.
- Step 2. Observe that RADIO-1 and RADIO-3 will be able to monitor the call. Dekey the console and have either radio respond to the call.
- Step 3. Observe that all consoles with TALKGROUP 1 can monitor both sides of the conversation.
- Step 4. Initiate a wide area call from CONSOLE-2 on TALKGROUP 2.
- Step 5. Observe that RADIO-2 and RADIO-4 will be able to monitor the call. Dekey the console and have either radio respond to the call.
- Step 6. Observe that all consoles with TALKGROUP 2 can monitor both sides of the conversation.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

C4.3.3 Talkgroup Selection and Call - Secure

1. DESCRIPTION

The Talkgroup Call is the primary level of organization for communications on a trunked radio system. Dispatchers with Talkgroup Call capability will be able to communicate with other members of the same talkgroup. This provides the effect of an assigned channel down to the talkgroup level. When a Talkgroup Call is initiated from a subscriber unit, the call is indicated on each dispatch operator position that has a channel control resource associated with the unit's channel/talkgroup. Digital encryption is used so only properly equipped and configured subscribers can monitor the conversation. A "Key" is used to encrypt the transmit audio. Only radios and Consoles with the same "Key" can decrypt the audio and listen to it.

SETUP

RADIO-1 - TALKGROUP 1 (Secure TX Mode)
RADIO-2 - TALKGROUP 2 (Secure TX Mode)
RADIO-3 - TALKGROUP 2 (No Keys)
RADIO-4 - TALKGROUP 1 (Clear TX Mode with Keys loaded)
CONSOLE-1 - TALKGROUP 1 and TALKGROUP 2 (Secure TX Mode)

VERSION #1.040

2. TEST

- Step 1. Initiate a wide area secure call from CONSOLE-1 on TALKGROUP 1.
- Step 2. Verify RADIO-1 can monitor and respond to the secure call.
- Step 3. Verify RADIO-4 can monitor and respond to the secure call because even though it is in clear mode the correct encryption keys are loaded for the secure call.
- Step 4. Initiate a wide area secure call from CONSOLE-1 on TALKGROUP 2.
- Step 5. Verify that RADIO-2 can monitor and respond to the secure call. Note that RADIO-3 cannot monitor the call.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

C4.3.4 PTT Unit ID/Alias Display

1. DESCRIPTION

Console operator positions contain various resources such as talkgroup, multigroup, Private Call which enables the dispatcher to communicate with the subscriber units. If activity occurs on one of these operator position resources, the unit ID or associated alias of the initiating radio appears at the console resource.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1
CONSOLE-2 - TALKGROUP 1

VERSION #1.010

2. TEST

- Step 1. Select the resource for TALKGROUP 1 on CONSOLE-1.
- Step 2. Initiate a call on TALKGROUP 1 from RADIO-2 and observe that the alias is seen at CONSOLE-1 in the resource window as well as in the Activity Log window.
- Step 3. Initiate a call from RADIO-1 and observe that the alias of RADIO-1 is seen at CONSOLE-1 in the resource window as well as in the Activity Log window.
- Step 4. Modify RADIO-2's alias. Make sure to give enough time for the alias change to propagate to the Zone Controller.
- Step 5. Initiate a call from RADIO-2 and observe the new alias of RADIO-2 is seen at CONSOLE-1 in the list in the resource window as well as in the Activity Log window.
- Step 6. Return RADIO-2's alias to its original state.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

C4.3.5 Emergency Alarm and Call Display Description

1. DESCRIPTION

Users in life threatening situations can use the emergency button on the radio to send an audible alarm and a visual alarm signal to a console operator in order to request immediate system access to a voice channel for an emergency call. An emergency alarm begins after the radio user presses the radio's emergency button. Pressing the emergency button places the radio in "emergency mode". To begin an emergency call, the radio user must press the radio's PTT button while in "emergency mode." The assigned voice channel will be dedicated to the emergency caller's talkgroup for an extended period of time, equal to the Message Hang Time plus the Emergency Hang Time. As with other call types, emergency calls can operate across sites as well as within the same site.

SETUP

RADIO-1 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1
CONSOLE-2 - TALKGROUP 1

VERSION #1.010

2. TEST

- Step 1. Initiate an Emergency Alarm from RADIO-1.
- Step 2. Observe the Emergency from RADIO-1 is received at CONSOLE-1 for TALKGROUP 1.
- Step 3. Acknowledge the Emergency at the operator position. Verify CONSOLE-2 receives notification that the call has been acknowledged.
- Step 4. Initiate a call with RADIO-1 to initiate an Emergency call.
- Step 5. Observe CONSOLE-1 and CONSOLE-2 can monitor RADIO-1
- Step 6. Clear the Emergency from CONSOLE-1 on TALKGROUP 1.
- Step 7. End the Emergency Alarm from RADIO-1.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

C4.3.6 Multigroup Call

1. DESCRIPTION

This trunking feature allows an equipped console operator position to transmit an announcement to several different talkgroups simultaneously. As with Talkgroup Calls, multigroup calls operate across sites as well as within the same site.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 2
RADIO-3 - RANDOM
CONSOLE-1 - ATG 1

Note: TALKGROUP 1 and TALKGROUP 2 are members of ATG 1. RANDOM is any talkgroup not a member of ATG 1.

VERSION #1.010

2. TEST

- Step 1. Using CONSOLE-1, select the ATG 1 resource.
- Step 2. Initiate the Multigroup Call from CONSOLE-1.
- Step 3. Observe that RADIO-1 and RADIO-2 receive the Multigroup Call.
- Step 4. Verify that RADIO-3 does not receive the Multigroup Call because it is not a member of ATG 1.
- Step 5. Answer the Multigroup Call using RADIO-1 and observe CONSOLE-1 receives the response.
- Step 6. Verify that if the call is answered within the repeater hang time, the console will receive the call on the ATG 1 resource tile, otherwise the console will receive the call on the TALKGROUP 1 tile.
- Step 7. Verify that if the call is answered within the repeater hang time, RADIO-2 will monitor the call.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

C4.3.7 Multi-Select Operation

1. DESCRIPTION

Multi-Select (Msel) allows the console operator to group a number of channels/talkgroups together such that when the general transmit bar is depressed, all of the multi-selected channels/talkgroups will transmit at the same time with the same information. Multi-Select is one way communication call. If a radio user responds to a Multi-Select call the talkgroup the user is affiliated to will be the only one to hear the call. There is no super-group formed, so radio communication is still at the single talkgroup level. Multi-Select is utilized to send an APB to several channels/talkgroups. A Multi-Select has a limit of twenty (20) trunking/conventional resources

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 2
CONSOLE-1 - TALKGROUP 1, TALKGROUP 2

VERSION #1.010

2. TEST

- Step 1. From CONSOLE-1, create an Msel group with TALKGROUP 1 and TALKGROUP 2.
- Step 2. Transmit on the Msel using the Msel instant transmit button.
- Step 3. Verify that RADIO-1 and RADIO-2 hear the call.
- Step 4. Initiate a call with RADIO-1.
- Step 5. Verify the call is heard on CONSOLE-1 but not on RADIO-2.
- Step 6. Initiate a call with RADIO-2.
- Step 7. Verify the call is heard on CONSOLE-1 but not on RADIO-1.
- Step 8. On CONSOLE-1 dissolve the Msel.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

C4.3.8 Talkgroup Patch

1. DESCRIPTION

Talkgroup Patch allows a dispatcher to merge several talkgroups together on one voice channel to participate in a single conversation. This can be used for situations involving two or more talkgroups that need to communicate with each other. Using the Patch feature, the console operator can talk and listen to all of the selected talkgroups grouped; in addition, the members of the individual talkgroups can also talk or listen to members of other talkgroups. Patched talkgroups can communicate with the console dispatcher and other members of different talkgroups because of the "supergroup" nature of the Patch feature.

NOTE : If "secure" and "clear" resources are patched together, one repeater for each mode may be assigned per site.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 2
RADIO-3 - TALKGROUP 1
RADIO-4 - TALKGROUP 2
CONSOLE-1 - TALKGROUP 1 and TALKGROUP 2

Note: All 4 Radios must have the same home zone.

VERSION #1.010

2. TEST

- Step 1. Using CONSOLE-1 create a patch between TALKGROUP 1 and TALKGROUP 2.
- Step 2. Initiate a patch call from CONSOLE-1.
- Step 3. Verify RADIO-1, RADIO-2, RADIO-3, and RADIO-4 can monitor the call.
- Step 4. Initiate several calls between the radios and verify successful communication.
- Step 5. Dissolve the patch created in step 1.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

C4.3.9 Talkgroup Patch - Secure

1. DESCRIPTION

Talkgroup Patch allows a dispatcher to merge several talkgroups together on one voice channel to participate in a single conversation. This can be used for situations involving two or more talkgroups that need to communicate with each other. Using the Patch feature, the console operator can talk and listen to all of the selected talkgroups grouped; in addition, the members of the individual talkgroups can also talk or listen to members of other talkgroups. Patched talkgroups can communicate with the console dispatcher and other members of different talkgroups because of the "supergroup" nature of the Patch feature.

SETUP

RADIO-1 - TALKGROUP 1 (Secure TX Mode)
RADIO-2 - TALKGROUP 2 (Secure TX Mode)
RADIO-3 - TALKGROUP 1 (No secure keys loaded)
RADIO-4 - TALKGROUP 2 (Clear TX Mode with keys loaded)
CONSOLE-1 - TALKGROUP 1 and TALKGROUP 2 (Secure TX Mode)

Note: All 4 Radios must have the same home zone.

VERSION #1.010

2. TEST

- Step 1. Using CONSOLE-1 create a secure patch between TALKGROUP 1 and TALKGROUP 2.
- Step 2. Initiate a patch call from CONSOLE-1.
- Step 3. Verify RADIO-1, RADIO-2 and RADIO-4 can monitor the call.
- Step 4. Initiate a talkgroup call on TALKGROUP 1 from RADIO-1.
- Step 5. Observe that all radios are able to hear RADIO-1 except RADIO-3.
- Step 6. Dissolve the patch.

Pass ____ Fail ____



MCC 7100/7500 Trunked Resources

C4.3.10 Alert Tones - Talkgroup

1. DESCRIPTION

Pre-defined alert tones can be transmitted on the selected Radio Resource to subscribers which can alert members of a channel / talkgroup to a particular event or signify to radio users special instructions are to follow. The Console has the ability to send an Alert-Tone signal on selected conventional or talkgroup resources.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1

VERSION #1.040

2. TEST

- Step 1. Select TALKGROUP 1 on CONSOLE-1.
- Step 2. Select Alert Tone 1 and depress the Alert Tone button.
- Step 3. Verify that RADIO-1 and RADIO-2 hear Alert Tone 1.
- Step 4. Repeat Steps 2-3 for Alert Tone 2 and 3.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

C4.3.11 Call Alert

1. DESCRIPTION

Call Alert Page allows a subscriber/dispatcher to selectively alert another radio unit. The initiating subscriber/console will receive notification as to whether or not the call alert was received. Units receiving a Call Alert will sound an alert tone and show a visual alert indication. The display will also show the individual ID of the initiating subscriber/console unit.

SETUP

RADIO-1 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1

VERSION #1.030

2. TEST

- Step 1. Using CONSOLE-1, select the call alert button in the "Private Call" resource window.
- Step 2. Enter the ID of RADIO-1 and send the call alert to RADIO-1.
- Step 3. Verify that RADIO-1 receives the alert and that the ID or alias of the console is shown.
- Step 4. Turn off RADIO-1.
- Step 5. Using CONSOLE-1, send the call alert to RADIO-1 again.
- Step 6. Verify that after trying to page RADIO-1, the console displays "Can not send call alert - target not found" in the summary/status list.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

C4.3.12 Console Initiated Private Call to Subscriber

1. DESCRIPTION

Private Conversation is a selective calling feature which allows a dispatcher or radio user to carry on one-to-one conversation that is heard only by the two parties involved. Subscriber units receiving a private call will sound an alert tone. As with other call types, Private Calls operate across sites as well as within the same site.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1

VERSION #1.020

2. TEST

- Step 1. Using CONSOLE-1, select the "PRIVATE-CALL" tile and click the Private Call function.
- Step 2. Select the unit to be Private Called, in this case RADIO-1. (or select the numeric keypad and enter the Unit ID to be Private Called.)
- Step 3. Click the Send button.
- Step 4. Answer the Private Call with RADIO-1 and respond to the console.
- Step 5. Verify RADIO-2 does not hear the private conversation.
- Step 6. After completing the Private Call, return to the normal talkgroup mode.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

C4.3.13 Console Priority

1. DESCRIPTION

Console Operator Positions have ultimate control of transmitted audio on an assigned voice channel resource. The Console Position has the capability to take control of an assigned voice channel for a talkgroup call so that the operator's audio overrides any subscriber audio. Console priority is a feature that enables dispatchers to gain immediate access to an assigned voice channel so that a central point of audio control exists.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1

VERSION #1.020

2. TEST

- Step 1. Initiate a Talkgroup call from RADIO-1 on TALKGROUP 1. Keep this call in progress until the test has completed.
- Step 2. Observe that RADIO-2 receives the call.
- Step 3. While the call is in progress, key up CONSOLE-1 on TALKGROUP 1.
- Step 4. Observe that RADIO-2 is now receiving audio from CONSOLE-1 on TALKGROUP 1.
- Step 5. De-key CONSOLE-1.
- Step 6. Verify RADIO-2 now receives RADIO-1 audio.
- Step 7. End the TALKGROUP 1 call from RADIO-1.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

C4.3.14 Channel Marker

1. DESCRIPTION

A Channel Marker is a distinct, short duration, audible tone over radio and Console speakers. The tone is initiated and cancelled by a console operator. The tone can be initiated only for the talkgroups or conventional channels. On initiation, it is generated periodically when there is no voice activity. The tone can be used for various purposes. The primary purpose of the tone is to inform radio users that the conventional channel or the trunked talkgroup is currently involved in a high priority situation and they should stay off the channel unless they are involved in the high priority situation. The tone also informs the users that a console operator is actively monitoring the talkgroup.

Note that the Channel Marker tone will only start when there is no voice activity for the selected Talkgroup or conventional channel. The channel Marker tone is sent in a current transmission mode of the Console user.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1
CONSOLE-2 - TALKGROUP 1

VERSION #1.010

2. TEST

- Step 1. Initiate a Channel Marker tone on TALKGROUP 1 from CONSOLE-1.
- Step 2. Verify RADIO-1 and RADIO-2 can monitor the Channel Marker tone on TALKGROUP 1.
- Step 3. Verify CONSOLE-1 and CONSOLE-2 also monitor the Channel Marker tone on TALKGROUP 1.
- Step 4. Initiate a call from RADIO-1 and continue to key longer than the preset Channel Marker tone period for TALKGROUP 1.
- Step 5. Verify while RADIO-1 is keyed, the Channel Marker tone is suppressed.
- Step 6. Verify after RADIO-1 de-keys, the periodic Channel Marker tone continues to be transmitted on TALKGROUP 1.
- Step 7. Cancel the Channel Marker on TALKGROUP 1 from CONSOLE-1.
- Step 8. Verify the Channel Marker is no longer monitored on TALKGROUP 1.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

C4.3.15 Console Tactical/Normal Priority

1. DESCRIPTION

The Tactical/Normal Priority feature is initiated at the console operator position and provides the dispatcher with the ability to change the priority for a particular talkgroup. When selected, a higher priority level (level 2) is assigned to the talkgroup. This overrides the priority level set in the system manager. Only emergency calls have a higher priority than tactical.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 2
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 3
RADIO-3 - SITE - SITE 1
RADIO-4 - TALKGROUP 1
RADIO-4 - SITE - SITE 1
RADIO-5 - TALKGROUP 2
RADIO-5 - SITE - SITE 1
RADIO-6 - TALKGROUP 3
RADIO-6 - SITE - SITE 1
RADIO-7 - TALKGROUP 4 (If testing with TDMA mode)
RADIO-7 - SITE - SITE 1
CONSOLE-1 - TALKGROUP 1, TALKGROUP 2, and TALKGROUP 3

Note: The priority level for the talkgroups selected should be the same.

VERSION #1.030

2. TEST

- Step 1. Simulate a busy system by disabling all voice paths except for one at SITE 1. (If this is a TDMA site, it will be necessary to have a call in progress with RADIO-7 for the duration of the test.)
- Step 2. Initiate a Talkgroup Call with RADIO-1 and observe it is received by RADIO-4. Keep this call in progress until instructed to end the call.
- Step 3. Key RADIO-2 and observe that the radio receives a busy. Key RADIO-3 and observe that the radio receives a busy.
- Step 4. End the talkgroup call established in step 2. Verify RADIO-2 receives the first callback and make a call to RADIO-5 upon receipt of the callback indication.
- Step 5. End the call between RADIO-2 and RADIO-5. Verify that RADIO-3 receives a call back and is able to communicate with RADIO-6.
- Step 6. Enable Tactical Priority for TALKGROUP 3 from CONSOLE-1. Initiate a Talkgroup Call with RADIO-1 and observe that it is received by RADIO-4. Keep this call in progress until instructed to end the call.
- Step 7. Key RADIO-2 and observe that the radio receives a busy then key RADIO-3 and observe that the radio receives a busy.
- Step 8. End the Talkgroup Call established by RADIO-1. Verify RADIO-3 now receives the first callback and is able to communicate with RADIO-6.
- Step 9. End the call between RADIO-3 and RADIO-6. Verify that RADIO-2 receives a call back and is able to communicate with RADIO-5.
- Step 10. Disable Tactical Priority for TALKGROUP 3.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

C4.3.16 Acoustic Crossmute - Mute Speaker Only

1. DESCRIPTION

Acoustic crossmuting means that selected operator positions will not hear outbound transmissions from operator positions with which they are cross-muted. This feature is used when operator positions are located in the same dispatch site. This test case will demonstrate operation when the Acoustic Cross Mute RF Cross Mute Scope parameter is set to the default value of "Speaker". When configured as such Acoustic Crossmute causes the muting of the speakers only.

The consoles under test can be either the MCC 7500 or the MCC 7100.

SETUP

RADIO-1 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1
CONSOLE-2 - TALKGROUP 1
CONSOLE-3 - TALKGROUP 1
CONSOLE-4 - TALKGROUP 1
The Consoles are located within the same dispatch site.

VERSION #1.020

2. TEST

- Step 1. Verify Acoustic Crossmute is not configured for CONSOLE-1 and CONSOLE-2.
- Step 2. Select TALKGROUP 1 resource on CONSOLE-1 and CONSOLE-2
- Step 3. Without Acoustic Crossmute configured, with the select speakers of CONSOLE-1 and CONSOLE-2 turned to maximum volume, initiate a call on TALKGROUP 1 using CONSOLE-1.
- Step 4. Confirm feedback is heard on the operator positions and RADIO-1 hears feedback on TALKGROUP 1.
- Step 5. Turn the volume to minimum on CONSOLE-1 and CONSOLE-2.
- Step 6. Verify Acoustic Crossmute is configured for CONSOLE-3 and CONSOLE-4 and that the Acoustic Cross Mute RF Cross Mute Scope parameter is set to the default value of "Speakers" for CONSOLE-4.
- Step 7. Select TALKGROUP 1 resource on CONSOLE-3 and CONSOLE-4.
- Step 8. With Acoustic Crossmute configured, with the select speakers of CONSOLE-3 and CONSOLE-4 turned to maximum volume, initiate a call on TALKGROUP 1 using CONSOLE-3.
- Step 9. Verify no feedback is heard at CONSOLE-3 and CONSOLE-4 and that RADIO-1 doesn't hear any feedback on TALKGROUP 1.
- Step 10. Plug a headset into CONSOLE-4 and verify that TALKGROUP 1 audio is heard in the headset.

Pass ____ Fail ____



MCC 7100/7500 Trunked Resources

C4.3.17 Instant Recall Recorder (IRR) Operation

1. DESCRIPTION

The Instant Recall Recorder (IRR) allows for audio from a phone call or a radio call to be played back at the MCC 7500 or MCC 7100 Console position. Thirty minutes of audio is saved for radio and an additional thirty minutes for telephone. The audio is saved on the positions hard disk in the form of a .wav file.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1

CONSOLE-1 - TALKGROUP 1 running IRR application.

VERSION #1.020

2. TEST

- Step 1. Select a radio channel on the CONSOLE-1 application window.
- Step 2. Select IRR from the CONSOLE-1 toolbar.
- Step 3. Initiate radio communication between RADIO-1 and RADIO-2.
- Step 4. Verify a new entry appears in the IRR log window.
- Step 5. Select the new entry from the list.
- Step 6. Press play and verify conversation replay.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

C4.3.18 Activity Log

1. DESCRIPTION

The Console activity log will show all traffic for the resource assigned to that console to include the time, radio alias, TG, PTT ID and Emergency Call.

The dispatcher has the capability of selecting a logged call within in the "Activity Log Window" for instant transmit on the corresponding logged resource.

This activity log can be logged to a text file for archival purposes.

Note: The log file in the ops will only be seen if you first check Log Activity in Elite Admin application then in folder options uncheck hide hidden system files. The location will be c:\Program Data\MCC7500\MessageMonitorLogs.

SETUP

RADIO-1 – TALKGROUP 1
RADIO-2 – TALKGROUP 2
RADIO-3 – TALKGROUP 3
RADIO-4 – TALKGROUP 4
CONSOLE-1 – TALKGROUP 1, TALKGROUP 2,
TALKGROUP 3, TALKGROUP 4

VERSION #1.020

2. TEST

- Step 1. On CONSOLE-1 select the "Show Activity Log" button on the tool bar to open the Activity Log Window.
- Step 2. Initiate calls on RADIO-1, RADIO-2, RADIO-3 and RADIO-4 to log call information and verify calls are displayed in the activity log window.
- Step 3. Select a logged call in the Activity Log Window and verify that the Channel Control Window (CCW) at the top of the Activity log window changes to the corresponding resource. Verify the dispatcher is capable of responding via the instant transmit button.
- Step 4. Open the text file created by the Activity Log and verify call traffic has been archived to the document file.

Pass____ Fail____



C4.4 RADIO CONTROL MANAGER (RCM) FEATURES

C4.4.1 Radio Check (Single Site)

1. DESCRIPTION

Radio Check is a RCM command used to verify that a radio is active in the trunking system. The Radio Check command causes the Zone Controller to poll for the radio requesting that the radio re-affiliate. When the radio re-affiliates, the RCM then has the knowledge that the radio is powered on and within system range. If the radio is involved in a conversation, whether group or interconnect, the RCM application displays a message to that effect.

The information displayed by the RCM in response to the Radio Check command is: current talkgroup affiliation, the multigroup that the talkgroup is attached to (assuming the talkgroup belongs to a multigroup), and the site where the radio is affiliated. If the radio does not respond to the Radio Check command, a message to that effect displays.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1

VERSION #1.030

2. TEST

- Step 1. Select the Status menu and then select the Radio Check item to open the Radio Check window.
- Step 2. Enter the ID or alias of RADIO-2 into the entry box and click the Apply button.
- Step 3. Observe the radio is polled and the current radio information is displayed on the RCM.
- Step 4. Turn off RADIO-1.
- Step 5. Enter the ID or alias of the RADIO-1 into the entry box and click the Apply button.
- Step 6. Observe that the RCM displays "Radio Not Found."
- Step 7. Depress and hold the PTT button of RADIO-2 until instructed to release.
- Step 8. Enter the ID or alias of RADIO-2 into the entry box and click the Apply button. Observe that a busy for the radio is displayed on the RCM.
- Step 9. Release the PTT button on RADIO-2.
- Step 10. Observe the radio is polled and the current radio information is displayed on the RCM.

Pass____ Fail____



Radio Control Manager (RCM) Features

C4.4.2 Radio Status

1. DESCRIPTION

This optional feature allows the Radio Control Manager (RCM) to view status information sent in by subscribers. Statuses are used to indicate the Radio operator's operational state (e.g. off duty). The information that will be displayed includes the radio alias, talkgroup alias, hour and minute time stamp, status number or message number, and the customer entered translation for the specific status. Status input is displayed in chronological order, independent of the type of status number.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1

* Configure RADIO-1 in the manager to use a particular status set.

* Configure the assigned status set (via the status set manager configuration objects) to include text translations for a few different statuses.

* The RCM user needs to be assigned the dispatch attachment group that matches the radio user's assigned dispatch attachment group.

VERSION #1.020

2. TEST

Step 1. Initiate a Status transmission from RADIO-1.

Step 2. Verify the RCM displays the proper Status text.

Pass ____ Fail ____



Radio Control Manager (RCM) Features

C4.4.3 Radio Snapshot

1. DESCRIPTION

Snapshot is a Radio Control Manager (RCM) command used to retrieve information about an individual radio. Information provided by the RCM application in response to the Snapshot command includes: the serial number of the radio, current talkgroup/multigroup and site affiliations; the Regroup, Inhibit, and Selector Lock state of the radio. Snapshot information is taken from the system databases. The Snapshot command does not initiate any communication with the target radio.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE -
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE -

* RADIO-1 and RADIO-3 must be programmed with Dynamic Regrouping capability.

*Make sure Radio Users are configured with a "Radio Primary Talkgroup Assignment" in the UCM.

VERSION #1.020

2. TEST

- Step 1. Submit a Dynamic Regroup command for RADIO-1 and RADIO-3 to be regrouped to TALKGROUP 3.
- Step 2. At the RCM, initiate the Snapshot command for RADIO-1.
- Step 3. Verify that the RCM shows RADIO-1 affiliated to SITE 1 and that its current Regroup state is "Regroup."
- Step 4. At the RCM, revert the dynamic regrouping on RADIO-1 and RADIO-3.
- Step 5. Initiate the Snapshot command for RADIO-1.
- Step 6. Verify RADIO-1 shows an affiliation to SITE 1 and that its current Regroup state is "Cancel Regroup."
- Step 7. At the RCM, inhibit RADIO-2 and then initiate the Snapshot command for RADIO-2.
- Step 8. Verify RADIO-2 shows an affiliation to and that its current Inhibit state is "Selective Inhibit."
- Step 9. At the RCM, revert RADIO-2 and then initiate the Snapshot command for RADIO-2.
- Step 10. Verify RADIO-2 shows an affiliation to and that its current Inhibit state is "Cancel Inhibit."

Pass____ Fail____



Radio Control Manager (RCM) Features

C4.4.4 Dynamic Regrouping (Single Site)

1. DESCRIPTION

Dynamic Regrouping allows the RCM to assign individual radios operating in different talkgroups to a temporary talkgroup via the Regroup command. Network managers or supervisors can override individual radio talkgroup selections by steering regrouped subscribers to a new talkgroup containing users which need to communicate on a temporary basis. After receiving a Regroup command, a radio will ignore the current setting of the talkgroup selector and move to the target talkgroup specified in the Regroup command. Unless the supervisor issues a LOCK command, the radio user can deselect the target talkgroup by selecting another talkgroup using the radio selector. A unique location on the radio selector is reserved for the target talkgroup following a Regroup command.

Dynamic Regrouping assignments can be initiated rapidly, but not instantaneously. Regrouping is best suited for planned activities or occasional changes from normal routines. It is not intended for immediate responses such as high speed chases or for a rapid deployment on a per incident basis.

Regrouped radios receiving a second Regroup command will move to the new target talkgroup specified in the second command. When a regrouped radio receives a Regroup command, all information pertaining to the previous Regroup command is lost. A Cancel Regroup command or a Revert returns an individual radio to its normal operation.

Note - RCM user must be attached to primary and target talkgroup.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1

RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 2

RADIO-3 - SITE - SITE 1
RADIO-4 - TALKGROUP 2
RADIO-4 - SITE - SITE 1

VERSION #1.030

2. TEST

- Step 1. With the RCM open from the main Command tab click on the "+" button . Choose Regroup.
- Step 2. Enter TALKGROUP 3 in the target field.
- Step 3. Enter the IDs or aliases of RADIO-1, RADIO-2, RADIO-3 and RADIO-4.
- Step 4. Once all desired radio information is entered and appears in the command window click the submit to initiate the command.
- Step 5. Observe all radios are regrouped and are able to communicate on TALKGROUP 3.
- Step 6. Switch the Subscriber to the Dynamic Regroup channel to acknowledge the group request.
- Step 7. Observe that the radios are able to select different talkgroups and are not locked onto the regrouped mode. Note- The Talkgroup selector knob has to be set to the dynamic regroup position before switching to any other talkgroup.
- Step 8. Observe that the Regroup task appears in the Command tab.
- Step 9. Issue a Selector Lock command all four radios and verify their selectors have been locked.
- Step 10. Revert both commands and verify the radios have returned to normal operation.

Pass_____ Fail_____



Radio Control Manager (RCM) Features

C4.4.5 Selective Radio Inhibit

1. DESCRIPTION

The INHIBIT command issued by the Radio Control Manager (RCM) disables a radio, preventing it from transmitting or receiving any audio. All of the radio's functionality ceases while a radio is inhibited by the RCM. Once inhibited, the radio cannot be used to monitor voice channels or for any other radio user initiated activity. Note that an inhibited radio still monitors the control channel so that it can be re-enabled with the Cancel Inhibit command. Upon receiving the Cancel Inhibit command from the RCM, the radio returns to its normal operation.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1

VERSION #1.030

2. TEST

- Step 1. With the RCM open from the main Command tab click on the "+" button .
- Step 2. Enter the IDs or aliases of RADIO-1.
- Step 3. Select "Selective Inhibit" button.
- Step 4. Once all desired radio information is entered and appears in the command window click the submit to initiate the command.
- Step 5. Observe RADIO-1 is inhibited and appears to be dead.
- Step 6. Observe that the Inhibit task appears in the Command tab.
- Step 7. Cancel the Inhibit by selecting the task in the Command tab and clicking the Revert button to submit the task.
- Step 8. Observe that the Cancel Inhibit task appears in the Command tab and that RADIO-1 is returned to normal operation.

Pass____ Fail____



Radio Control Manager (RCM) Features

C4.4.6 Emergency Alarm Display (Single Site)

1. DESCRIPTION

The emergency call information that is displayed on the Radio Control Manager (RCM) includes the radio alias of the radio that initiated the Emergency Alarm, the talkgroup that the radio was affiliated to at the time the alarm was sent, and the time the alarm was received.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1

One RCM, which has TALKGROUP 1 attached is required.

VERSION #1.030

2. TEST

- Step 1. With the Radio Control Manager (RCM) open select the Event tab and verify that the Emergency Alarm window is visible. If it is not, select the Emergency Alarm check box to bring it to the RCM viewable area
- Step 2. Initiate an Emergency Alarm from RADIO-1.
- Step 3. Observe that the RCM receives the Emergency Alarm.
- Step 4. Acknowledge the Emergency by selecting the Emergency in the window and clicking on the Respond button.
- Step 5. Verify the window displays the radio alias, the talkgroup, and the time the alarm was received.
- Step 6. Again, select the displayed Emergency and click the Delete button to clear the emergency.
- Step 7. Reset the radio by holding the Emergency button until the radio clears.
- Step 8. Repeat Steps 1-7 using RADIO-2.

Pass____ Fail____



C4.5 FAULT MANAGEMENT

C4.5.1 Unified Event Manager - Base Views

1. DESCRIPTION

The Unified Event Manager (UEM) in its base configuration provides a number of views. The purpose of this test is to demonstrate the key views available from the UEM.

The Physical Summary and Detail View (Physical Map) and Service Summary and Detail View (Service Map) in previous releases are deprecated and are replaced by the Zone Map. Custom views can be saved and retrieved by other NM Client users.

SETUP

NMclient01 - UEM session up and running.

VERSION #1.010

2. TEST

- Step 1. Alarms View: In the navigation pane expand Fault Management and select Alarms. The view displays active alarms for managed resources, displaying impacted managed resources and specific objects on the managed resource along with selected alarm properties.
- Step 2. Alarm View Search: Customize the Active Alarms display by selecting the View option from the menu bar, then select Search. Perform a Managed Resource search for channels, site controllers and routers by entering "Contains" and ch, sc, and z00 respectively in the search fields to perform the three separate searches. For each of the three searches a filtered alarm view is

displayed that contains alarms for the appropriate device in the search.

- Step 3. Network Events View: In the navigation pane expand Fault Management and select Network Events. The view displays recent events reported for managed resources, displaying impacted managed resources and specific object on the managed resource along with selected event properties. Alarming events are base for creating alarm objects.
- Step 4. Physical Summary View: In the navigation pane expand Zone Views and Physical, then select Physical Summary View. The Physical Summary View provides an aggregated alarm severity status of the devices located at all subnets in the Zone.
- Step 5. Service Summary View: In the navigation pane expand Zone Views and Service, then select Service Summary View. The Service Summary View provides a quick summary of the service status of sites in a Zone, including access to Channel status.
- Step 6. Zone Map: In the navigation pane, expand Zone Views and select Zone Map. The Zone Map view provides an aggregated alarm severity status of the devices located at discovered sites in the Zone.
- Step 7. Network Database: In the navigation pane select Network Database. The Network Database displays a list of all discovered Managed Resources and Sites. The display includes properties of each resource as well as overall severity of all objects and/or sub resources

Pass____ Fail____



Fault Management

C4.5.2 Station Power Amp Failure Reports to the Unified Event Manager (UEM)

1. DESCRIPTION

This test will demonstrate that the Unified Event Manager (UEM) alarms view is able to capture information about various failures at the system and zone level.

A station will be keyed while the output is unloaded to simulate a power amp failure. The failures will be monitored on the UEM.

Note: For safety, either power down the station or TX Inhibit it before disconnecting or re-connecting the dummy load to prevent accidental keying of the station.

Note: This test should be done on a site with more than 2 channels. Failsoft will occur if the test is done on a 2 channel site.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 2
RADIO-2 - SITE - SITE 1
NMclient01 - UEM session up and running.

* All Radios should be "Site Locked"

VERSION #1.020

2. TEST

- Step 1. Verify that the power amp of the station to be tested has no active alarms against it.
- Step 2. Disconnect the dummy load/antenna from the station.
- Step 3. Make several talkgroup calls using RADIO-1 until the test station has been keyed.
- Step 4. Observe that an alarm indicating a Power Amp failure appears on the UEM alarms view. For SmartX sites you will need to look at event view to see cause of alarm.
- Step 5. Reconnect the dummy load/antenna disconnected in Step 3.
- Step 6. In approximately 5 minutes, observe the changes to the alarm on the UEM, indicating the module is restored to service.

Pass____ Fail____

Fault Management

C4.5.3 Core Router Failure Reports to the Unified Event Manager

1. DESCRIPTION

This test will demonstrate that the Unified Event Manager (UEM) alarms view is able to capture information about various failures at the system and zone level.

A Core Router/Gateway will be powered off to simulate a failure. The system health will be monitored on UEM.

NOTE: Powering a combine Core/Exit Router/Gateway down will affect both the Core and Exit routing functions.

SETUP

NMclient01 - UEM session up and running.

VERSION #1.040

2. TEST

- Step 1. Verify that the Router/Gateway to be tested displays without failures (normal) on UEM. The core router is contained in the specific subnet that it is physically collocated with in the network.
- Step 2. Power down the Router/Gateway.
- Step 3. Observe that an alarm indicating a Router/Gateway failure appears on the UEM alarms view.
- Step 4. Restore power to the Router/Gateway.
- Step 5. Observe the changes to the alarm in UEM, indicating the Router/Gateway is enabling.
- Step 6. Observe that alarm view updates in the UEM, indicating the Router/Gateway has recovered and is enabled.

Pass ____ Fail ____



Fault Management

C4.5.4 Site Path Failure (Ethernet) Reports to the Unified Event Manager

1. DESCRIPTION

This test will demonstrate that the Unified Event Manager (UEM) alarms view is able to capture information about various failures at the system and zone level.

This test simulates a microwave/transport failure by removing a customer selected site data link and monitoring the alerts.

Note: If using a Simulcast site, this test refers to the Prime Site links. While failures would be seen at the subsite level if a Subsite link were failed, the site would not drop into Site Trunking.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
NMclient01 - UEM session up and running.

* RADIO-1 should be "Site Locked"

VERSION #1.030

2. TEST

- Step 1. Remove the Ethernet cable(s) to the SITE 1 router(s) (If Simulcast, this refers to the Prime Site router(s)) at the site where RADIO-1 is affiliated. Be certain to remove the Ethernet cable from both routers if redundant site links are being utilized.
- Step 2. Observe the UEM reports CommFailure alarms for the devices at the affected site.
- Step 3. In addition, observe that the site is now in the Site Trunking mode.
- Step 4. Reconnect the Ethernet cable(s) disconnected in Step 1.
- Step 5. Observe the site returns to the Wide Area Trunking mode.
- Step 6. Observe the topology and alarms/events that appear in the UEM, indicating the site is in recovery and after a period of time has recovered.

Pass____ Fail____

C4.5.5 Alarm Processing – Acknowledged/Un- acknowledge alarm

1. DESCRIPTION

The Unified Event Manager (UEM) provides the user the ability to acknowledge alarms raised against managed resources and their objects. The operation is available for users with appropriate permissions and audited. This is the base UEM alarm acknowledgement functionality available in all UEM deployments. It is further enhanced if Enhanced Navigation is enabled.

SETUP

No prior setup is required.

VERSION #1.030

2. TEST

- Step 1. Login to UEM Client as user with permissions to perform alarm acknowledge operation.
- Step 2. Create an alarm condition by simulating an alarm on a managed device in the system.
- Step 3. Navigate to Alarms View and sort by clicking on the header of Ack Status column.
- Step 4. Review all not acknowledged alarms and locate test alarm that has been generated.
- Step 5. Double-Click on the alarm to open Alarm details window.
- Step 6. Ack status value should be set to Not acknowledged.
- Step 7. Click Acknowledge button to acknowledge this alarm and verify that Acknowledge status has changed to include information on the current user and timestamp of the operation. The Alarms view should show alarm status as Acknowledged.
- Step 8. Click Unacknowledged button and verify that Acknowledge status has changed to Unacknowledged and includes information on the current user and timestamp of the operation.

Pass____ Fail____



Fault Management

C4.5.6 Customizable Alarm Clear Timer in the Unified Event Manager

1. DESCRIPTION

The Unified Event Manager (UEM) provides the user the ability to make adjustments to global settings for the Alarm Clear Timer to control how long Cleared alarms persist on the UEM display window. In the current release two timers are provided, cleared acknowledged and unacknowledged alarms. Note: The Cleared alarm cleanup procedure runs every 900 seconds (15 minutes) and because of that the cleared alarms are removed after time left to next policy run + retention period currently configured in the policy.

SETUP

NMclient01 - UEM session up and running.

VERSION #1.030

2. TEST

- Step 1. Navigate to Alarm Cleanup Policy under Administration Tools -> Policies in the tree view.
- Step 2. Configure the Period for Clear Acknowledged Alarms timer for 900 seconds (15 minutes) and keep Clear Non-Acknowledged Alarms setting as 3600 (60 minutes) in Alarm Cleanup Policy.
- Step 3. Generate clear alarms (e.g. by forcing synchronization of managed resource) and acknowledge all selected cleared alarms.
- Step 4. Open Alarms View and sort alarms by clicking on Severity column header to have clear alarm at the top. Acknowledge alarms with severity clear generated in previous step
- Step 5. Sort alarms by clicking on the "Ack Status" column and observe the customized Alarm View for cleared alarm displays all cleared alarms generated for last 15 minutes. Verify the generated and acknowledged alarms with severity clear will be removed from UEM after the timeout expires.
- Step 6. Navigate to Alarm Cleanup Policy under Administration Tools -> Policies in the tree view.
- Step 7. Configure the Period for Clear Non-Acknowledged Alarms for 900 seconds (15 minutes) in Alarm Cleanup Policy.
- Step 8. Generate clear alarms (e.g. by forcing synchronization of managed resource) and acknowledge all selected cleared alarms.
- Step 9. Observe the Alarm view and verify the generated unacknowledged alarms with severity clear will be removed from UEM after the timeout expires.
- Step 10. Return the value to the original value.

Pass____ Fail____



C4.6 SYSTEM RELIABILITY FEATURES

C4.6.1 Station Failure

1. DESCRIPTION

When a base station repeater at one site fails due to hardware problems, the pending call is lost and the trunking controller removes the channel from service system wide. This failure can be created by powering down one base station repeater.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1

VERSION #1.010

2. TEST

- Step 1. Power down a voice repeater for any voice channel at SITE 1.
- Step 2. Initiate calls using RADIO-1 to step through all available voice channels.
- Step 3. Verify that the disabled channel is not used at SITE 1.

Pass____ Fail____



System Reliability Features

C4.6.2 Link Failure between MCC 7100/7500 site and Zone Controller

1. DESCRIPTION

This test will demonstrate that the two communication paths between the MCC 7100/7500 Console Site and Zone Controller are redundant and the system will continue uninterrupted if the main path fails. To accomplish this test one of the two NIC connections is removed at the Zone Controller.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 1
RADIO-4 - TALKGROUP 2
RADIO-4 - SITE -
CONSOLE-1 and CONSOLE-2 at the MCC 7100/7500 Console site are affiliated to the TALKGROUP 1 and TALKGROUP 2 talkgroups.

VERSION #1.010

2. TEST

- Step 1. Initiate a Talkgroup Call with RADIO-1 in TALKGROUP 1.
- Step 2. Observe that only RADIO-2, CONSOLE-1 and CONSOLE-2 are able to monitor and respond to the call
- Step 3. Initiate a Talkgroup call with RADIO-3 in TALKGROUP 2.
- Step 4. Observe that only RADIO-4, CONSOLE-1 and CONSOLE-2 are able to monitor and respond to the call.
- Step 5. Remove the Ethernet cable to Link 1 from the NIC on the Zone Controller, this will simulate a Zone Controller to Console Site Link failure.
- Step 6. Observe that the calls on TALKGROUP 1 and TALKGROUP 2 can continue.
- Step 7. Repeat steps 1-6 for the other Zone Controller.
- Step 8. Connect the Ethernet cables to normalize the system.

Pass ____ Fail ____



System Reliability Features

C4.6.3 Site Failsoft

1. DESCRIPTION

Failure of all control channels, failure of all voice channels, or failure of the site controller will cause a site (RF Subsystem) to enter failsoft operation. Subscribers can be programmed to operate in failsoft by talkgroup; to search its list of control channel frequencies in failsoft; or to disable failsoft altogether. When a site enters failsoft, a radio programmed for failsoft by talkgroup will first look for a specific failsoft channel dictated by the selected talkgroup. Since many systems have different frequencies across sites, if the radio is unable to find the talkgroup's failsoft channel the radio will instead operate in the control channel search failsoft mode. A radio programmed or needing to search control channels for failsoft frequencies will lock onto the first control channel in its control channel list.

Note: Radios should not be site locked when in failsoft mode. The radio will not check the full list of 64 control channels programmed into the radio's code plug. All radios should be programmed to have the same sequence of control channel frequencies. Note: The subscribers MUST be SmartZone capable.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 1
RADIO-4 - TALKGROUP 2
RADIO-4 - SITE - SITE 1

* Program the Radios for failsoft operation by talkgroup. TALKGROUP 1 should use a different channel for failsoft than TALKGROUP 2 and neither should be a control channel.

* In order to prevent roaming turn off all sites except the site under test.

VERSION #1.010

2. TEST

- Step 1. Using the Unified Event Manager (UEM), place the subsystem into failsoft mode.
- Step 2. Verify that the Radios emits a failsoft tone approximately once every ten seconds.
- Step 3. Initiate a Talkgroup Call from RADIO-1 while in failsoft mode.
- Step 4. Verify that only RADIO-2 can hear RADIO-1.
- Step 5. Dekey RADIO-1 and power down the failsoft channel associated with TALKGROUP 1.
- Step 6. Key RADIO-1 and verify RADIO-2 can still monitor the call but the other radios cannot.
- Step 7. Dekey RADIO-1 and initiate a Talkgroup Call from RADIO-3.
- Step 8. Verify that only RADIO-4 can hear RADIO-3.

Pass ____ Fail ____



C4.7 RADIO AUTHENTICATION

C4.7.1 Radio Successfully Authenticates

1. DESCRIPTION

This test verifies that the radio has performed and passed authentication. The user of the radio is not notified that authentication has been successful, but it is shown on the infrastructure with Zone Watch.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1

No authentication key for RADIO-1 in AuC.
System wide Authentication is Enabled

VERSION #1.010

2. TEST

- Step 1. KVL load a randomly created authentication key into RADIO-1.
- Step 2. Download this authentication key from the KVL to the AuC.
- Step 3. Verify on AuC client that the authentication key was received.
- Step 4. Cycle power on RADIO-1.
- Step 5. Verify on Zone Watch that authentication was performed.
- Step 6. Confirm RADIO-1 can perform a Talkgroup call with RADIO-2.

Pass____ Fail____



C4.8 REPORT GENERATION TESTS

C4.8.1 Historical Reports

1. DESCRIPTION

Performance reports can be created automatically for dynamic statistical information about the air traffic activity on the system. These reports provide assistance with system management, resource planning, usage allocation, and monitoring. All reports are preformatted and summarize air traffic activity for a configured time span.

Note: Depending on the time span selected smaller time intervals may not be available.

SETUP

No prior setup is required for this test.

VERSION #1.010

2. TEST

- Step 1. From the PC Application Launcher, select a zone.
- Step 2. From that zone's menu, choose Zone Historical Reports.
- Step 3. From the Historical Reports Player window that opens, select a report.
- Step 4. Using the left mouse button, click on the view button.
- Step 5. Observe a window opens allowing a user to enter report parameters.
- Step 6. Enter all desired data for the report and Generate Report.
- Step 7. Observe a window appears showing the requested report.
- Step 8. Close the report window.
- Step 9. Run the following reports during testing: Talkgroup at Zone Summary; User at Zone Summary; Site Summary.

Pass_____ Fail_____



C4.9 SYSTEM MANAGEMENT TESTS

C4.9.1 ZoneWatch (Single Site)

1. DESCRIPTION

ZoneWatch is an administration tool for monitoring radio traffic on a system. A system manager can use ZoneWatch to analyze traffic patterns for load distribution and troubleshoot radio and site problems. ZoneWatch is used to view current radio traffic activity for the system. This activity is displayed in graphical format, color-coded for easy identification of the type of activity occurring on the system.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 1
RADIO-3 - SITE - SITE 1
RADIO-4 - TALKGROUP 1
RADIO-4 - SITE - SITE 1

VERSION #1.010

2. TEST

- Step 1. Verify that ZoneWatch has been configured for the Grid and Multi Site Scroll windows to display system activity.
- Step 2. From the PC Application Launcher, select a zone folder.
- Step 3. From within that zone, select ZoneWatch.
- Step 4. Select the appropriate profile to be able to view the channel usage on the system.
- Step 5. Initiate several calls with the radios and observe that the appropriate channel usage information is displayed.

Pass____ Fail____



System Management Tests

C4.9.2 Affiliation Display (Single Site)

1. DESCRIPTION

Affiliation Display is a Private Radio Network Management (PRNM) application that monitors the mobility of radios for a particular zone. Mobility describes how radio users travel between different sites in a zone and how they communicate with other members of their assigned talkgroup or even with members outside of their talkgroup. A radio can be viewed in more than one zone. As a radio roams from one site to another or changes talkgroups, Affiliation Display updates and displays the affiliation and de-affiliation information for a monitored radio. This information can be useful for the troubleshooting and tracking of radios in the system and for monitoring the movement of traffic within a zone.

The Affiliation Display is divided into three sections: Site Viewer, Talkgroup Viewer, and Radio Viewer.

- The Site Viewer displays the number of talkgroups and number of radios affiliated to that site.
- The Talkgroup Viewer displays how many radios are affiliated to that talkgroup and the number of sites at which the talkgroup has radios affiliated.
- The Radio Viewer window displays affiliation information for a custom list of radios.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 1
RADIO-4 - TALKGROUP 2
RADIO-4 - SITE - SITE 1

VERSION #1.010

2. TEST

- Step 1. Add RADIO-1, RADIO-2, RADIO-3, and RADIO-4 to the Affiliation Display.
- Step 2. Verify that RADIO-1 and RADIO-2 show they are affiliated to SITE 1 and TALKGROUP 1.
- Step 3. Verify that RADIO-3 and RADIO-4 show they are affiliated to SITE 1 and TALKGROUP 2.
- Step 4. Change the talkgroup of RADIO-1 and RADIO-2 to TALKGROUP 2.
- Step 5. Verify that RADIO-1 and RADIO-2's affiliated talkgroup changes to TALKGROUP 2 on the Affiliation Display.

Pass____ Fail____



System Management Tests

C4.9.3 Configuration Management - Subscriber Capabilities

1. DESCRIPTION

The Provisioning Manager (PM) controls the parameters for all radio users and dispatchers on the system. Within the Subscriber section, the Radio User Configuration Window enables the network manager to tailor SmartZone subscribers' capabilities. Multigroup, Secure, Call Alert, Private Call, and Telephone Interconnect are some of the features that can be enabled or disabled. The features that could be unique to the particular user are configured directly in the Radio User Configuration Window. The features that could be configured the same for a group of users are placed into records called profiles. The network manager references the profile which contains the desired setup for these features from the Radio User Configuration Window.

Note - A profile must already exist to be referenced through the Radio Configuration Window but can be modified later if needed.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE -

* Flag both radios to be capable of Call Alert, Private Call, and Dispatch Calls.

* Set the "User Enabled" flag to YES for both RADIO-1 and RADIO-2.

VERSION #1.010

2. TEST

- Step 1. Initiate a Call Alert (PAGE) from RADIO-1 to RADIO-2. Verify that RADIO-2 receives the Call Alert.
- Step 2. Change the Call Alert Enabled flag to NO for RADIO-1 via the PM.
- Step 3. Initiate a Call Alert from RADIO-2 to RADIO-1. Verify that RADIO-2 receives a reject when attempting to Call Alert RADIO-1.
- Step 4. Change the Call Alert Enabled flag back to YES for RADIO-1 via the PM.
- Step 5. Initiate a Call Alert from RADIO-2 to RADIO-1. Verify that RADIO-1 now receives the Call Alert.
- Step 6. Initiate a Private Call (CALL) from RADIO-1 to RADIO-2. Verify that RADIO-2 receives the Private Call.
- Step 7. Change the Private Call Enabled flag to NO for RADIO-1 via the PM.
- Step 8. Initiate a Private Call from RADIO-2 to RADIO-1. Verify that RADIO-2 receives a reject when attempting to Private Call RADIO-1.
- Step 9. Change the Private Call Enabled flag back to YES for RADIO-1 via the PM.
- Step 10. Initiate a Private Call from RADIO-2 to RADIO-1. Verify that RADIO-1 now receives the Private Call.

Pass____ Fail____



System Management Tests

C4.9.4 Configuration Management - Talkgroup Capabilities

1. DESCRIPTION

The Provision Manager (PM) controls the parameters for all radio users and dispatchers on the system.

Within the Subscriber section, the Talkgroup Configuration Window enables the network manager to tailor SmartZone Talkgroup Capabilities. Emergency, Secure and Priority Monitor are some of the features that can be enabled or disabled. The features that could be unique to the particular user are configured directly in the Talkgroup Configuration Window. The features that could be configured the same for a group of users are placed into records called profiles. The network manager references the profile which contains the desired setup for these features from the Talkgroup Configuration Window.

NOTE: A profile must already exist to be referenced through the Talkgroup Configuration Window but can be modified later if needed.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE -

* Set the "Talkgroup Enabled" flag to YES for TALKGROUP 1 in the PM.

VERSION #1.030

2. TEST

- Step 1. Initiate a call from RADIO-1 on TALKGROUP 1. Verify that RADIO-2 hears the RADIO-1 audio.
- Step 2. Change the Talkgroup Enabled flag to NO for TALKGROUP 1 via the PM.
- Step 3. Initiate a call from RADIO-1 or RADIO-2 on TALKGROUP 1. Verify that neither radio can initiate a call because of the change in status of the Group Enabled Flag of TALKGROUP 1.
- Step 4. Initiate an Emergency call from RADIO-1. Verify that both the console (if present) and RADIO-2 can hear the transmission.
- Step 5. Dekey RADIO-1.
- Step 6. Change the Talkgroup Enabled flag back to YES for TALKGROUP 1 via the PM.
- Step 7. Initiate a call from RADIO-1 on TALKGROUP 1. Verify that both the console (if present) and RADIO-2 hear RADIO-1.

Pass____ Fail____



System Management Tests

C4.9.5 Current Status and Diagnostics for MCC 7100/7500 Console

1. DESCRIPTION

This test will demonstrate that the Unified Event Manager (UEM) can change the state of sites and the site status will show in the UEM. To accomplish this, the current state of a Console site will be displayed and using the UEM - "Issue Command" feature, it will be changed.

SETUP

Select the Physical Sites object in the UEM tree for the site to be tested.

VERSION #1.010

2. TEST

- Step 1. In the Unified Event Manager (UEM) Physical Detail View screen, verify the Console Site is green (No alarms).
- Step 2. Through the UEM, open the devices under the site container by right clicking and selecting "View Devices".
- Step 3. Choose the Console position to disable by highlighting the correct device, right clicking and selecting "Issue Command".
- Step 4. Disable the Application Platform or VPM-Dispatch Application (depending on the console type) for the Console from the window and select "Apply".
- Step 5. Observe that the UEM shows that the Application Platform or VPM-Dispatch Application is now Disabled and is User Requested. Verify that the Console Site container shows WARNING.
- Step 6. Choose the Console position and enable by highlighting the correct device, right clicking and selecting "Issue Command".
- Step 7. Enable the Application Platform or VPM-Dispatch Application for the Console from the window and select "Apply".
- Step 8. Observe that the UEM shows that the Application Platform or VPM-Dispatch Application is now Enabled and is User Requested. Verify that the Console Site container returns to a green status.
- Step 9. Close the open windows.

Pass____ Fail____



System Management Tests

C4.9.6 Unified Event Manager - Diagnostics - ASTRO Repeater Site

1. DESCRIPTION

The purpose of this test is to demonstrate diagnostic commands can be sent to a Radio Frequency (RF) site and the proper status is reported at the Unified Event Manager (UEM).

All commands are initiated from the UEM.

Standalone and MultiSite configurations are tested.

SETUP

NMclient01 - UEM session up and running in the Network Database view.

VERSION #1.030

2. TEST

- Step 1. From the UEM, right click on an ASTRO Repeater Site managed resource and select the Command option.
- Step 2. The command window opens for the ASTRO repeater Site managed resource with the following commands available: Site Trunking, Site Off, Wide Trunking, and Site Failsoft.
- Step 3. Select Site Trunking and click the Apply button.
- Step 4. The command execution status is displayed in the command window. After the command is executed, the site enters site trunking mode. The event is displayed in the Network Events Browser. An alarm is displayed in the Alarms Browser.
- Step 5. Select Site Off and click the Apply button.
- Step 6. The command execution status is displayed in the command window. After the command is executed, the site enters site off mode. The event is displayed in the Network Events Browser. An alarm is displayed in the Alarms Browser.
- Step 7. Select Wide Trunking and click the Apply button.
- Step 8. The command execution status is displayed in the command window. After the command is executed, the site enters wide trunking mode. The event is displayed in the Network Events Browser.

Pass____ Fail____



C4.10 SIGNOFF CERTIFICATE

By their signatures below, the following witnesses certify they have observed the system Acceptance Test Procedures.

Signatures

WITNESS:

_____	Date: _____
-------	-------------

Please Print Name: _____

Initials:

Please Print Title: _____

WITNESS:

_____	Date: _____
-------	-------------

Please Print Name: _____

Initials:

Please Print Title: _____

WITNESS:

_____	Date: _____
-------	-------------

Please Print Name: _____

Initials:

Please Print Title: _____



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PROPOSAL TO
CITY OF RIVERSIDE

EXHIBIT C-4

COVERAGE ATP

DESIGN AND INSTALLATION OF LAND MOBILE RADIO

JULY 28, 2016

RFP NO. 1558



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COVERAGE ATP

C4.1 OVERVIEW

This Coverage Acceptance Test Plan (CATP) is designed to verify that the voice radio system implemented by Motorola for City of Riverside Public Utilities meets or exceeds the required reliability as shown on Motorola's maps. The CATP defines the coverage testing method and procedure, the coverage acceptance criterion, the test documentation, and the responsibilities of both Motorola and City of Riverside Public Utilities.

Coverage Acceptance Testing is based upon a coverage prediction that accurately represents the implemented infrastructure and parameters that are consistent with the contract agreements.

Subsequent sections define the coverage acceptance test configurations and test criteria.

C4.2 CATP DEFINITIONS

Several definitions are needed to accurately describe the coverage acceptance test method and criteria. Where cited, these terms or methods are defined in TIA TSB-88.1-D¹ or TSB-88.3-D².

C4.2.1 Defined Test Area

The defined test area is the geographical area in which communications will be provided that meet or exceed the specified Channel Performance Criterion (CPC) at the specified reliability for the specified equipment configurations. The defined test area are listed in Table 4-2 Coverage Acceptance Test Summary, along with names of the corresponding Motorola maps which show the defined test areas. Please see Section 10 for the coverage maps and graphical representation of the shapefiles used as coverage boundaries of the maps.

For coverage testing, each defined test area will be divided into a grid pattern by Motorola 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, from a hundred to many thousands, depending on the size of the defined test area, desired confidence in results, type of coverage test, and the predicted versus required reliability.

C4.2.2 Channel Performance Criterion (CPC)

The CPC is the specified minimum design performance level in a faded channel. {TSB-88.1-D, §5.2} For this system, the CPC is the Delivered Audio Quality (DAQ) as stated in Table 4-2 Coverage

¹ *Wireless Communications Systems --- Performance in Noise- and Interference-Limited Situations --- Part 1: Recommended Methods for Technology Independent Performance Modeling* Technical Service Bulletin TSB-88.1-D, Telecommunications Industry Association (TIA), Arlington VA, 2012.

² *Wireless Communications Systems --- Performance in Noise- and Interference-Limited Situations --- Part 3: Recommended Methods for Technology Independent Performance Verification*, Technical Service Bulletin TSB-88.3-D, Telecommunications Industry Association (TIA), Arlington VA, 2013.



Acceptance Test Summary. The DAQ definitions are provided in Table 4-1 {TSB-88.1-D, §5.4.2, Table 3}.

Table 4-1: DAQ Definitions

DAQ	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.

The CPC pass/fail criterion is the faded performance threshold, plus any adjustments for antenna performance, external noise, and in-building or in-vehicle losses. {TSB-88.1-D, §5.4.2, Figure 5} The faded performance threshold for the specified CPC is determined using the receiver's static reference sensitivity adjusted by the projected CPC parameters for the applicable Modulation Type and DAQ as listed in the current version of TSB-88.1, Annex A, Table A-1. For coverage testing of digital voice radio systems, the faded performance threshold is the applicable Bit Error Rate (BER) from the projected CPC parameters.

C4.2.3 Reliability

The Covered Area reliability is the percentage of locations within the defined test area that are predicted to meet or exceed the specified CPC. The Motorola maps indicate the Covered Areas within which this system is predicted to provide at least the reliability of meeting or exceeding the CPC as stated in Table 4-2 Coverage Acceptance Test Summary.

For the defined test areas guaranteed for Covered Area reliability, only the painted covered area on Motorola's maps will be tested for coverage acceptance. No acceptance testing will be performed in locations predicted on Motorola's maps to be below the required Covered Area reliability.

After all accessible tiles in the defined test area have been tested, the Covered Area reliability will be determined by dividing the number of tiles tested that meet or exceed the CPC pass/fail criterion by the total number of tiles tested. {TSB-88.3-D, §5.1, equation 1}

C4.2.4 Direction(s) of Test

The directions of the test in Table 4-2 Coverage Acceptance Test Summary defines the directions which will be tested for coverage acceptance. Outbound (also called forward link, downlink, or talk-out) is the path from the fixed equipment outward to the mobile or portable radios. Inbound (also called reverse link, uplink, or talk-in) is the path from the mobile or portable radios inward to the fixed equipment. Outbound and Inbound independently means each direction will be evaluated as a separate independent test, and their pass/fail criterion are not related or dependent.

C4.2.5 Equipment Configurations

This section defines the equipment configurations and infrastructure design parameters upon which the coverage guarantee and the coverage acceptance test are based. The equipment



configurations are defined in Table 4-2 Coverage Acceptance Test Summary, and include user equipment, outdoor definition, defined test area, number of test tiles, reliability, CPC, CPC pass/fail, and direction(s) of test. The infrastructure design parameters are defined in Table 4-3 Infrastructure Design Parameters, and include site names, site locations, and antenna system parameters. If the implemented system equipment configuration and/or infrastructure design parameters vary from these configurations and/or parameters, a revised coverage map will be used to define the test configuration and potential areas from which test tiles will be included in the revised coverage acceptance test.

Coverage testing will be conducted with equipment installed per the configurations in Table 4-2 Coverage Acceptance Test Summary, and with the mobile antennas in unobstructed locations that are not adjacent to other large objects or metallic items which would distort the antenna patterns.



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Table 4-2: City of Riverside Public Utilities Coverage Acceptance Test Summary

User Equipment	Outdoor / In-Building	Defined Test Area & Map Name	Number of Test Tiles	Reliability	CPC	CPC Pass/Fail	Direction(s) of Test
ASTRO25 Trunked System							
APX Portable with half-wave flex whip antenna in swivel case with remote speaker microphone for transmit and receive	Outdoor	Portable Outbound and Inbound maps supplied with proposal. (On-Roads Only)	1510 (0.3 mile tiles)	95%	DAQ-3.4	2.0% BER Inbound, 2.0% BER Outbound with Subjective DAQ Re-Test Allowed	Outbound and Inbound Independently
APX Mobile in CRPU vehicle with unity gain antenna mounted centered on roof at least 4.9 ft high and 15 ft or less of coax	Outdoor	Mobile Outbound and Inbound maps supplied with proposal. (On-Roads Only)	1315 (0.3 mile tiles)	95%	DAQ-3.4	2.0% BER Inbound, 2.0% BER Outbound with Subjective DAQ Re-Test Allowed	Outbound and Inbound Independently

Table 4-3: City of Riverside Public Utilities Infrastructure Design Parameters

Site Name	Longitude	Longitude	Transmit Antenna System		Receive Antenna System	
			Mount Height	Antenna Model	Mount Height	Antenna Model
Zone MSE - MSE						
Box Springs	117° 17' 52.00 W	33° 58' 11.00 W	50 ft	[Sinclair] SC479-HF1LDF(D00-E5765)	70 ft	[Sinclair] SC479-HF1LDF(D00-E5765)

July 28, 2016
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C4.2.5.1 Outdoor Only Coverage

The test plan contained in this document is meant to test on-street coverage only.

C4.2.6 CPC Pass/Fail Criterion for a Test Tile

For each equipment configuration, the CPC pass/fail criterion for a test tile is stated in Table 4-2 Coverage Acceptance Test Summary. Each equipment configuration will have only one CPC pass/fail criterion for a test tile.

To measure BER the coverage test will be performed with the appropriate attenuator value installed in the test radio antenna line, to establish an equivalent signal level performance for each equipment configuration.

Any tile that fails the objective BER test described above will be re-tested using a subjective DAQ test. Any tile that fails the objective BER test, but passes a subjective DAQ re-test will be declared passed.

Coverage for the portable outdoor equipment configurations will be verified for acceptance by attenuation of the test radio for BER and Subjective DAQ tests. The attenuation will be the difference between the test radio's antenna system and the additional loss used in Motorola's coverage prediction to account for portable antenna performance. The attenuator values are provided in Table 4-4.

This provides a method of verifying that the radio system provides the required BER or Subjective DAQ for the specified CPC for each of the defined equipment configurations.

Below are the attenuator values required to evaluate each equipment configuration. The methodology to determine the attenuator value is demonstrated in TSB-88.1-D §5.4.2, Figure 5. The attenuator value includes the proper values for the equipment configuration requirement plus adjustments for the test equipment setup. Should the test equipment setup losses (e.g. cable length) vary, an adjustment to the attenuator value may be required to represent the required equipment configuration accurately.

Table 4-4: Attenuator Values To Evaluate Each Equipment Configuration

User Equipment Configuration and Outdoor / In-Building	Attenuator Value
Mobile	0 dB
Portable Outdoors	-6.70 dB

C4.2.7 Required Number of Test Tiles in the Defined Test Area

The method used to test coverage is a statistical sampling of the defined test 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 defined test 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 defined test area. There is one test sample per test tile, where a sample consists of multiple sub-samples.

Coverage acceptance testing will be performed in the defined test area as indicated on Motorola-provided maps. To verify that the reliability requirement is met, the defined test area indicated on Motorola's maps will be divided into uniformly sized test tiles, with at least the number of test tiles indicated in Table 4-2 Coverage Acceptance Test Summary. The number of test tiles indicated in



Table 4-2 is at least the minimum required by the Estimate of Proportions formula as stated in section 1.2.1 (Defined Test Area) of this document.

Per TSB-88.3-D, the stated minimum outdoor 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. For a given defined test area, all test tiles must be of equal size. The maximum test tile size is 2 by 2 km (1.24 by 1.24 miles) {TSB-88.3-D, §5.5.1}. 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.

No acceptance testing will be performed in locations outside the defined test area as indicated on the Motorola-provided maps. Motorola and City of Riverside Public Utilities may agree to perform “information only” tests in locations outside the defined test area; however, these “information only” test results will not be used for coverage acceptance. Any “information only” test locations must be defined before starting the test. If the added locations require significant additional time and resources to test, a change order will be required and Motorola may charge City of Riverside Public Utilities on a time-and-materials basis.

C4.2.8 Accessibility to Test Tiles

Prior to testing, Motorola and City of Riverside Public Utilities will evaluate the proposed grid locations to determine if known inaccessible grids exist. If there are known inaccessible grids, they will be removed from testing. If a significant number of grids are deemed inaccessible, Motorola will reevaluate the entire grid deployment to ensure statistical validity. If during the test, Motorola and City of Riverside Public Utilities identify any test tiles that are inaccessible for the coverage test (due to lack of roads, restricted land, etc.) those inaccessible tiles will be eliminated from the acceptance test calculation. {TSB-88.3-D, §5.5.4}

C4.2.9 Random Selection of a Test Location in Each Tile

This CATP provides an objective method of randomly selecting and tracking test locations using Motorola’s VoyagerSM coverage testing tool. The method has direct correlation with Motorola’s coverage prediction methodology.

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. If the selected test location is in a shielded area such as a tunnel or underground parking garage, the data from that test location must be eliminated and a replacement test location must be used.

C4.2.10 CPC Measurements in Each Tile

For Outbound and Inbound BER testing, complementary timing profiles will be used by Voyager and the Voyager Fixed Network application, VFNE-2, to interleave the inbound and outbound testing. VFNE-2 will be used to gather inbound test statistics and initiate a continuous outbound test pattern. The mobile application, Voyager, will gather outbound test statistics and will send an inbound test pattern to VFNE-2.



C4.3 RESPONSIBILITIES AND PREPARATION

This section identifies the responsibilities of City of Riverside Public Utilities and Motorola regarding requirements for equipment, personnel, and time during the coverage test.

- City of Riverside Public Utilities will provide the following for the duration of the coverage test:
- At least two test vehicle(s) that is representative of the vehicles to be installed with radios, and will provide the driver(s).
- Exclusive use of the test channels required by Motorola during the test.
- For mobile coverage testing, the antenna must be mounted per the equipment configuration.
- Provide 4 user radios for the test.

Motorola will provide the following for the duration of the coverage test:

- At least two Motorola Voyager coverage testing tool.
- One or more computers equipped with Motorola VFNE-2 software, and connected to the radio network for collecting inbound signal statistics.
- A timing profile to allow the test radio to transmit and receive at regular intervals will be established to facilitate automatic inbound and outbound BER statistics gathering.

As required, Motorola will provide a receiver signal strength calibration file for the test radio(s) used with the Voyager coverage testing tool.

Before starting the test, City of Riverside Public Utilities and Motorola will agree upon the time frame for Motorola's submission of a report containing the coverage test results.

C4.4 CATP PROCEDURES

A coverage acceptance test will be performed using Motorola's Voyager tool to randomly select test locations, and to manage BER data collection.

Voyager consists of the following:

- A voice test radio connected to an antenna installed in a representative location on the test vehicle. The test radio will monitor transmissions from the fixed network radio site(s).
- A Global Positioning System (GPS) receiver, which will provide the computer with the location and speed of the test vehicle.
- A computer with the Voyager Fixed Network (VFNE-2) application, connected to the system network to retrieve inbound BER statistics and to initiate the outbound test pattern.

The procedure for the objective BER coverage test will be as follows:

- The Voyager tool will be installed in a test vehicle, which will be driven over a route planned to cover the accessible tiles within the defined test area.
- During the coverage test, the laptop computer screen will display the vehicle's location on a map of the defined test area overlaid with the grid of test tiles. Voyager will automatically initiate outbound measurements and inbound transmissions based on the defined timing profile. The computer will provide a visual indication that a measurement has been completed. Voyager will



manage the coverage test data collection, and will store the outbound measurements for each tested tile for later analysis. Voyager will use the information collected by the VFNE-2 fixed end application for the inbound tests. Voyager will use its merge and export feature to match the inbound measurements to a test tile and display the BER statistics.

- For FDMA Standalone System Inbound/Outbound BER Coverage Testing, one channel is required. The outbound test will use an O.153 (formerly V.52) test pattern initiated on a base station transmit frequency. The inbound test will use a 1011Hz test pattern on the base station's receive frequency. The FDMA base station must be put into test mode to gather inbound signal strength and BER information. While in test mode the FDMA outbound test pattern can also be initiated. The Voyager Fixed Network (VFNE-2) application will connect to the system test port to establish an IP session to each base station to gather inbound signal statistics. The outbound O.153 test pattern, once initiated, will send a continuous test pattern over the air to allow the radio in the Voyager test vehicle to gather signal statistics whenever a test is initiated.
- Any tile that fails the objective BER test described above will be re-tested using a subjective DAQ test. Any tile that fails the objective BER test, but passes the subjective DAQ re-test will be declared passed.

The procedure for the subjective DAQ re-test of failed BER tiles (if needed) will be as follows:

- A subjective listening re-test will be performed on tiles that fail the objective BER test, to verify talk-in and talk-out DAQ performance of those tiles.
- Talk-out and talk-in will be evaluated independently.
- 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 (three to seven) 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 audio that pass and fail the subjective DAQ test.
- A fixed dispatch location will be established. Prior to testing, City of Riverside Public Utilities and Motorola will agree upon a procedure to allow each audio transmission to be evaluated for approximately five seconds.
- The test participants will be divided into teams, each consisting of personnel from both City of Riverside Public Utilities and Motorola. Each team will have members that operate a portable radio in the field, and members that are stationed at the fixed dispatch location.
- As the field test team(s) drive through the coverage area, test locations within each re-test tile will be selected randomly by Voyager's GPS location indication. Voyager will be used to log the talk-in and talk-out pass/fail result as well as any pertinent notes for the location.
- At each re-test tile location, each field test team member will listen to a talk-out audio transmission, and will record his or her subjective pass/fail evaluation of the DAQ for the tile. Team members stationed at the dispatch location will evaluate talk-in audio quality of transmissions from the test radio(s) in that tile. Each team member will maintain a test log to record date, time, and subjective pass/fail evaluation for each re-test tile location. Subjective pass/fail evaluation will be based on the DAQ descriptions in Table 4-1. The determination of whether each re-test tile passes or fails the required DAQ value will be the majority vote of all team members' pass/fail subjective evaluations for that tile. An odd number of team members are required to avoid ties for the pass/fail majority vote.



Should any subjective DAQ re-test tile fail, a retry of the transmission will occur. Should the retry pass, the re-test tile will be considered a pass. If a retry should occur, it will be noted in the test log notes for that test tile. Retries will be limited to a maximum of 100% of the total number of tested tiles.

C4.5 CATP DOCUMENTATION AND COVERAGE ACCEPTANCE

During the coverage acceptance test, Voyager generates computer files that include the raw test data. A copy of this data will be provided to City of Riverside Public Utilities at the conclusion of the coverage test. Motorola will process this data to produce a map detailing the coverage test results, and to determine whether the coverage test was passed for each user equipment configuration.

The coverage acceptance criterion for a user equipment configuration will be that the voice radio system implemented by Motorola for City of Riverside Public Utilities meets or exceeds the reliability stated in Table 4-2 Coverage Acceptance Test Summary for that user equipment configuration. The system coverage acceptance criterion will be the successful passing of each of the user equipment configurations defined in Table 4-2 Coverage Acceptance Test Summary.

Motorola reserves the right to review any test tiles that fail. If a coverage test, or a portion thereof, is suspected by Motorola to have failed due to external interference, those tiles suspected of being affected by an interferer may be re-tested. If the test tiles re-tested are confirmed to have failed due to interference or external noise, those test tiles will be excluded from all acceptance calculations and Motorola will work with City of Riverside Public Utilities to identify potential solutions to the interference issues.

Motorola will conduct this Coverage Acceptance Test only once. If any portion of the test is determined to be affected by proven equipment malfunctions or failures, Motorola will repeat the portion of the test affected by the equipment malfunction or failure. City of Riverside Public Utilities will have the option to accept the coverage at any time prior to completion of the coverage test or documentation process.

Motorola will submit to City of Riverside Public Utilities a report detailing the coverage test results. This report will include a document, which is to be signed by both City of Riverside Public Utilities 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.

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PROPOSAL TO
CITY OF RIVERSIDE

EXHIBIT C-5

PERFORMANCE SCHEDULE

DESIGN AND INSTALLATION OF LAND MOBILE RADIO

JULY 28, 2016

RFP NO. 1558



The design, technical, pricing, and other information ("Information") furnished with this submission is proprietary information of Motorola Solutions, Inc. ("Motorola") and is submitted with the restriction that it is to be used for evaluation purposes only. To the fullest extent allowed by applicable law, the Information is not to be disclosed publicly or in any manner to anyone other than those required to evaluate the Information without the express written permission of Motorola.

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City of Riverside Public Utilities P25 Project Schedule

ID	Task Name	Duration	Start	Finish	3rd Quarter Jul Aug Sep	4th Quarter Oct Nov Dec	1st Quarter Jan Feb Mar Apr
1	City of Riverside Public Utilities P25 Project	158d	Tue 8/2/16	Thu 3/9/17			
2	PreContract Activities	80d	Tue 8/2/16	Mon 11/21/16			
3	Motorola Solutions Selected as Vendor	0d	Tue 8/2/16	Tue 8/2/16			
4	Order Processing (Gate 7 - Procurement & Build)	80d	Tue 8/2/16	Mon 11/21/16			
5	Review Customer Design Requirements	10d	Tue 8/2/16	Mon 8/15/16			
6	Process Equipment list	10d	Tue 8/16/16	Mon 8/29/16			
7	Order Bridged	5d	Tue 8/30/16	Mon 9/5/16			
8	Manufacturing and Staging (Gate 7 - Procurement & Build)	55d	Tue 9/6/16	Mon 11/21/16			
9	Manufacture Motorola FNE	35d	Tue 9/6/16	Mon 10/24/16			
10	Manufacture Non-Motorola Equipment	35d	Tue 9/6/16	Mon 10/24/16			
11	Develop Programming Configurations	10d	Tue 9/6/16	Mon 9/19/16			
12	Ship to Staging	0d	Mon 10/24/16	Mon 10/24/16			
13	Stage System	15d	Tue 10/25/16	Mon 11/14/16			
14	CCSI Acceptance	0d	Mon 11/21/16	Mon 11/21/16			
15	Contract	104d	Mon 10/17/16	Thu 3/9/17			
16	Contract Award	0d	Mon 10/17/16	Mon 10/17/16			
17	Contract Administration	5d	Mon 10/17/16	Fri 10/21/16			
18	Project Kick-Off	5d	Mon 10/24/16	Fri 10/28/16			
19	Frequency Licensing Complete <Customer Responsibility>	0d	Mon 10/17/16	Mon 10/17/16			
20	Contract Design Review (Gate 9 & 8)	62d	Mon 10/31/16	Tue 1/24/17			
21	Review Contract Design	10d	Mon 10/31/16	Fri 11/11/16			
22	Develop Fleetmaps	10d	Wed 11/2/16	Tue 11/15/16			
23	Complete Transition Survey	0d	Fri 11/11/16	Fri 11/11/16			
24	Design Approval	0d	Fri 11/11/16	Fri 11/11/16			
25	Perform Staging ATP	5d	Tue 11/15/16	Mon 11/21/16			
26	Ship Equipment to Field	10d	Tue 11/22/16	Mon 12/5/16			
27	Receive and Inventory Equipment in Field	13d	Tue 12/6/16	Thu 12/22/16			
28	Warehouse <Customer Responsibility>	30d	Wed 12/14/16	Tue 1/24/17			
29	INSTALLATION (Gate 6 - Installation & Optimization)	29d	Fri 12/23/16	Wed 2/1/17			
30	Perform R-56 Audit	3d	Fri 12/23/16	Tue 12/27/16			
31	Link Verification	6d	Fri 12/23/16	Fri 12/30/16			
32	FNE Installation (Gate 6 - Installation & Optimization)	8d	Mon 1/2/17	Wed 1/11/17			
33	Install FNE Master site at UOC	5d	Mon 1/2/17	Fri 1/6/17			

City of Riverside Public Utilities P25 Project Schedule					
ID	Task Name	Duration	Start	Finish	3rd Quarter Jul Aug Sep Oct Nov Dec 1st Quarter Jan Feb Mar Apr
34	Install FNE ASR Site at Box Springs	3d	Mon 1/9/17	Wed 1/11/17	1/11
35	FNE Installations Complete	0d	Wed 1/11/17	Wed 1/11/17	
36	Console Installation (Gate 6 - Installation & Optimization)	7d	Mon 1/9/17	Tue 1/17/17	
37	Install Console at UOC	5d	Mon 1/9/17	Fri 1/13/17	
38	Install Consoles at RERC	3d	Thu 1/12/17	Mon 1/16/17	
39	Console Installations Complete	0d	Mon 1/16/17	Mon 1/16/17	1/16
40	Antenna Installation (Gate 6 - Installation & Optimization)	4d	Thu 1/12/17	Tue 1/17/17	
41	Install and test Antenna network at Box Springs	4d	Thu 1/12/17	Tue 1/17/17	
42	Install Control Station Antenna at UOC	1d	Mon 1/16/17	Mon 1/16/17	
43	Antenna Installation Completed	0d	Tue 1/17/17	Tue 1/17/17	1/17
44	Installation Acceptance	0d	Tue 1/17/17	Tue 1/17/17	1/17
45	System Optimization (Gate 6 - Installation & Optimization)	8d	Mon 1/23/17	Wed 2/1/17	
46	Optimize System FNE	8d	Mon 1/23/17	Wed 2/1/17	
47	Optimization Complete	0d	Wed 2/1/17	Wed 2/1/17	2/1
48	Audit and Acceptance Testing (Gate 5 - System Testing & Cutover)	7d	Mon 2/6/17	Tue 2/14/17	
49	Perform System Testing	2d	Mon 2/6/17	Tue 2/7/17	
50	Perform Coverage Testing	5d	Wed 2/8/17	Tue 2/14/17	
51	SATP Acceptance	0d	Tue 2/7/17	Tue 2/7/17	2/7
52	Cutover (Gate 5 - System Testing & Cutover)	2d	Wed 2/8/17	Thu 2/9/17	
53	Cutover FNE	1d	Wed 2/8/17	Wed 2/8/17	
54	Cutover Dispatch Centers	1d	Thu 2/9/17	Thu 2/9/17	
55	Cutover Complete	0d	Thu 2/9/17	Thu 2/9/17	2/9
56	Finalize (Gate 4 - Implementation Close)	20d	Fri 2/10/17	Thu 3/9/17	
57	Final Inspection w/Customer	2d	Fri 2/10/17	Mon 2/13/17	
58	Punchlist Resolution	10d	Fri 2/10/17	Thu 2/23/17	
59	Finalize Documentation	15d	Wed 2/15/17	Tue 3/7/17	
60	Transition to Service/PTC	2d	Wed 3/8/17	Thu 3/9/17	
61	Final Acceptance	0d	Thu 3/9/17	Thu 3/9/17	3/9

PROPOSAL TO
CITY OF RIVERSIDE

EXHIBIT D

SERVICE

STATEMENT OF

WORK

DESIGN AND INSTALLATION OF LAND MOBILE RADIO

JULY 28, 2016

RFP NO. 1558



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SERVICE STATEMENT OF WORK

Motorola has over 85 years of experience supporting mission critical communications for public safety and public service agencies. Motorola's technical and service professionals use a structured approach to life cycle service delivery and provide comprehensive maintenance and support throughout the life of the system. The value of support is measured by system availability, which is optimized through the use of proactive processes, such as preventive maintenance, fault monitoring and active response management. System availability is a function of having in place a support plan delivered by highly skilled support professionals, backed by proven processes, tools, and continuous training.

D.1 THE MOTOROLA SERVICE DELIVERY TEAM

D.1.1 Customer Support Manager

Your Motorola Customer Support Manager provides coordination of support resources to enhance the quality of service delivery and to ensure your satisfaction. The Customer Support Manager (CSM) is responsible to oversee the execution of the Warranty and Service Agreement and ensure that Motorola meets its response and restoration cycle time commitments. The CSM will supervise and manage the Motorola Authorized Servicer's functions.

D.1.2 Motorola System Technologists

The Motorola System Technologists (ST) is available to assist Motorola's Authorized Servicers when needed.

D.1.3 Motorola System Support Center

Located in Schaumburg, Illinois, the System Support Center (SSC) is a key component to the overall management and system maintenance. As detailed in this Customer Support Plan, the following services are provided by the System Support Center:

- Network Event Monitoring
- Annual Preventative Maintenance
- Dispatch Service
- On Site Support
- Remote Security Patch Installation
- Network Hardware Repair
- Technical Support



D.1.4 Motorola Local Service Provider

Motorola's authorized service centers are staffed with trained and qualified technicians. They provide rapid response, repair, restoration, installations, removals, programming, and scheduled preventive maintenance tasks for site standards compliance and RF operability. Motorola's authorized service centers are assessed annually for technical and administrative competency.

Motorola places great emphasis on ensuring that communications systems, such as the one proposed for the City of Riverside Public Utilities Department (the City), meet high standards for design, manufacture, and performance. To enhance the value of the communications system being acquired, Motorola offers customized warranty and post-warranty services as outlined in this section.

D.2 WARRANTY SERVICES

Motorola will provide warranty services per our standard warranty terms and conditions as outlined within the Communication Systems Agreement within this proposal. In addition to the Standard Commercial Warranty, the service products that comprise the Custom Warranty package mirror those delivered to the City and are listed below along with a brief description.

D.2.1 Network Event Monitoring Service

Network Event Monitoring Service helps keep your network at optimum availability so it is ready to serve mission critical communications needs. By watching over the network continuously, Motorola through its 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 Event Monitoring Service provides improved productivity and enhanced network performance, which in turn helps to increase your technology Return-On-Investment.

Using a combination of network event monitoring software, automated alerts, and remote diagnostics inquiries, our System Support technologists actively monitor your network to maximize network uptime and overall preparedness...for the expected and unexpected. Upon receiving an alert, our team immediately performs 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 your site to achieve restoration.

Motorola's Network Monitoring service is a vital component of an intelligent communication support plan that keeps your system operating smoothly, your costs down, and assures maximum preparedness at all times.

Specifically, Network Monitoring Service provides:

- Improved network availability
- Remote and timely resolution to minimize downtime
- Cost efficiencies
- Optimized technician time at site due to assessment and knowledge transfer before dispatch
- Minimize unnecessary trips to site
- Mitigate need for 24x7 operations monitoring center
- Detailed Reports



D.2.2 Annual Preventative Maintenance

Annual Preventative Maintenance provides routine test and alignment of your infrastructure, which helps improve system efficiency and minimize network downtime. Trained technicians:

- Physically inspect equipment
- Remove dust and foreign substances
- Clean filters
- Measure, record, align and adjust equipment to meet original manufacturer's specifications

This service is performed based on a mutually agreed schedule. Network Preventative Maintenance proactively detects issues that may result in system malfunctions and operational interruptions.

D.2.3 Dispatch Service

Motorola's Dispatch Service ensures that trained and qualified technicians are dispatched to diagnose and restore your communications network. Following proven response and restoration processes, the local authorized service center in your area is contacted and a qualified technician is sent to your 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 verifies resolution and with your approval, closes the case. Activity records are also available to provide a comprehensive history of site performance, issues, and resolution.

D.2.4 On-Site Support

When remote resolution is not possible, a local field technician will be dispatched to the affected site to resolve the issue. Following proven response and restore processes, Motorola's System Support Center contacts the local authorized service center in your area and dispatches a qualified technician to your site. An automated escalation and case management process ensures that technician site arrival and system restoration comply with contracted response times. The field technician restores the system by performing first level troubleshooting on site. If the technician is unable to resolve the issue, the case is escalated to the System Support Center or product engineering teams as needed.

D.2.5 Remote Security Patch Installation Service

Commercial security software updates are often designed without RF systems in mind and could cause inadvertent harm to your radio network, disrupting mission-critical communications and putting your first responders and citizens at risk. The Motorola Remote Security Patch Installation Service assures that commercial anti-virus definitions, operating system software patches, and Intrusion Detection Sensor signature files are compatible with your 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. Proactive security updates are remotely applied by Motorola to help maintain operational integrity of your network and minimize cyber security risk.

Table 1-1: Remote Security Patch Installation Services

	RSPI
Anti-virus Definition Update	✓
Minor Release (patch release)	✓
Information Assurance Remediation	
Major Release (system release)	
Hardware Refresh	
Implementation Services	
Regional Partner Invoicing	available

- Anti-virus definitions and intrusion detection sensor updates for Motorola supplied equipment from applicable original equipment manufacturer.
- 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 software service packs that may be available.
- Recommendations for IA remediation may include, but is not limited to the following: provide security software updates; provide operating system security updates or patches; implement configuration changes; upgrade to a later ASTRO 25 System Release (upgrade expense not included), or recommending a compensating control.
- Regional partner invoicing provides ability to separate invoicing across multiple agencies.

D.2.6 Network Hardware Repair

Network Hardware Repair service provides for the repair of all Motorola-manufactured equipment, as well as select equipment from third-party infrastructure equipment that Motorola has provided. All repair management is handled through a central location eliminating your need to send equipment to multiple locations.

Comprehensive test labs replicate your network in order to reproduce and analyze the issue. State-of-the-art, industry-standard repair tools enable our technicians to troubleshoot, analyze, test, and repair your equipment. Our ISO9001 and TL9000-certified processes and methodologies ensure that your equipment is quickly returned maintaining the highest quality standards.

Service agreements allow you to budget your maintenance costs on an annual basis. Equipment covered under service agreements also receives higher service priority, which results in quicker repair times.

D.2.7 Technical Support Service

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 System Support Center (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.



D.3 POST WARRANTY SERVICES

As Motorola's continuing commitment to supporting your system, warranty services can be extended after the first year to provide maintenance and service support in future years. Any of the services that we identify can be customized in future years, and are available for purchase in "System Support Services" packages. These system support services significantly benefit the City because the system can be effectively supported after the warranty period, thereby maximizing the operational capabilities and useful life of the system and protecting your investment in the system.

D.4 SUMMARY

Whether it's a routine service call, or a disaster situation, Motorola understands its responsibility and takes pride in its commitment to deliver proven response service to the public safety community. Motorola has the capability to provide the technical, administrative, consultative, and maintenance repair services needed to support, enhance, and maintain the effectiveness of your communications network. Motorola's goal is to provide the City with the services and qualified resources, to maintain and improve system operation and availability, and to deliver world-class service support.

Warranty support services to be delivered are outlined in Table 1-2.

Table 1-2: Warranty and Post Warranty Service Overview

Warranty and Post Warranty Service Overview	Warranty Year	
Network Event Monitoring Service	✓	
Annual Preventative Maintenance	✓	
On Site Support	✓	
Remote Security Patch Installation	✓	
Network Hardware Repair	✓	
Technical Support Service	✓	

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