Proposal for

City of Durham, North Carolina

Project 25 Upgrade

1700 Belle Meade Ct., Lawrenceville, GA 30043

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Motorola Solutions, Inc.
1700 Belle Meade Court
Lawrenceville, GA 30043

September 14, 2012

Mr. Rik Rasmussen
Radio System Manager
1840 Camden Avenue
Durham, NC 27704

RE: Radio System Upgrade

Dear Mr. Rasmussen:

Motorola Solutions, Inc. ("Motorola") is pleased to have the opportunity to provide the City of Durham, NC a proposal to upgrade your current Motorola Communication Network in a multi-year phased approach that will allow you to migrate to the advanced Project 25 standards as your budget allows while keeping all the mission critical features your first responders are using today.

The Motorola Project Team has taken great care to propose a solution that will meet your needs and provide you with unsurpassed value. Our proposal offers a turnkey package for all three phases, including engineering, project management, system integration, and lifecycle maintenance tailored to the City of Durham.

Motorola's proposal is conditioned upon your acceptance of the terms and conditions contained in the Communications System Agreement (CSA) included in this proposal, or a negotiated version thereof.

Motorola appreciates the opportunity to present this proposal and looks forward to continuing our long term partnership. If you have any questions concerning this proposal please contact your Account Executive, Scott Hurt at (336) 312-9165

Sincerely,

MOTOROLA SOLUTIONS, INC.

Marshall Wright
MSSSI Vice President & Director of Sales
North America Government &Commercial Markets

Section 2. System Description

Motorola is proposing a communications solution for the City of Durham that details migration of the current Motorola SmartZone 4.1 Simulcast radio system to a Motorola ASTRO P25 simulcast system platform. Motorola has developed a comprehensive migration plan based on each user agencies needs. The migration plan accounts for how Subscribers, RF Sites, Consoles and Core Infrastructure will be migrated and/or replaced over time. The following new equipment or upgrades to existing equipment are proposed for Year one of the three year plan phased upgrade.

- A P25 Master site will be installed during Phase 1 of the project and will replace the current SmartZone 4.1 Master site currently utilized in the existing simulcast system.
- The existing SmartZone simulcast sub system will be integrated into the P25 core Master Site using Motorola's SmartX site converters. This concept will allow the City of Durham to utilize their existing SmartZone simulcast infrastructure and continue realizing the benefits of the current system during the upgrade process. This allows for a multiyear phased approach for upgrading the entire system to P25 allowing costs to be distributed over a three year plan.
- Motorola MCC7500 Dispatch Consoles utilized with the ASTRO P25 systems will be supplied that will integrate directly into the P25 Master Site. These P25 Consoles will be installed at all currently operational dispatch centers. The consoles will maintain all feature sets and will be fully operational across all phases of the upgrade plan.
- All existing SmartZone infrastructure equipment that will be utilized during the SmartX phase one of the upgrade plan will be upgraded if required to the latest software/firmware release particular to each piece of equipment.

2.1 Phased P25 System Upgrade Plan Year One

2.1.1 Zone Master Site

A new ASTRO P25 Master Site will be supplied and installed. This site will consist of a fully functional P25 Master Core and will support the SmartX interface for the existing simulcast system during the upgrade migration. This Master Site will also support the MCC7500 P25 dispatch consoles to be installed in phase one.

2.1.2 911 Communications Dispatch Consoles

The consoles currently in use at all 911 dispatch centers will be replaced with MCC7500 console systems. These console systems will be connected to the new Zone P25 Master Site using the existing City of Durham Microwave Radio Network. The MCC7500 consoles will support P25 operation and continued operation for the SmartZone simulcast network. The centers will also use conventional channel gateways (CCGW) connected to the MCC7500 console systems to operate conventional and trunked 4.1 control stations for existing systems communications. Upon implementation of all phases the CCGWs will continue to support backup and conventional operation. The console system will have a direct connection to the Master site that will support fully functional wide area P25 operation.

2.1.3 City of Durham Simulcast System using SmartX

Upon replacement of the City of Durham dispatch consoles the simulcast radio system will be integrated into the P25 Zone Master Site using Motorola SmartX technology. The SmartX Site Converter focuses on the initial infrastructure upgrade of the core Master Site to an ASTRO 25 IP core network. This will be followed in years two and three by Subscriber / RF Site migrations to full ASTRO 25 operation. SmartX Site Converters can provide a valuable first step in moving to the ASTRO 25 platform to enable ASTRO 25 features, products and capabilities while keeping 3600 Sites/Radios operational through their useful life. An ASTRO 25 network with SmartX Site Converter forms a powerful hybrid network – one that can blend existing SmartZone remote sites (3600) with ASTRO 25 sites (9600) for enhanced interoperability and flexibility. City of Durham agencies can maximize the value from their existing equipment while gradually investing in a path to the future. A mixed network is enabled through the deployment of SmartX Site Converters that convert SmartZone site audio (Analog and/or Digital IMBE) and signaling information to IP data packets routed on the ASTRO 25 network.

Motorola will use the SmartX site converter concept in the migration strategy to integrate the large City of Durham simulcast subsystem into the new P25 Zone core.

This will allow continued use of that SmartZone infrastructure and allow the City of Durham to continue realizing the benefits of the existing simulcast system while developing a final P25 upgrade migration plan for their infrastructure. Portions of the existing City of Durham simulcast infrastructure will be upgraded to the SmartZone 4.1 Z release if required.

2.2 Year two P25 migration, P25 RF Overlay

During the second phase of the system upgrade the P25 Simulcast Prime Site infrastructure will be installed. This P25 prime site will be equipped to support the final 24 RF channel configuration of the Durham P25 Radio system.

An RF site overlay consisting of twelve P25 RF channels at each of the City of Durham's four RF sites will be installed and made operational. The system Receiver antennae system as well as the system Transmitter antennae networks at each site will be replaced to support P25 simulcast operation. This fully operational P25 simulcast overlay will allow the City to migrate a portion of the departments and users to full P25 operation.

The existing SmartZone simulcast system will continue to operate on a reduced number of RF channels to support the portion of users that remain operational of the legacy system.

2.3 Year Three Completion of P25 System Upgrade

During the final phase of the system upgrade the remaining subset of RF channels operational on the legacy SmartZone simulcast system will be replaced with P25 Simulcast RF channels. These channels will be integrated into the previously equipped P25 Simulcast Prime Site.

The remaining radio users will migrate operations to the fully upgraded and fully equipped ASTRO P25 Simulcast System.

This phase completes the upgrade process. This approach allows the City of Durham to distribute system upgrade costs over a three year period while maintaining a fully functional and robust radio network during the upgrade process. When complete the City of Durham will be operational with an ASTRO P25 Compliant Simulcast Radio System. All 911 dispatch centers will be operational with ASTRO P25 MCC7500 Console systems.

2.4 Project Tasks for Year One

Motorola will provide personnel resources for the following tasks.

- Assist City of Durham technicians with site installation planning and guidelines for System infrastructure equipment installation
- Assist City of Durham technicians with the site installation planning and guidelines for dispatch console equipment at all dispatch centers.
- Motorola will assist with performing legacy system equipment upgrades if required in order to bring all equipment to the versions required for SmartX operation.
- Motorola will perform optimization and integration tasks for new P25 equipment and integrate all equipment into the P25 Master Site Zone Core.

City of Durham will provide personnel resources for the following tasks.

- Perform physical installation of P25 Master Site.
- Perform physical installation of all MCC7500 Console systems
- Assist Motorola personnel with any required legacy system upgrade process.
- Provide all RF site, Prime Site, Dispatch Site and Master Site connectivity via the existing City of Durham Microwave Radio System Network.
- Assist Motorola personnel with optimization and integration of P25 Master Site equipment.

  The City of Durham shall be responsible for all civil and electrical work required or related to this project.

2.5 City of Durham Responsibilities

As part of the migration strategy the City of Durham will have certain responsibilities for each phase of the upgrade migration. Final tasks and responsibilities will be outlined in a comprehensive scope of work at a later date. These responsibilities and tasks shall include but not be limited to the following.

2.5.1 Site Links

The City of Durham shall provide and be responsible for the required links from all remote radio sites to the appropriate Master Site or Prime Site. This will also include the links to console sites as well as Network Management sites.

2.5.2 TenSr Channel Bank equipment

The SmartX converter system strategy for the City of Durham simulcast integration into the P25 system requires that the simulcast system and RF sites be connected to the new P25 Zone 1 Master at the Camden Ave. tower. The existing channel banks can be used to connect to the SmartX site converters however the equipment must be at required hardware and software levels for proper operation. Motorola will supply Durham's technical personnel with the required information however it shall be the responsibility of the City to provide any hardware, software and labor required to upgrade the channel banks.

It is believed that the existing channel banks will require no hardware or software upgrade.

2.5.3 Quantar 4.1

It is proposed to utilize the existing Quantars at the RF sites in phase one for SmartX operation. Motorola will supply the required equipment to modify the stations. Motorola and City of Durham technical personnel will work together to convert the Quantar sites. The joint team will also develop procedures for installing and linking the site switches and routers to Master Sites. Motorola will provide assistance with troubleshooting any conversion and connection issues. It shall be the responsibility of the the City of Durham to provide site connectivity to the appropriate sites. The City of Durham personnel shall also provide Motorola site access to the required infrastructure sites.

2.6 P25 RF System Overlay for Year Two

Motorola will supply the required infrastructure equipment for the P25 simulcast and twelve channel RF overlay. It shall be the responsibility of the City of Durham to provide all civil and electrical services required. City of Durham technicians shall install all equipment with guidance from Motorola personnel. Motorola personnel will optimize and integrate the overlay into the P25 Master Site. City of Durham technical personnel will assist with the tasks.

The City of Durham shall be responsible for any radio tower stress studies or structural upgrades required to support the system antennae configurations.

No additional antennae are planned for this project. The project assumes replacement of existing transmission lines and antennae as described previously in the project phases resulting in no net increase in equipment with the exception of a ½ " test line for the receive Tower Top Amplifier system at each RF site.

2.7 P25 System Upgrade Completion Year Three

As part of this final phase Motorola will supply all required infrastructure equipment required to complete the final twelve channel addition to the P25 overlay at each of the four RF sites.

It shall be the responsibility of the City of Durham to provide all civil and electrical services required. City of Durham technicians shall install all equipment with guidance from Motorola personnel. Motorola personnel will optimize and integrate the channel additions into the P25 system. City of Durham technical personnel will assist with the tasks.

This phase will complete the City of Durham radio system ASTRO P25 upgrade and provide for a fully compliant ASTRO P25 twenty four channel, four site simulcast radio system. All dispatch centers will have installed per previous phases MCC7500 ASTRO P25 console dispatch equipment.

2.8 Equipment Description

2.8.1 Master Site Equipment

The Master Site system consists of a complex network of servers, computer workstations, high-speed Local Area Network (LAN)/Wide Area Network (WAN) devices, databases, and software applications. The term “master site” designates the location of core equipment providing a central point of control for the operation of the radio communication system.

There is a master site location for each zone core. In an M Series zone core, the location of the User Configuration Server (UCS) and, if available, the System Statistics Server (SSS) will designate the master site. At the master site for these zone core architectures the zone controller (ZC), audio distribution, and network management equipment work together to process calls, distribute audio, assign channel resources, and conduct network management functions for the system.

2.8.1.1 M3 Zone Architecture

The Multi-Zone Capable (M3) zone core represents a sophisticated P25-compliant system with high availability designed to fulfill the need for mission critical operations, at the same time preventing from an unauthorized access to the resources and information. Application virtualization supports multiple server applications residing on a reduced number of hardware platforms, thus reducing hardware and space requirements without affecting the system's functionality.
A zone has a master site that contains the computing backbone for that zone. The master sites contain all the components necessary for controlling calls within a zone and for communicating with other zones to manage InterZone calls. 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.

One or two zone controllers are used to process system-wide commands and handle call processing and mobility management functions for the system. In systems with two zone controllers, there is a connection from each zone controller to the LAN switch and a direct connection between the two zone controllers. The LAN switch connection allows each zone controller to communicate with the gateway routers/Core Gateways.

The zone controller is an application running on generic application hardware platform. System configuration determines whether the application shares the physical server with other applications or is the only application on the server.

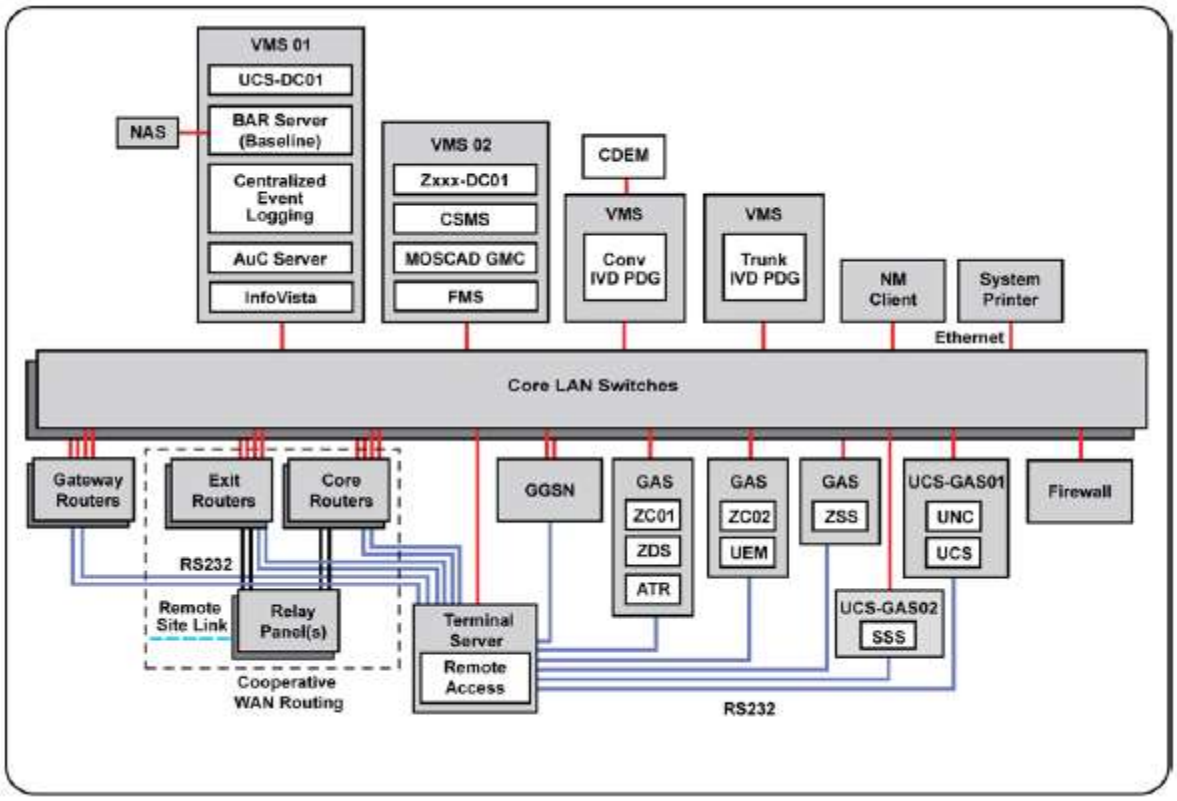

Figure 2-1: M3 Zone Core Architecture

The M3 zone core is a full IV&D high capacity, multi-zone system. Up to five servers host two zone controllers and Network Management applications. A 48-port terminal server is supplied. The SSG140Firewall is managed through a Firewall Manager application set up on a separate server. All of the system devices are redundant to increase reliability of the system.

2.8.2 Master Site Components

2.8.2.1 Master Site LAN Switches

The master site LAN switch is used to aggregate all the Ethernet interfaces for all master site devices including Network Management servers and clients, zone controllers, and various master site routers. The switch determines which device a packet is meant for and dispatches it to the appropriate device.
Devices are physically connected into the switch in a way that provides the highest reliability to support critical network traffic. System configuration determines the number of the switches used.

Two redundant Virtual LANs (VLANs) are set up within the LAN switch. The purpose of these Transitional LANs (TLAN1 and TLAN2) is to carry intrazone traffic between the various core, gateway, and exit routers. Two are needed to provide redundancy to address a single point of failure for Ethernet ports in the routers. If an Ethernet port fails, traffic is transferred to the remaining TLAN. In M3 zone core architectures, TLAN1 is set up on switch 1 and TLAN2 is set up on switch 2.

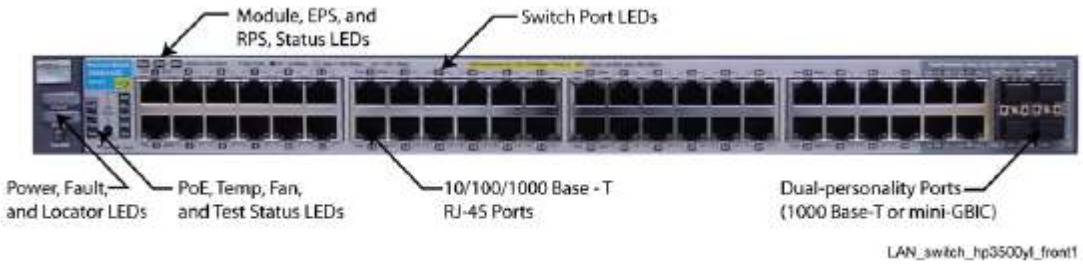

Figure 2-2: Master Site LAN Switches

2.8.2.2 Application Server(s)

The Generic Application Server is software that is installed on each server. Depending on the zone core architecture, from one to five servers can be used.

The application server hardware platform provides the computing backbone capable of supporting the following applications without requiring separate hardware servers for each application:

- **Zone Controller (ZC)** - The zone controller is responsible for processing calls, managing audio paths, controlling zone infrastructure, and providing services to subscribers and console operators. It can be installed in single and redundant configurations.
- **User Configuration Server (UCS)** - The UCS houses the database containing configuration records for home zone maps, users, radios, talkgroups, Adjacent Control Channels (ACC), security information at a system-level, and other system-level parameters. The information is configured using the User Configuration Manager (UCM) application and is saved in the UCS database. There is one active UCS per system.
- **System Statistics Server (SSS)** - The SSS collects and stores system-wide statistical information from each of the Air Traffic Routers (ATRs) for use by the system-level Historical Reports application. Statistics concerning resource usage and allocation are maintained for sites, channels, zones, talkgroups, and users. The SSS is optional and only one active is required per system.
- **Unified Network Configurator (UNC)** - The UNC is a network configuration tool that provides controlled and validated configuration management of system devices.
- **Unified Event Manager (UEM)** - The UEM provides fault management for the system. The UEM monitors the health of objects such as servers, zone controllers, and sites. Device status information is obtained using the Simple Network Management Protocol (SNMP). There is one UEM server per zone.
- **Zone Statistics Server (ZSS)** - The ZSS if purchased, collects and stores zone-wide statistics regarding call processing traffic. It derives this information from the Air Traffic Information Access (ATIA) stream supplied by the Air Traffic Router. The ZSS provides this information to the Historical Reports. There is one ZSS per zone.
- **Air Traffic Router (ATR)** - The ATR collects air traffic information from the zone controller and distributes the information to the statistical servers, ZoneWatch clients, and to any billing or accounting service hosts. The air traffic information also includes Radio Control Manager feedback, such as a response or fulfillment of an RCM command. This RCM feedback is forwarded to RCM clients. There is one ATR per zone.
- **Zone Database Server (ZDS)** - The ZDS is primarily used for distribution of configuration information to the following devices: Console, Conventional Channel Interface devices, and MGEG. There is one ZDS per zone.

2.8.2.3 Zone Controller and Server Applications (System Level and Zone Level)

Servers are computers that "serve" data to other computers and devices (clients). Servers are different from client computers. In general, clients consume and manipulate information and resources, while servers are *providers* of information and resources. In the system, there are many servers and each has a specialized function or set of functions.
The server applications perform the following functions:

- Collect and display system fault information
- Compile system statistics
- Provide a user interface for system configuration.
- Store records for users, infrastructure, and radios
- Manage call processing activities

System Level	User Configuration Server
	System Statistics Server
	Unified Network Configurator
Zone Level	Zone Controller
	Zone Statistics Server
	Air Traffic Router
	Unified Event Management Server
	Zone Database Server

Figure 2-3: System Level and Zone Level

Zone Controller

The zone controller application is responsible for processing calls, managing audio paths, controlling zone infrastructure, and providing services to subscribers and console operators.

The server hosting the zone controller application is equipped with Ethernet ports that interface with the various system devices. The zone controller subsystem may include redundant zone controllers. The LAN switch is used to switch system resources between the zone controllers and provide high availability call management within the zone. While both zone controllers are powered and enabled at the same time, only one is actively participating in call processing tasks at any one time (active ZC) while the second controller that is not actively processing calls in the zone is in the standby mode.

A redundant zone controller in each zone provides protection against a hardware or software failure that may result in the loss of wide area trunking until the zone controller is repaired or recovers automatically. Wide area trunking is the normal operating state for each site in the system. If all sites are in wide area trunking mode within a zone, communication paths cover the entire zone. The zone controller manages the call processing and audio routing through an active Control Channel. Each site needs a Control Channel and at least one operational voice channel to stay in wide area trunking. Switchover to the standby zone controller occurs if the active zone controller loses the ability to maintain wide area trunking.

System information that is necessary for call processing is downloaded to both zone controllers. The zone controller applications reside on physical servers that include hardware for storing data and communicating with zone resources. The host hardware platforms and the zone controller applications are identical.

Active and Standby Zone Controllers

In systems with redundancy, one of the two zone controllers is designated as the active zone controller and the other is designated as the standby zone controller. These zone controllers exchange operating modes to maintain system performance and reliability.

When the operating status of a zone controller is the active mode, it supports zone controller functionality. When the operating status of a zone controller is the standby mode it supports backup zone controller functionality.

Zone Controller and Trunking IV&D

The zone controller supports and manages channel resource allocation for both voice and data. From the data services perspective, the zone controller provides the following functions:

- Responds to the HLR query by the PDR to obtain zone affiliation information (subscriber location) and subscriber status information.
- Responds to the VLR queries from the RNG to obtain site affiliation information. In addition, registration, de-registration, site roaming, and zone roaming information is communicated from the zone controller to the RNG for processing data service requests.
- Assigns a 9600 baud channel as a data channel and allocates the channel to the base station. A subscriber radio communicates with the PDG over this channel.
- Tracks the number of active data channels at a site.
- Manages and enforces channel preemption rules.
- Maintains data channel lease with the site controllers.
- Maintains the busy queue for data channel request from the sites.
- Provides mobility management functions for each Mobile Subscriber Unit (MSU).

- Allocates and manages radio channel resources and determines which channels are used as the Packet Data Channel (PDCH).
- Determines PDCH preemption based on preemption rules. Provided that the system-wide Data Channel Preemption parameter is set, the TG can preempt data parameters.
- Maintains Busy Queue for data channel requests from a site. PDCH requests follow existing priority levels for call processing.

The Motorola Packet Data Gateway (PDG) is a hardware and software platform designed to link a customer's data network to the Motorola network. It is placed at the junction of the wire line network and the Radio Frequency (RF) data network. It provides the interconnection between the two networks through its routing, translation, fragmentation, and error reporting services. The PDG employs Internet Protocol Version 4 (IPv4) routing.

The PDG provides the interface between the Customer Enterprise Network (CEN) and packet data users in the system. The PDG performs registration services for packet data users, maintains user permissions and mobility information. Also provides routing of traffic to the radio network or the GPRS Gateway Support Node (GGSN) router.

The main software components of the PDG are the Packet Data Router (PDR) and the Radio Network Gateway (RNG).
The RNG communicates with the zone controller to maintain a local Packet Data Visitor Location Register (PD-VLR) for all data users that are currently registered in the zone.

2.8.2.4 Fault Management at the Zone Level

The Unified Event Manager application provides integrated fault information for a zone including any or all sites in that zone. The server monitors faults from each of the sites and their devices.

2.8.2.5 Configuration Management at the Zone Level

For network management users, the ASTRO® 25 radio system features integrated interfaces for accessing configuration information for all devices. The Network Management clients allow users to navigate and configure network devices.
The User Configuration Server (UCS) and Unified Network Configurator server applications provide database processing required for the system-wide network management functions.

User Configuration Manager (UCM) is the application installed on the UCS server. It supports the tools necessary for management personnel to configure console users, radios, radio users, talkgroups, multigroups, security access for users in the system, security access for users in the system, all the Console information, and some system-level parameters for call capability.

Unified Network Configurator (UNC) manages the configurations of the routers, switches, terminal servers, base radios, site controllers, comparators, SmartX Site Converters, MCC 7500 Voice Processor Modules (VPMs), conventional base radios, Telephone Media Gateways, Reference Distribution Modules, conventional comparators, and links on an on-going basis. It also distributes the configuration data created in UCM to zone controllers, Packet Data Gateways (PDG), conventional Packet Data Gateways, and Air Traffic Routers (ATR).

The Unified Network Configurator consists of two applications:

- VoyenceControl to manage network transport devices such as switches and routers.
- Unified Network Configurator Wizards (UNCW) to manage the RF infrastructure.

The UNCW is an application that provides forms that are filled out according to specified system parameters. It allows the user to easily discover, configure, and manage the system. Wizards assist in enforcing the ASTRO® 25 radio system operational rules.

System configuration information is stored in the UCS and UNC databases. The databases interact to synchronize crucial system-level and zone-level parameters. The synchronization of the parameters is bidirectional – a set of parameters is published from UCS to UNC and a different set is published from UNC to UCS.

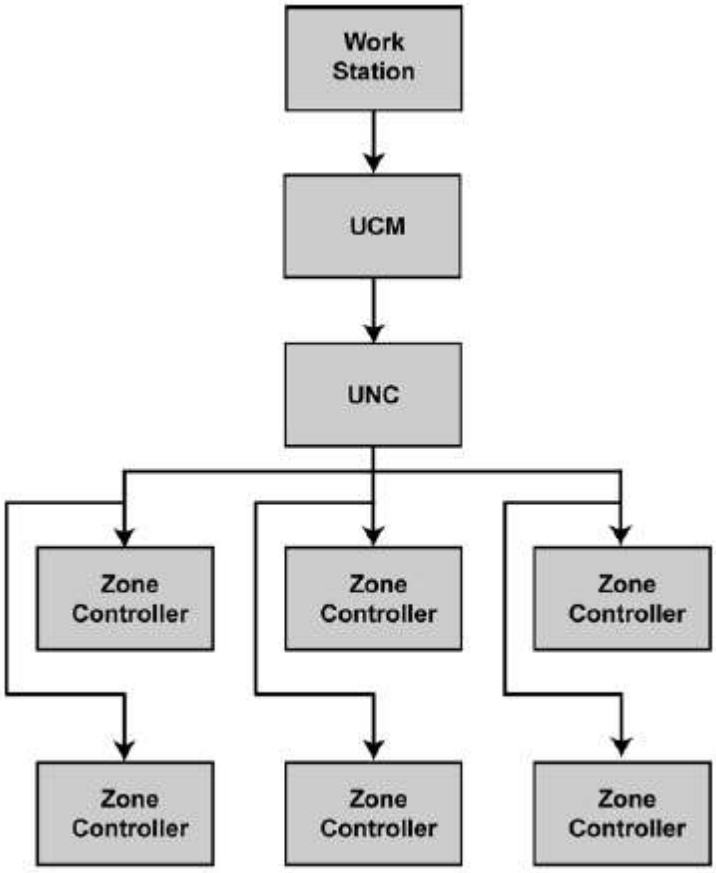

Figure 2-4: Subscriber Information Flow

2.8.2.6 Performance Management at the System and Zone Levels

System performance, as defined here, is the system's ability to handle call requests, as measured by how often radio users experience busies when attempting to make calls. System performance is more easily optimized when you have a clear understanding of how the system is supposed to perform and how well it actually performs under typical operating conditions. Over time, system performance can be affected by changes in usage patterns and by modifications made in response to changing communication needs.

Statistical data is collected, by the Zone and System Statistics Database server applications, based on groups specified by the administrator. The groups are based on object type, time interval, and number of intervals. For example, a collection group may be defined to collect statistics about talkgroups. A single collection group will not, however, be capable of collecting statistics about both sites and zones; two separate collection groups would be needed. Also, a collection group collects statistics for a single collection interval. These statistics are then organized into reports. Two types of reports are supported:

- Dynamic Reports – These reports are real-time, short-term reports that are updated for each interval of time selected by the user.
- Historical Reports – These are reports that cover a specific time interval. The amount of historical information that can be recovered depends on the specified time interval. Historical reports are static, once the Historical report is generated, it does not change.

The ZSS database takes information in the form of the ATIA stream from the ATR and parses these records to the Report Players, which run on the Network Manager client. The zone statistical information in the ZSS database summarizes call processing traffic. The SSS database stores call traffic statistics from each zone. This data is processed, aggregated, and stored for up to one year.

2.8.2.7 Security Management at the System and Zone Levels

All Network Management server applications have defined access privileges for each user. At a minimum, all the applications support password protection. The UEM and UNC applications use their own authentication and authorization processes for security management within the application.

The UCM application includes features for setting user privileges and controlling their access to view and/or modify information contained in the configuration databases. Optional Agency Partitioning software allows a system administrator to assign access privileges to specific applications. These applications include Configuration Manager, Radio Control Manager, Historical Reports, and ZoneWatch. The system administrator can also grant or restrict a user's access to multiple zones. Access to configuration management tools at the system level for devices that cross zone boundaries should be normally restricted to selected personnel because of the severe impact that improper changes can have on the entire system. The appropriate Motorola personnel should be contacted if it is ever necessary to reconfigure the equipment at any of the master sites.

The Private Network Management suite of client applications, except for the UNC and UEM applications, can be accessed by an authorized user through a single login. The UNC and UEM applications have their own separate and unique logins. If routers and switches are accessed through the UNC, two logins are required, one for the UNC and the other for the specific device being accessed.

2.8.2.8 Network Management Server Interaction

As with many components of the system, the zone controllers, and system servers are highly interdependent. They rely heavily on each other to supply critical data in support of their individual functions.

No.	Server Interaction
1	User Configuration Server (UCS) Database Synchronization between the UCS and the Unified Network Configurator (UNC) database is initiated from the UCM or UNCW user interfaces by users. Subscriber information and some infrastructure configuration information is pushed to devices automatically.
2	Subscriber (subset of the UCS database) and infrastructure data is pushed to UNC. Then, UNC sends that data to the zone controller.
3	Live call data passes from the zone controller to the Air Traffic Router (ATR). Radio user and Radio Control Manager (RCM) commands and information are sent through this link.
4	Statistical data is sent from the ATR to the Zone Statistics Server (ZSS).
5	Zone statistical data is sent from the ATR to the System Statistics Server (SSS).
6	Call control information is sent from the zone controller to the Enhanced Telephone Interconnect server. Enhanced Telephone Interconnect fault information is passed to the zone controller.
7	Call control information is passed between the zone controller and a site controller.
8	All devices in the zone fault managed by the UEM, send fault and event notifications to the zone-level Unified Event Manager (UEM) server, after they are discovered in the UEM application.
9	RF site devices also send fault and event notifications to the UEM located in the zone they are part of. If a device is proxied by the Motorola Supervisory Control and Data Acquisition (MOSCAD NFM) application, fault management data may be obtained from MOSCAD NFM.
10	Updated alias and configuration information is passed between the UNC and the Console Database Manager (CDM)/Alias Database Manager (ADM) server.
11	The following events occur: • Configuration data is passed from the UNC to the ATR (for example, object aliases). • Fault events and configuration data for the Dynamic Shared Services Algorithm (DSSA) are sent to the ATR.
13	Polling paths between the RF sites and the UEM. Diagnostic and fault information for other devices are sent through this link to the UEM. This includes the repeaters, simulcast base radios, Ambassador Electronics Bank (AEB), simulcast comparators and PNM Servers.
14	Fault status information is exchanged between the UEM and the ATR
15	All zone controllers send default subscriber records to the UCS.

Figure 2-5: Server Interaction

2.8.2.9 Virtual Management Servers

Virtual Management Servers are based on the HP DL360 hardware platform and provide Virtual Machine environment for server applications.

The HP DL360 G6 server is installed in two different architectures, as a standalone server and a virtual server.

The HP DL360 G6 server with virtualization software and the operating system is the platform used to install and operate the following services:

- System and zone level Domain Controllers
- Backup and Restore Services
- Syslog
- Core Security Management Server
- MOSCAD GMC
- Authentication Center (AuC)
- InfoVista
- Firewall Management Server
- PDG IVD Virtual Servers
- PDG HPD Virtual Server
- PDG Conventional Virtual Server

The virtualization software provides the means to create Virtual Machines (VM) that allow the installation and operation of software in an environment where each VM operates as an independent server. Virtualization makes it possible to install and run a system domain controller and a zone domain controller on the same physical server. A third Virtual Machine is created in one of the domain controller servers to house an instance of the Linux operating system and the Backup and Restore application. The number of physical servers can vary between one and two based on the master site configuration.

Other features supported with the DL360 server include:

- The HP DL360 server with the Linux operating system is the platform used to install and operate the Packet Data Gateway software. A single DL360 provides the RNG and PDR services.
- Separate Virtual Management Servers based on the HP DL360 hardware are installed for Conventional and Trunking PDGs when they are present in the system.
- The HP DL360 server in a standalone configuration with the MicrosoftWindows 2003 operating system is the platform used to install and operate the Transport Network Performance software.

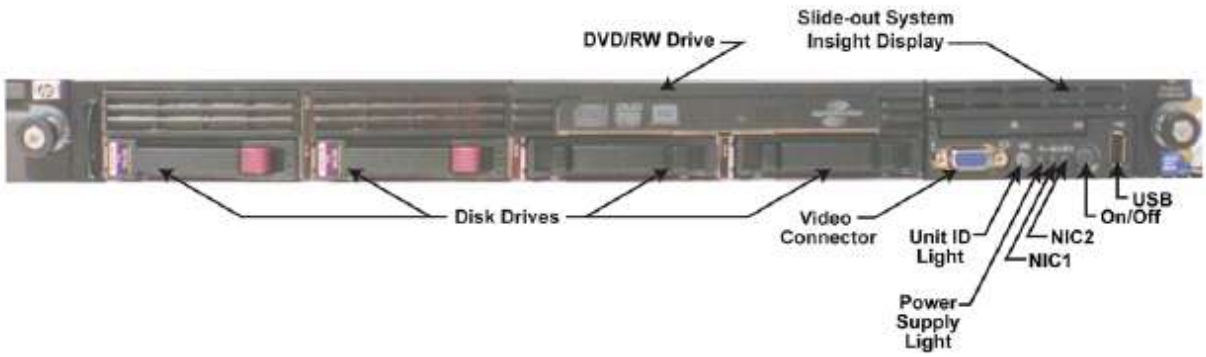

Figure 2-6: HP DL360 G6 Server

2.8.2.10 Domain Controllers and Authentication Servers

Multiple servers contribute to authentication functions in ASTRO® 25 systems:

- Servers referred to as "domain controllers" provide Active Directory functionality. All domain controllers are peers of each other. Active Directory provides mechanisms that keep domain controllers synchronized.
- Zone Level Domain Controller is the primary RADIUS and the system Level Domain Controller is the secondary RADIUS server. The synchronization of the RADIUS data (RADIUS clients) is automatic.
- Network Management Servers are not DNS servers any more. The DNS functionality resides fully in the Domain Controller.
- The Core Security Management Server (CSMS) and terminal server(s) provide authentication for remote users. The RSA SecurID® product installed on the CSMS provides both password and two-factor authentication. Two-factor authentication requires the user to possess both a token and a PIN that must be memorized by the user. Accounts maintained using the RSA on the CSMS are separate from user accounts in Active Directory.

2.8.2.11 Backup and Restore Services

ASTRO® 25 system Backup and Restore (BAR) services provide mechanisms to back up and restore important files.

A BAR server works in tandem with BAR client software to provide the means to back up and restore data for workstations and server devices in the radio system. The server that provides the BAR function exists as a single virtual machine on a Virtual Server host. The Virtual Server host runs on the ESXi based operating system.

Two levels of functionality are available:

- **Baseline functionality** – this level is standard with ASTRO® 25 systems. It supports only the following ASTRO® 25 system BAR clients:
  - Domain Controllers
  - Authentication Center (AuC) server, if this feature is implemented in the system
  - Network Management servers and zone controllers
  - Linux-based BAR client for backing up the baseline BAR server itself
- **Full functionality** – this level supports all BAR clients in ASTRO® 25 systems. It is an optional feature that can be implemented on a new system or added as an expansion to an existing system.

2.8.2.12 Data Subsystem – Packet Data Gateway and GGSN

The data subsystem comprises of the Packet Data Gateway (PDG) and the GGSN. The Motorola PDG is a hardware and software platform designed to link a customer's data network to the IV&D network. A multi-zone system requires one PDG per zone for seamless system-wide packet data service operation. The PDG employs Internet Protocol Version 4 (IPv4) routing.

The main software components are responsible for the following:

- The **Packet Data Router (PDR)** is one of the two applications in the PDG. The PDR manages all aspects of the IP protocol. It also provides a logical interface between the GPRS Gateway Support Node (GGSN) router and the Radio Network Gateway (RNG). The PDR forwards outbound data traffic to the RNG in the zone where the subscriber is located. The RNG at the zone where the subscriber is located is known as “Serving RNG”.
- The **Radio Network Gateway (RNG)** is one of the two applications in the PDG. The RNG provides a logical interface between the local Radio Frequency (RF) resources and the PDR to support data calls to subscriber radios.
- The PDG is placed at the junction of the wire line network and the Radio Frequency (RF) data network. It provides the interconnection between the two networks through its routing, translation, fragmentation, and error reporting services.

The Packet Data Service is a bearer service that connects two parties in a communication system with IP protocol. The communication is performed in one of the following three modes:

- Mobile to mobile
- Mobile to IP host
- IP host to mobile

The GPRS Gateway Support Node (GGSN) router serves as the network interface between the Motorola Radio Network and the Customer Enterprise Network (CEN). One side of the router connects to the Motorola Radio Network Infrastructure (RNI) while the other side attaches to a peripheral network to interface with the border routers of the CEN.

The GGSN router is designed to handle IP routing services for end-to-end data messaging on the ASTRO® 25 network. The router's functions include the following:

- Network address translation for static and dynamic IP addressing and IP fragmentation
- Secure IP tunneling
- Internet Control Message Protocol (ICMP) error reporting for troubleshooting activities

If IV&D packet data services are supported in the system, the HPD PDG and IV&D PDG share the one common GGSN in the system. An additional GGSN is not required or supported.

The PDG resides on an HP DL 360 in L Series and M Series zone core architectures. The data subsystem involves installation of the GGSN that resides on a separate S6000 router hardware.

2.8.2.13 Packet Date Gateway – Trunking IV&D and Trunking HPD

The Packet Data Gateway (PDG) provides the interface between the Customer Enterprise Network (CEN) and packet data users in the system. The PDG performs registration services for packet data users, maintains user permissions and mobility information. It also routs traffic to the radio network or the GGSN router.
If Dynamic Host Configuration Protocol (DHCP) services are used, then a DHCP server at the CEN assigns an IP address to the packet data user terminal (such as a Premier MDC) when a packet data session is requested. The main software components of the PDG are the Packet Data Router (PDR) and the Radio Network Gateway (RNG).

The Packet Data Gateway (PDG) is installed at the master site. It interfaces directly with the Ethernet LAN switch.

In the Data Subsystem, one PDG per zone is required; in a multi-zone system, each zone that provides HPD services must include an HPD PDG at the master site.

2.8.2.14 Core Security Management

The Core Security Management Server (CSMS) functions as a management entity for network security in an ASTRO 25 system. It operates on the Microsoft® Windows® Server operating system.

The applications running on the CSMS are configured to operate within the system to protect the integrity of the radio network from external Customer Enterprise Network Interface Barrier (CENIB) connections.

The CSMS manages the components in the network interface barrier and is equipped with antivirus management software and, optionally, remote user authentication management software.

2.8.3 M Series Zone Core Routers

The M Series zone core architectures employ the S6000 MNR (Motorola Network Router) hardware to perform network transport functions for the control of audio, data, and network management traffic used by the system. The number of routers depends on the master site architecture:

- **M1** architecture – a single core router, a single gateway router, no exit routers
- **M2** architecture – dual core routers, dual gateway routers, no exit routers
- **M3** architecture – dual core routers, dual gateway routers, dual exit routers.

Depending on their function, routers used at the master site can be divided into:

- Gateway routers
- Core routers
- Exit routers
- Border router
- Peripheral network router
- GGSN router

The master site routers support a range of interface types, including 10/100 Mbps Ethernet and channelized T1. The Enterprise OS (EOS) software uses a wide range of standard routing protocols, such as static routes, OSPF, BGP and PIM for multicast communication, to maintain connectivity between servers and other devices in the zone, remote sites and other zones. EOS supports fragmentation and Quality of Service (QoS) to guarantee high-quality voice and data delivery services. The Simple Network Management (SNMP) is used for fault management. EOS also supports numerous standard protocols and services; for example, the Dynamic Host Configuration Protocol (DHCP) and the Network Time Protocol (NTP).

Gateway Routers

Gateway routers are used for devices that require network redundancy and are multicasting beyond their local LAN. The gateway router functions as a unicast forwarding router, a multicast control and audio rendezvous point and an audio switch interface. It also provides network management functionality. The gateway routers provide functional support for the zone controller, Ambassador Electronics Bank, MGEG, Packet Data Gateway, and Network Management routing.

When used to support the Packet Data Gateway, the gateway routers are used in this system as an interface between the Packet Data Gateway and the Ethernet LAN switch.

Gateway routers serve as the interface for all control and audio information that flows between the zone controller and the resources necessary to process a call. These resources include the RF sites, the MGEGs, consoles, and telephone interconnect.

Core Routers

Core routers route network traffic between the master site and other sites within a zone (IntraZone support). The core router connects to the Enterprise Ethernet switch on two 100Base-TX links. The core router connects to the site links through the RJ45 connectors on the relay panel. The core routers used by the system are Motorola Network Router (MNR) S6000 routers configured with 12-port T1/E1 modules. Motorola provides support for the T1/E1 and Ethernet Site Links.

Exit Routers

Exit routers handle network traffic between master sites (InterZone links support). There are four exit routers in each zone of a multi-zone system. The exit routers are installed in the zone to route all inbound and outbound InterZone traffic for the zone. Exit routers are only present in the M3 configuration. The exit routers used by the system are Motorola Network Router (MNR) S6000 Routers configured with 12-port T1/E1 modules. Master sites support T1/E1 and Ethernet Site Links.

An exit router performs the following tasks:

- Handles InterZone links. The exit routers have two Ethernet ports that connect into different master site LAN switches and a 12-port T1/E1 connector connected to the relay panel for InterZone traffic.

Exit routers use the Border Gateway Protocol (BGP) for InterZone routing.

- Deploys packets among its multiple connections on both the LAN and WAN interfaces using dynamic routes. The packets destined for the control Ethernet interfaces on the zone controller, as well as the packets for network management, are routed through the Transitional LAN (TLAN) ports of the Ethernet LAN switch using dynamic routes.
- Communicates with other zones through the relay panel using the T1/E1 connection. The routers learn about the PVCs on the T1/E1 connection from the relay panel. Each PVC originates on an exit router in one zone, and terminates on an associated exit router in the adjacent zone.

The exit routers are configured in an active/inactive configuration. The active exit router typically handles all the traffic under normal conditions. The inactive exit router takes over all the traffic when the active exit router fails, or takes over individual PVCs that are failing for the active exit router.

Border and Peripheral Network Routers

Border and **Peripheral network** routers provide interfaces to the Motorola Radio Network Infrastructure (RNI) to extend the DMZ (border router) and peripheral network (peripheral network router), respectively.

GGSN Router – M Series Zone Cores

The M Series zone cores employ the GPRS Gateway Support Node (GGSN) router to handle network traffic between the Motorola radio network and external networks to support data services. This router is based on the S6000 MNR (Motorola Network Router) hardware.

Cooperative WAN Routing

The Motorola Cooperative WAN Routing (CWR) solution consists of core and/or exit routers in combination with relay panels to provide the site and InterZone transport interface.

Core/Exit Routers with 12–Port T1/E1 Module

The core and exit routers support up to two 12-port T1/E1 modules per chassis. Each module features one WAN interface that supports up to 12 T1/E1 ports. In a CWR configuration, the two 12-port T1/E1 modules allow the core/exit routers to support up to 24 channelized T1/E1 ports.

Figure 2-7: CWR – S6000 with Two 12-port T1/E1 Modules

Relay Panel

The relay panel is an electromechanical relay-based switch-box that interconnects the T1/E1 ports on the active router with the WAN lines. The 12-port T1/E1 WAN module is connected to the relay panel through a single 12-Port T1/E1 interconnect cable. The relay panel uses latching relays to retain its current state, even during a loss of power.

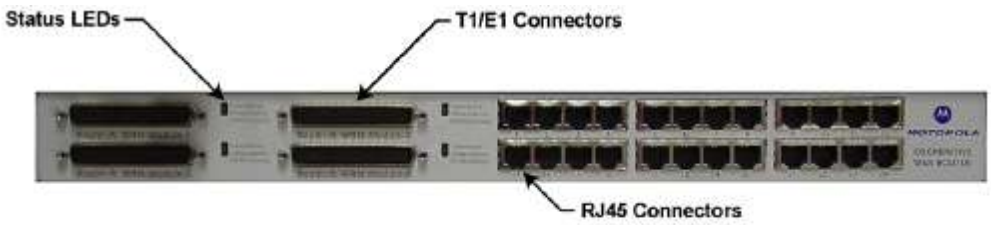

Figure 2-8: Relay Panel

The routers are connected to the relay panel via 12-port relay cables which run from the 12-port T1/E1 modules on the routers to one of two sets of high-density T1/E1 connectors on the relay panel. The left set of T1/E1 connectors on the relay panel attaches to the 12-port T1/E1 modules on one S6000 router, and the right set of T1/E1 connectors on the relay panel attaches to the other S6000 router.

Figure 2-9: CWR Connections

2.8.4 Terminal Server LX Series – Remote Access

The Remote Access subsystem consists of a terminal server and modems. The terminal server is used to perform out-of-band management on devices at the master site.

Out-of-Band Management

Out-of-band management is the use of a dedicated terminal server for device maintenance. It allows a user to monitor and manage servers and other network equipment at a master site by remote control.

Out-of-band management consists of a set of modems and one 16-port or 48-port terminal server. The server provides an interface to the Ethernet LAN switch on one side and to the modems on another. The LAN interface provides connections to the serial (console) interfaces of all the devices at the master site. This connection provides the means to access a device through its IP address which in turn allows access to all the other programmable functions. The modems provide a method to dial into the terminal server connected to the master site LAN switch. Telnet is supported, as well as connectivity to the serial ports of the routers, switches, and servers.

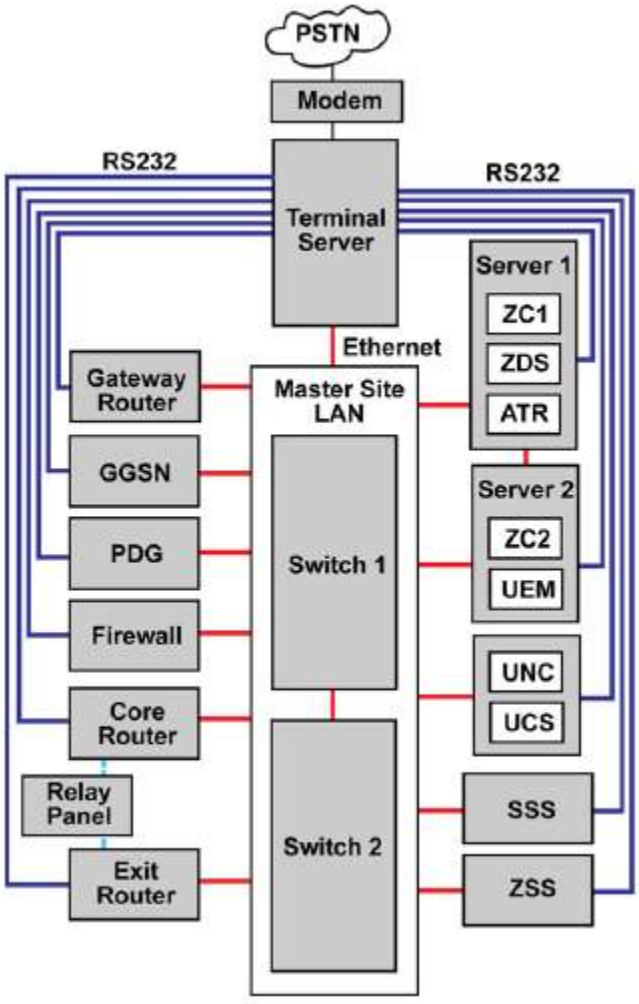

Figure 2-10: Out-of-Band Management in M3

A terminal server connects a number of devices or modems to a central server. The terminal server is the access point for all administration with the Network Management servers, zone controllers, and other IP devices in the zone.
The terminal server supports a serial connection to servers and network transport equipment in the zone.

An Ethernet connection is also provided to allow access by Network Management clients to all the managed devices.

PC clients operating on the Local Area Network (LAN) can connect with the terminal server and access devices from a programmed menu. The terminal server can also be connected to an external modem to allow dial-up access across the Public Switched Telephone Network (PSTN).

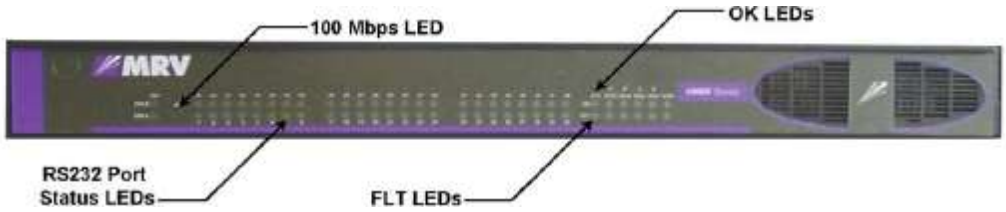

Figure 2-11: LX-4048 Terminal Server

2.8.5 Network Time Protocol Server

TRAK 9100 is a GPS-based frequency and time reference unit that provides the following outputs to meet the **network time** and **network transport synchronization** requirement of the trunked IV&D system:

- UTC time for the network time synchronization through the 10Base-T
- T1 or E1 signals for the network transport synchronization (framed, RS422, and TTL) through Telecommunication modules
- IRIG-B signals for time stamps on the analog data logging recorders

The TRAK 9100 may be configured for redundant operation in order to meet the availability requirement. The redundant configuration consists of one GPS Rubidium oscillator module as the main frequency reference, another GPS double oversized oscillator module as standby reference unit, and two power supplies.

At the Master Site, the NTP server provides Network Time Protocol (NTP) services for the servers and the network transport equipment on the master site LAN. By default, all three master site configurations rely on one of the Generic Application Servers as the source for NTP services, however they can be optionally equipped with

a TRAK 9100 physical server. The TRAK 9100, when configured as a Network Time Protocol (NTP) server, is a Global Positioning System (GPS) receiver that supplies Stratum 1 frequency and time reference for equipment at the master site.

The backup NTP service is provided by the primary Generic Application Server (GAS01).For the M Series systems that deploy the optional TRAK 9100 NTP server, the TRAK is used as the primary NTP time source known as “ntp01”.

The secondary NTP server is the primary Generic Application Server (GAS01 known as “ntp02”. For M Series systems that do not deploy a TRAK 9100 NTP server there is only one time source, ntp02. For these configurations, if the primary NTP fails (no TRAK), the secondary will be discovered (ntp02) and provide NTP services.

The modules installed in the TRAK 9100 are the following:

- GPS receiver with Rubidium oscillator
- GPS receiver with double-ovenized oscillator
- AC/DC power supplies
- Digital Distribution Modules (DDMs)
- Frequency Distribution Modules (FDMs)
- Telecommunications modules (TEL)
- Fault Sensing Unit (FSU) module

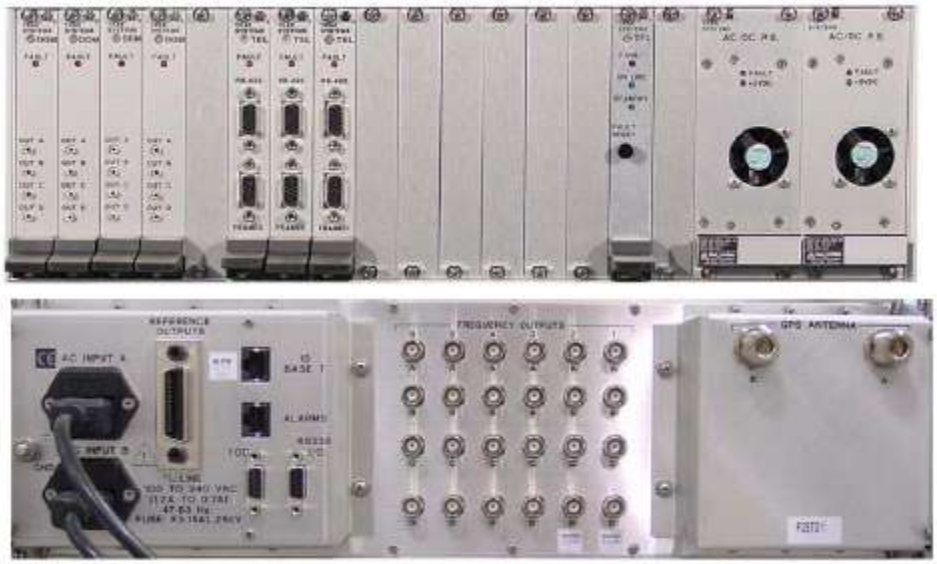

Figure 2-12: TRAK 91—Network Time Reference

2.8.6 Firewalls

A firewall is a network security device providing network boundary enforcement and attack detection features. The firewall restricts traffic to known sources, destinations, and protocols, based on the hosts and services that are specified in the firewall configuration. All other traffic that is not defined is discarded.

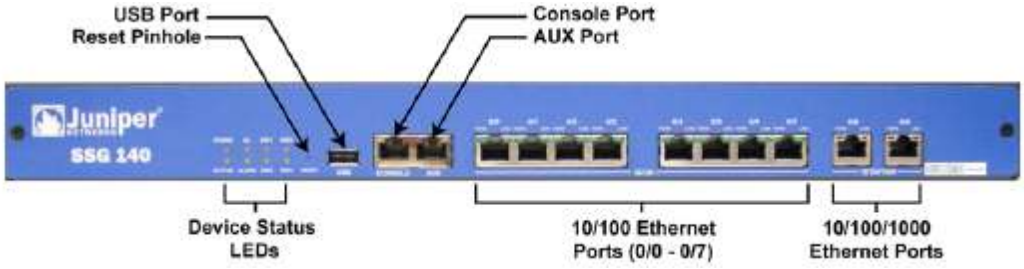

Figure 2-13: SSG140Firewall

2.8.7 Master Site Optional Components

2.8.7.1 HP Workstation

The HP Z420 hardware supports the Private Network Management Client application suite. The PNM client may be installed at the master site and also at remote locations.

2.8.7.2 MOSCAD Graphical Master Computer

The Graphical Master Computer (GMC) is at the center of MOSCAD Network Fault Management. GMC collects and stores fault information related to elements in ASTRO® 25 sites. This fault information is relayed through Remote Terminal Units (RTUs) and accessed through Graphical Work Station (GWS).

2.9 MOSCAD NFM Description

2.9.1 Network Fault Management Overview

MOSCAD® Network Fault Management (NFM) is an integrated solution. It provides the operator and network engineer with the required tools to configure, monitor, and control devices in ASTRO25 communication sites.

MOSCAD NFM provides a common method for controlling auxiliary system devices (such as tower lights, power, and environmental equipment). It also collects and forwards data concerning the state of communication devices such as base stations, channel banks, microwave radios, and time reference.

MOSCAD NFM includes six main components:

- GMC (Graphical Master Computer)
- GWS (Graphical Workstation)
- SNT (SDM3000 Network Translator)
- SDM3000 RTU (Remote Terminal Unit)
- MOSCAD® IP Gateway
- NFM XC RTU

The connectivity of all these devices is based on IP protocols. The SDM3000 RTU, SNT, IP Gateway, and XC devices support a web server which allows direct access to information stored on these devices.

- The NFM XC RTU is an advanced Simple Network Management Protocol (SNMP) based mediation device that enables the GMC to acquire information regarding the fault and configuration of elements/devices in ASTRO® 25 sites. Each RTU has a web server that the technical support team can access through a standard web browser. It can retrieve the topology map of the site and alarms stored in the event buffer. Additional maintenance tasks can also be implemented through the web server.
- The SDM3000 is also an advanced Simple Network Management Protocol (SNMP) based mediation device that enables the GMC to acquire information regarding the fault and configuration of elements/devices in ASTRO® 25 sites. Each SDM3000 has a web server that the technical support team can access through a standard web browser. It can retrieve the topology map of the site and alarms stored in the events buffer. Additional maintenance tasks can also be implemented through the web server. The SDM3000 RTU provides additional robustness to fault management reporting through acknowledged trap receipt and SNMP-v3 encrypted communications.

- The SDM3000 Network Translator (SNT) serves as a front-end communication device for the GMC by collecting and forwarding data from SDM3000 RTUs that are connected to the same zone (region). The SDM3000 Network Translator communicates with SDM3000 RTUs over SNMP.
- The fault management control centers are Unified Event Manager (UEM) and MOSCAD® NFM Graphical Master Computer (GMC) that are integrated with the MOSCAD® NFM RTUs in ASTRO® 25 sites. The UEM communicates with the NFM RTUs using SNMP, the industry standard communication protocol. The GMC communicates with the SDM3000 Network Translator and MOSCAD® IP Gateway using a proprietary protocol over TCP/IP.

SNMPv3: The Simple Network Management Protocol (SNMP) is an application layer protocol designed to facilitate the exchange of management information between network devices. SNMP-transported data (such as packets per second and network error rates) helps network administrators to:

- Manage network performance
- Find and solve network problems
- Plan for network growth

The fault management software communicates with the RTUs (either type) using SNMP, the industry standard communication protocol.

The MOSCADNFM system is capable of monitoring a broad range of analog, digital, and simple closure inputs. As such, some components do not have any other connection to the network. These components can be monitored for fault conditions and reported to UEM and the GMC. Elements of this type include, for example, UPSs (Universal Power Supply), channel banks, microwave gear, and antenna systems.

2.9.2 NFM System Components

The MOSCAD NFM system provides complete and efficient communications with the infrastructure as well as the flexibility to adapt to a variety of system requirements. MOSCAD NFM provides the complete interface, real-time monitoring, and control of RF sites. It monitors sites equipped with various configurations and quantities of microwave radios and base stations. The list also includes QUANTAR® and QUANTRO comparators, channel banks, RF devices, and other third-party site support devices.

Typical components of MOSCAD NFM are described in the following sections. They are as follows:

- SDM3000 Network Translator (SNT, hardware)
- SDM3000 RTU (Remote Terminal Unit, hardware)
- SDM3000 Builder (software application, configures SDM3000 RTUs and SNT)
- NFM XC RTU (hardware)
- MOSCAD IP Gateway (hardware)

- Fault Management Site-Builder (software application, configures both NFM XC RTUs and MOSCAD IP Gateways)
- MOSCAD IP Gateway Toolbox (software application)
- GMC (Graphical Master Computer, hardware)
- GWS (Graphical Workstation, hardware)

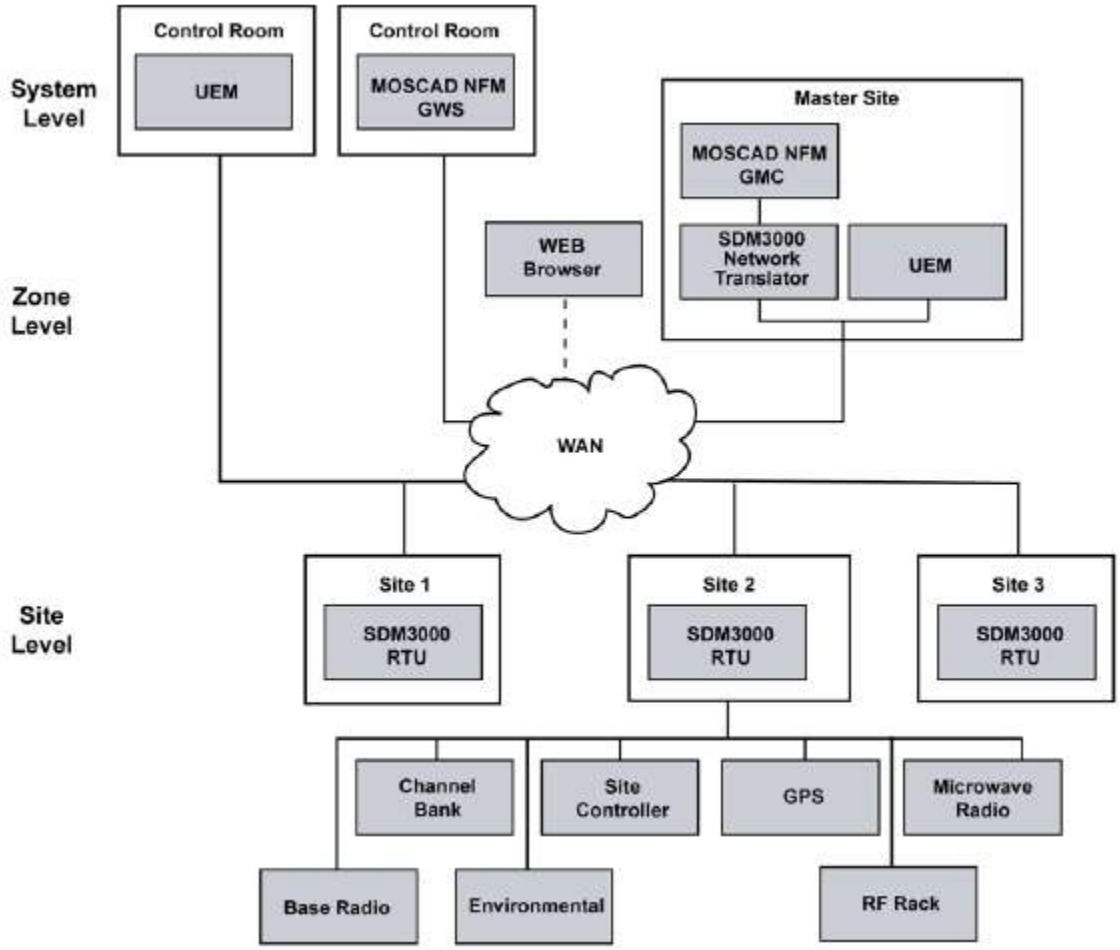

Figure 2-14: NFM System Components

2.9.2.1 SDM3000 Hardware-Based Devices

The SDM3000 hardware-based devices are:

- SDM3000 Network Translator (SNT)
- SDM3000 Remote Terminal Unit (SDM3000 RTU)
- MCC 7500 Aux I/O Server

SDM3000 Network Translator

SDM3000 Network Translator enables data exchange between GMC and SDM3000 RTUs located in the same zone. The SDM3000 Network Translator serves as the bridge between the GMC and the SDM3000 RTUs through the communication backbone. SDM3000 Network Translator provides the capability to forward Connection Messages to the GMC. These Connection Messages consist of remote site alarms from microwave radios, base stations, comparators, channel banks, RF devices, and other third-party devices.

SDM3000 RTUs

This section provides an overview of the following components:

- SDM3000 Basic Remote Terminal Unit (RTU)
- SDM3000 Advanced unit
- SDM3000 I/O Expansion RTU
- MOSCAD® RS-232 Multiplexer

SDM3000 Basic Unit

The SDM3000 (Site Device Manager 3000) Basic unit consists of a CPU, I/O, I/O interface, LEDs, and optional internal power supply sections. It is designed for 19-inch rack mounting. The SDM3000 RTU operates as a standalone unit.
The SDM3000 Basic unit includes the following discrete inputs and outputs:

- 48 discrete Wet or Dry discrete inputs
- 16 electrically energized digital outputs

Figure 2-15: SDM3000 Basic Unit

SDM3000 Advanced Unit

The SDM3000 Advanced unit consists of a CPU, I/O, I/O interface, LEDs, and optional internal power supply sections. It is designed for 19-inch rack mounting. The SDM3000 RTU operates as a standalone unit.

The SDM3000 Advanced unit includes the following discrete inputs and outputs:

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

The SDM3000 Advanced unit discrete inputs and outputs support can be expanded by connecting up to six SDM3000 I/O Expansion RTUs.

It also includes the following ports:

- one RS-232 (with flow control) or one RS-485 (selectable)
- 4 RS-232 (comm ports 1,3, and 4 with flow control)
- 1 Communication port to SDM3000 I/O expansion RTUs
- 2 LAN ports (Ethernet, 10/100Base-T)
- 1 Console Port (Ethernet, 10/100Base-T)

Figure 2-16: SDM3000 Advanced Unit

MOSCAD RS-232 Multiplexer

The MOSCAD® RS-232 Multiplexer (NFM R-MUX) is used to expand the connectivity of a single SDM3000 RS-232 port. A multiplexer allows for one serial session to take place at a time. Concurrent serial sessions are achieved only with independent connections to unique SDM3000 serial ports. The RS-232 Multiplexer unit is designed for 19-inch rack mounting.

The Multiplexer communicates with the following devices:

- TeNSr/IMACS Channel Bank
- Quantar Receiver
- Quantar IR

Two models of the MOSCAD® RS-232 Multiplexer are available.

- Model F4558 (also known as R-MUX 1001) consists of:
  - Default 1 IN to 8 OUT serial ports
  - Up to 16 expandable output ports
  - Expandable one Power IN to 2 OUT
- Model F4568 (also known as R-MUX 1004) consists of:

◦ Two default 1 IN to 4 OUT serial ports
◦ Up to 4 expandable 1 IN to 4 OUT serial ports
◦ Expandable one Power IN to 2 OUT

Figure 2-17: MOSCAD NFM R-MUX

SDM3000 Builder Application

The SDM3000 Builder software is used to plan and configure the SDM3000 RTUs and SDM3000 Network Translators in ASTRO® 25 sites. It is a Microsoft Windows™-based software application that facilitates easy planning of your zones and sites. Based on information you enter in the SDM3000 Builder screens, the software calculates intersite and intrasite dependencies, such as defining the number, order and connections of the CPU and I/Os in the SDM3000 unit, while taking into consideration your equipment and needs.
The user builds the system level configuration (project) and installs it in the SDM3000 unit. The project is organized in a hierarchical structure of zones and sites. For each site, devices, objects, and MOSCAD equipment are defined. For each item in the project hierarchy, identifiers and characteristics are defined and configured.

2.10 PRNM Suite Applications Overview

Motorola Private Radio Network Management (PRNM) suite applications
FCAPS is a Network Management model intended to maximize the available resources and minimize system downtime and maintenance costs. It consists of five functional areas: Fault Management, Configuration Management, Accounting, Performance Management, and Security Management.

Applications	FCAPS	Purpose
Application Launcher	N/A	A launch point for PRNM applications. Using Application Launcher, you can open one or more of the management applications that you have permission to access.
System-Level Applications:		
Software Download	Configuration	A tool that provides software upgrades to specific devices.
System Profile	Performance	A tool that allows you to track usage at the system level. Shows the number of applications open, who is using the application, the number of available licenses, and the processes of the open applications.
User Configuration Manager (UCM)	Configuration, Security	The primary tool to configure and manage radio network users.
System Historical Reports	Accounting, Performance	A tool that uses predefined reports to show data from archived information. System Historical Reports spans system level.
Zone-Level Applications:		
Affiliation Display	Performance	A tool to monitor radio, talkgroup, and site use. Affiliation Display spans zone, site, and radio unit levels.
Air Traffic Information Access (ATIA) Log Viewer	Performance	A tool that allows to view radio events occurring in the zone in a raw data format from the Air Traffic Router Server (ATR) application.
Dynamic Reports	Accounting, Performance	A tool that provides predefined reports using data taken dynamically from the database.

Applications	FCAPS	Purpose
Zone Historical Reports	Accounting, Performance	A tool that uses predefined reports to show data from archived information. Zone Historical Reports spans zone, site, and unit levels.  **NOTE** For details on the Custom Historical Reports application, refer to the *Historical Reports* manual.
Radio Control Manager Reports	Accounting, Performance	A tool that provides reports on radio activity.
Radio Control Manager	Configuration, Security	A primary tool used in controlling and monitoring radio activity, which has configuration capability in the Dynamic regrouping feature. Radio Control Manager spans zone, site, and unit levels.
Zone Profile	Performance	A tool to track usage at a zone level. It shows the number of applications open, who is using the application, the number of available licenses, and the processes of the open applications.
ZoneWatch	Fault, Performance	A tool that monitors call processing resource assignments, including channels, sites, and any hardware assigned to a call. ZoneWatch spans zone, site, and unit levels.

Figure 2-18: Motorola PRNM Suite Applications

2.11 UEM Description

Unified Event Manager (UEM) is an application that provides reliable fault management services for the ASTRO® 25 radio systems.
The main functions of the UEM are:

- Device discovery
- Fault management
- Supervision
- Synchronization

The Unified Event Manager (UEM) is a fault management application designed for critical fault management functions such as:

- Processing fault notifications (SNMP traps or informs)
- Detecting and reporting loss of communication with managed devices
- Making sure that the status reported is up-to-date
- Discovering single or all devices within a subsystem
- Troubleshooting faults
- Sending commands to network elements

The UEM presents the faults and, in general, the status of the network elements in the following four views:

- Alarms View
- Maps View
- Network Events View
- Network Database View

The UEM user accounts are managed within the application. You can set up system partitions and assign management responsibility to one or more administrators. The UEM also controls critical management operations invoked by operators within the application.

The UEM provides the capability to manage devices securely (using the SNMPv3 protocol). The UEM can detect and report loss of fault notifications. It can quickly update without constantly polling the devices. The UEM North Bound Interface (NBI) supports notifications in the form of SNMPv3 traps to registered managers and access to management data. The NBI uses SNMPv3 and the User-Based Security Model (USM) to provide secure communication between the UEM and NMS.

2.11.1 Fault Management Overview

Fault management in the UEM application includes processing and presentation of events sent by a network element in the form of an SNMP trap or inform.

Failures in the network, network elements, and communication links can interrupt routine activities. In such situations, the UEM reports events.

2.11.1.1 UEM Events

An event is a basic unit of management information that relates to an occurrence, such as:

- Initial discovery or rediscovery of an element
- Status update of an element
- Deletion of an element
- Failure in an element

Events form a repository of information for all the occurrences in the system. A UEM event contains many attributes, including the managed resource impacted, the associated entity or component, textual description, and the severity of the occurrence.

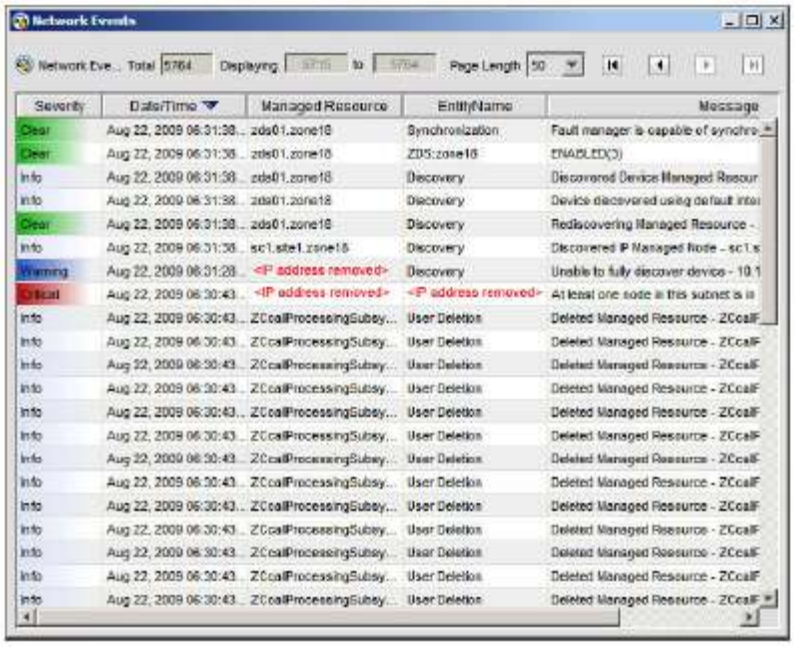

Figure 2-19: UEM Events

2.11.1.2 UEM Alarms

An alarm results from an event in a managed device or network element. It occurs as a result of a pre-determined significant state (a failure or a fault) that may require user attention. Alarms are raised within the UEM based on notifications from the network element, or by the UEM to report failures associated with fault management functions.

Alarms can fall into the following general catagories:

- Communication alarms
- Equipment alarms
- Quality of service alarms

Alarms across a network are commonly related to:

- Resources that have failed
- Connectivity issues
- Devices malfunctioning
- Threat assessment reports
- SNMPv3 credentials failure

2.11.1.3 Severity Definitions

Alarms are assigned with severity levels, indicated by a severity color and an alarm message. The action required depends on the severity of the alarm.

Severity	Value	Color	RGB Value
CommFailure	1 (Highest Severity)	Black	0,0,0
Critical	2	Red	199,14,12
Major	3	Orange	199,149,10
Minor	4	Yellow	235,219,82
Warning	5	Cyan	49,90,201
Clear	6 (Lowest Severity)	Green	19,184,20
Info	7	White	221,229,252
Unknown	8	Gray	181,181,181

Figure 2-20: Severity Categories

2.11.1.4 Event Category Definitions

Network Elements detect and report conditions that have caused or may cause an interruption in their operation to the UEM. Such conditions may be related to physical failures of the device. For example, the failure of a fan, or a channel going out of service. The UEM may also report certain conditions that it detects within the application or on the device. In all cases, the UEM inspects the condition reported and categorizes the event.

Description	Condition
Attribute Value Change Event	An important parameter value has changed.
Communication Alarm	A communication/synchronization loss or regain has been detected.
Equipment Alarm	An equipment or link has failed or a previously reported failure has cleared.
Informational Event	A condition that is important, but is not a failure at this time. **NOTE** Some informational events report conditions that may cause a failure in the future. These events are normally reported with a severity higher than 'Info'.
Management Event	A condition has been detected and reported by the UEM and related to a critical function of this application.
Quality of Service Alarm	A service-impacting condition has been detected.
Security Violation	A credential mismatch condition has been detected by the UEM. Typically associated with devices that use SNMPv3 to communicate with the UEM.

Figure 2-21: Event Category

2.11.1.5 Alarms Browser

The alarms browser can be invoked from the navigation tree (under Fault Management). In the alarms browser, only the active alarm (that is the latest failure or an event clearing a failure) for a device is displayed. Double-click any entry to open the detailed view of the selected alarm. The Alarm Details window allows the UEM user to perform the following functions:

- Assign/Unassign an alarm
- Annotate an alarm
- View the history of the selected alarm

2.11.1.6 Alarm Summary

Alarm summary is used to display the count of the total number of alarms organized by categories and/or severities. It is positioned just below the navigation tree in the main window. Each severity is represented in a single cell or graph, depending on the presentation that is selected. The view is updated automatically and the counts can be seen at all times, irrespective of the view that is currently open.

The presentation of the alarm summary can be modified by clicking the buttons at the top of the summary panel. Three different presentations are available:

- Table view
- Bar graph view
- Pie chart view

2.11.1.7 Events Browser

The Network Events Browser can be invoked from the navigation tree (under Fault Management). The Events Browser displays all the notifications received or generated by the UEM, including the various properties related to events that are raised against devices. You may double-click any entry to open the detailed view of the selected event. A default of 50 events can be viewed on a single page. The page length can be customized, with a maximum of 1,000 events shown on a single page. The maximum number of events that can be held in the UEM database is 10,000. The default sorting criterion for the Network Events Browser is the Date/Time. You can sort the contents by any attribute by clicking the associated column heading.

2.11.1.8 Network Database Overview

The Network Database serves as an inventory view for the resources that are currently present in the UEM database. By default, it displays certain critical properties associated with these resources. Resources may be physical devices (for example a repeater site controller), networks or logical entities (for example a Site). The contents are presented in a tabular format with each row corresponding to a resource. The default page size of this view is 25 entries, but it can be modified to show more or fewer entries in one page.

The Network Database displays a status value for each resource. This value is calculated based on the highest severity of the alarms that are currently outstanding against the resource.

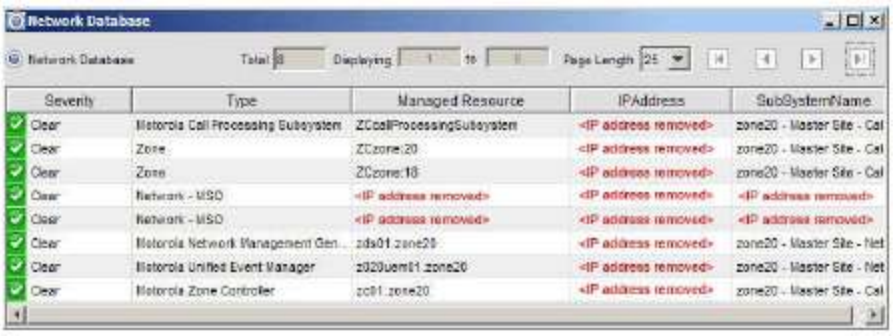

Figure 2-22: Unified Event Manager – Network Database

2.11.2 Performance Management Overview

The UEM can collect and plot statistical data. You can use the data to analyze functions and performance of your system. The data collection for these statistics is triggered 10 minutes after the server application startup time.

The following statistics are available for collection and plotting:

- Host Resource Statistics
- Ethernet Link Statistics

2.11.2.1 Host Resource Statistics

Selected devices support the following host resource statistics:

- **Processor Load:** This graph shows CPU usage in percentage points at a given time. The polling interval can be set according to your preferences. If multiple CPUs are involved, the average value is presented here.
- **RAM Usage:** This graph shows RAM usage in kilobytes at a given time. The polling interval can be set according to your preferences.

2.11.2.2 Ethernet Link Statistics

The polling interval for Ethernet link statistics is set to 15 minutes by default. It can be configured at runtime.

The Motorola Network Router (MNR) is the only device that supports Ethernet link statistics. The following statistics are enabled by default for all Ethernet WAN IF objects:

- IPTD Average
- IPTD Minimum
- IPTD Maximum
- IPDV Average
- IPDV 99% Average
- IPLR Loss Rate

2.11.3 Discovery

In the UEM, discovery is adding devices and the logical resources associated with them into the UEM database. When discovering the site, UEM attempts to discover a pre-defined list of IP addresses, based on the network design of the system. Once the devices are discovered, the UEM reads and stores critical parameters. It also determines the current health (status) of the devices and their components. Then it starts monitoring the connectivity (supervision) to the devices.

2.12 Unified Network Configurator

2.12.1 Unified Network Configurator Overview

The UNC is an advanced network configuration tool that provides controlled and validated configuration management of system devices. The UNC is a Motorola central configuration management solution that includes the following tools:

- VoyenceControl
- Unified Network Configurator Wizards (UNCW)

The system devices that are managed using UNC include:

- Zone Controller
- Trunking Site Controller
- Conventional Site Controller
- Routers
- Switches
- Trunking Base Radios
- Conventional Base Radio
- Comparators
- MCC 7500 Voice Processor Module (VPM)
- SmartX Site Converter
- Packet Data Gateways
- Air Traffic Routers
- Terminal Servers
- Telephone Media Gateway
- Reference Distribution Module
- Conventional Comparators
- Conventional Packet Data Gateways

2.12.2 Unified Network Configurator Features

The UNC has the following features:

- Scheduled distribution – Determines the time and the day when the configurations are sent to the devices.
- Distribution monitoring – Indicates the status of configuration changes, whether the change is in progress, completed, pending, or failed.
- Change logging – Maintains an audit trail of various user interactions with the configuration system to assist in diagnosing issues.
- Configuration versioning – Tracks versions constantly for changes, provides the ability to query configuration changes, and compare versions.
- Rollback to previous version – Enables device configuration changes and reinstates a previous version at the click of a button.
- OS Management and Credential Management – Performs Operating System (OS) management and credential management.

- Remote invocation of device commands – Enables adjusting device configurations remotely by executing commands from an NM Client.

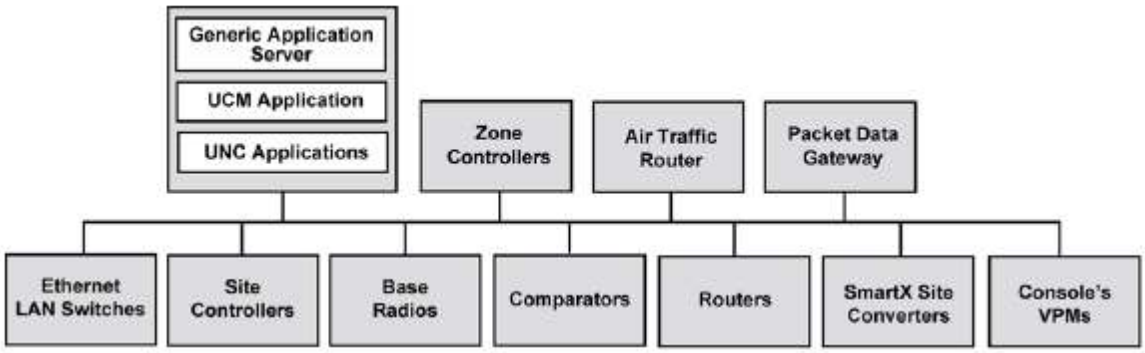

Figure 2-23: Functional Architecture of the UNC

The UNC features two software applications used to configure network devices: VoyenceControl and the UNC Wizards. The Network Management (NM) Client launches either VoyenceControl or the UNC Wizard application through the Internet Explorer Web browser. These applications are used to discover network devices, manage configurations, and manage credentials.

The Discovery Wizards are used to manage site, zone core, and network devices. Any configuration information obtained from the devices is pulled into the stored configurations area of the UNC. The stored information can then be used to manage changes. The updated configurations can be sent (pushed) to the device.

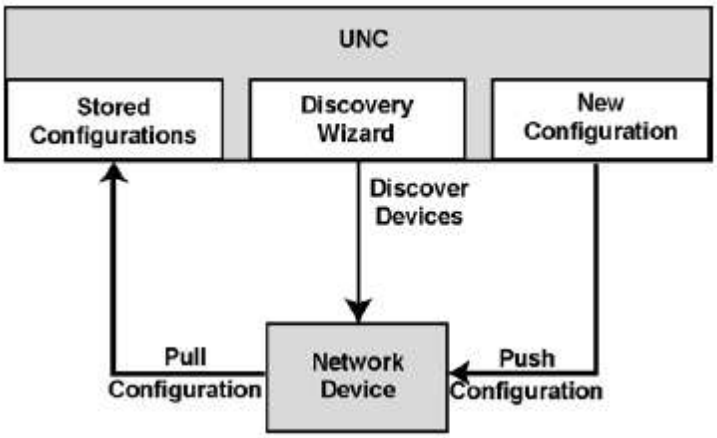

Figure 2-24: Configuration Management by the UNC

2.12.3 UNC Graphical User Interfaces

There are two Graphical User Interfaces (GUIs) that manage configuration:

- VoyenceControl
- Unified Network Configurator Wizard

VoyenceControl Graphical User Interface

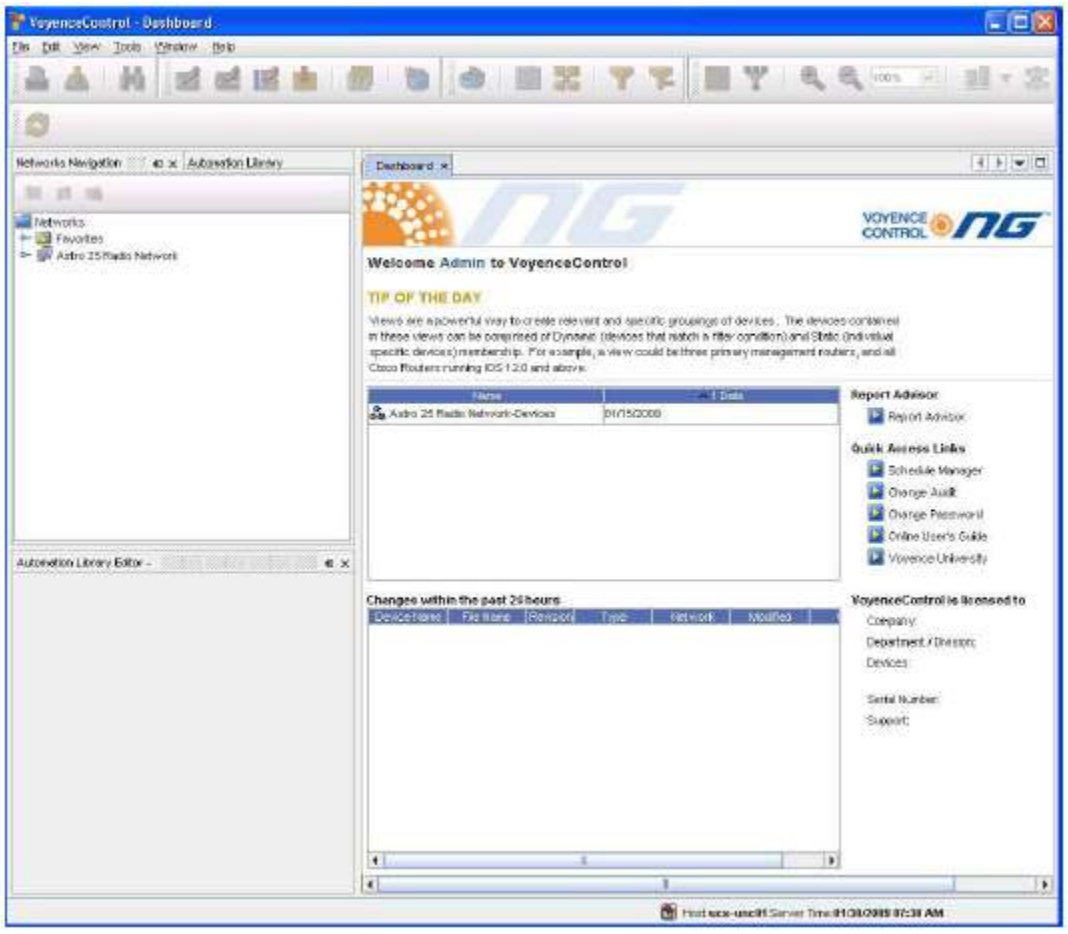

Figure 2-25: VoyenceControl Dashboard

The navigation tree on the left side of the Dashboard allows you to access the Astro 25 Radio Networks folders.

Folder	Content
Networks	The Astro 25 Radio Network folder stores all of the configuration information for your system.
Favorites	Stores views, screens, and reports that you "bookmark" for frequent reference.
Devices	Stores all network devices configured within the system.
Sites	Stores physical representations of devices within the system. Sites use locations to reflect the organization of devices on your network.
Views	Stores groupings of operational network devices.
Workspaces	Stores developmental "sandboxes" for device configuration changes.

Figure 2-26: Navigation Tree Folders

By selecting Tools on the menu bar, you can open the Schedule Manager, Automation Library, OS Inventory, and other VoyenceControl tools. Once a tool is selected, it appears as a tab on your dashboard.

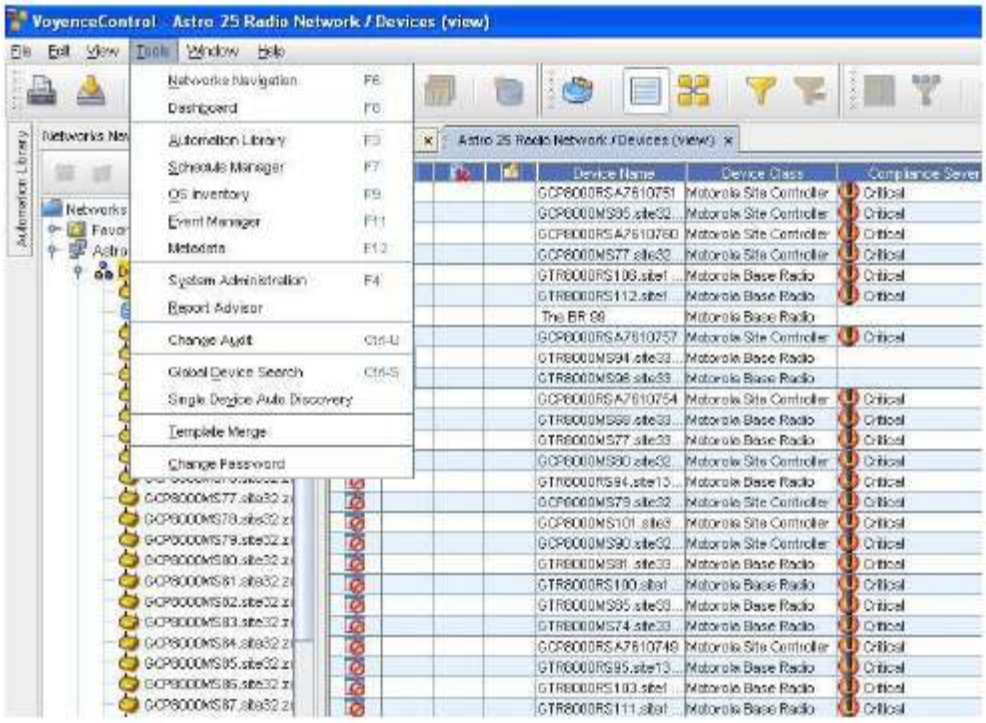

Figure 2-27: VoyenceControl Tools Menu

2.12.3.1 View-Based and Site-Based Navigation

The UNC efficiently segments the management of devices in the network by using Folders and Views. They allow you to implement and manage device containers within your network in a way that it best reflects your management needs.
Views have no relationship to one another, as they contain flat and sometimes unrelated groupings of devices. As such, views have no relational hierarchy in a network. However, for organizational purposes, views are maintained in a folder structure within a network. When creating a view of a device, there is no dependency on site type, logical connections, or physical location. A view allows you to select desired devices and group them. Views have no dependency on other folders used for navigation. Any specific device can appear in multiple views.

The UNC maintains the site content by displaying the first-level nodes under the Sites as Zones. All of the zone core devices exist there. Also, the zone consists of sites. The sites contain all of the site and subsite equipment (for multi-site systems).
Sites have parent/child hierarchy relationships. A physical representation of a site shows the relationships within the site hierarchy. A logical connection indicates the connection between devices and sites, regardless of the hierarchical layout. The following are the characteristics of sites:

- Each network has a single-site hierarchy.
- A device can exist only in a single site.
- All information entered into a higher level site is propagated to the lower tier sites, for example, contact and address information. When inherited by subsites, this information can be overwritten.

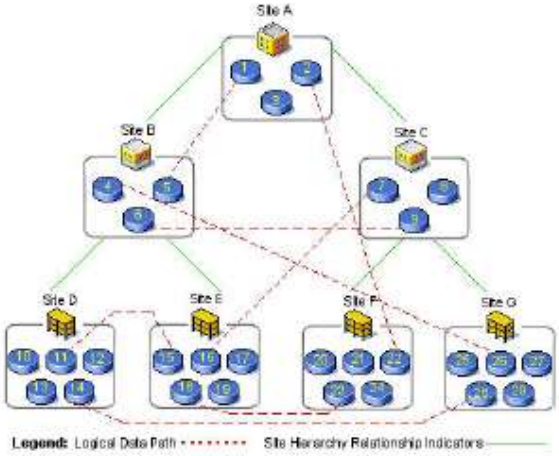

Figure 2-28: UNC Site Relationship

2.13 UCM Overview

The User Configuration Manager (UCM) is a Microsoft Windows® based Private Radio Network Management (PRNM) Suite application. The UCM is used during the configuration of the system. It is also used to modify configuration parameters. To configure the system, both the UCM and the Unified Network Configurator (UNC) are needed.

With the UCM, you can:

- Configure system–level parameters for call capability, including the Consoles, Adjacent Control Channels (ACCs), and InterZone control paths. You can configure system-level parameters for the master site, such as the parameters for home zone mapping and sub-band restricted ID mapping.
- Configure console users, radios, radio users, talkgroups, multigroups, agency groups, and Broadcast Data Agencies.
- Configure security access for users in the system.
- Configure the type of ZoneWatch windows that you want to monitor. Create at least one watch profile before you can start ZoneWatch.
- level zone objects such as MGEG Application Platform, AuxI/O Configuration, Console Site, RF Site, Conventional Site, and Interconnect Subsystem.
- When you initially configure or changes the UCM, the configuration information is updated on the User Configuration Server application (UCS).

The User Configuration Manager main window is the primary interface for the UCM application.

The UCM main window contains a list of object classes and objects used to enter and maintain system-level and zone-level configuration information. The following is a list of object classes in the User Configuration Manager main window:

- **System Configuration** - an object class containing objects and configuration parameters for the infrastructure of the system.
- **Consoles** - an object class containing objects and configuration parameters for consoles.
- **Subscribers** - an object class containing objects and configuration parameters for radio users, talkgroups, and Broadcast Data Agencies.
- **Security** - an object class containing objects and configuration parameters for management application users and security groups.
- **ZoneWatch Configuration** - an object class containing objects and configuration parameters to define how data is displayed and accessed in the ZoneWatch application.
- **Radio System Infrastructure** - an object class containing objects and configuration parameters for high-level zone configuration.

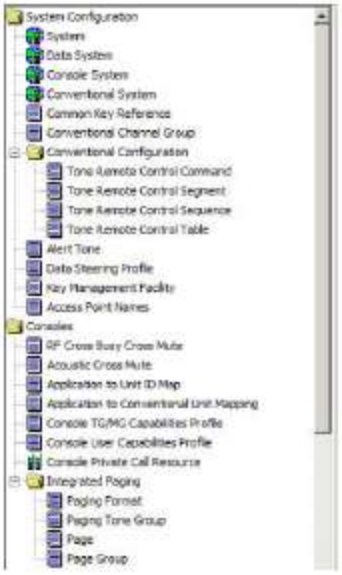

Figure 2-29: UCM Main Window — Part 1

Figure 2-30: UCM Main Window — Part 2

Figure 2-31: UCM Main Window — Part 3

2.14 ZoneWatch Description

ZoneWatch is an application that lets you monitor radio call traffic for an individual zone in real time. This application uses different Watch Windows that allow you to display only the information you want to see.

Examples of trunking activity and radio call traffic displayed in the Watch Windows include the following:

- Radio IDs
- Talkgroup IDs
- Aliases
- Specific call information
- Channel and time slot (TDMA) assignments

The ZoneWatch application monitors all radio call activity by pulling trunking information from the Air Traffic Router (ATR) server application, which receives updates from the Air Traffic Information Access (ATIA) stream distributed by the zone controller.

ZoneWatch also receives fault information relating to repeater sites, console sites, and the zone controller from the Unified Event Manager (UEM).

ZoneWatch uses different types of Watch Windows to display zone, site, talkgroup, and radio information for a specific zone. The different window profiles, which contain window definitions and filters, define how to display the information and how to apply limits to the type of data that you can view. The following are examples of the types of information that you may choose to view:

- Activity in a Zone

You can open ZoneWatch to monitor radio call activity within a zone. You can see constantly updated information on who is using the system, where the radio users are located, what infrastructure resources are being used, and any significant changes in system usage.

- Message Type

Information is displayed by one or any combination of two types of messages: Secure and Emergency.

- Raw Data

A Raw Data filter allows the selection or exclusion of information. The data that is selected for inclusion is displayed as raw data (no formatting).

- Site Information

A site filter object allows you to specify the site that you want to monitor. The site selection must consist of a site within the same zone as the ZoneWatch. The site filter essentially limits the view to only a specific site in a zone. You can, however, have other windows open to show information from other sites in the zone. You can have a maximum of 20 ZoneWatch windows open at any time on the workstation. Typically, you use between 4 and 8 open windows to monitor the radio call traffic on the system.

- New Resources

Restart ZoneWatch each time you add radios and group resources to the system. As these resources generate radio call activities, ZoneWatch displays the activity information.

Monitor the Multisite Scroll Watch Window for information about radio call activity within the zone. The Watch Window utilizes a scrolling display that shows trunking activity for the zone.

Figure 2-32: ZoneWatch Multi Site Scroll Watch Window

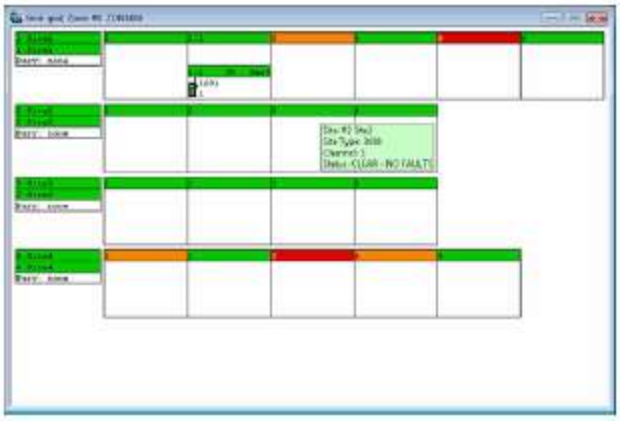

Figure 2-33: ZoneWatch Channel Grid Watch Window

2.15 Zone Controller

The zone controller is a software application that provides centralized control for call processing and mobility management functions in an ASTRO® 25 system. The zone controller application is responsible for processing calls, managing audio paths, controlling zone infrastructure, and providing services to subscribers and dispatch consoles.

The zone controller application resides on a Generic Application Server.
The zone controller can operate in a standalone configuration or a redundant configuration. In a standalone configuration the zone controller communicates with other components in the system through a Local Area Network (LAN) switch

installed at the zone core of an ASTRO® 25 system. In a system with redundant zone controllers, the LAN switch is used to switch system resources between the zone controllers and provides high availability call management within the zone. While both zone controllers are powered and enabled at the same time, only one is actively participating in call processing tasks at any one time.

The redundant zone controller configuration provides protection against a single point of hardware or software failure that results in the loss of wide area trunking until the zone controller is repaired or recovers automatically. The redundant zone controller remains in the standby state as long as the active zone controller does not report a malfunction that causes a switchover.

Wide area trunking is the normal operating state for each site in the system and provides subscribers with the capability to communicate with members of their talkgroup regardless of site location. The zone controller provides control information that allows the system components to set up call processing and audio routing.

2.15.1 Redundant Multi-Zone Configuration

A Redundant multi-zone system supports up to seven zones along with all the Network Management applications. Two redundant zone controller applications along with the ZDS, ATR, UEM, and ZSS NM applications are used at each zone. The System Statistics Server (SSS) is optional in this configuration. The SSS, UNC, and UCS NM applications reside on system level servers.

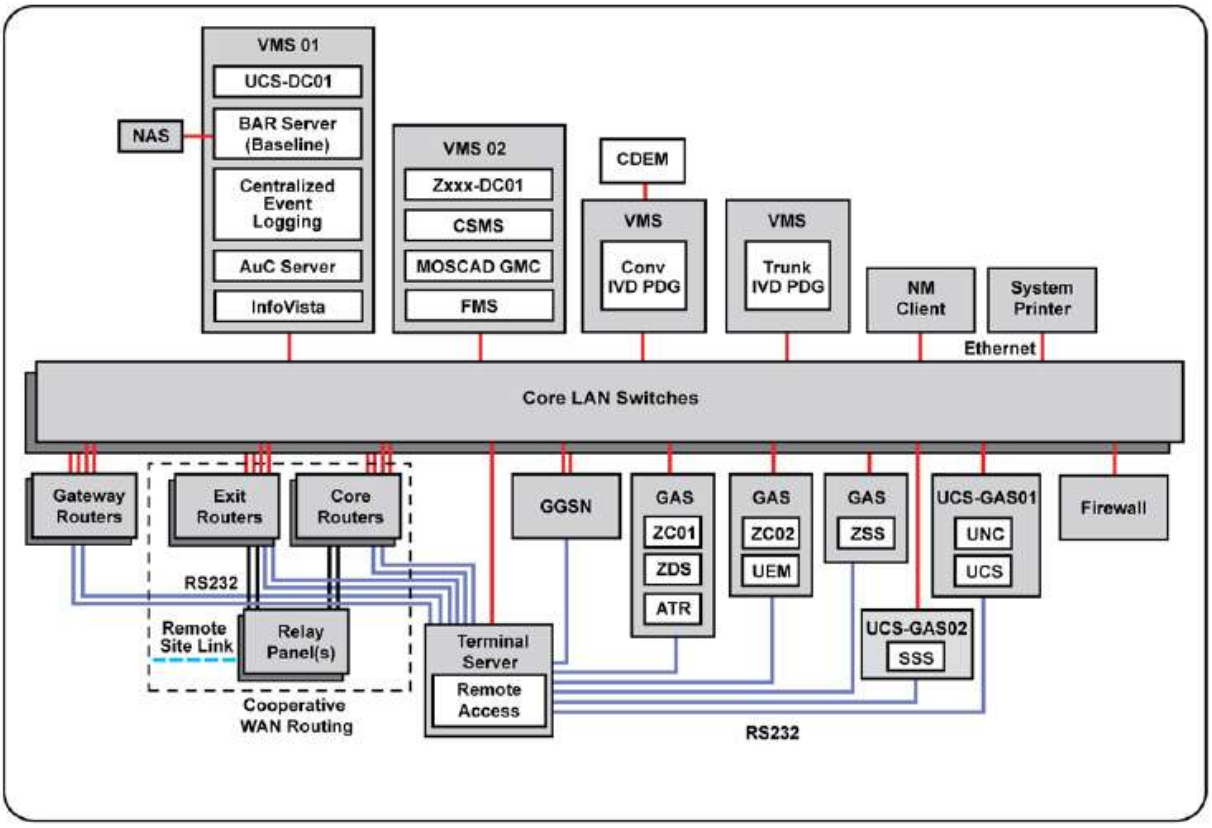

Figure 2-34: Redundant Multi-zone Configuration

2.15.2 Zone Controller Function

In an ASTRO 25 system, the zone controller is used to process system-wide commands for call processing, mobility management, data transactions, and some network management functions. The zone controller communicates with the gateway routers through the zone core LAN switch by establishing an IP session to each router.

2.16 GTR 8000 Expandable Site Subsystem

The GTR 8000 Expandable Site Subsystem is an integrated open rack or cabinet that consist of GTR 8000 Base Radios (transceiver module, power amplifier module, fan module and power supply module for each transmission channel). The GTR 8000 Expandable Site Subsystem may also contain GCP 8000 Site Controller modules, XHub modules, or GPB 8000 Reference Distribution Modules (RDMs), and optional RFDS equipment. This configuration provides a major advantage in terms of reduced site cabling and costs. All the required connections between the base radios and the site controllers, XHubs, or RDMs are contained in the backplane; whereas individual units mounted in a 19-inch rack or cabinet require external cabling. Also, the site controller, XHub, or RDM modules in a GTR 8000 Expandable Site Subsystem do not have a power supply of their own, but draw power from the base radio power supply modules.

Each GTR 8000 Expandable Site Subsystem cabinet contains a maximum of either five or six base radios, depending upon the system configuration. Additional GTR 8000 Expandable Site Subsystem racks or cabinets can be added to increase the number of channels at a site. The base radio's 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 the control section of the base radio's transceiver module. On-board serial and Ethernet ports are located on the transceiver's module for local servicing through Configuration/Service Software (CSS) and the Unified Network Configurator (UNC). 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. Radio Frequency Distribution System (RFDS) provides the interface between the transceivers and the site antennas and between the power amplifier and the site antennas. Each transceiver has an Ethernet connection to the site controller, XHub, or RDM modules.

2.16.1 Supported System Configurations

The GTR 8000 Expandable Site Subsystem is available in the following system configurations:

- Trunked High Performance Data (HPD) Site
- ASTRO 25 Repeater Site (trunked IV&D)
- IP Simulcast Remote Site (trunked IV&D)
- Circuit Simulcast Remote Site (trunked IV&D)
- Centralized Conventional Architecture

2.16.2 Supported Frequencies for Trunked IV&D and ASTRO 25 Conventional Operation

The GTR 8000 Expandable Site Subsystem is available for 12.5 kHz operation in the following frequency bands:

- 700, 800 MHz
- UHF R1 (380-435 MHz)
- UHF R2 (435–524 MHz)
- VHF (136–174 MHz)

2.16.3 Overview for a GTR 8000 Expandable Site Subsystem in a Trunked Repeater Site

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 site controller. The site controller routes these packets upstream to the zone controller for further processing and routing.

2.16.4 GTR 8000 Expandable Site Subsystem for Trunked Repeater

The GTR 8000 Expandable Site Subsystem is an integrated cabinet or open rack with site controller, channel equipment, and RFDS equipment, which is available for most frequency bands. For repeater site operation, the cabinet/rack includes the following components:

- Redundant site controller modules
- Up to six trunked transceiver modules
- Up to four conventional transceiver or receiver modules
- Up to six power amplifier modules (not necessary for conventional Rx only BRs)
- Up to six power supply modules
- RFDS equipment for the transmit (Tx) and receive (Rx) paths
- GGM 8000 Gateways (optional)
- Junction panel, for connection to other devices at the site, such as site gateway(s), Rx and Tx antennas, and optional MOSCAD Network Fault Management.

The site controller modules, transceiver modules, and power amplifier modules are arranged in the slots of the cabinet/rack. Each transceiver, power amplifier, and power supply represents a channel in the subsystem. The GTR 8000 Expandable Site Subsystem supports up to 28 channels. Therefore, a maximum of six transceivers, power amplifiers, and power supplies may be installed in the cabinet/rack with a maximum of six cabinets/racks. Any expansion cabinets/racks attached to the prime cabinet/rack use XHubs instead of site controllers.

The active site controller module communicates with the channels and sends status messages over the backplane of the GTR 8000 Expandable Site Subsystem chassis. The standby site controller module passively monitors status messages on the backplane to determine whether the active site controller is still operational. Various messaging and signaling across the backplane includes inbound/outbound traffic flow, frequency reference and synchronization signaling, network management traffic, and status/failover related messaging. A bank of power supplies along the bottom of the cabinet/rack supply power to the modules. The cabinet/rack is supplied with up to six AC power connections. DC power or backup batteries can also be connected. The rack can run on a combination of AC power and backup battery power, while continuing to charge the backup batteries. Installation and replacement for all the modules in the rack is accessible through the front of the rack.

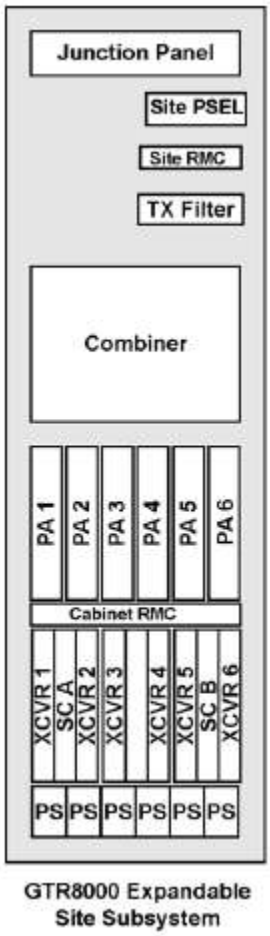

Figure 2-35: GTR 8000 Expandable Site Subsystem for Repeater Site –Module Configuration

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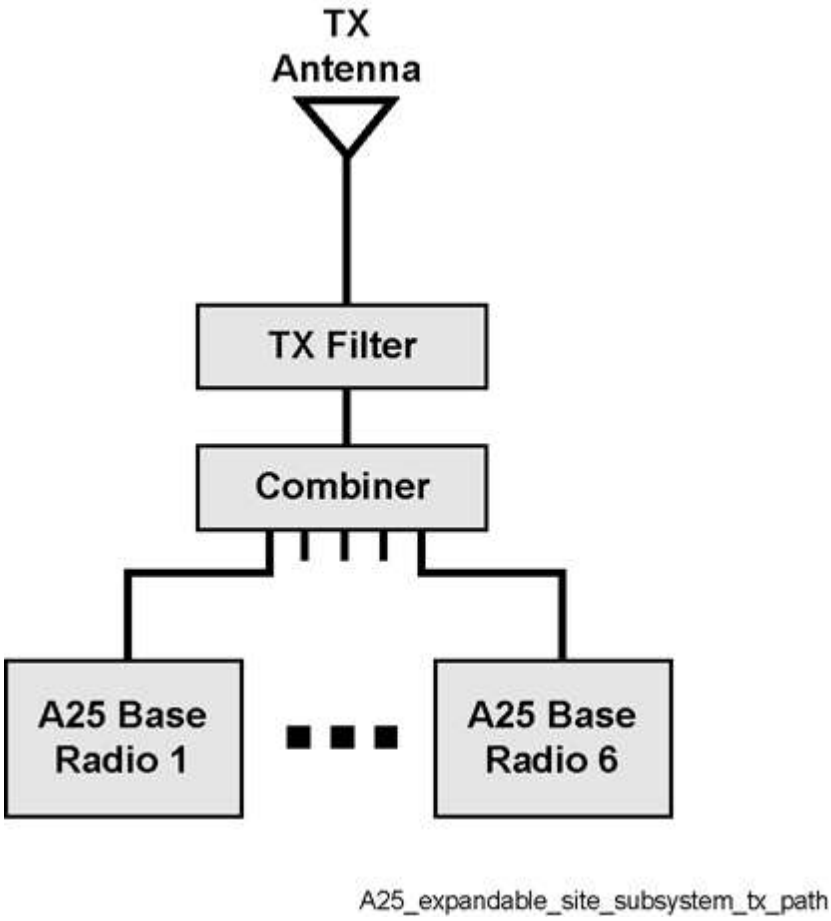


Figure 2-36: GTR 8000 Expandable Site Subsystem for Trunked Repeater Site – Transmit Path

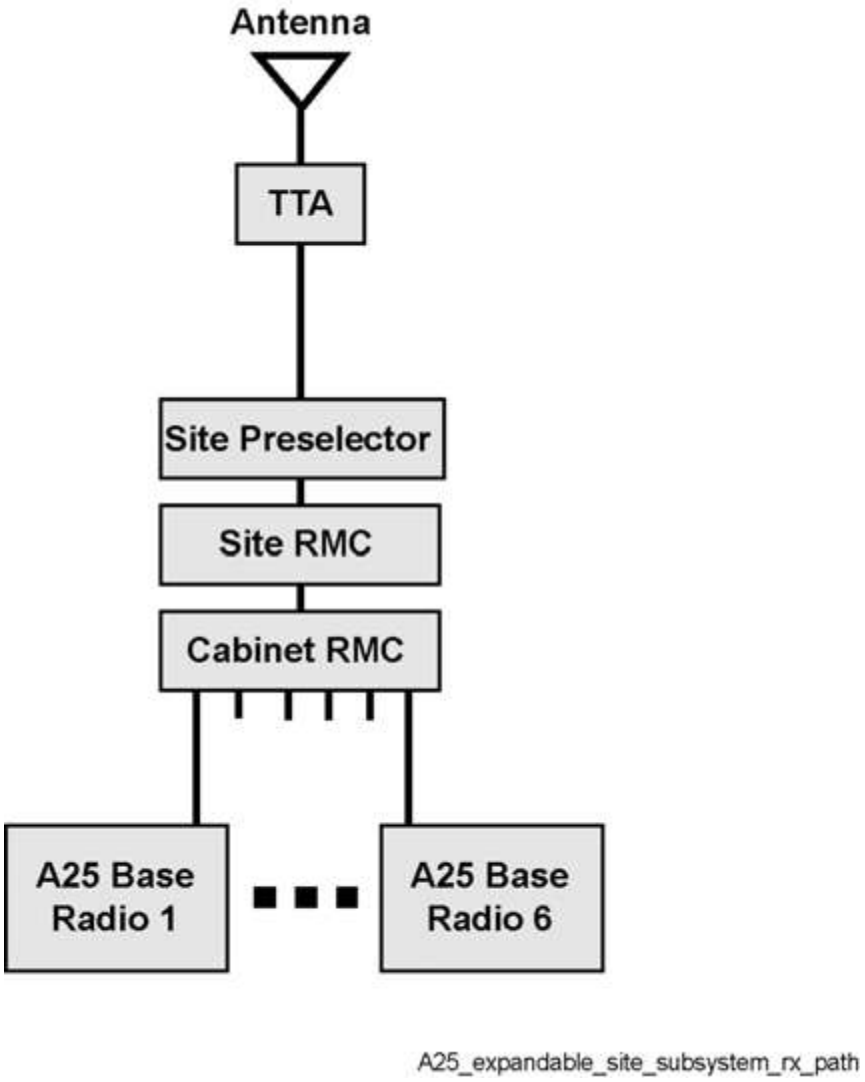


Figure 2-37: GTR 8000 Expandable Site Subsystem for Trunked Repeater Site – Receive Path

2.17 MCC7500 Console Sites – Architecture Overview

A console site in an ASTRO® 25 radio communication system is identified by the location of dispatch console equipment (dispatch console position and/or Archiving Interface Server - AIS) in various system configuration architectures. The term "dispatch console subsystem" is often used to identify a combination of equipment directly supporting console operations which might include the dispatch console position, AIS, Aux I/O Server, a router and/or gateway transport and interface equipment.

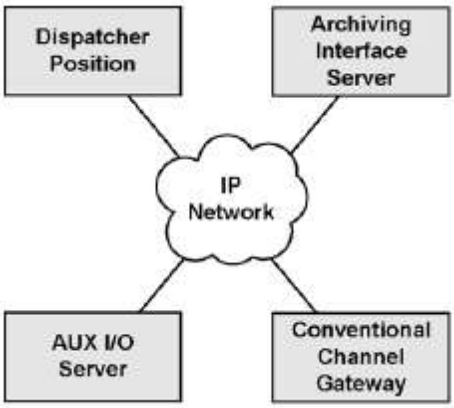


Figure 2-38: Key Components of Console Sites

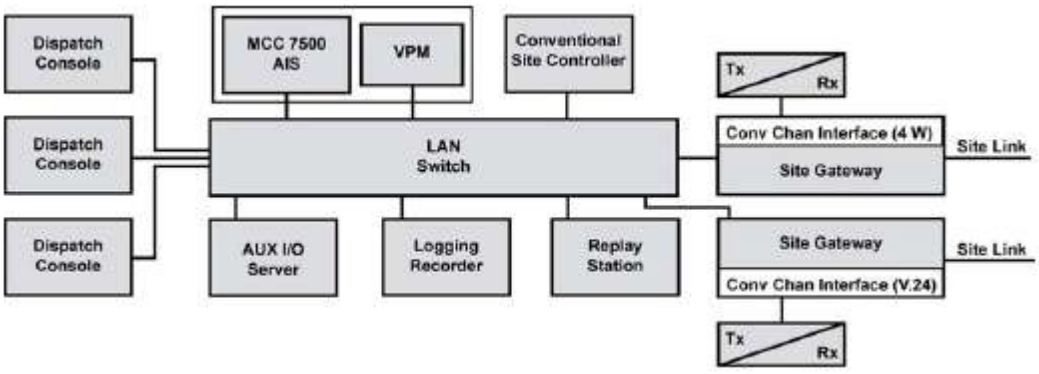


Figure 2-39: Remote MCC 7500 Dispatch Console Subsystem with Conventional and Aux I/O

Remote Console Sites (Without Path Diversity)

A remote MCC 7500 console site is a site that is remote from the zone core. A remote console site not utilizing path diversity interfaces to the core through the WAN switch/Cooperative WAN Routing (CWR) using a single remote console site router. Like an RF site, a remote console site has two logical connections to the zone core. Each connection connects to a different core router.

2.18 MCC 7500 Dispatch Console with VPM Overview

The MCC 7500 Dispatch Console is a Mission Critical IP command and control solution designed to provide optimal quality audio and reliable communication. A dispatch console or "console position" interfaces directly to the IP network to support communication and administration activities for trunked and conventional radios. Each console operator can be setup to monitor talkgroups, multi-groups, and channel resources. Additionally, the MCC 7500 console can be established to provide end-to-end voice encryption for secure communication, priority handling of emergency calls, and Agency Partitioning depending on your system architecture and system implementation.

2.18.1 Console Site Architectures

A console site in the MCC 7500 Dispatch Console subsystem can have one or more console operator positions. The location of the dispatch console, the system architectures it supports and customer requirements determine the equipment included at a console site. The console site can be found in one of the following site architectures:

- **Console Site** - co-located at a Master Site
- **Remote Console Site** - co-located at a Conventional RF Site
- **Remote Console Site**
- **Remote Console Site at a Distributed Conventional Hub Site in a Conventional Subsystem**

Console sites are designated as co-located or remote based on how they interface to the masterSite (zone core). A console site is considered co-located if the site's Ethernet LAN switch is connected directly to a port on one of the master site LAN switches. Up to four console sites can be co-located at a master site that includes two master site LAN switches.

Remote Console Sites require a console site router or Site Gateway device and are connected to the zone core through a Wide Area Network (WAN) link. Large control rooms with many dispatch consoles may be divided into two or more console sites to support performance and availability requirements.

2.18.2 Dispatch Console Subsystem

A Console Site can contain various Dispatch Console Subsystems each consisting of various different components depending on the console site architecture and features purchased. Dispatch console operator positions can share some of the subsystem equipment at a console site. A Dispatch Console Subsystem could contain any of the following equipment:

- MCC 7500 Dispatch Console Operator Position (a Windows-based platform)
- Voice Processor Module (VPM) for each operator position – Interface to peripheral equipment
- Peripheral Equipment: Speakers, Microphones, other peripherals
- Archiving Interface Server (AIS) – interface support for the console and logging equipment
- Logging Recorders and Replay stations – for audio and information archiving
- Aux I/O Servers – an interface external components with the console
- Ethernet LAN Switch – Remote Console Site
- Site Router or Site Gateway devices (for a Remote Console Site)

Equipment at a remote site that would not be considered part of the dispatch console subsystem but might be co-located with the dispatch console subsystem could include, but may not be limited to, the following:

- Network Time Protocol source
- Conventional Channel Interface devices (routers or site gateway devices)
- Conventional Base Radios
- Conventional Site Controller

Each Console Operator Position has a dedicated VPM which interfaces to the Ethernet LAN Switch at the console site. Additionally, if the Audio Logging is implemented, the Archiving Interface Server (AIS) also has a dedicated VPM. The VPM provides all the audio processing services and encryption/decryption services for the VPM-based dispatch console and the AIS which includes the following:

- Vocoding services capable of supporting AMBE and IMBE
- Audio processing services - capable of supporting audio level adjustments, summing, filtering, and multiple, simultaneous audio streams.
- Encryption and decryption services - Capable of supporting multiple simultaneous encryption/decryption sessions using multiple algorithms and multiple secure keys.

2.18.3 Dispatch Console — Operator Position

The MCC 7500 Dispatch Console consists of a Motorola-certified tower PC with built-in LAN connection, a monitor, and the operator interface.

The computer used in the MCC 7500 Dispatch Console Operator position uses the Microsoft® Windows Vista® Business edition Operating System and Motorola software to provide call processing services through a graphical user interface (GUI). The MCC 7500 Dispatch Console includes a suite of Application Programming Interfaces (APIs that may be used by third-party companies to interface Computer-Aided Dispatch (CAD) systems, Non-Motorola dispatch consoles, or other devices with the Motorola radio system.

Figure 2-40: Dispatch Operator Position

2.18.4 Voice Processor Module (VPM)

The Voice Processor Module (VPM) is a device that combines the functions of a voice card, encryption card, and a general purpose input/output module in an MCC 7500 Console subsystem. The VPM provides the necessary interfaces to connect analog devices to the MCC 7500 digital console and it is responsible for audio routing between the dispatch operator, peripherals, and the local network. It contains both digital and analog (audio) circuits to support the secure and clear voice processing.

The low-profile VPM can be rack mounted, console furniture mounted or placed on the desktop. The VPM communicates with the console operator position computer over Ethernet. The VPM can be up to 100 Meters (328 feet) from the Ethernet switch. This allows the operator position computers to be installed in a separate computer room and the VPM to be at the operator position.

Figure 2-41: VPM Front View

2.18.5 MCC 7500 VPM Peripherals

MCC 7500 VPM works with the following peripherals:

- One desktop microphone
- Two headset jacks
- Eight desktop speakers
- One logging recorder
- One radio instant recall recorder
- One telephone instant recall recorder
- One external telephone set
- One external paging encoder
- One footswitch
- One generic transmit audio input

2.18.6 Desktop Speakers

The VPM can support up to eight speakers. Each speaker on a dispatch console contains unique audio. That is, an audio source cannot appear in multiple speakers at a single dispatch console.

Figure 2-42: Desktop Speaker

The speaker is a self-contained unit that is placed on a desktop, mounted in a rack/furniture, mounted on a wall, or mounted on a computer monitor. It contains an amplifier that provides a maximum of 2 Watts of power. The VPM provides power for the speakers through its interconnecting cable. A mounting bracket is included with the speaker. The speaker is designed for use near computer monitors.

The speaker provides the user with a continuous volume control. This serves as a master volume control for all the audio that appears in the speaker. When the user adjusts this volume control, all the audio in the speaker is increased or decreased by the same amount. The speaker is configured to provide either full muting or a fixed level (determined by the hardware and not user adjustable) when its volume control is set to its minimum level. The cable supplied with the speaker contains one end with two of the pins shorted together. When plugged into the speaker, this end causes the minimum volume to be set to full mute. If the other end of the cable is plugged into the speaker, the minimum volume is set to the minimum level.

2.18.7 Desk 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 2-43: Gooseneck 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.
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.

2.18.8 Footswitch

The VPM can support a single footswitch, which can contain either one or two pedals:

- If a footswitch with one pedal is used, the pedal controls the General Transmit feature.
- If a footswitch with two pedals is used, one pedal controls the General Transmit feature and the other controls the Monitor feature.

The footswitch allows users to operate these features with their feet so their hands are freed for other tasks. If desired, the footswitch is permanently fastened to the floor.

Figure 2-44: MCC 7500 Footswitch

2.18.9 Instant Recall Recorder Port (for Radio)

The Instant Recall Recorder (IRR) port (for radio) allows an instant recall recorder to be connected to a dispatch console. The port provides an RJ45 connector with a 600 Ohm analog audio output containing the receive radio audio on the selected channels. Tones generated by the dispatch console (For example, emergency tones, callback tones, and busy tones) are not included in the audio output. In this way, they do not interfere with a dispatch console user's ability to understand the voice audio that is recorded.

No playback speaker input or recording control line output are provided on the port. Generally, the third-party instant recall recorder provides these functions.

Short-term, console-specific audio recording is a mechanism used to record a portion of the inbound audio present on a specific dispatch console and make it readily available to the dispatch console user. This recorded audio is retained by the recording system for a short period of time (typically about 60 minutes) and is easily played back by the dispatch console user, which allows the dispatch console user to replay received audio that might have missed.

2.18.10 External Paging Encoder Port

The External Paging Encoder Port feature allows an external tone paging encoder to be used with a dispatch console to provide tone paging services. Paging tones generated by the encoder are transmitted by the dispatch console on the selected conventional radio resource(s). If a user wants to send paging tones on an ASTRO® 25 Conventional channel, an external paging encoder is required.

This feature has an RJ45 connector with an analog 600 Ohm audio input to which the paging tones are applied. A Paging Push-to-Talk (PTT) input enables a dry contact closure to be applied that indicates when the dispatch console should transmit the tones on the radio channel(s).

When the dispatch console sees the Paging PTT input go active, it transmits the audio appearing at the audio input on the selected conventional channel(s). If PL Stripping is enabled on a conventional channel, the PL is stripped when the paging tones are transmitted. No de-emphasis filtering is performed and no talk extend is provided with externally generated tones. Generally, the external paging encoder provides these functions.

2.18.11 Local Logging Recorder Port

The Local Logging Recorder Port allows an external logging recorder to be connected to a dispatch console. The port provides an RJ45 connector with a 600 Ohm analog output. The audio that appears on this output is configured and is typically the audio that is transmitted and/or received at that dispatch console. The configuration of audio presented at this port is tied to the physical dispatch console, so that no matter what user is logged on the dispatch console, the same type of audio is logged. This configuration is done as part of configuring the dispatch console at the radio system's network manager. The local logging recorder port is configured to log any combination of the audio sources listed below:

- Audio received from the currently selected radio resources. The level of this audio is not affected by either the individual volume setting of the radio resource or the master volume control on the speaker or headset jack.
- Microphone audio being transmitted to the currently selected radio resources by the operator.
- Microphone audio being transmitted to unselected radio resources by the operator.
- Any tones generated by the dispatch console that appear in its speakers, such as trunking tones and emergency tones.
- Tones generated by an external paging encoder.

Long-term, console-specific audio recording is used to record a portion of the inbound and outbound audio present on a specific dispatch console. This recording is usually done by providing a logging port at the dispatch console and wiring that port to a track of an audio recording device. These recordings are typically archived for long-term storage and provide a historical record of the Radio Communications made at a given dispatch console.

2.18.12 Headset Jacks

The VPM is capable of supporting up to two headset jacks. A headset jack allows a dispatch console user to use a headset while operating the dispatch console. The headset jack supports headsets that use either PJ7 (6-wire) or PJ327 (4-wire) long frame connectors. 6-wire headsets have a PTT button while 4-wire headsets do not have a PTT button. The headset jacks ship from the factory configured for 6-wire headsets. If 4-wire operation is desired, changes must be made inside the headset jack box depending on the version of the headset box.

Figure 2-45: Headset Jack

The headset jack contains two volume controls:

- For adjusting the level of received radio audio
- For adjusting the level of received telephone audio

A small dimple is molded into the headset jack housing near the telephone volume control so a dispatch console user can tell them apart without having to look at them. The headset jack allows users to use headsets, which both decreases the ambient noise in a control room and reduces the effect of any ambient noise on dispatch console transmissions. This improves the quality of the audio being transmitted from the control room and allows the dispatch console users to hear received audio more clearly.

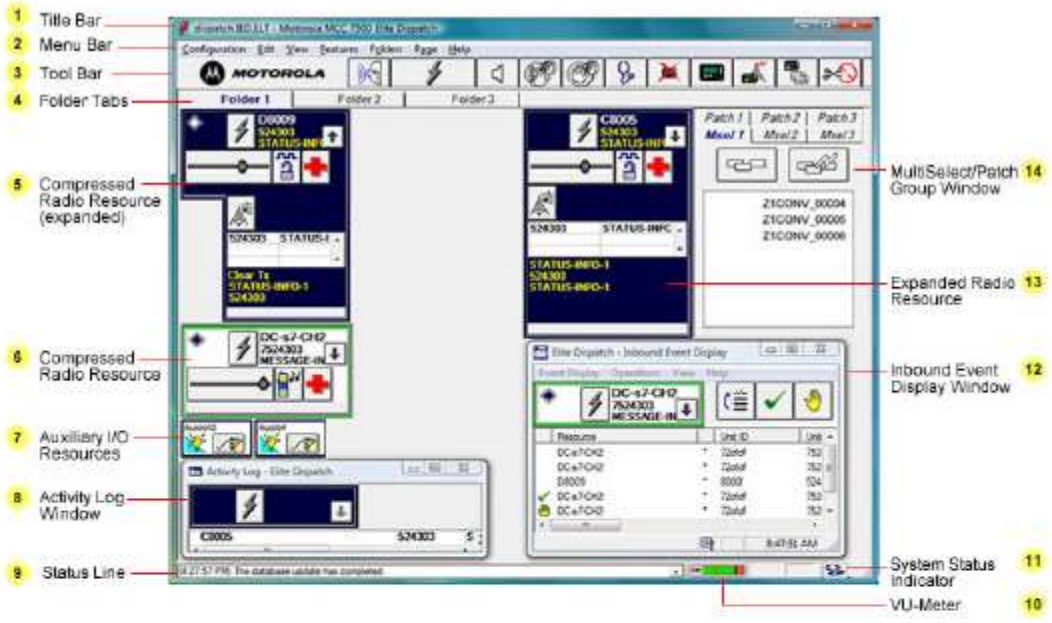
When a headset is plugged into a headset jack, the selected receive audio is typically removed from the speaker(s) and routed to the headset earpiece.

If a telephone set connected to a dispatch console external telephone port is taken off hook while a headset is connected to a dispatch console, the selected radio audio is removed from the headset earpiece and routed to the appropriate speaker(s). The received telephone audio is routed to the headset earpiece. The headset microphone becomes live and its audio is routed to the external telephone set. This allows a dispatch console user to talk and listen on the telephone set in a hands-free full-duplex mode.

The headset jack is mounted either underneath a writing surface or on top of a writing surface. The headset jack is designed with a low profile and rounded edges to minimize “knee banging” when mounted underneath a writing surface.

2.19 MCC7500 Elite Dispatch Position

2.19.1 Elite Dispatch Main Window



Dispatch Window Elements

1	**Title Bar**	Shows the name of the configuration currently open.
2	**Menu Bar**	Displays the menus available in Elite Dispatch. See Elite Dispatch Menu Options for more information.
3	**Toolbar**	Toolbars display shortcut buttons for commonly used menu items and features. Toolbar contents are configured by the Administrator. See Toolbar for more information.
4	**Folder Tabs**	The resources in a configuration are grouped into folders to simplify desktop organization. Resources in the selected folder appear on the desktop. To select a different folder, choose its folder tab. Only one folder can be selected at a time.

5	**Compressed Resource (expanded)**	When the operator clicks the drop-down arrow of a compressed resource, a flap is displayed which shows all the features of the resource.
6	**Compressed Resource**	To conserve screen space, some resources may be compressed. They can be expanded using the drop-down arrow on the compressed resource.
7	**Auxiliary I/Os or Auxio Resources**	These allow control of an external device (such as a door, light or alarm) monitored by the control center and display its status, usually on/off or open/close.
8	**Activity Log**	Lists the most recent calls received at the console. This is an optional display which can be disabled by the Elite Administrator. If enabled, the dispatcher can elect to show or hide the Activity Log.
9	**Status Line**	Displays status and error messages. To see a list of the most recent messages, select the down arrow to the right of the status line. To close the list, select the arrow again.
10	**VU-Meter**	Appears in the status line and indicates the audio level of incoming or outgoing audio transmissions.
11	**System Status Indicator**	Appears in the lower right-hand corner of the Elite desktop if there is a change in system status. See System Status Indicator for more information.
12	**Event Display Window**	Lists events received at the console. This is an optional feature which is configured by the Elite Administrator. If enabled, the dispatcher can elect to show or hide the Event Display window.
13	**Expanded Radio Resource**	A resource that is set up to always display all features. It is locked so that the set of displayed features cannot be compressed by the dispatch operator.
14	**MultiSelect/Patch Group Window**	Displays the Multiselect (Msel) and Patch folders associated with the selected configuration, and lists the resources in the currently selected Msel or Patch folder. If the Msel or Patch folder includes a lock icon, the resources included in the group cannot be edited by the Dispatch operator.

Figure 2-46: Elite Dispatch Main Window

VU-Meter

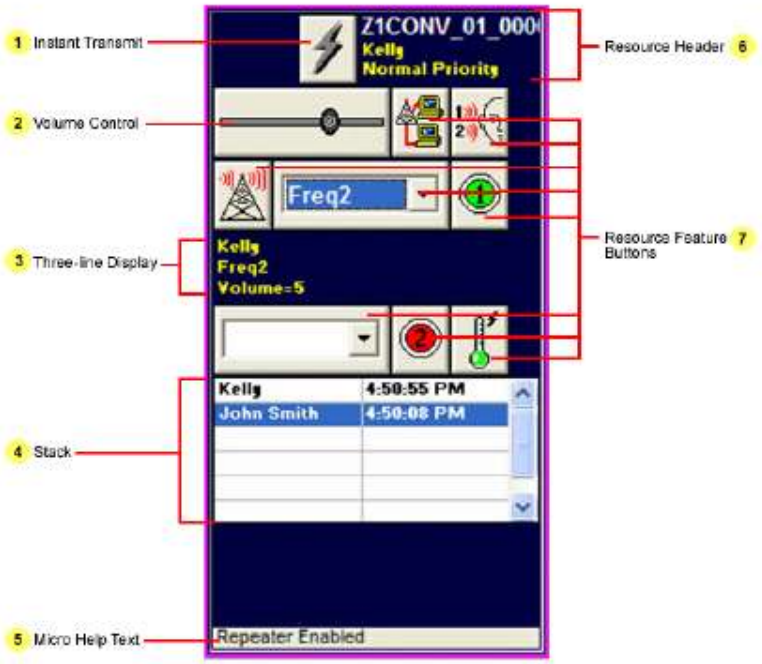
The VU-Meter feature on the Dispatch Console provides a visual indication of audio input/output levels. Using the VU-Meter, a Dispatch user can adjust the volume of the speakers or reposition the microphone for optimal audio levels.

2.19.2 Radio Resource Window

Radio resource windows can be viewed two ways: Expanded View or Compressed View. When a resource is compressed, a small arrow button next to the resource header allows you to expand the window. A resource that has been added to a folder in its *expanded* mode has no arrow button because it always displays all resource feature buttons.

Radio resource windows are configured in the Elite Admin application. The appearance of radio resources in your system may be different, depending upon the features and the arrangement determined by the Administrator.

An example of a radio resource window in expanded view is shown on the following page.



1	**Instant Transmit Button**	Press and hold this button to send an Instant Transmit to the resource. Changes to red during transmission.
2	**Volume Control**	Slide control to increase or decrease the volume of the resource's audio. Adjust by dragging the button left or right.
3	**Three-line Display**	Optional panel on the radio resource and configured by the Administrator. Up to three lines of information specific to this resource can be displayed.
4	**Stack**	Displays incoming calls to this resource. Calls are listed in chronological order with the newest entry at the top of the list. See the section "Using the Stack" for more information.
5	**Micro Help Text**	Brief descriptive text displayed as a user moves the mouse over a button or feature on a resource window.
6	**Resource Header**	Displays up to three lines of information. First line is always the radio name. Lines 2 and 3 are optional and configured by the Administrator.
7	**Resource Feature Buttons**	Features available for use with a radio resource can be accessed quickly by clicking on the feature buttons included in the window. Features are assigned to resources by the Administrator. To review all the feature buttons, see Radio Resource Features.

Figure 2-47: radio resource window in expanded view

Compressed View

To conserve space on the screen, some resource windows can be displayed in their *compressed* mode. Although compressing resource windows allows the user to fit more on the screen, it also hides some information. Resources that have the ability of showing or hiding more information have an arrow button located in the resource header.

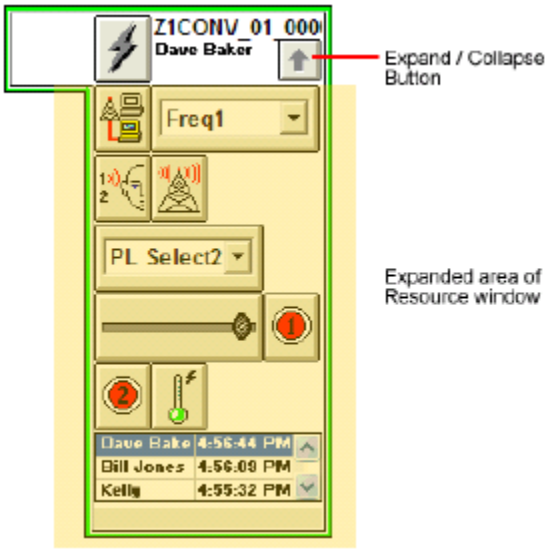
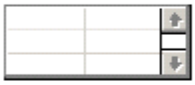
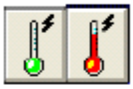


Figure 2-48: radio resource window in compressed view

Radio Resource Features

Features available for use with a radio resource can be accessed quickly by clicking the feature buttons included in the Radio Resource window. The features for each resource are configured in the Elite Admin application. The following table describes the feature buttons available in Elite Dispatch console.

Button	Feature Name	Description
	Emergency	Allows the Dispatch operator to quickly respond to an emergency call. When clicked, this button displays the Emergency Quicklist on the operator's console.
	Transmit Mode	Allows the Dispatch operator to select the transmit mode used for outbound transmissions on a specific resource.
	Call Alert	Feature which provides an indication on the console position or radio that a call is requested with a specific unit.
	Private Call	Feature used to establish private communication between a console position and a radio.
	Volume	Volume control on a resource so the Dispatch operator can adjust the audio volume for the radio.
	Stack	A multi-line stack which displays incoming calls on a resource. The left-hand column displays the alias or ID of the initiating radio, the right-hand column is configured by the Administrator.
	Three-line Display	A three-line display on the resource which may be a feature or text. Content on each line is configured by the Administrator.
	Priority Select	Toggle this button to switch between Normal Priority (green) and Tactical Priority (red) for this resource. A dispatch operator may use this feature to assign a higher priority, giving the resource a better chance of gaining communication access during a repeater busy scenario. Only emergency calls have a higher priority than tactical.
	Repeat Enabled/Disabled	Toggle this button to allow the audio received from the base station to be repeated to other subscriber units or whether those received calls will only be heard at console positions.

	Frequency Select	If a resource is equipped with multiple frequencies, the desired frequency can be selected from the frequency select drop-down list.
	Secondary Receiver Muted/Unmuted	Some radios are equipped with a talkaround switch that allows them to transmit to each other without going through the system repeaters. Consoles may have a secondary receiver tuned to the talkaround frequency, allowing the operator to hear talkaround conversations at the console. The Mute Secondary Receiver feature allows the operator to mute the receiver tuned to the talkaround frequency so talkaround conversations cannot be heard at the console.
	Remote Monitor	Remotely command a radio to key-up its microphone and transmit for a short period of time. It is a listen-only mode and the radio shows no indication that it is transmitting. The feature is used if a radio is stolen or if the user is not responding to calls.
	Radio Check	Check if the subscriber unit is functioning on a resource, without causing interruption to the specific unit. It can be used as a routine preventive maintenance check or as a specific action, when the operator has some reason to doubt the availability of the unit.
	Radio Enable/Disable	Enable or disable the subscriber unit remotely. It can be used to disable a stolen or lost unit or to enable a previously disabled unit.
	Status Request	Remotely interrogate a subscriber unit and obtain its current status.
	Voice Sel Call	Communicate with a single console or radio unit without having other units on the same channel listening to the conversation. It eliminates the annoyance of users having to listen to traffic that has nothing to do with them.
	Channel Marker Available/Activated	Activate a channel marker button on a resource to identify a channel as priority and to warn non-critical radio users not to transmit. All parallel Dispatch consoles will see an activated channel marker and any operator position can deactivate it. A single operator position is permitted to activate up to 20 channel markers.

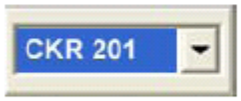
	Private Line Select	If a resource is equipped with Private Line capability, the desired Private Line can be selected from the drop-down list.
	External Controller Enabled/Disabled	Known as "Takeover", this feature allows an operator to take over or cease the communications being initiated from a remote console. The Takeover Switch inhibits or permits the circuit used by these remote positions to communicate with the system. By default, the circuit allowing the remote console to operate is enabled.
	Outbound Secure Key	Available for digital conventional resources only. Allows a Dispatcher to select from a list of encryption keys for secure transmission.
	Wildcards I and II	Similar to the Auxiliary I/O controls, Wildcards can be used to toggle the state of an external control at a base station.
	Main/Alternate Channel control	Allows a Dispatcher to choose which channel is active for a conventional site. The Main/Alternate button may appear on the resource in one of three states: Main channel active, Alternate channel active, Main/Alt state Unknown. (The default button states are shown here.)
	Channel-associated Public Auxiliary I/O	An Auxiliary I/O button may appear on the resource in one of three states: Inactive, Active, or Unknown. (The default button states are shown here.) If the Aux I/O is safety-protected, a  icon appears at the top left side of the Inactive state button.
	Resource not available indicator	The resource status feature is used to inform the operator of the availability of a resource. When the resource becomes fully functional, the indicator is removed. For channels capable of analog or digital operation, the partially available indicator means that analog communication on the channel is unavailable; only digital mode communications are available while the resource is in this state.
	Resource partially available indicator	

Figure 2-49: Radio Resource Features

2.20 Simulcast Prime Site Equipment

An IP Simulcast Subsystem is a multi-site RF (radio frequency) subsystem consisting of an IP simulcast prime site and up to 15 IP simulcast remote sites to provide radio coverage to a large area. In addition to supporting simulcast operations, an IP simulcast subsystem can also support voting, multicast, data steering, and console interface operations.

Simulcast operation is a radio system topology that uses multiple transmitters on the same frequency in separate locations to transmit the same signal. Simulcast operation is desirable in areas where frequencies are scarce and in areas where physical barriers (for example, mountains and buildings) can cause deficiencies in signal coverage.

Multicast function (conventional only) is performed when multiple base radios can transmit and receive, operating on different frequencies, and can still receive copies of the same voice or data from the comparator. To implement multicast function, the site employs (requires) a voting operation to establish the best quality signal for transmission.

Voting operation in a radio system topology employs multiple receivers on the same frequency in separate locations to support a "receive" coverage area that is equal to the "transmit" coverage area for the subsystem. With the voting operation, the a signal transmission from a subscriber radio may be received by multiple base radio receivers where the signals are processed by comparator devices which perform a "voting" operation to produce the best composite signal based (from the signal transmission received by the multiple base radio receivers) to that the "voted" composite signal (best quality signal) that can be transmitted through the system (routed through the zone core and base radio transmitters).

The remote sites extend the coverage of the simulcast subsystem. The remote sites can be 15 physically separate sites or 14 physically separate sites, with one remote site installed at the same physical location as the prime site. This is known as a collocated remote site. The system treats the entire simulcast subsystem (prime site and all remote sites) as a single site.

An IP simulcast subsystem can have up to 30 channels with each channel assigned up to 15 remote sites.

The standard configuration prime site supports voting, simulcast and multicast operations for conventional channels and simulcast for trunked channels. Support at the prime site can accommodate channels that are all trunking, all conventional or a combination of trunking and conventional channels.

Up to 30 GCM 8000 Comparators are supported which interface directly to the Ethernet LAN switches.

IP Simulcast Prime Site with collocated RF site

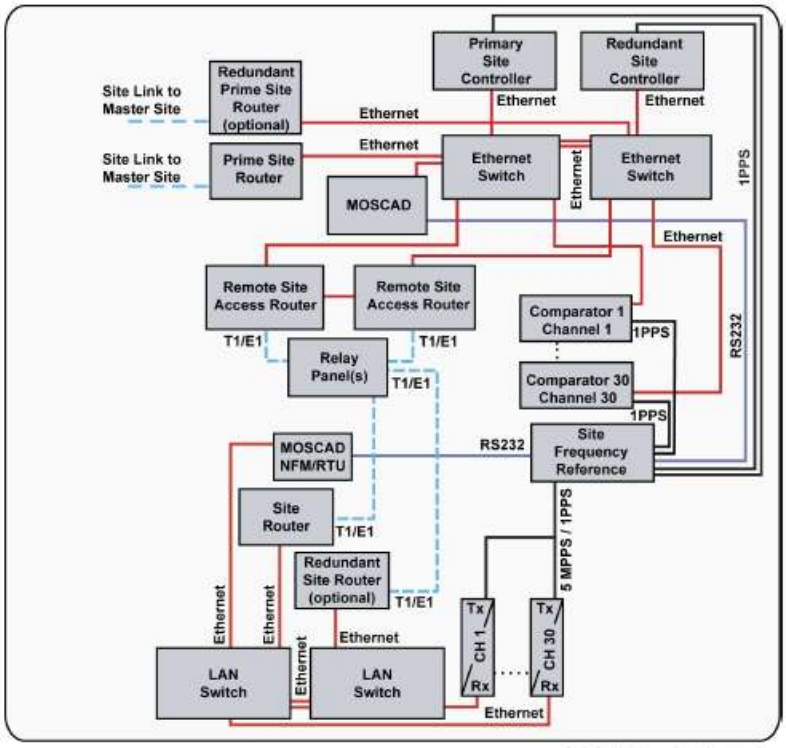


Figure 2-50: IP Simulcast Prime Site with collocated RF Site

Combining an IP simulcast prime site and master site (zone core) in the same physical location is often economically desirable. With T1/E1 links, the T1/E1/FT1/FE1 link from the collocated transport device (prime site router or gateway) is connected directly to a relay patch panel.

2.20.1 IP Simulcast Prime Site Components

The critical components of the prime site in an IP simulcast subsystem are:

- Redundant GCP 8000 Site Controllers
- Two HP 2600 Ethernet LAN Switches (standard configuration)
- Four HP 3500 Ethernet LAN Switches (high availability configuration)
- GCM 8000 Comparators (trunked and IP conventional)
- TRAK 9100 Simulcast Site Reference
- Routers or Gateways:
  - Prime Site S6000 Routers (T1/E1 or Ethernet link), or
  - Prime Site GGM 8000 Gateways (T1/E1 or Ethernet link)

- Remote Site Access S6000 Routers (T1/E1 or Ethernet link), or
- Remote Site Access GGM 8000 Gateways (Ethernet link)

2.20.1.1 GCP 8000 Site Controllers

The GCP 8000 Site Controller is the control interface between the IP simulcast subsystem and the zone controller. The site controller performs the following functions:

- Translates mobility and call service control messages received from the channels into the protocol required for interfacing to the zone controller.
- Translates the mobility and call service control messages received from the zone controller into the protocol required for interfacing to the channels.
- Maintains a mobility database, which is uploaded to the zone controller as part of the recovery process when the site transitions from Site to Wide Area Trunking.
- Supervises subsystem resources. This includes determining channel status and remote site status based on status information received from the channels. These statuses are reported to the Network Manager and also indicate to the zone controller the capabilities of the channels at the site. The zone controller uses the channel capabilities for resource allocation.
- Performs trunked data call processing while in Site Trunking.
- Supports Site Trunking and Failsoft failure modes.
- Receives the 1 PPS from the TRAK 9100 Simulcast Site Reference and Global Positioning Satellite and then provides a unique launch time reference for the comparators and base radios.

An IP simulcast site subsystem requires two site controller chassis, with each chassis holding a single site controller module in a redundant configuration. The site controllers automatically determine the active and standby site controller operation. Upon failure of the active site controller, the standby site controller takes over as the active site controller.

In order for the two site controllers to properly transition between standby and active operational modes, the site controller assigned as SC1 must have the site controller module installed in the upper slot of the chassis, and the site controller assigned as SC2 must have the site controller module installed in the lower slot of the chassis.

2.20.1.2 Ethernet LAN Switches

There are two HP 2610 Ethernet switches at the prime site in a standard configuration. Two of them are paired together to form the core of the prime site LAN. They are paired together for redundancy such that if one of switch fails, half of the hosts (site controllers, comparators) on the LAN are still connected to a working switch.

In a single prime site link configuration, there is a single prime site router or gateway which is attached to one of the Ethernet switches. The entire prime site is therefore dependent on this Ethernet switch for its connection to the master site.

In a dual prime site link configuration, there are two prime site routers or gateways, each of which is attached to a corresponding prime site LAN switch. This ensures that if either switch fails, there is still a path to a prime site router or gateway for connectivity to the master site.

2.20.1.3 GCM 8000 Comparators

Each comparator module collects all the data of a single channel from all of the remote sites. The comparator receives voice and data packets and compares them. The comparator chooses the best received signal from all of the received signals to build the signal that is sent to the base radio transmitters. The single data stream is routed to the master site. The comparator forwards outbound audio from the master site to the base radios at the remote sites.

2.20.1.4 TRAK 9100 Simulcast Site Reference

The TRAK 9100 SSR derives a 1 PPS signal from the satellite signal through a GPS antenna and sends it to the comparators and site controllers. The comparators use the 1 PPS signal as a frequency reference at the prime site, and provides the reference to the base radios at a remote site in a standard configuration, so that all the devices involved in the transmission of the audio have a common timing source (GPS).

2.20.1.5 Prime Site Routers or Gateways

The prime site router or gateway provides transport between the IP simulcast prime site and zone core. This includes all the traffic for the site, including voice control, data, and network management traffic. These transport devices can support either T1/E1 site links or Ethernet site links.

For T1/E1 site link support with a site link requiring more than 2 T1’ s, the prime site router configured with an UltraWAN module is employed. For T1/E1 site link support for a site link requiring 2 or less T1’ s, the prime site gateway can be employed with a built-in T1/E1 port providing transport to/from the zone core. With T1/E1 site links, audio and control traffic intended for the zone core (inbound traffic) is sent to the transport device over the prime site LAN where it is encapsulated into frame relay for delivery over a T1/E1. Outbound frame relay traffic from the zone core is carried over a Permanent Virtual Circuit (PVC) to the transport device (prime site router or site gateway). These transport devices function to terminate the PVC and frame relay, to distribute audio and control traffic to the prime site LAN, where it is processed by the site controllers or comparators.

If mutual aid is supported in the subsystem, the site configuration will be slightly different. The transport devices deliver frame relay traffic over T1/E1 through the channel bank, which multiplexes mutual aid and trunking system traffic into separate time slots for channelized T1/E1 delivery to the zone core.

For Ethernet site link support, the site gateway can be employed as the transport device to the zone core. The site gateway uses a built-in Ethernet port providing transport to/from the zone core. The site gateway is the appropriate solution to provide Ethernet transport between the IP prime site and zone core; however, the prime site router may be used as well.

Regardless of the type of transport or transport device used, the transport device is interfaced to the Ethernet LAN switch.

2.20.1.6 Remote Site Access Routers or Gateways

There are two remote site access routers or gateways located at the prime site. The remote site access routers or gateways provide the IP network routing interfaces between the prime site and all of the remote sites. Remote site access routers are deployed in a CWR routing arrangement using either T1/E1 links to relay patch panels or Ethernet links to backhaul switches, which serve as the endpoints for each of the prime site links. Remote site access gateways can only be deployed using Ethernet links to backhaul switches.

2.20.2 IP Simulcast Remote Site Components

The critical components of a remote site in an IP simulcast subsystem are:

- **Standard Configuration**
  - GTR 8000 Base Radios, conventional GPW 8000 Receivers, or GTR 8000 Expandable Site Subsystems
  - Ethernet LAN Switches
  - TRAK 9100 Simulcast Site Reference
  - S2500 Routers or GGM 8000 Gateways (T1/E1 or Ethernet link)

2.20.2.1 Base Radios

The GTR 8000 Base Radio, conventional GPW 8000 Receiver, or GTR 8000 Expandable Site Subsystem provides the RF link between the IP simulcast subsystem prime site and the subscriber/mobile radios.

The base radio captures inbound signals through the external receive (Rx) antennas from the subscriber/mobile radios. It then amplifies, filters, and demodulates the signals into the voice and data packets that are forwarded to the prime site.

For outbound signals, the base radio maps the digital voice and data packets to discreet voltage levels, which are then used to modulate an RF carrier. The modulated RF carrier is amplified and may be combined with other RF channels, filtered, and routed to the transmission (Tx) antennas.

2.20.2.2 Ethernet LAN Switches

The HP 2610 Ethernet LAN switches in a standard configuration interface the remote site router or gateway to the base radios. If the number of base radios is 14 or less at the remote site, only one switch is required.

Each LAN switch provides connectivity for a 10/100Base-T LAN. The LAN switches are connected to each other through a Gigabit stacking interface that makes it possible to provide a management communication link with up to 30 base radios. The two-switch configuration also provides a degree of protection in case of a switch failure. If one of the switches fails, a management link still exists to the base radios connected to the unaffected switch, and the audio services are not affected.

For a standalone GTR 8000 Base Radio configuration, odd-numbered base radios are connected to one LAN switch and even-numbered base radios are connected to the other. For a GTR 8000 Expandable Site Subsystem in a standard configuration, the option to choose which channels to configure in each rack/cabinet, such as even channels and odd channels in different racks/cabinets is available. Another option available is to select the connections made to the racks/cabinets from the LAN switches.

The LAN switches send SNMP events back to the Unified Event Manager (UEM).

2.20.2.3 TRAK 9100 Simulcast Site Reference

The TRAK 9100 Simulcast Site Reference (SSR) in a standard configuration is a GPS-based frequency and time reference unit. The signal requirements the SSR provides for the simulcast subsystem are 1 PPS (Pulse Per Second), 5 MPPS, and 1 PPS + 5 MPPS composite signals. At the remote site, the SSR provides composite (1 PPS + 5 MPPS) to the standalone GTR 8000 Base Radio and 1 PPS and 5 MPPS to the GTR 8000 Expandable Site Subsystem.

2.20.2.4 Remote Site Routers or Gateways

The remote site router or gateway provides the IP network routing interface between the remote site and the prime site. For T1/E1 links to the prime site, the remote site router or gateway interfaces to the prime site through a WAN Link. For Ethernet links to the prime site, the remote site router or gateway uses an Ethernet connection to a backhaul switch and then through a WAN Link. In the dual remote link configuration, two remote routers or gateways are deployed, one for each remote link.

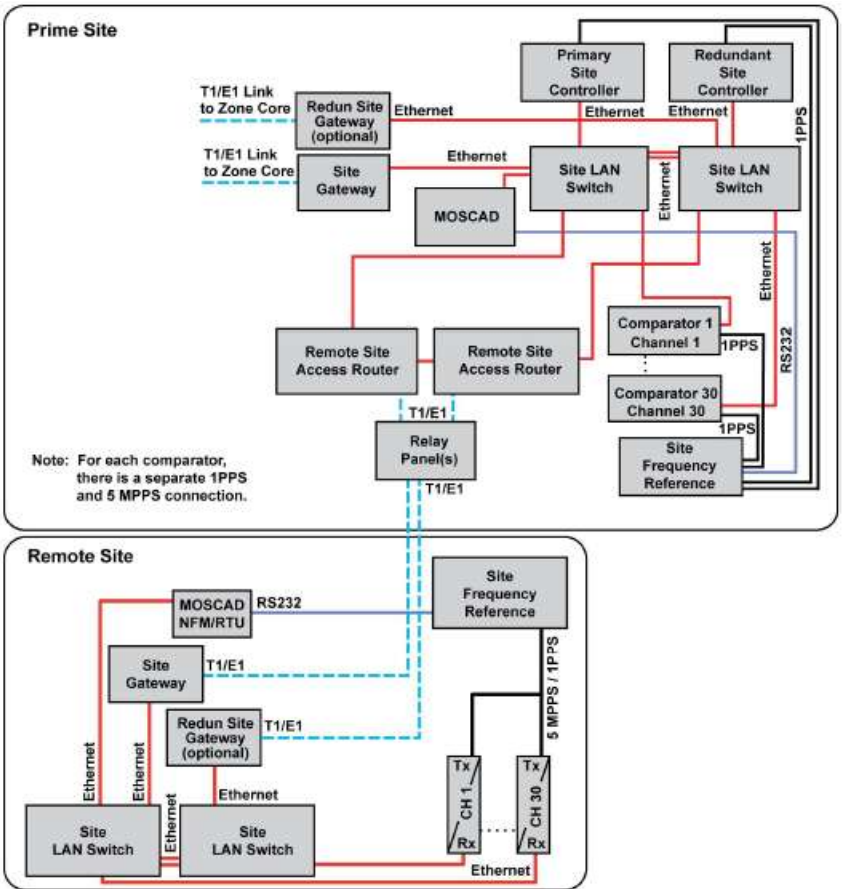


Figure 2-51: Typical Prime/Remote Standard Configuration

2.21 SmartX Site Converter

The SmartX Site Converter is a device designed to allow communication between subscriber radios at existing 3600 RF sites and an ASTRO® 25 Integrated Voice and Data system. It enables the continued use of 3600 RF sites and subscriber radios on an ASTRO® 25 release 7.7 or higher system, thus allowing the gradual replacement of equipment that is at or near end of life with the newer technology and operational capabilities of an ASTRO® 25 system.

The SmartX Site Converter can be used to interface SmartZone® 3.0, 3.5, and 4.1 RF sites to a current ASTRO® 25 Integrated Voice and Data system. SMARTNET® 3.1 or 3.2 sites must be upgraded to a SmartZone® remote site, which can then be connected through the SmartX Site Converter to the ASTRO® 25 system.

The SmartX Site Converter performs the following tasks:

- Call control information
  - Bidirectional conversion between circuit-based 3600 call control packets

and ASTRO® 25 IP-based call control protocol so calls can be managed through the ASTRO® 25 zone controller.

- Audio information
  - Conversion of analog audio from 3600 sites to G.728 packets that can be routed over the ASTRO® 25 IP network to the MCC 7500 consoles and to other 3600 sites.
  - Conversion of analog audio from 3600 sites to Advanced Multi Band Excitation (AMBE) audio packets for routing over the ASTRO® 25 IP network to ASTRO® 25 RF sites.
  - Routing without conversion of digital Improved Multi Band Excitation (IMBE) audio from the 3600 sites to other 3600 sites, MCC 7500 consoles, and ASTRO® 25 RF sites.
  - Conversion of AMBE audio from MCC 7500 consoles or ASTRO® 25 RF sites to analog or IMBE format for routing to analog or digital 3600 RF sites.
- System management
  - Converts 3600 site faults and diagnostics to enable management of the 3600 sites by the ASTRO® 25 network fault management system. It reports 3600 site states and faults to the fault manager using Simple Network Management Protocol version 3 (SNMPv3).

The SmartX Site Converter is based on the Voice Processor Module (VPM) hardware platform. Specialized software allows the VPM to perform the tasks required for SmartX Site Converter operation.

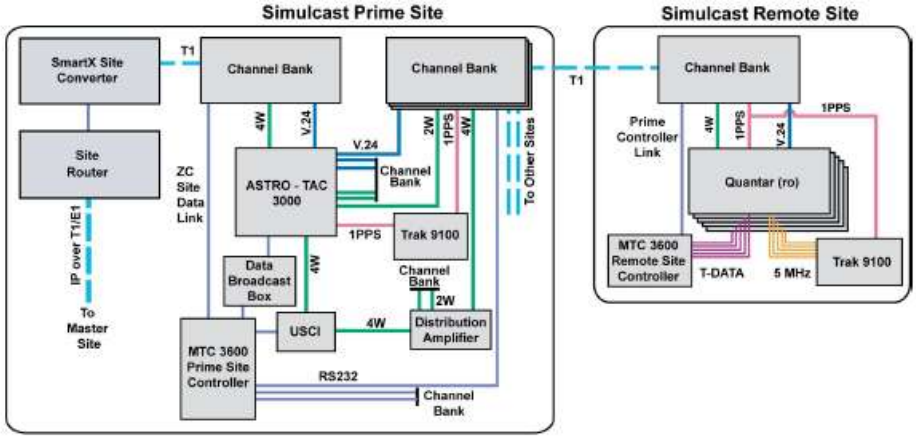


Figure 2-52: Circuit based simulcast system with SmartX site converter

Call types supported

The SmartX Site Converter supports the following types of calls for sites connected to an ASTRO® 25 system:

- Talkgroup Call (clear)
- Talkgroup Call utilizing message trunking with PTT ID
- Talkgroup Call utilizing transmission trunking
- Talkgroup Call (ASTRO® 25) encrypted
- Emergency Call
- Emergency Alarm
- Multigroup Call
- Supergroup Call
- Priority Monitor (Scan)
- Enhanced Private Call
- Call Alert
- Console Priority
- Busy/Callback
- AllStart/Faststart Call Set-up

Section 3. Functional Acceptance Test Plan

City of Durham, NC

ASTRO P25 Master with SmartX

In-Field Draft

Table of Contents

3.1 3600 Sites on ASTRO 7.X (SmartX)

3.1.1 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 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
RADIO-3 - TALKGROUP 2
RADIO-4 - TALKGROUP 2

VERSION #1.150

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____

3.1.2 Unified Network Configurator (UNC) Device Management - SmartX Channel Parameter

1. DESCRIPTION

The Unified Network Configurator (UNC) allows users to perform various functions on the system. This test will cover the modification of a parameter on a device.

SETUP

No prior setup is required.

VERSION #1.040

2. TEST

Step 1. On a Network Management client, double-click the UNC Wizard (UNCW) shortcut on the desktop, and a UNC Wizard client session will launch. When prompted, use the Login dialog box to login to the UNC Wizard using the appropriate username and password.

Step 2. Using the UNC Wizard , select a channel from a Trunked 3600 Site to update.

Step 3. The following fields will appear in the UNC Wizard page, Line Interface-Digital, Slot number-Digital, Line Interface Analog, and Slot number-Analog.

Step 4. Make a change to one of the fields using the UNC Wizard.

Step 5. On a Network Management client, double-click the UNC shortcut (UNC) on the desktop, and a VoyenceControl client session will launch. When prompted, use the Login dialog box to login to the UNC using the appropriate username and password.

Step 6. Start a UNC client session and open the Schedule Manager. Configuration remedy jobs are immediately added to the Schedule Manager with a status of Pending for all affected target devices.

Step 7. Highlight the pending jobs related to this update, and approve the remedy jobs in the Schedule Manager. The remedy jobs will then indicate a status of running in the Schedule Manager. Refresh the Schedule Manager view until the jobs are completed.

Step 8. View the configuration data for the device and verify that the change made in the wizard has been updated in the devices current configuration.

Step 9. Repeat the procedure to place the parameter for the channel back to the initial value.

Pass____ Fail____

3.1.3 Unified Network Configurator Discovery of SmartX Converter

1. DESCRIPTION

The Unified Network Configurator (UNC) will have the ability to manage devices on the legacy 3600 Trunked Site attached to the ASTRO system. By using the Unified Network Configurator Wizard (UNCW) to initially discover the site, devices can then be managed using the UNC. This test will demonstrate the UNCW process for discovering the 3600 Trunking Site.

SETUP

The site being discovered must be configured and be ready for discovery.

VERSION #1.040

2. TEST

Step 1. If not logged into the Unified Network Configurator Wizard, select the shortcut for the application and log in using the appropriate username and password.

Step 2. From the list of available tasks on the left side of the screen, select Subnet Discovery. The right side of the page will refresh presenting the fields required in order to discover devices.

Step 3. Select the discovery type by clicking on the Discovery Type drop down list. Then select the appropriate site type. With the selection made in the drop down list the fields needing information will be made available on the rest of the page.

Step 4. Complete the required fields with the appropriate information for the site being discovered.

Step 5. Select "Submit"

Step 6. Log into the Unified Network Configurator by using the appropriate user name and password. From the "Tools" menu select "Schedule Manager".

Step 7. In the Schedule Manager view select the refresh icon and verify the job for the site discovery is running. The discovery time varies with the site type and devices to be dicovered. Verify that the discovery job completes by refreshing the Schedule Manager screen.

Step 8. Once the job has completed, verify the site is available to be managed in the Unified Network Configurator screen.

Pass____ Fail____

3.2 Wide Area Trunking Features

3.2.1 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 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
RADIO-3 - TALKGROUP 2
RADIO-4 - TALKGROUP 2

VERSION #1.150

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____

3.2.2 Talkgroup Call - Mixed 3600 Trunking Site

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 - TALKGROUP 1
RADIO-1 - SITE - XSITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - Cole Mill
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - XSITE 1
RADIO-4 - TALKGROUP 2
RADIO-4 - SITE - Cole Mill
CONSOLE-1 - TALKGROUP 1, TALKGROUP 2
CONSOLE-2 - TALKGROUP 1, TALKGROUP 2
(TALKGROUP 1 is analog talkgroup, TALKGROUP 2 is digital talkgroup on XCamden and XCamden is the 3600 Trunking Site on the ASTRO system)

VERSION #1.050

2. TEST

Step 1. Initiate a Wide Area Call with RADIO-1 in TALKGROUP 1.

Step 2. Observe that RADIO-2, CONSOLE-1 and CONSOLE-2 can monitor and respond appropriately to the call.

Step 3. Initiate a Wide Area Call with RADIO-3 in TALKGROUP 2.

Step 4. Observe that RADIO-4, CONSOLE-1 and CONSOLE-2 can monitor and respond appropriately to the call.

Pass____ Fail____

3.3 System Management Tests

3.3.1 ZoneWatch

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 - Camden
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - Cole Mill
RADIO-3 - TALKGROUP 1
RADIO-3 - SITE - Lake Michie
RADIO-4 - TALKGROUP 1
RADIO-4 - SITE - Parkwood

VERSION #1.080

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____

3.3.2 UEM - Views

1. DESCRIPTION

The Unified Event Manager (UEM) provides three different views. The purpose of this test is to validate the views available from the UEM.

SETUP

NMclient01 - UEM session up and running.

VERSION #1.080

2. TEST

Step 1. The first view is the Active Alarms. In the navigation pane expand Fault Management and select Alarms.

Step 2. Customize the Active Alarms display by selecting the Edit option from the menu bar, then select Search.

Step 3. Perform a Managed Resource search for channels, site controllers and routers by entering "Starts with" and ch, sc, and z00 respectively in the search fields to perform the three separate searches.

Step 4. For each of the three searches a filtered alarm view is displayed that contains alarms for the appropriate device in the search.

Step 5. The second view is the Physical Summary view. In the navigation pane, expand Zone Maps and select Physical Summary. The Physical Summary View provides an aggregated alarm severity status of the devices located at all subnets in the Zone.

Step 6. The third view is the Service Summary. In the navigation pane, under Zone Maps select Service Summary. The Service Summary View provides a quick summary of the service status of sites in a Zone.

Step 7. In the main UEM window is an Alarm Summary View pane. In the Alarm Summary View, select the format for the desired view, pie, tabular or bar.

Pass____ Fail____

3.4 MCC 7500 Trunked Resources

3.4.1 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.

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 #1.060

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____

3.4.2 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 #1.120

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____

3.4.3 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 #1.060

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____

3.4.4 Instant Recall Recorder (IRR) Operation on the MCC 7500

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 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

CONSOLE-1 - TALKGROUP 1 running IRR application.

VERSION #1.010

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 two portables.

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____

3.4.5 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 #1.090

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____

3.4.6 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 #1.070

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____

3.4.7 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 #1.030

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____

3.4.8 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 #1.120

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____

3.4.9 Tone Paging - Conventional

1. DESCRIPTION

This test verifies that an MCC7500 console using a Conventional channel is able to transmit tone pages without using an external paging tone generator. This test can be run using Digital Conventional, Mixed Mode or MDC1200 Channels.

SETUP

RADIO-1 - SITE 1 - CONVCH 1

CONSOLE-1 - CONVCH 1

VERSION #1.030

2. TEST

Step 1. From CONSOLE-1 create a paging queue containing paging tones.

Step 2. From CONSOLE-1 start the pages on - CONVCH 1

Step 3. Verify that the tones are transmitted and received in on CONVENTIONAL CHANNEL 1.

Pass____ Fail____

3.5 Signoff Certificate

By their signatures below, the following witnesses certify they have observed the system Acceptance Test Procedures.

Signatures

WITNESS: _____Date: _____

Please Print Name: _____ _____

Please Print Title: _____

WITNESS: _____Date: _____

Please Print Name: _____ _____

Please Print Title: _____

WITNESS: _____Date: _____

Please Print Name: _____ _____

Please Print Title: _____

Section 4. Statement of Work

4.1 Introduction

This Statement of Work (SOW) describes the deliverables to be furnished to the City of Durham, North Carolina and the tasks to be performed by Motorola, its subcontractors, and by the City of Durham in order to implement the SmartZone 4.1 Simulcast radio system to a Motorola ASTRO P25 simulcast system platform detailed below. This SOW provides the most current understanding of the work required by both parties to ensure a successful project implementation.

It is understood that this SOW may be revised during contract negotiations or during the Contract Design Review (CDR), and through any other Change Orders that may occur during the execution of the project. If there are changes to the Scope of Work, those changes must be reflected in this SOW before becoming binding on either party. This SOW will be an Exhibit to the Contract negotiated between Motorola and the City of Durham. After contract execution, changes to the SOW must be made through the formal contract Change Order process as set forth in the Contract.

PHASE ONE

Zone Master Site

- A new ASTRO P25 Master Site will be supplied and installed. This site will consist of a fully functional P25 Master Core and will support the SmartX interface for the existing simulcast system during the upgrade migration. This Master Site will also support the MCC7500 P25 dispatch consoles to be installed in phase one.

911 Communications Dispatch Consoles

- The consoles currently in use at all 911 dispatch centers will be replaced with MCC7500 console systems. These console systems will be connected to the new Zone P25 Master Site using the existing City of Durham Microwave Radio Network.

Simulcast System using SmartX

- Upon replacement of the City of Durham dispatch consoles the simulcast radio system will be integrated into the P25 Zone Master Site using Motorola SmartX technology. The SmartX Site Converter focuses on the initial infrastructure upgrade of the core Master Site to an ASTRO 25 IP core network. This will be followed in years two and three by Subscriber / RF Site migrations to full ASTRO 25 operation.

PHASE TWO

P25 migration, P25 RF Overlay

- During the second phase of the system upgrade the P25 Simulcast Prime Site infrastructure will be installed. This P25 prime site will be equipped to support the final 24 RF channel configuration of the Durham P25 Radio system.
- An RF site overlay consisting of twelve P25 RF channels at each of the City of Durham's four RF sites will be installed and made operational.

PHASE THREE

Completion of P25 System Upgrade

- During the final phase of the system upgrade the remaining subset of RF channels operational on the legacy SmartZone simulcast system will be replaced with P25 Simulcast RF channels. These channels will be integrated into the previously equipped P25 Simulcast Prime Site.
- The remaining radio users will migrate operations to the fully upgraded and fully equipped ASTRO P25 Simulcast System.

4.2 Contract

4.2.1 Contract Award (Milestone)

- The City of Durham and Motorola execute the contract; both parties receive all the necessary documentation.

4.2.2 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 City of Durham.

City of Durham Responsibilities

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

Completion Criteria

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

4.2.3 Project Kickoff

Motorola Responsibilities

- Conduct a project kickoff meeting during the Contract Design Review (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 City of Durham.
- Review the resource and scheduling requirements with the City of Durham.
- Review the Project Schedule with the City of Durham to address upcoming milestones and/or events.
- Review the teams' interactions (Motorola and the City of Durham), meetings, reports, milestone acceptance, and the City of Durham's participation in particular phases.

City of Durham Responsibilities

- Ensure the City of Durham's key project team participants attend the meeting.

Completion Criteria

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

4.3 Contract Design Review (CDR)

4.3.1 Review Contract Design

Motorola Responsibilities

- Meet with the City of Durham 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 City of Durham 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. (City of Durham is responsible for supplying links)

- Establish demarcation point (SUPPLIED BY THE MOTOROLA SYSTEM ENGINEER) to define the connection point between Motorola-supplied equipment and City of Durham-supplied link(s) and external interfaces. (City of Durham is responsible for supplying links)
- Determine each site's ability to accommodate proposed equipment based upon physical capacity.
- Prepare Site Evaluation Report that summarizes findings of above-described site evaluations.
- If applicable, test existing equipment with which Motorola equipment will interface.

City of Durham Responsibilities

- Ensure City of Durham's key project team participants attend the meeting.
- Make timely decisions according to the Project Schedule.
- Ensure all frequency licensing is in place or planned for.
  - As mandated by FCC, the City of Durham, 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

- Design documentation has been completed including updated System Description, Equipment List, system drawings, or other documents applicable to the project.
- Agreed upon deviations from the proposed system have been incorporated into the contract documents accordingly.
- 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.

4.3.2 Design Approval (Milestone)

- City of Durham executes a Design Approval milestone document.

4.4 Order Processing

4.4.1 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 City of Durham 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.

City of Durham Responsibilities

- Approve shipping location(s).
- Complete and provide Tax Certificate information verifying tax status of shipping location.

Completion Criteria

- Equipment list has been verified for correct model numbers, version, options, and delivery data.
- Trial validation is completed.
- Equipment order has bridged to the manufacturing facility.

4.5 Manufacturing and Staging

4.5.1 Manufacture Motorola Fixed Network Equipment

Motorola Responsibilities

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

City of Durham Responsibilities

- None.

Completion Criteria

- FNE shipped to the field and/or staging facility.

4.5.2 Manufacture Non-Motorola Equipment

Motorola Responsibilities

- Manufacture (third party equipment suppliers) non-Motorola equipment necessary for the system based on equipment order.

City of Durham Responsibilities

- None.

Completion Criteria

- Non-Motorola manufactured equipment is shipped to the field and/or the staging facility.

4.5.3 Ship to Staging (Milestone)

- All equipment needed for staging is shipped to Motorola's factory staging facility (CCSi).

4.5.4 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.
- Inventory the equipment with serial numbers and installation references.
- Complete system documentation.
- Provide a Factory Acceptance Test Plan.
- Third party subsystems may be staged at the manufacturer's facilities and integrated in the field.

City of Durham 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 has been completed and the system is ready for testing.

4.5.5 Perform Staging Acceptance Test Procedure

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 City of Durham-witnessed tests based upon Factory Acceptance Test Plan. (when required)

City of Durham Responsibilities

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

Completion Criteria

- Factory Acceptance Testing is completed and approved by City of Durham.

4.5.6 Ship Equipment to Field

Motorola Responsibilities

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

City of Durham Responsibilities

- None.

Completion Criteria

- Equipment is ready for shipment to the field.

4.5.7 CCSi Ship Acceptance (Milestone)

- All equipment is shipped to the field.

4.6 Civil Work

4.6.1 Site Development at Camden Ave Site

Installation of transmit and receive antennas for 12 new channels installed in existing shelter.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.
- Existing tower to be used for antennas – 480 ' Guyed Tower.

Motorola Will:

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).

- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility "may have a significant environmental impact" and thus require additional documentation, submittals, or work.
- Perform four point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. The structural analysis does not include mapping, structural measurement survey, materials testing, geotechnical investigation, and/or other field investigation to acquire the data. If the tower structure fails the analysis, the cost of any site relocation or modifications to the tower required to support the antenna system will be the responsibility of Durham.
- Provide tower climbing and tower mapping services for towers up to 350 feet to collect information about structural members and existing equipment.
- Research permit requirements (building, utility, and construction) for the construction of the proposed site, and determine if the permits are required. If a permit is required, Motorola shall obtain the necessary permit forms and complete the necessary information on behalf of the City of Durham.
- Submit the completed application forms to the local jurisdiction and apply for applicable permits.

Site Preparation

- Provide one-time mobilization costs for the construction crews. Any remobilization due to interruptions/delays that are out of Motorola's control will result in additional costs.

Antenna and Transmission Line Installation

- Install 3 antenna(s) for the RF system.
- Install 1 GPS antenna(s).
- Install 1 tower top amplifier(s).
- Install up to 550 linear feet of 1/2-inch transmission line.
- Install up to 550 linear feet of 7/8-inch transmission line.
- Install up to 1100 linear feet of 1-5/8-inch transmission line.
- Perform sweep tests on transmission lines.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work

- Install 4 each 8-outlet distribution-bar(s) and wire each outlet to individual breaker.

Miscellaneous Work

- Remove old antennas and lines from tower and transport to legal dump.

Site Development at Lake Michie Site

- Installation of transmit and receive antennas for 12 new channels installed in existing shelter.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.
- Existing tower to be used for antennas – 380 ' Guyed Tower.

Motorola Will:

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility "may have a significant environmental impact" and thus require additional documentation, submittals, or work.
- Perform four point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. The structural analysis does not include mapping, structural measurement survey, materials testing, geotechnical investigation, and/or other field investigation to acquire the data. If the tower structure fails the analysis, the cost of any site relocation or modifications to the tower required to support the antenna system will be the responsibility of Durham.
- Provide tower climbing and tower mapping services for towers up to 350 feet to collect information about structural members and existing equipment.
- Research permit requirements (building, utility, and construction) for the construction of the proposed site, and determine if the permits are required. If a permit is required, Motorola shall obtain the necessary permit forms and complete the necessary information on behalf of the City of Durham.
- Submit the completed application forms to the local jurisdiction and apply for applicable permits.

Site Preparation

- Provide one-time mobilization costs for the construction crews. Any remobilization due to interruptions/delays that are out of Motorola's control will result in additional costs.

Antenna and Transmission Line Installation

- Install 3 antenna(s) for the RF system.
- Install 1 GPS antenna(s).
- Install 1 tower top amplifier(s).
- Install up to 420 linear feet of 1/2-inch transmission line.
- Install up to 420 linear feet of 7/8-inch transmission line.
- Install up to 840 linear feet of 1-5/8-inch transmission line.
- Perform sweep tests on transmission lines.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work

- Install 1 8-outlet distribution-bar(s) and wire each outlet to individual breaker.

Miscellaneous Work

- Remove old antennas and lines from tower and transport to legal dump.

4.6.2 Site Development at Cole Mill Road Site

- Installation of transmit and receive antennas for 12 new channels installed in existing shelter.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.
- Existing tower to be used for antennas – 150 ' Monopole.

Motorola Will:

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed

communication facility "may have a significant environmental impact" and thus require additional documentation, submittals, or work.

- Perform four point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. The structural analysis does not include mapping, structural measurement survey, materials testing, geotechnical investigation, and/or other field investigation to acquire the data. If the tower structure fails the analysis, the cost of any site relocation or modifications to the tower required to support the antenna system will be the responsibility of Durham.
- Provide tower climbing and tower mapping services for towers up to 350 feet to collect information about structural members and existing equipment.
- Research permit requirements (building, utility, and construction) for the construction of the proposed site, and determine if the permits are required. If a permit is required, Motorola shall obtain the necessary permit forms and complete the necessary information on behalf of the City of Durham.
- Submit the completed application forms to the local jurisdiction and apply for applicable permits.

Site Preparation

- Provide one-time mobilization costs for the construction crews. Any remobilization due to interruptions/delays that are out of Motorola's control will result in additional costs.

Antenna and Transmission Line Installation

- Install 3 antenna(s) for the RF system.
- Install 1 GPS antenna(s).
- Install 1 tower top amplifier(s).
- Install up to 200 linear feet of 1/2-inch transmission line.
- Install up to 200 linear feet of 7/8-inch transmission line.
- Install up to 400 linear feet of 1-5/8-inch transmission line.
- Perform sweep tests on transmission lines.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work

- Install 1 8-outlet distribution-bar(s) and wire each outlet to individual breaker.

Miscellaneous Work

- Remove old antennas and lines from monopole and transport to legal dump.

4.6.3 Site Development at Parkwood Site

- Installation of transmit and receive antennas for 12 new channels installed in existing shelter.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.
- Existing tower to be used for antennas – 350 ' Self supported Tower.

Motorola Will:

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility "may have a significant environmental impact" and thus require additional documentation, submittals, or work.
- Perform four point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. The structural analysis does not include mapping, structural measurement survey, materials testing, geotechnical investigation, and/or other field investigation to acquire the data. If the tower structure fails the analysis, the cost of any site relocation or modifications to the tower required to support the antenna system will be the responsibility of Durham.
- Provide tower climbing and tower mapping services for towers up to 350 feet to collect information about structural members and existing equipment.
- Research permit requirements (building, utility, and construction) for the construction of the proposed site, and determine if the permits are required. If a permit is required, Motorola shall obtain the necessary permit forms and complete the necessary information on behalf of the City of Durham.
- Submit the completed application forms to the local jurisdiction and apply for applicable permits.

Site Preparation

- Provide one-time mobilization costs for the construction crews. Any remobilization due to interruptions/delays that are out of Motorola's control will result in additional costs.

Antenna and Transmission Line Installation

- Install 3 antenna(s) for the RF system.
- Install 1 GPS antenna(s).

- Install 1 tower top amplifier(s).
- Install up to 400 linear feet of 1/2-inch transmission line.
- Install up to 400 linear feet of 7/8-inch transmission line.
- Install up to 800 linear feet of 1-5/8-inch transmission line.
- Perform sweep tests on transmission lines.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work

- Install 1 8-outlet distribution-bar(s) and wire each outlet to individual breaker.

Miscellaneous Work

- Remove old antennas and lines from tower and transport to legal dump.

City of Durham Will:

- If required, prepare and submit EME plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines. [Note: Should the City of Durham desire guidance with this task, Motorola is able to recommend resources. Additionally, Appendix A of Motorola's Standards and Guidelines for Communication Sites (R56) discusses Electromagnetic Energy and provides a basic methodology for structuring an FCC compliant program. If the City of Durham does not have a copy of Motorola's Standards and Guidelines for Communication Sites (R56) v 2005, one will be provided.]
- As applicable, coordinate, prepare, submit, and pay for all required permits and inspections for the work that is the City of Durham's responsibility.
- Review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the City of Durham shall review and approve the re-submitted plans within 7 calendar days from the date of submittal.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- Secure clear and unencumbered title, MOU, or Lease Agreement with the property owner.
- Provide property deed or lease agreement, and boundary survey, along with existing as-built drawings of the site and site components to Motorola for conducting site engineering.
- Provide a right of entry letter from the site owner for Motorola to conduct field investigations.
- Provide clear and stable access road to the site for heavy-duty construction vehicles, cement trucks and cranes. Sufficient space must be available at the site for these vehicles to maneuver under their own power, without assistance from other equipment.
- Arrange for space on the structure for installation of new antennas at the proposed heights on designated existing antenna-mounting structures.

- Provide as-built structural and foundation drawings of the structure and site location(s) along with geotechnical report(s) for Motorola to conduct a structural analysis.
- Provide support facilities for the antenna cables (cable ladder, entry ports, waveguide bridge) from the antenna to the equipment room.
- Pay for any upgrade of the antenna support structure necessary to accommodate the new antennas.
- Provide space, HVAC, backup power (UPS, generator), outlets, grounding, surge suppression, lighting, fire suppression and cabling facilities for the equipment room per Motorola's R56 specifications. Ceiling and cable tray heights in the equipment rooms should be such as to accommodate 7-1/2-foot equipment racks, and the ceiling should be 9 feet or greater.
- Confirm that there is adequate utility service to support the new equipment and ancillary equipment.
- Confirm that the existing generator is sufficient to support the new equipment and ancillary equipment loads.
- If required, remove or relocate any existing facilities, equipment, and utilities to create space for new site facilities and equipment.
- If required, provide any physical improvements (walls, roofing, flooring, painting, etc.) necessary to house the equipment in the existing room.
- Upgrade the existing grounding and transient voltage suppression systems to Motorola's current R56 Standards, and supply a single point system ground, of ten (10) ohms or less, to be used on all fixed equipment supplied under this proposal. Supply a grounding tie point within ten (10) feet of the-Motorola-supplied equipment.
- Supply required standby generator power to support the additional proposed equipment. This power source shall be adequate to back up all radio equipment, future equipment growth, and ancillary equipment such as, but not limited to, interior lighting, tower lighting and HVAC.
- Supply required UPS Power to support the additional proposed equipment. This uninterruptible power source shall be adequate to back-up all radio equipment as well as future equipment growth.
- Provide support and entry facilities for the cables (cable ladder/chaseway, entry ports, etc.) between the proposed equipment locations.
- Secure power connection to the room, associated permitting, and installation of a meter and disconnect within 50 feet of the proposed shelter location.
- Provide properly sized electrical panel with breakers to wire ESS cabinet distribution.

Assumptions:

- No prevailing wage, certified payroll, mandatory union workers or mandatory minority workers are required for this work
- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- Site has adequate electrical service for the new shelter and tower. Utility transformer, transformer upgrades, line, or pole extensions have not been included.

- Pricing has been based on National codes such IBC or BOCA. Local codes or jurisdictional requirements have not been considered in this proposal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety.
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate. Additional landscaping or aesthetic improvements (decorative fencing, stealth towers, etc.) have not been included in this proposal.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.
- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola's R56 standards.
- The existing utility service and backup power facilities (UPS, generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The City of Durham does not desire upgrade of the existing site to meet Motorola's R56 standards.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.

Completion Criteria

- Site development completed and approved by Durham.

4.6.4 Site Development Complete

- All site development is completed and approved by the City of Durham.

4.6.5 Site Development Acceptance (Milestone)

- All site developments are completed and accepted by the City of Durham.

4.7 System Installation

4.7.1 Install Fixed Network Equipment

City of Durham Responsibilities

- Provide secure storage for the Motorola-provided equipment, at a location central to the sites. Motorola will coordinate the receipt of the equipment with the City of Durham's designated contact and inventory all equipment.
- Install system equipment as specified by the Equipment List, System Description, and system drawings.
- Provide Motorola with the subscriber information for input into the system database, for activation.
- Provide Motorola with database conversion assistance.
- Bond the supplied equipment to the site ground system in accordance with Motorola's Standards and Guidelines for Communication Sites (R56).
- Provide access to the sites as necessary.
- Remove/dispose/relocate existing equipment to a City designated location.

Completion Criteria

- Fixed Network Equipment installation completed and ready for optimization.

4.7.2 Fixed Network Equipment Installation Complete

- All fixed network equipment is installed and accepted by the City of Durham.

4.7.3 Console Installation

City of Durham Responsibilities

- Install consoles in the space provided by the City of Durham.
- Connect the City of Durham-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.
- Install a dedicated Local Area Network (LAN) at each dispatch center to connect the proposed console positions.
- Connect the appropriate equipment to the Durham-supplied ground system in accordance with Motorola's R56 Site Installation Standards. Perform the console programming based on the console templates approved by the City of Durham.

- For consoles not located at the master site, additional network link resources will be required, as identified in the network diagram provided by Motorola.
- Provide demarcation point located within 25 feet of the console interface.
- **The existing consoles that will be used as part of the trade-in promotional offer must be returned to Motorola, once the new Consoles have been installed**

Completion Criteria

- Console installation is complete.

4.7.4 Console Installation Complete

- Console installation is completed by the City of Durham.

4.7.5 System Installation Acceptance (Milestone)

- All equipment installations are completed and accepted by the City of Durham.

4.8 System Optimization

4.8.1 Optimize System FNE

Motorola Responsibilities

- 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.
- Optimize each subsystem.
- 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.
- Test and optimize the simulcast system.
- Integrate the consoles and RF sites into the system to ensure proper operation.
- Setup the consoles on the new radio system to perform the dispatching operation.

City of Durham 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.
- Instruct dispatchers on any temporary configurations for dispatching until cutover is complete.

Completion Criteria

- System FNE optimization is complete.

4.8.2 Link Verification

Motorola Responsibilities

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

City of Durham Responsibilities

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

Completion Criteria

- Link verification is successfully completed.

4.8.3 Optimization Complete

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

4.9 Training

4.9.1 Perform Training

Motorola Responsibilities

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

City of Durham Responsibilities

- Identify specific courses and number of participants to be trained.
- Schedule participants to attend training to comply with the project schedule.
- Provide training facilities as appropriate for the courses selected.
- Attend training classes.
- Comply with the pre-requisites in the Training Plan.

Completion Criteria

- All training classes are completed.

4.9.2 Training Complete

- All training classes are completed.

4.10 Audit and Acceptance Testing

4.10.1 Perform R56 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).

City of Durham Responsibilities

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

Completion Criteria

- All R56 audits completed successfully.

4.10.2 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 City of Durham) has completed the corrective action(s).
- Prepare documentation of component tests to be delivered as part of the final documentation package.

City of Durham Responsibilities

- Witness tests if desired.

Completion Criteria

- Equipment testing has been successfully completed.

4.10.3 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 City of Durham for review.
- Resolve any minor task failures before Final System Acceptance.

City of Durham Responsibilities

- Witness the functional testing.

Completion Criteria

- Functional testing has been successfully completed and approved by the City of Durham.

4.10.4 System Acceptance Test Procedures (Milestone)

- City of Durham approves the completion of all the required tests.

4.11 Finalize

4.11.1 Cutover

Motorola Responsibilities

- Motorola and the City of Durham develop the 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.

City of Durham 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 have been trained, ***prior to cutover*** and the Subscribers have been activated on the system.

Completion Criteria

- Successful migration has occurred from the existing system to the new system.

4.11.2 Resolve Punchlist

Motorola Responsibilities

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

City of Durham 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 have been resolved and approved by the City of Durham.

4.11.3 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.
- Provide additional information regarding post warranty support, included in the Warranty/Post Warranty section of this document.

City of Durham Responsibilities

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

Completion Criteria

- All service information has been delivered to and approved by the City of Durham.

4.11.4 Finalize Documentation

Motorola Responsibilities

- Provide an electronic as-built system manual on a Compact Disk (CD). The documentation will include the following:
  - System Level Diagram.
  - Site Block Diagrams.
  - Site Floor Plans.
  - Site Equipment Rack Configurations.
  - Antenna Network Drawings for RF Sites.
  - ATP Test Checklists.
  - Functional Acceptance Test Plan test sheets and results.
  - Equipment Inventory List.
  - Console Programming Template.

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

- Provide console operator manual at each dispatch center.

City of Durham Responsibilities

- Receive and approve all documentation provided by Motorola.

Completion Criteria

- All required documentation has been provided to and approved by the City of Durham.

4.11.5 Final Acceptance (Milestone)

- All deliverables are completed as contractually required.
- Final System Acceptance has been received from the City of Durham.

4.12 Project Administration

4.12.1 Project Status Meetings

Motorola Responsibilities

- Attend all project status meetings with the City of Durham, 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 City of Durham or Motorola.

City of Durham Responsibilities

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

Completion Criteria

- Meetings and submission of meeting minutes have been completed.

4.12.2 Progress Milestone Submittal

Motorola Responsibilities

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

City of Durham Responsibilities

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

Completion Criteria

- City of Durham approves of the Milestone Completion document(s).

4.13 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 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.

Section 5. Training

5.1 Overview

Motorola Solutions understands that the successful implementation and use of your communications system depends on effective training. We have developed a training proposal for Durham, NC to ensure a comprehensive understanding of the proposed ASTRO 25 system and all user equipment. We are leveraging over 75 years of training experience working with customers just like you to provide recommendations for your consideration. The training proposal detailed in the following pages incorporates customer feedback coupled with a best practices systematic approach to produce effective course delivery and content.

Our commitment to Durham, NC is to provide unsurpassed services that ensure the system operates efficiently for the life of the system, and in doing so, directly train your personnel to acquire a level of knowledge to utilize the system at its maximum potential.

Durham, NC personnel will gain in-depth understanding of the power of the new ASTRO 25 system through education and proficient daily use. Our high-quality training focuses attention on student needs. Training is complemented by our detailed documentation and available continuing education program.

We will collaborate with Durham, NC to develop a final customized training plan that fits your needs and assures that System Administrators, Maintenance Technicians and End Users are skilled in using the new ASTRO 25 system.

5.2 Training Approach

Our training solution delivers a combination of online training and field based instructor led training at Durham, NC locations using the operational equipment and classrooms. Motorola Solutions will employ knowledgeable and experienced instructors, well-designed courseware and integrated lab activities.

Training is based upon several key criteria:

- Course design is driven by an analysis of student needs and focuses on how-to rather than theory.
- Learning objectives are based upon what students need to accomplish on the job and focus on specific applications or components.
- Hands-on lab opportunities using Durham, NC specific job aids are incorporated into training to maximize the transfer of skills and the retention/reuse of information.

Our instructors bring invaluable experience and first-hand knowledge of public safety systems into their training approach. This experience and knowledge provides them a better understanding of and insight into the practical aspects of the role of Durham, NC Managers, Technicians and End Users. Each has a proven ability to communicate with novice as well as expert personnel – please check our instructor resumes and client references.

5.3 Courses Proposed

Motorola Solutions has identified the following course(s) that are necessary to achieve the training goals for Durham, NC. Course description files for the recommended courses are provided in the matrix below and/or in the training appendix. Class delivery for instructor-led courses in the field will be tailored for your system and features.

Specifically, our proposed training plan addresses the following categories as identified in your request for proposal:

- System Administrators
- Maintenance Technicians
- Console End Users

It is recommended that students bring their laptop computers for all System Administrator and Technician classes. One set of hard copy manuals will be provided for the class. Students will receive their manuals in CD-ROM format and hard copy participant guides.

System Administrator						
Course	**Target Audience**	**No. of Sessions**	**Duration (days)**	**Location**	**Date**	**No. of Attendees**
ASTRO 25 IV&D 7.x Trunking with M Core System Overview Part 1 of 3 (Self-Paced Online)	System Managers and Technicians	NA	6-12 Hours	Online	Prior to Part 2	Up to 12
Course Synopsis: The ASTRO 25 Integrated Voice and Data System Overview course is intended to provide an overview of the ASTRO 25 System in order to familiarize the various audiences with the overall system capabilities, components, features, and benefits.						
ASTRO 25 IV&D 7.x Introduction to Radio System Management Applications Part 2 of 3 (Self-Paced Online)	System Managers and Technicians	NA	6-12 Hours	Online	Prior to Part 3	Up to 12
Course Synopsis: This course provides an introduction to the Motorola Solutions Radio System Management Applications. This course is a Prerequisite to Radio System Administrator.						
ASTRO 25 IV&D 7.x Radio System Administrator Workshop Part 3 of 3 (Instructor Led)	System Managers	1	5	Durham, NC	Post Installation and Prior to Managing	Up to 12
Course Synopsis: This workshop covers management functions for an ASTRO 25 Integrated Voice and Data (IV&D) System. Learning activities in this document-based training course focus on how to use the different ASTRO 25 IV&D System Management applications. Participants will be provided with an opportunity to discuss how to structure their organization and personnel for optimal ASTRO 25 IV&D system use..						

System Administrator

Course	Target Audience	No. of Sessions	Duration (days)	Location	Date	No. of Attendees
ASTRO 25 IV&D Trunked System – Interfacing to SmartZone 3600 Systems with SmartX (Self-Paced Online)	System Managers and Technicians	NA	4 hours	Online	Prior to Managing	Up to 12
Course Synopsis: The ASTRO® 25 Integrated Voice and Data (IV&D) — SmartX Site Converter is designed to allow communication between subscriber radios at existing 3600 RF sites and an ASTRO 25 IV&D system. It is based on the Voice Processor Module hardware platform and enables the continued use of 3600 RF sites and subscriber radios with the release of ASTRO 25 7.7 or higher. .						

Technician Maintenance Training

Course	Target Audience	No. of Sessions	Duration (days)	Location	Date	No. of Attendees
ASTRO 25 IV&D 7.x M Core Workshop (Instructor-led)	Master Site Technicians	1	5	Durham, NC	Prior to Maintaining	Up to 12
Course Synopsis: This workshop teaches advanced troubleshooting skills and best practices for the ASTRO 25 Integrated Voice and Data System Release 7.x. The workshop focuses on gathering and analyzing system information to implement the appropriate actions that return a system to full operational status.						
ASTRO 25 7.x IV&D IP Based Digital Simulcast with GTR8000 Repeater Workshop (Instructor-led)	Simulcast and Remote Site Technicians	1	5	Durham, NC	Prior to Maintaining	Up to 12
IP Simulcast Course Synopsis: This workshop describes the components in the ASTRO 25 Integrated Voice and Data System Digital Simulcast subsystem. This course presents how the Simulcast subsystem operates and explains the tools and methods available for troubleshooting components within the Simulcast subsystem.						
GTR8000 Course Synopsis: This workshop describes the components in the ASTRO 25 Integrated Voice and Data System GTR 8000 site subsystem. This course presents how the GTR 8000 site subsystem operates and explains the tools and methods available for troubleshooting components within the repeater site subsystem.						
MCC7500 Dispatch Console (Instructor-led)	Console Technicians	1	4	Durham, NC	Prior to Maintaining	Up to 12
Course Synopsis: This course familiarizes technicians in troubleshooting/repair functions, operating procedures, and hardware/software applications for the MCC 7500 console. The focus is on a detailed discussion of console hardware and hands-on activities with the installation and configuration of the MCC 7500 console.						

Console End User Training

Course	Target Audience	No. of Sessions	Duration (days)	Location	Date	No. of Attendees
MCC7500 Console Operator Upgrade Differences **Train-the-Trainers** (Instructor-led) 4 training consoles (2x1 Ratio) Prerequisite: Proficient on CENTRACOM Gold Elites	Console Trainers	2 (4 hr sessions)	1	Durham, NC	Prior to Cut-over	16 (8 per)

Course Synopsis:

Focusing on the differences after the upgrade, this course provides participants with an introduction to the dispatch console, its basic operation and tailored job aids which will be available for assistance in operation. Through facilitation and hands-on activities, the user learns how to perform common tasks associated with the console operation. It also provides the customer's identified training personnel with the knowledge of, and practice applying training techniques that they will need to enable them to successfully train their students. Trainers will use video, facilitation, and hands-on activities to facilitate learning events supported by tailored or customized training materials and job aids. They will become proficient at discussing the common tasks associated with operation of the customer's consoles.

Section 6. Warranty and Maintenance

6.1 Introduction

Motorola provides an integrated total support plan for service, support, and repair of the City of Durham ASTRO 25 communications network. Our comprehensive support services can help reduce your total cost of ownership and ensure service availability while helping you cost-effectively deliver new network capabilities. The services described in this section are designed to provide complete support of the network and ensure optimal efficiency, security, and reliability of your investment.

6.2 Warranty Services

Our standard warranty program consist of a one-year parts and labor warranty from the date of system acceptance of the *new* equipment included in this proposal (**Error! Reference source not found.**). Coverage for existing equipment will remain on the current maintenance support agreement. Local onsite support and preventative maintenance will be provided by the City of Durham.

Table 6-1: Standard one-year warranty services overview

Warranty Service	Year 1
Dispatch Service	✓
Technical Support	✓
Network Monitoring Service	✓
Security Monitoring Service	✓
Security Update Service	✓
Infrastructure Repair Service with Advanced Replacement	✓

6.2.1 Dispatch Service

The System Support Center (SSC) is the single point of contact for all service issues. With Dispatch Service, one phone call to the SSC and the system response and restoration process begins immediately (**Error! Reference source not found.**). Dispatch maintains contact with the local, onsite servicer as they diagnose and restore the communications network. Once a technician addresses the issue, the SSC verifies resolution and, with City approval, closes the case. Activity records are also available to provide comprehensive history of site performance, issues, and resolutions.

Figure 6-1: One call does it all, does it fast, and does it right

6.2.2 Technical Support

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. The SSC delivers Technical Support 24 hours per day, 365 days a year. Our SSC technologists specialize 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. SSC technologists monitor Technical Support cases continuously against stringent inbound call management and case management standards to ensure rapid and consistent issue resolution. Technical Support service translates into measurable, City-specific metrics for assured network performance and system availability.

6.2.3 Network Monitoring Service

Network Monitoring Service can help keep your network at optimum availability so it is ready to serve mission-critical communications needs. By watching over the network continuously, Network Monitoring Service takes action whenever needed, and resolves network problems. We often intervene and correct the problem before you even know a problem exists. Network Monitoring Service provides improved productivity and enhanced network performance, which in turn helps to increase your technology return-on-investment.

Using a combination of network monitoring software, automated alerts, and remote diagnostics inquiries, our SSC 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, a local field technician is dispatched immediately to your site to achieve restoration.

Network Monitoring service is a vital component of an intelligent communication support plan that keeps your business operating smoothly, your costs down, and assures maximum preparedness at all times.

6.2.4 Security Monitoring Service

Security elements such as anti-virus, firewalls, and Intrusion Detection Systems (IDS) are a good first step, but they are not enough to secure your network. Radio network operators must take additional steps to reduce vulnerabilities to potential attack and protect critical radio network infrastructure. Our ASTRO 25 Security Monitoring Service is a complete solution that reduces the risk of network availability being impacted by a security threat. Specialized security analysts provide uninterrupted monitoring of the radio network security elements utilizing advanced correlation and visualization tools to detect, characterize, and respond to events that are specifically applicable to government and public safety radio networks (Figure 6-2). Our security analysts have direct and immediate access to Motorola engineers for rapid resolution. This level of service ensures the operational impact that security events may cause to your network are minimized or eliminated.

Figure 6-2: Protect your critical business assets

6.2.5 Security Update Service

Security Update Service (SUS) provides the latest releases of software security updates. 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. SUS 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.

After these patches have been pre-tested and certified by Motorola, an email notification is sent to customers upon availability of new updates with access to a Motorola secure extranet website that will enables customers to download the pre-tested, certified security updates when convenient. Deploying these pre-tested updates and patches as they become available assures preparedness against network performance interruptions due to security vulnerability, and electronic attack. Customers may also purchase the ability to have these pre-tested patches automatically deployed on their system.

6.2.6 Infrastructure Repair Service with Advanced Replacement

Infrastructure Repair with our Advanced Replacement upgrade supplements your spares inventory with our centralized inventory of critical equipment (Figure 6-3). In advance of Motorola repairing the malfunctioning unit, we send a replacement unit to you within 24 hours to ensure a spare unit is available. Upon receipt of the malfunctioning unit, Motorola repairs the unit and replaces it in our centralized inventory.

Figure 6-3: Reliable, timely network repair

6.3 Post Warranty Maintenance

6.3.1 Overview

As our continuing commitment to supporting your system, the post-warranty maintenance and support period will begin upon completion of the warranty year (Table 6-2). Post-warranty pricing includes the warranty year services described in subsection 6.2, plus the Software Upgrade Agreement II (SUAII) (Table 6-3). *Costs for six years of SUA II are included in the total System Package Price and covers three upgrades over the six year period.*

This full suite of services, along with the SUAII, provides support and maintenance of your system for optimal uptime and availability to all system users. These services are in addition to the base cost of the system and are customizable to meet your specific needs.

Table 6-2: Post-warranty support services overview

Post-Warranty Service	
Dispatch Service	✓
Network Monitoring	✓
Security Monitoring	✓
Security Update Service	✓
Technical Support	✓
Infrastructure Repair Service with Advanced Replacement	✓
Software Upgrade Agreement II	✓

6.3.2 Software Upgrade Agreement II

Modern LMR systems are specialized information technology (IT) networks that are a hybrid composition of commercial off-the-shelf (COTS) IT components, specialized radio frequency (RF) components and software designed to comply with standards-based specifications. To ensure the highest level of operation, allow for system expansion, provide maximum lifespan and protect the initial investment, regular update and replacement of individual software and hardware components is required.

SUAII is comprehensive approach to technology refreshment of the ASTRO 25 system aligned with the Motorola lifecycle roadmap. SUAII is a complete package of hardware, software and implementation services required to update the ASTRO 25 system every two years to a level consistent the latest systems leaving the factory.

Updates to OEM components ensure availability of repair services support and may also provide increased capacity and processing speed. Regular updates enable system expansion (i.e. expansion of RF sites, dispatch positions, data subsystems, network management positions, etc.). Professional implementation services guarantee live system upgrades are performed with minimal interruption to system operation with minimal reliance on owner resources. SUAII ensures the ASTRO 25 system functions at the highest level of operation, allows for expansion and feature enhancement, and maximizes the lifespan of the investment. For owners that are committed to upgrading their system on a regular basis, SUAII provides a consistent budgeting solution that provides complete coverage.

Table 6-3: Post-Warranty Pricing

POST-WARRANTY MAINTENANCE	YEAR 2	YEAR 3	YEAR 4
Phase 1	$ 210,385	$ 216,697	$ 223,198
Phase 2		$ 64,523	$ 66,459
Phase 3			$ 42,710
TOTAL AFTER EACH PHASE	$ 210,385	$ 281,220	$ 332,367
**Software Upgrade Agreement II (SUAII) w/ labor & hardware	Included	Included	Included
Existing Equipment/Existing Maintenance Contract	$ 226,862	$ 105,556	$ 89,151
GRAND TOTAL WITH EXISTING MAINTENANCE PER PHASE	$ 437,247	$ 386,776	$421,518

***Costs for six (6) years of SUAII are included in the total System Package Price and covers three (3) upgrades.*

Post Warranty Maintenance covers infrastructure only. Subscribers, logging, transport and onsite labor are not included.

6.4 Summary

Motorola Support Services ensure peak network and operational performance by offering a diverse portfolio of scalable support services. Motorola has an extensive service organization to provide local, trained, and qualified service personnel to manage your communications network. Our Support Services focuses on performance, both technological and operational, to maximize the efficiency and security of your communications network. These services can help increase both the availability and the operating efficiency of your network, while effectively managing costs and ensuring the Safety of your employees and the citizens they protect (Figure 6-4).

Figure 6-4: We focus on our core competency so you can focus on yours

Our in-depth and first-hand knowledge of mobility communications processes, technologies, and integrated solutions is invaluable. We have more than 80 years of experience in designing, building, maintaining and managing large, complex mobile networks. Our 6,500 Motorola Services professionals and over 8,000 partners and certified subcontractors, have the support of a global network of research and development centers and test labs, as well as Motorola service and support centers at local, regional, and national levels. Few organizations claim to offer such a complete range of professional services within the communications industry. Even fewer are prepared to deliver.

Section 7. Pricing

7.1 Pricing Overview:

The City of Durham's Radio System Upgrade includes three phases with System Integration, Project Management, Training, Lifecycle Management, Engineering, and Warranty.

Phase I

(41) MCC7500 Console Positions, P25 Master Site, and Smart X Converter

Phase II

Simulcast Prime site and (48) P25 Stations at (4) sites with new antenna systems

Phase III

Final Phase to turn system over to P25 adding (48) Stations at (4) sites

Total Proposal Price (3 phases)	**$13,057, 311**
Motorola Incentives:	
Corporate Promotional Lease Rate	**0%**
Console and DIU trade-in	**($250,000)**
Customer Loyalty Discount	**($300,000)**
System Discount (3 Phases)	**($750,000)**
Investment	**$11,757, 311**
Sales Tax	**$640,433**
Total System Investment	**$12,397,744 ****

**** See pricing notes on the following page.**

(1) Motorola is offering a 0% interest rate that is valid until October 31, 2012. Motorola must receive a signed Lease Purchase Agreement, Communication System Agreement, and Purchase Order (if required by the City) on or before October 31, 2012 for this rate to apply. There will be three annual payments of $4,132,581.33, each with the first payment due one year from contract execution.

(2) The following system incentives are valid until November 22, 2012.

Console and DIU trade-in	**($250,000)**
Customer Loyalty Discount	**($300,000)**
System Discount (3 Phases)	**($750,000)**

7.2 Warranty

The terms and conditions of Motorola's Standard Commercial Warranty apply.

Motorola has priced the above sites, services and equipment quantities as a single system. Changes in sites, services and/or equipment quantities will result in an adjustment of the system discount, and may affect the overall system price.

LESSEE FACT SHEET

Please help Motorola Solutions, Inc. provide excellent billing service by providing the following information:

1. Complete **Billing** Address CITY OF DURHAM

_____

_____

Attention: _____

Phone: _____

2. Lessee County Location: _____

3. Federal Tax I.D. Number _____

4. Purchase Order Number to be referenced on invoice (if necessary) or other "descriptions" that may assist in determining the applicable cost center or department: _____

5. Equipment description that you would like to appear on your invoicing:_____

Appropriate Contact for Documentation / System Acceptance Follow-up:

6. Appropriate Contact & Mailing Address _____

_____

_____

_____

Phone: _____

Fax: _____

7. Payment remit to address: **Motorola Credit Corp.**
P.O. Box 71132
Chicago IL 60694-1132

Thank you

EQUIPMENT LEASE-PURCHASE AGREEMENT

Lease Number: 23337

LESSEE:	**LESSOR:**
CITY OF DURHAM 101 City Hall Plaza Durham NC 27701	Motorola Solutions, Inc. 1303 E. Algonquin Rd. Schaumburg, IL 60196

Lessor agrees to lease to Lessee and Lessee agrees to lease from Lessor, the Equipment described in any Schedule A now or hereafter attached hereto ("Equipment") in accordance with the following terms and conditions of this Equipment Lease-Purchase Agreement ("Lease").

1. TERM. This Lease will become effective upon the execution hereof by Lessor. The Term of this Lease will commence on date specified in Schedule A and unless terminated according to terms hereof or the purchase option, provided in Section 18, is exercised this Lease will continue until the Expiration Date set forth in Schedule B attached hereto ("Lease Term").

2. RENT. Lessee agrees to pay to Lessor or its assignee the Lease Payments (herein so called), including the interest portion, in the amounts specified in Schedule B. The Lease Payments will be payable without notice or demand at the office of the Lessor (or such other place as Lessor or its assignee may from time to time designate in writing), and will commence on the first Lease Payment Date as set forth in Schedule B and thereafter on each of the Lease Payment Dates set forth in Schedule B. Any payments received later than ten (10) days from the due date will bear interest at the highest lawful rate from the due date. Except as specifically provided in Section 5 hereof, the Lease Payments will be absolute and unconditional in all events and will not be subject to any set-off, defense, counterclaim, or recoupment for any reason whatsoever. Lessee reasonably believes that funds can be obtained sufficient to make all Lease Payments during the Lease Term and hereby covenants that it will do all things lawfully within its power to obtain, maintain and properly request and pursue funds from which the Lease Payments may be made, including making provisions for such payments to the extent necessary in each budget submitted for the purpose of obtaining funding, using its bona fide best efforts to have such portion of the budget approved and exhausting all available administrative reviews and appeals in the event such portion of the budget is not approved. It is Lessee's intent to make Lease Payments for the full Lease Term if funds are legally available therefor and in that regard Lessee represents that the Equipment will be used for one or more authorized governmental or proprietary functions essential to its proper, efficient and economic operation.

3. DELIVERY AND ACCEPTANCE. Lessor will cause the Equipment to be delivered to Lessee at the location specified in Schedule A ("Equipment Location"). Lessee will accept the Equipment as soon as it has been delivered and is operational. Lessee will evidence its acceptance of the Equipment by executing and delivering to Lessor a Delivery and Acceptance Certificate in the form provided by Lessor.

Even if Lessee has not executed and delivered to Lessor a Delivery and Acceptance Certificate, if Lessor believes the Equipment has been delivered and is operational, Lessor may require Lessee to notify Lessor in writing (within five (5) days of Lessee's receipt of Lessor's request) whether or not Lessee deems the Equipment (i) to have been delivered and (ii) to be operational, and hence be accepted by Lessee. If Lessee fails to so respond in such five (5) day period, Lessee will be deemed to have accepted the Equipment and be deemed to have acknowledged that the Equipment was delivered and is operational as if Lessee had in fact executed and delivered to Lessor a Delivery and Acceptance Certificate.

4. REPRESENTATIONS AND WARRANTIES. Lessor acknowledges that the Equipment leased hereunder is being manufactured and installed by Motorola Solutions, Inc. pursuant to contract (the "Contract") covering the Equipment. Lessee acknowledges that on or prior to the date of acceptance of the Equipment, Lessor intends to sell and assign Lessor's right, title and interest in and to this Agreement and the Equipment to an assignee ("Assignee"). LESSEE FURTHER ACKNOWLEDGES THAT EXCEPT AS EXPRESSLY SET FORTH IN THE CONTRACT, LESSOR MAKES NO EXPRESS OR IMPLIED WARRANTIES OF ANY NATURE OR KIND WHATSOEVER, AND AS BETWEEN LESSEE AND THE ASSIGNEE, THE PROPERTY SHALL BE ACCEPTED BY LESSEE "AS IS" AND "WITH ALL FAULTS". LESSEE AGREES TO SETTLE ALL CLAIMS DIRECTLY WITH LESSOR AND WILL NOT ASSERT OR SEEK TO ENFORCE ANY SUCH CLAIMS AGAINST THE ASSIGNEE. NEITHER LESSOR NOR THE ASSIGNEE SHALL BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL,

INCIDENTAL, OR CONSEQUENTIAL DAMAGES OF ANY CHARACTER AS A RESULT OF THE LEASE OF THE EQUIPMENT, INCLUDING WITHOUT LIMITATION, LOSS OF PROFITS, PROPERTY DAMAGE OR LOST PRODUCTION WHETHER SUFFERED BY LESSEE OR ANY THIRD PARTY.

Lessor is not responsible for, and shall not be liable to Lessee for damages relating to loss of value of the Equipment for any cause or situation (including, without limitation, governmental actions or regulations or actions of other third parties).

5. NON-APPROPRIATION OF FUNDS. Notwithstanding anything contained in this Lease to the contrary, in the event the funds appropriated by Lessee's governing body or otherwise available by any means whatsoever in any fiscal period of Lessee for Lease Payments or other amounts due under this Lease are insufficient therefor, this Lease shall terminate on the last day of the fiscal period for which appropriations were received without penalty or expense to Lessee of any kind whatsoever, except as to the portions of Lease Payments or other amounts herein agreed upon for which funds shall have been appropriated and budgeted or are otherwise available. The Lessee will immediately notify the Lessor or its Assignee of such occurrence. In the event of such termination, Lessee agrees to peaceably surrender possession of the Equipment to Lessor or its Assignee on the date of such termination, packed for shipment in accordance with manufacturer specifications and freight prepaid and insured to any location in the continental United States designated by Lessor. Lessor will have all legal and equitable rights and remedies to take possession of the Equipment. Notwithstanding the foregoing, Lessee agrees, to the extent not prohibited by law, that it will not cancel this Lease under the provisions of this Section if any funds are appropriated to it, or by it, for the acquisition, retention or operation of the Equipment for the fiscal period in which such termination occurs or the next succeeding fiscal period thereafter.

6. LESSEE CERTIFICATION. Lessee represents, covenants and warrants that: (i) Lessee is a state or a duly constituted political subdivision or agency of the state of the Equipment Location; (ii) the interest portion of the Lease Payments shall be excludable from Lessor's gross income pursuant to Section 103 of the Internal Revenue Code of 1986, as it may be amended from time to time (the "Code"); (iii) the execution, delivery and performance by the Lessee of this Lease have been duly authorized by all necessary action on the part of the Lessee; (iv) this Lease constitutes a legal, valid and binding obligation of the Lessee enforceable in accordance with its terms; (v) Lessee will comply with the information reporting requirements of Section 149(e) of the Code, and such compliance shall include but not be limited to the execution of information statements requested by Lessor; (vi) Lessee will not do or cause to be done any act which will cause, or by omission of any act allow, the Lease to be an arbitrage bond within the meaning of Section 148(a) of the Code; (vii) Lessee will not do or cause to be done any act which will cause, or by omission of any act allow, this Lease to be a private activity bond within the meaning of Section 141(a) of the Code; (viii) Lessee will not do or cause to be done any act which will cause, or by omission of any act allow, the interest portion of the Lease Payments to be or become includible in gross income for Federal income taxation purposes under the Code; and (ix) Lessee will be the only entity to own, use and operate the Equipment during the Lease Term.

Lessee represents, covenants and warrants that (i) it will do or cause to be done all things necessary to preserve and keep the Lease in full force and effect, (ii) it has complied with all public bidding and Bond Commission requirements (as defined in the Code) where necessary and by due notification presented this Lease for approval and adoption as a valid obligation on its part, and (iii) it has sufficient appropriations or other funds available to pay all amounts due hereunder for the current fiscal period.

If Lessee breaches the covenant contained in this Section, the interest component of Lease Payments may become includible in gross income of the owner or owners thereof for federal income tax purposes. In such event, notwithstanding anything to the contrary contained in Section 11 of this Agreement, Lessee agrees to pay promptly after any such determination of taxability and on each Lease Payment date thereafter to Lessor an additional amount determined by Lessor to compensate such owner or owners for the loss of such excludibility (including, without limitation, compensation relating to interest expense, penalties or additions to tax), which determination shall be conclusive (absent manifest error). Notwithstanding anything herein to the contrary, any additional amount payable by Lessee pursuant to this Section 6 shall be payable solely from Legally Available Funds.

It is Lessor's and Lessee's intention that this Agreement not constitute a "true" lease for federal income tax purposes and, therefore, it is Lessor's and Lessee's intention that Lessee be considered the owner of the Equipment for federal income tax purposes.

7. TITLE TO EQUIPMENT; SECURITY INTEREST. Upon shipment of the Equipment to Lessee hereunder, title to the Equipment will vest in Lessee; provided, however, that (i) in the event of termination of this Lease by Lessee pursuant to Section 5 hereof; (ii) upon the occurrence of an Event of Default hereunder, and as long as such Event of Default is continuing; or (iii) in the event that the purchase option has not been exercised prior to the Expiration Date, title will immediately vest in Lessor or its Assignee. In order to secure all of its

obligations hereunder, Lessee hereby (i) grants to Lessor a first and prior security interest in any and all right, title and interest of Lessee in the Equipment and in all additions, attachments, accessions, and substitutions thereto, and on any proceeds therefrom; (ii) agrees that this Lease may be filed as a financing statement evidencing such security interest; and (iii) agrees to execute and deliver all financing statements, certificates of title and other instruments necessary or appropriate to evidence such security interest.

8. USE; REPAIRS. Lessee will use the Equipment in a careful manner for the use contemplated by the manufacturer of the Equipment and shall comply with all laws, ordinances, insurance policies and regulations relating to, and will pay all costs, claims, damages, fees and charges arising out of the possession, use or maintenance of the Equipment. Lessee, at its expense will keep the Equipment in good repair and furnish all parts, mechanisms and devices required therefor.

9. ALTERATIONS. Lessee will not make any alterations, additions or improvements to the Equipment without Lessor's prior written consent unless such alterations, additions or improvements may be readily removed without damage to the Equipment.

10. LOCATION; INSPECTION. The Equipment will not be removed from, [or if the Equipment consists of rolling stock, its permanent base will not be changed from] the Equipment Location without Lessor's prior written consent which will not be unreasonably withheld. Lessor will be entitled to enter upon the Equipment Location or elsewhere during reasonable business hours to inspect the Equipment or observe its use and operation.

11. LIENS AND TAXES. Lessee shall keep the Equipment free and clear of all levies, liens and encumbrances except those created under this Lease. Lessee shall pay, when due, all charges and taxes (local, state and federal) which may now or hereafter be imposed upon the ownership, leasing, rental, sale, purchase, possession or use of the Equipment, excluding however, all taxes on or measured by Lessor's income. If Lessee fails to pay said charges and taxes when due, Lessor shall have the right, but shall not be obligated, to pay said charges and taxes. If Lessor pays any charges or taxes, Lessee shall reimburse Lessor therefor within ten days of written demand.

12. RISK OF LOSS: DAMAGE; DESTRUCTION. Lessee assumes all risk of loss or damage to the Equipment from any cause whatsoever, and no such loss of or damage to the Equipment nor defect therein nor unfitness or obsolescence thereof shall relieve Lessee of the obligation to make Lease Payments or to perform any other obligation under this Lease. In the event of damage to any item of Equipment, Lessee will immediately place the same in good repair with the proceeds of any insurance recovery applied to the cost of such repair. If Lessor determines that any item of Equipment is lost, stolen, destroyed or damaged beyond repair, Lessee at the option of Lessor will: either (a) replace the same with like equipment in good repair; or (b) on the next Lease Payment date, pay Lessor the sum of : (i) all amounts then owed by Lessee to Lessor under this Lease, including the Lease payment due on such date; and (ii) an amount equal to all remaining Lease Payments to be paid during the Lease Term as set forth in Schedule B.

In the event that Lessee is obligated to make such payment with respect to less than all of the Equipment, Lessor will provide Lessee with the pro rata amount of the Lease Payment and the Balance Payment (as set forth in Schedule B) to be made by Lessee with respect to that part of the Equipment which has suffered the Event of Loss.

13. INSURANCE. Lessee will, at its expense, maintain at all times during the Lease Term, fire and extended coverage, public liability and property damage insurance with respect to the Equipment in such amounts, covering such risks, and with such insurers as shall be satisfactory to Lessor, or, with Lessor's prior written consent, Lessee may self-insure against any or all such risks. All insurance covering loss of or damage to the Equipment shall be carried in an amount no less than the amount of the then applicable Balance Payment with respect to such Equipment. The initial amount of insurance required is set forth in Schedule B. Each insurance policy will name Lessee as an insured and Lessor or it's Assigns as an additional insured, and will contain a clause requiring the insurer to give Lessor at least thirty (30) days prior written notice of any alteration in the terms of such policy or the cancellation thereof. The proceeds of any such policies will be payable to Lessee and Lessor or it's Assigns as their interests may appear. Upon acceptance of the Equipment and upon each insurance renewal date, Lessee will deliver to Lessor a certificate evidencing such insurance. In the event that Lessee has been permitted to self-insure, Lessee will furnish Lessor with a letter or certificate to such effect. In the event of any loss, damage, injury or accident involving the Equipment, Lessee will promptly provide Lessor with written notice thereof and make available to Lessor all information and documentation relating thereto.

14. INDEMNIFICATION. Lessee shall, to the extent permitted by law, indemnify Lessor against, and hold Lessor harmless from, any and all claims, actions, proceedings, expenses, damages or liabilities, including attorneys' fees and court costs, arising in connection with the Equipment, including, but not limited to, its selection, purchase, delivery, possession, use, operation, rejection, or return and the recovery of claims under insurance policies thereon.

15. ASSIGNMENT. Without Lessor's prior written consent, Lessee will not either (i) assign, transfer, pledge, hypothecate, grant any security interest in or otherwise dispose of this Lease or the Equipment or any interest in this Lease or the Equipment or; (ii) sublet or lend the Equipment or permit it to be used by anyone other than Lessee or Lessee's employees. Lessor may assign its rights, title and interest in and to this Lease, the Equipment and any documents executed with respect to this Lease and/or grant or assign a security interest in this Lease and the Equipment, in whole or in part. Any such assignees shall have all of the rights of Lessor under this Lease. Subject to the foregoing, this Lease inures to the benefit of and is binding upon the heirs, executors, administrators, successors and assigns of the parties hereto.

Lessee covenants and agrees not to assert against the Assignee any claims or defenses by way of abatement, setoff, counterclaim, recoupment or the like which Lessee may have against Lessor. No assignment or reassignment of any Lessor's right, title or interest in this Lease or the Equipment shall be effective unless and until Lessee shall have received a notice of assignment, disclosing the name and address of each such assignee; provided, however, that if such assignment is made to a bank or trust company as paying or escrow agent for holders of certificates of participation in the Lease, it shall thereafter be sufficient that a copy of the agency agreement shall have been deposited with Lessee until Lessee shall have been advised that such agency agreement is no longer in effect. During the Lease Term Lessee shall keep a complete and accurate record of all such assignments in form necessary to comply with Section 149(a) of the Code, and the regulations, proposed or existing, from time to time promulgated thereunder. No further action will be required by Lessor or by Lessee to evidence the assignment, but Lessee will acknowledge such assignments in writing if so requested.

After notice of such assignment, Lessee shall name the Assignee as additional insured and loss payee in any insurance policies obtained or in force. Any Assignee of Lessor may reassign this Lease and its interest in the Equipment and the Lease Payments to any other person who, thereupon, shall be deemed to be Lessor's Assignee hereunder.

16. EVENT OF DEFAULT. The term "Event of Default", as used herein, means the occurrence of any one or more of the following events: (i) Lessee fails to make any Lease Payment (or any other payment) as it becomes due in accordance with the terms of the Lease, and any such failure continues for ten (10) days after the due date thereof; (ii) Lessee fails to perform or observe any other covenant, condition, or agreement to be performed or observed by it hereunder and such failure is not cured within twenty (20) days after written notice thereof by Lessor; (iii) the discovery by Lessor that any statement, representation, or warranty made by Lessee in this Lease or in writing ever delivered by Lessee pursuant hereto or in connection herewith is false, misleading or erroneous in any material respect; (iv) proceedings under any bankruptcy, insolvency, reorganization or similar legislation shall be instituted against or by Lessee, or a receiver or similar officer shall be appointed for Lessee or any of its property, and such proceedings or appointments shall not be vacated, or fully stayed, within twenty (20) days after the institution or occurrence thereof; or (v) an attachment, levy or execution is threatened or levied upon or against the Equipment.

17. REMEDIES. Upon the occurrence of an Event of Default, and as long as such Event of Default is continuing, Lessor may, at its option, exercise any one or more of the following remedies: (i) by written notice to Lessee, declare all amounts then due under the Lease, and all remaining Lease Payments due during the Fiscal Year in effect when the default occurs to be immediately due and payable, whereupon the same shall become immediately due and payable; (ii) by written notice to Lessee, request Lessee to (and Lessee agrees that it will), at Lessee's expense, promptly return the Equipment to Lessor in the manner set forth in Section 5 hereof, or Lessor, at its option, may enter upon the premises where the Equipment is located and take immediate possession of and remove the same; (iii) sell or lease the Equipment or sublease it for the account of Lessee, holding Lessee liable for all Lease Payments and other amounts due prior to the effective date of such selling, leasing or subleasing and for the difference between the purchase price, rental and other amounts paid by the purchaser, Lessee or sublessee pursuant to such sale, lease or sublease and the amounts payable by Lessee hereunder; and (iv) exercise any other right, remedy or privilege which may be available to it under applicable laws of the state of the Equipment Location or any other applicable law or proceed by appropriate court action to enforce the terms of the Lease or to recover damages for the breach of this Lease or to rescind this Lease as to any or all of the Equipment. In addition, Lessee will remain liable for all covenants and indemnities under this Lease and for all legal fees and other costs and expenses, including court costs, incurred by Lessor with respect to the enforcement of any of the remedies listed above or any other remedy available to Lessor.

18. PURCHASE OPTION. Upon thirty (30) days prior written notice from Lessee to Lessor, and provided that no Event of Default has occurred and is continuing, or no event, which with notice or lapse of time, or both could become an Event of Default, then exists, Lessee will have the right to purchase the Equipment on the Lease Payment dates set forth in Schedule B by paying to Lessor, on such date, the Lease Payment then due together with the Balance Payment amount set forth opposite such date. Upon satisfaction by Lessee of such purchase conditions, Lessor will transfer any and all of its right, title and interest in the Equipment to Lessee as is, without warranty, express or implied, except that the Equipment is free and clear of any liens created by Lessor.

19. NOTICES. All notices to be given under this Lease shall be made in writing and mailed by certified mail, return receipt requested, to the other party at its address set forth herein or at such address as the party may provide in writing from time to time. Any such notice shall be deemed to have been received five days subsequent to such mailing.

20. SECTION HEADINGS. All section headings contained herein are for the convenience of reference only and are not intended to define or limit the scope of any provision of this Lease.

21. GOVERNING LAW. This Lease shall be construed in accordance with, and governed by the laws of, the state of the Equipment Location.

22. DELIVERY OF RELATED DOCUMENTS. Lessee will execute or provide, as requested by Lessor, such other documents and information as are reasonably necessary with respect to the transaction contemplated by this Lease.

23. ENTIRE AGREEMENT; WAIVER. This Lease, together with the Delivery and Acceptance Certificate and other attachments hereto, and other documents or instruments executed by Lessee and Lessor in connection herewith, constitutes the entire agreement between the parties with respect to the Lease of the Equipment, and this Lease shall not be modified, amended, altered, or changed except with the written consent of Lessee and Lessor. Any provision of the Lease found to be prohibited by law shall be ineffective to the extent of such prohibition without invalidating the remainder of the Lease.

The waiver by Lessor of any breach by Lessee of any term, covenant or condition hereof shall not operate as a waiver of any subsequent breach thereof.

24. EXECUTION IN COUNTERPARTS. This Lease may be executed in several counterparts, each of which shall be deemed an original and all of which shall constitute but one and the same instrument.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the _____ day of October, 2012.

LESSEE:	**LESSOR:**
CITY OF DURHAM	**MOTOROLA SOLUTIONS, INC.**
By:_____	By:_____
Title:_____	Title:_____

OPINION OF COUNSEL

With respect to that certain Equipment Lease-Purchase Agreement # 23337 dated October____, 2012 by and between Motorola Solutions, Inc. and the Lessee, I am of the opinion that: (i) the Lessee is, within the meaning of Section 103 of the Internal Revenue Code of 1986, a state or a fully constituted political subdivision or agency of the State of the Equipment Location described in Schedule A hereto; (ii) the execution, delivery and performance by the Lessee of the Lease have been duly authorized by all necessary action on the part of the Lessee, (III) the Lease constitutes a legal, valid and binding obligation of the Lessee enforceable in accordance with its terms; and (iv) Lessee has sufficient monies available to make all payments required to be paid under the Lease during the current fiscal year of the Lease, and such monies have been properly budgeted and appropriated for this purpose in accordance with State law.

_____

Attorney for **CITY OF DURHAM**

SCHEDULE A
EQUIPMENT LEASE-PURCHASE AGREEMENT

Schedule A Lease Number: **23337**

This Equipment Schedule dated as of October____, 2012 is being executed by MOTOROLA SOLUTIONS, INC. ("Lessor") and **CITY OF DURHAM** (Lessee"), as a supplement to, and is hereby attached to and made a part of that certain Equipment Lease-Purchase Agreement Number **23337** dated as of October____, 2012 ("Lease"), between Lessor and Lessee.

Lessor hereby leases to Lessee under and pursuant to the Lease, and Lessee hereby accepts and leases from Lessor under and pursuant to the Lease, subject to and upon the terms and conditions set forth in the Lease and upon the terms set forth below, the following items of Equipment

QUANTITY	DESCRIPTION (Manufacturer, Model, and Serial Nos.)
	Refer to attached Equipment List.
Equipment Location:	

Initial Term: 36 Months

Commencement Date: **11/1/2012**
First Payment Due Date: **11/1/2013**

3 Annual Payments of $4,132,581.33 as outlined in the attached Schedule B, plus Sales/Use Tax of $0.00, payable on the Lease Payment Dates set forth in Schedule B.

EXECUTED as of the date first herein set forth.

LESSEE:

City of Durham

By: _____

Title: _____

LESSOR:

Motorola Solutions, Inc.

By:_____

Title:_____

City of Durham (Schedule B)

Compound Period .....: Annual

Nominal Annual Rate ... : 0.000 %
Effective Annual Rate .. : 0.000 %
Periodic Rate .....: 0.0000 %
Daily Rate .....: 0.00000 %

CASH FLOW DATA

	Event	Start Date	Amount	Number	Period	End Date
1	Loan	11/01/2012	12,397,744.00	1		
2	Payment	11/01/2013	4,132,581.33	3	Annual	11/01/2015

AMORTIZATION SCHEDULE - Normal Amortization

	Date	Payment	Interest	Principal	Balance
Loan	11/01/2012				12,397,744.00
2012	Totals	0.00	0.00	0.00	
1	11/01/2013	4,132,581.33	0.00	4,132,581.33	8,265,162.67
2013	Totals	4,132,581.33	0.00	4,132,581.33	
2	11/01/2014	4,132,581.33	0.00	4,132,581.33	4,132,581.34
2014	Totals	4,132,581.33	0.00	4,132,581.33	
3	11/01/2015	4,132,581.33	0.01-	4,132,581.34	0.00
2015	Totals	4,132,581.33	0.01-	4,132,581.34	
Grand Totals		12,397,743.99	0.01-	12,397,744.00	

INITIAL INSURANCE REQUIREMENT: $12,397,744.00

Except as specifically provided in Section five of the Lease hereof, Lessee agrees to pay to Lessor or its assignee the Lease Payments, including the interest portion, in the amounts and dates specified in the above payment schedule.

LESSEE:

CITY OF DURHAM

By: _____

Title: _____

Date: _____

LESSOR:

Motorola Solutions, Inc.

By: _____

Title: _____

Date: _____

CERTIFICATE OF INCUMBENCY

I, _____ do hereby certify that I am the duly elected or
(Signature of Secretary/Clerk)
appointed and acting Secretary or Clerk of the **CITY OF DURHAM** , an entity duly organized and existing under the laws of the **State of North Carolina** that I have custody of the records of such entity, and that, as of the date hereof, the individuals named below are the duly elected or appointed officers of such entity holding offices set forth opposite of their respective names. I further certify that (i) the signatures set opposite their respective names and titles are their true and authentic signatures and (ii) such officers have the authority on behalf of such entity to enter into that certain Equipment Lease Purchase Agreement number **23337** dated October____, 2012 , and Schedule A number **23337** dated October____, 2012, between **CITY OF DURHAM** and Motorola Solutions, Inc. .

Name	**Title**	**Signature**
_____	_____	_____

(Individual who signed Lease documents should be listed here and sign where applicable)

IN WITNESS WHEREOF, I have executed this certificate and affixed the seal of **CITY OF DURHAM** , hereto this _____ day of October, 2012.

By: _____
(Signature of Secretary/Clerk)

SEAL

EVIDENCE OF INSURANCE

Fire, extended coverage, public liability and property damage insurance for all of the Equipment listed on Schedule A number **23337** dated October____, 2012 to that certain Equipment Lease Purchase Agreement number **23337** dated October____, 2012 will be maintained by the **CITY OF DURHAM** as stated in the Equipment Lease Purchase Agreement.

This insurance shall name MOTOROLA SOLUTIONS, INC. or its assignee as additional insured and loss payee for the term of the Schedule A number **23337** dated October____, 2012.

This insurance is provided by:

_____
Name of insurance provider

_____
Address of insurance provider

_____
City, State and Zip Code

_____
Phone number of insurance provider

In accordance with the Equipment Lease Purchase Agreement Number **23337** , **CITY OF DURHAM** , hereby certifies that following coverage are or will be in full force and effect:

Type	**Amount**	**Effective Date**	**Expiration Date**	**Policy Number**
Fire and Extended Coverage	_____	_____	_____	_____
Property Damage	_____	_____	_____	_____
Public Liability	_____	_____	_____	_____

Lessee:

CITY OF DURHAM

By: _____

Its: _____

Date: October____, 2012

STATEMENT OF ESSENTIAL USE/SOURCE OF FUNDS

To further understand the essential governmental use intended for the equipment together with an understanding of the sources from which payments will be made, please address the following questions by completing this form or by sending a separate letter:

1. What is the specific use of the equipment?

2. Why is the equipment essential to the operation of **CITY OF DURHAM?**

3. Does the equipment replace existing equipment?

   If so, why is the replacement being made?

4. Is there a specific cost justification for the new equipment?

   If yes, please attach outline of justification.

5. What is the expected source of funds for the payments due under the Lease for the current fiscal year and future fiscal years?

Lessee: **CITY OF DURHAM**

By: _____

Its: _____

Date: October____, 2012

LESSEE RESOLUTION

At a duly called meeting of the Governing Body of the Lessee (as defined in the Lease Agreement) held on **October____, 2012** the following resolution was introduced and adopted.

BE IT RESOLVED by the Governing Board of Lessee as follows:

1. **Determination of Need.** The Governing Body of Lessee has determined that a true and very real need exists for the acquisition of the Equipment or other personal property described in the Lease Schedule dated as of **October____, 2012**, between **CITY OF DURHAM** (Lessee) and Motorola Solutions, Inc. (Lessor).
2. **Approval and Authorization.** The Governing body of Lessee has determined that the Lease Agreement, substantially in the form presented to this meeting, is in the best interests of the Lessee for the acquisition of such Equipment or other personal property, and the Governing Board hereby approves the entering into of the Lease Agreement by the Lessee and hereby designates and authorizes the following person(s) to execute and deliver the Lease Agreement on Lessee's behalf with such changes thereto as such person deems appropriate, and any related documents, including any escrow agreement, necessary to the consummation of the transactions contemplated by the Lease Agreement.

   Authorized Individual(s):_____
   Printed or typed name(s) and title(s) of Individual(s) authorized to execute the Lease Agreement.

3. **Adoption of Resolution.** The signatures below from the designated individuals for the Governing Body of the Lessee evidence the adoption by the Governing Body of this Resolution.

Signature: _____ **Attested By:** _____

Name and Title : _____ **Name and Title:** _____

Form **8038-G**
(Rev. May 2010)
Department of the Treasury
Internal Revenue Service

Information Return for Tax-Exempt Governmental Obligations

▶ Under Internal Revenue Code section 149(e)
▶ See separate instructions.
Caution: *If the issue price is under $100,000, use Form 8038-GC.*

OMB No. 1545-0720

Part I Reporting Authority

If Amended Return, check here ▶ ☐

1 Issuer's name
City of Durham

2 Issuer's employer identification number (EIN)

3 Number and street (or P.O. box if mail is not delivered to street address) | Room/suite
101 City Hall Plaza

4 Report number *(For IRS Use Only)*
3

5 City, town, or post office, state, and ZIP code
Durham NC 27701

6 Date of issue
11/01/2012

7 Name of issue
Equipment Lease-Purchase #23337

8 CUSIP number

9 Name and title of officer of the issuer or other person whom the IRS may call for more information

10 Telephone number of officer or other person
( )

Part II Type of Issue (enter the issue price) See instructions and attach schedule

11	Education	11	
12	Health and hospital	12	
13	Transportation	13	
14	Public safety	14	11748145.42
15	Environment (including sewage bonds)	15	
16	Housing	16	
17	Utilities	17	
18	Other. Describe ▶	18	
19	If obligations are TANs or RANs, check only box 19a ▶ ☐ If obligations are BANs, check only box 19b ▶ ☐		
20	If obligations are in the form of a lease or installment sale, check box ▶ ☐		

Part III Description of Obligations. Complete for the entire issue for which this form is being filed.

	(a) Final maturity date	(b) Issue price	(c) Stated redemption price at maturity	(d) Weighted average maturity	(e) Yield
21	11/1/2015	$ 11,748,145.42	$	3 years	2.74 %

Part IV Uses of Proceeds of Bond Issue (including underwriters' discount)

22	Proceeds used for accrued interest		22	
23	Issue price of entire issue (enter amount from line 21, column (b))		23	11748145.42
24	Proceeds used for bond issuance costs (including underwriters' discount)	24		
25	Proceeds used for credit enhancement	25		
26	Proceeds allocated to reasonably required reserve or replacement fund	26		
27	Proceeds used to currently refund prior issues	27		
28	Proceeds used to advance refund prior issues	28		
29	Total (add lines 24 through 28)		29	
30	Nonrefunding proceeds of the issue (subtract line 29 from line 23 and enter amount here)		30	

Part V Description of Refunded Bonds (Complete this part only for refunding bonds.)

31	Enter the remaining weighted average maturity of the bonds to be currently refunded ▶	years
32	Enter the remaining weighted average maturity of the bonds to be advance refunded ▶	years
33	Enter the last date on which the refunded bonds will be called (MM/DD/YYYY) ▶	
34	Enter the date(s) the refunded bonds were issued ▶ (MM/DD/YYYY)	

Part VI Miscellaneous

35	Enter the amount of the state volume cap allocated to the issue under section 141(b)(5) . . .	35		
36a	Enter the amount of gross proceeds invested or to be invested in a guaranteed investment contract (GIC) (see instructions)	36a		
b	Enter the final maturity date of the GIC ▶ _____			
37	Pooled financings: a Proceeds of this issue that are to be used to make loans to other governmental units	37a		

b If this issue is a loan made from the proceeds of another tax-exempt issue, check box ▶ ☐ and enter the name of the issuer ▶ _____ and the date of the issue ▶ _____

38 If the issuer has designated the issue under section 265(b)(3)(B)(i)(III) (small issuer exception), check box . . . . ▶ ☐

39 If the issuer has elected to pay a penalty in lieu of arbitrage rebate, check box . . . . . ▶ ☐

40 If the issuer has identified a hedge, check box . . . . . ▶ ☐

Signature and Consent

Under penalties of perjury, I declare that I have examined this return and accompanying schedules and statements, and to the best of my knowledge and belief, they are true, correct, and complete. I further declare that I consent to the IRS's disclosure of the issuer's return information, as necessary to process this return, to the person that I have authorized above.

▶ _____ Signature of issuer's authorized representative Date ▶ _____ Type or print name and title

Paid Preparer's Use Only

Preparer's signature ▶	Date	Check if self-employed ☐	Preparer's SSN or PTIN
Firm's name (or yours if self-employed), address, and ZIP code ▶		EIN	
		Phone no.	( )

EQUIPMENT LEASE PURCHASE AGREEMENT DELIVERY AND ACCEPTANCE CERTIFICATE

The undersigned Lessee hereby acknowledges receipt of the Equipment described below ("Equipment") and Lessee hereby accepts the Equipment after full inspection thereof as satisfactory for all purposes of lease Schedule A to the Equipment Lease Purchase Agreement executed by Lessee and Lessor.

Equipment Lease Purchase Agreement Date: October____, 2012

Lease Schedule A Date: October____, 2012

Equipment Lease Purchase Agreement No.: 23337 Lease Schedule A No. : 23337

EQUIPMENT INFORMATION

QUANTITY	MODEL NUMBER	EQUIPMENT DESCRIPTION
		Equipment referenced in lease Schedule A# 23337 dated October____, 2012. See Schedule A for a detailed Equipment List.

LESSEE:

CITY OF DURHAM

By: _____

Date: _____

Equipment List **Durham 4.1 upgrade for SMARTX**

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
1	2	T6651	MTC 3600 SMARTZONE SIMULCAST PRIME	377
2	4	T6360	MTC 3600 SIMULCAST RESC SOFTWARE	377

Equipment List **Durham P25 Master Site**

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
1	1	SQM01SUM0226	MASTER SITE CONFIGURATION	877
a	1	CA02093AA	M3 SYSTEM (1-100) 1ST ZONE	877
b	1	CA01471AA	ADD: WINDOWS SUPPLEMENTAL TRANS CON	877
c	1	CA02113AA	ASTRO 25 FDMA TRKG OPERATION	877
d	1	CA02081AA	TRUNKED INTEGRATED DATA	877
e	5	CA02106AA	ASTRO 25 FDMA VOICE SITE	877
f	1	CA01403AA	ADD: SMARTX 3600 SYSTEM LICENSE	877
g	1	CA01404AA	ADD: SMARTX 3600 SITE LICENSE	877
2	1	CA01720AA	ADD: ANTI-VIRUS SERVICE (SERVERS)	877
a	1	CA01724AB	BACK UP & RECOVERY (BAR)	877
b	1	CA01722AB	FIREWALL MGMT SERVICE	877
c	9	CA02105AA	MCC7500/MCC7100 CONSOLE LIC	877
d	58	CA01316AA	ADD: UNC ADDTL DEVICE LIC (QTY 10)	877
e	24	CA01208AA	ENH: 500 RADIO USER LICENSES	877
f	11	CA02193AA	ADD: ANTI-MALWARE DEF UPDATE LIC	877
g	3	Z13AG	ENH: UNIFIED NETWORK CONFIGURATOR (	877
h	3	ZA00921AA	PROVISIONING MANAGER	877
i	3	CA01224AB	ENH: UNIFIED EVENT MANAGER (UEM)	877
j	1	D999AL	ENH: SECURITY PARTITIONING	877
k	1	CA00965AA	ENH: CHANNEL PARTITIONING	877
l	1	CA01453AA	ADD: FLEXIBLE AIR TRAFFIC INFORMATI	877
m	1	ZA00103AA	ENH: TECHNICAL ASSISTANCE, TEN HOUR	877
n	3	D52AJ	ENH: ZONEWATCH	877
o	3	DA00148AG	ENH: ZONE HISTORICAL REPORTS	877
p	1	ZA00149AD	ENH: DYNAMIC REPORTS	877
q	3	Z801AM	ENH: RADIO CONTROL MANAGER	877
r	2	ZA00151AG	ENH: AFFILIATION USER REPORTS	877
s	1	CA01238AA	ENH: EMAIL ALARM NOTIFICATIONS	877
t	2	CA02102AA	MOSCAD NFM VIRT APP A7.13 A3.1	877
3	1	DLN6692	HP LASERJET PRINTER CP3525DN 110V	877
4	1	TT2565	NM Z420 HIGH TIER WIN7-IE9 64BIT	708
5	1	T7787	ASTRO 7.13 CLIENT APPLICATION SW	877

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
6	1	DS019BLK	19" LCD, BLACK, NON-TOUCH	708
7	2	TT2565	NM Z420 HIGH TIER WIN7-IE9 64BIT	708
8	2	T7787	ASTRO 7.13 CLIENT APPLICATION SW	877
9	2	DS019BLK	19" LCD, BLACK, NON-TOUCH	708
10	2	DDN9657	CRYSTAL REPORTS	708
11	2	T7885	MCAFEE WINDOWS AV CLIENT	708
12	1	TT1969	RSA AUTH. MGMT V. 6.1 WITH 25 CLIEN	708
a	1	TT04523AA	ADD: RSA ACE SERVER MAINTENANCE FOR	708
13	1	DDN8653	RSA 5 YEAR HARD TOKEN SOLD ONLY IN	708
14	1	TT2022	LX4000T 8 PORT TERMINAL SERVER, NO	708
15	11	T7449	WINDOWS SUPPLEMENTAL TRANS CONFIG	877
16	1	DDN9590	SSG140 FIREWALL W/ 2 YEARS SUPPORT	708
17	1	CLN1856	2620-24 ETHERNET SWITCH	147
18	1	SQM01SUM0205	GGM 8000 GATEWAY	147
a	1	CA01616AA	ADD: AC POWER	147
19	1	SQM01SUM0205	GGM 8000 GATEWAY	147
a	1	CA01616AA	ADD: AC POWER	147
20	1	SQM01SUM0225	A1 MESSAGING ONLY APPLIANCE	68
a	1	CA02055AA	UNS PRESENCE FOR CO-HAB ONLY	68
21	2000	DDN1301	A1 - RADIO LICENSE ACCESS TO SERVIC	68
22	41	T7746	ASTRO 25 MESSAGING SMART CLIENT SOF	68
23	1	SQM01SUM0224	UNIFIED NETWORK SERVICES	232
a	1	CA02036AA	UNIFIED NETWORK SERVICES SERVER	232
b	1	CA02053AA	SUPPLEMENTAL CD TRANSPARENT IA ON P	232
24	1	HKVN4129A	PRESENCE WITH IA	232

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
25	1	HKVN4126A	PRESENCE WITH IA FOR MCCP	232
26	1	DSTRAK91009E	REMOTE SITE REDUNDANT MODULAR FREQU	207
27	100	L1700	CABLE: 1/4" SUPERFLEX POLY JKT PER	207
28	4	DDN9769	1/4" TYPE N MALE CONNECTOR FOR FSJ1	207
29	1	SQM01SUM0238	SRC7500 SWITCHING ROUTING CENTER (7	147
a	1	CA02194AA	HIGH TIER CORE LAN SWITCHES (HP3800	147
b	1	CA01345AA	ADD: DUAL GATEWAY ROUTERS STANDARD	147
c	1	CA01346AA	ADD: QTY 1 PAIR CORE ROUTERS CWR	147
d	1	CA01361AA	ADD: GGSN	147
30	1	T7599	SMARTX SITE CONVERTER	277
a	1	CA01401AA	ADD: SMARTX SITE CONVERTER SOFTWARE	277
b	1	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN	277
31	1	BLN1297	VPM POWER SUPPLY MOUNTING KIT	277
32	1	CVN1230	SMARTX SOFTWARE	277
33	1	SQM01SUM0205	GGM 8000 GATEWAY	147
a	1	CA01616AA	ADD: AC POWER	147
34	1	T7688	KEY MANAGEMENT FACILITY	137
a	1	ZA00860AA	ADD: KMF SERVER AND CLIENT SOFTWARE	137
35	1	TT2551	KMF DL380 G8 SERVER WITH WINDOWS SE	708
36	1	SQM01SUM0222	KMF CRYPTR	137
a	1	CA00147AG	ADD: BASIC SOFTWARE OPTION	137
b	1	CA00143AF	ADD: DES OFB ENCRYPTION KIT	137
c	1	CA00182AV	ADD: AES 256 ENCRYPTION KIT	137
37	1	TKN9285	RACK MOUNT KIT FOR CRYPTR II	811
38	1	DS019BLK	19" LCD, BLACK, NON-TOUCH	708
39	2	TT2538	Z420 LOW TIER WORKSTATION WINDOWS 7	708
40	2	DS019BLK	19" LCD, BLACK, NON-TOUCH	708
41	2	T7885	MCAFEE WINDOWS AV CLIENT	708

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
42	2	T7537	KVL 4000 KEYLOADER	201
a	2	U239AD	ADD: ASTRO 25 MODE	201
b	2	QA01767AA	ADD: KVL RADIO AUTHENTICATION	201
c	2	X795AJ	ADD: ASN MODE	201
d	2	CA01598AA	ADD: AC LINE CORD US	201
e	2	CA00182AP	ADD: AES ENCRYPTION SOFTWARE	201
f	2	X423AF	ADD: DES/DES-XL/DES-OFB ENCRYPTION	201
g	2	C543	ADD: CABLE FOR RNC, DIU, MGEG	201
h	2	C724	CABLE, KEYLOAD	201
i	2	CA01603AA	ADD: USB COMM/CHARGE CABLE W/ CUP	201
43	2	HKN6182	KEYLOADING CABLE ADAPTER (GCAI)	514
44	2	TDN9390	KVL CABLE FOR XTS3000 AND MTS2000	644
45	2	TKN8209	CABLE KEYLOAD MX	201
46	1	TT2264	GENWATCH3 OVER-THE-AIR BASE	708
a	1	TT05408AA	ASTRO25 (9600) CONTROL CHANNEL OPTI	708
b	1	TT05234AA	UPGRADE FROM (3) EXCEL REPORTS TO F	708
c	1	TT05235AA	GW3-OTA UPGRADE FROM 2 MO. TO 12 MO	708
d	1	TT05217AA	TRIGGER MONITOR	708
e	1	TT05411AA	ACTIVITY AND EMERGENCY DISPLAY BY T	708
47	1	L3561	GW3 PC BUNDLE. INCL OS,SQL, OFFICE	708
48	1	TT2207	GENESIS INTEGRATED XTL2500 700/800	708
49	2	TRN7343	SEVEN AND A HALF FOOT RACK	509
50	7	DSOP820B	PDU, 120V HARDWIRE (8) 20A OUTLET P	207
51	7	DS1101378	RACK MT ADAPTER PLATE, 19 IN FOR DS	207
52	8	DSTSJ100BT	SPD, RJ-48 CONNECTED FOR T1/E1, 10/	207
53	8	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TS	207
54	1	DVN4046	MASTER SYSTEM KEY STARTER KIT	430
55	1	DLN6822	CSA HC SERVER	877
56	2	DLN6823	CSA LC SERVER	877

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
57	1	DLN6864	CSA POWER SUPPLY	877
58	1	DLN6844	CPH 300 GB HARD DRIVE	877
59	1	DLN6866	DVD DRIVE	877
60	1	DLN6880	DAS - CHASSIS ONLY	877
61	1	DLN6878	DAS - 600 GB SAS HARD DRIVE	877
62	1	DLN6879	DAS - PROCESSOR MODULE	877
63	1	DLN6867	DAS POWER SUPPLY	877
64	1	CKN6948	SAS CABLE - 2M	877
65	1	B1936	SMARTX VOICE PROCESSOR MODULE FRU	277
66	1	1009513002	GPIOM/VPM POWER SUPPLY FRU (0100951	454
67	1	30009351001	DC CABLE ASSY	443
68	1	58009256065	DB9F/RJ45 VPM PRG ADPTR	443
69	1	SQM01SUM0205	GGM 8000 GATEWAY	147
a	1	CA01616AA	ADD: AC POWER	147
70	1	CLN1856	2620-24 ETHERNET SWITCH	147
71	1	CLN1838	FRU: 3500-48 ETHERNET SWITCH	147
72	1	CLN1856	2620-24 ETHERNET SWITCH	147
73	1	CLN1837A	620 REDUNDANT/EXTERNAL POWER SUPPLY	147
74	1	CLN8489	48 PORT TERMINAL SERVER	147
75	1	ST6018	S6000 12 PORT T1/E1 II MODULE	147
76	1	T7380	CO-OP WAN ROUTER RELAY PANEL	147
77	1	ST6011	S6000 4-PORT FLEXWAN MODULE	147
78	1	ST6202	SRC 24 PORT T1/E1EXP II	147

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
79	1	DKN6144A	ASSY,CBL,3 FT,RELAY PNL,CWR,S6000	147
80	1	DDN9590	SSG140 FIREWALL W/ 2 YEARS SUPPORT	708
81	1	DDN1073	DL360 VIRTUAL SERVER - NO OS NON-R	708
82	1	DLN6742	460 WATT POWER SUPPLY	424
83	1	DLN6744	300 GB SAS HARD DISK DRIVE	424
84	1	DLN6745	DVD-RW SATA DRIVE (DL360)	424
85	1	DDN8325	17" LCD DRAWER W/ KEYBOARD & MOUSE,	229

Equipment List **Durham MOSCAD for P25 System**

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
1	1	F4544	SITE MANAGER ADVANCED	469
a	1	V266	ADD: 90VAC TO 260VAC PS TO SM	469
b	1	VA00220	SDM3000 NETWORK TRANSLATOR ASTRO F/	469
2	2	TT2565	NM Z420 HIGH TIER WIN7-IE9 64BIT	708
3	2	DSFAP17BLK	17" NEC LCD, BLACK, NON-TOUCH MONIT	708
4	2	TT2177	INTOUCH RUNTIME 60K TAG W/O-I/O, V1	708
5	2	T7885	MCAFEE WINDOWS AV CLIENT	708
6	1	F4544	SITE MANAGER ADVANCED	469
a	1	V266	ADD: 90VAC TO 260VAC PS TO SM	469
b	1	VA00220	SDM3000 NETWORK TRANSLATOR ASTRO F/	469
7	3	F4544	SITE MANAGER ADVANCED	469
a	3	V240	ADD:24 VDC PS TO SM	469
b	3	VA00221	SDM3000 ASTRO F/W FOR A7.11	469
c	9	V592	AAD TERM BLCK & CONN WI	469
8	3	F4528	GMC_PER_DEVICE_SW_LICENSES	382
a	3	V809	GMC_SW_LIC_PER_NFM-RTU_I-O	382
b	72	V843	GMC_SW_LIC_PER_GTR8000_MS_BR	382
c	6	V206	GMC_SW_LIC_PER_GCP8000_MS_CONTR	382
9	3	F2463	RTU_PER_DEVICE_SW_LICENSES	382
a	3	V839	RTU_SW_LIC_PER_NFM-RTU_I-O	382
b	72	VA00312	RTU_SW_LIC_PER_GTR8000_MS_BR	382
c	6	VA00325	RTU_SW_LIC_PER_GCP8000_MS_CONTR	382
10	1	F4544	SITE MANAGER ADVANCED	469
a	1	V266	ADD: 90VAC TO 260VAC PS TO SM	469
b	1	VA00220	SDM3000 NETWORK TRANSLATOR ASTRO F/	469

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
11	1	F4544	SITE MANAGER ADVANCED	469
a	1	V240	ADD:24 VDC PS TO SM	469
b	1	VA00221	SDM3000 ASTRO F/W FOR A7.11	469
c	3	V592	AAD TERM BLCK & CONN WI	469
12	1	F4528	GMC_PER_DEVICE_SW_LICENSES	382
a	1	V809	GMC_SW_LIC_PER_NFM-RTU_I-O	382
b	1	V838	GMC_SW_LIC_PER_TRAK_GPS	382
c	12	VA00310	GMC_SW_LIC_PER_GCM8000_COMP	382
d	24	V843	GMC_SW_LIC_PER_GTR8000_MS_BR	382
e	2	V206	GMC_SW_LIC_PER_GCP8000_MS_CONTR	382
13	1	F2463	RTU_PER_DEVICE_SW_LICENSES	382
a	1	V839	RTU_SW_LIC_PER_NFM-RTU_I-O	382
b	1	V838	RTU_SW_LIC_PER_TRAK_GPS	382
c	12	V835	RTU_SW_LIC_PER_GCM8000_COMP	382
d	24	VA00312	RTU_SW_LIC_PER_GTR8000_MS_BR	382
e	2	VA00325	RTU_SW_LIC_PER_GCP8000_MS_CONTR	382
14	1	F4544	SITE MANAGER ADVANCED	469
a	1	V266	ADD: 90VAC TO 260VAC PS TO SM	469
b	1	VA00220	SDM3000 NETWORK TRANSLATOR ASTRO F/	469
15	1	F4544	SITE MANAGER ADVANCED	469
a	1	V240	ADD:24 VDC PS TO SM	469
b	1	VA00221	SDM3000 ASTRO F/W FOR A7.11	469
c	3	V592	AAD TERM BLCK & CONN WI	469
16	1	F4528	GMC_PER_DEVICE_SW_LICENSES	382
a	1	V809	GMC_SW_LIC_PER_NFM-RTU_I-O	382
b	1	V838	GMC_SW_LIC_PER_TRAK_GPS	382
17	1	F2463	RTU_PER_DEVICE_SW_LICENSES	382
a	1	V839	RTU_SW_LIC_PER_NFM-RTU_I-O	382
b	1	V838	RTU_SW_LIC_PER_TRAK_GPS	382
18	1	F4544	SITE MANAGER ADVANCED	469
a	1	V266	ADD: 90VAC TO 260VAC PS TO SM	469
b	1	VA00220	SDM3000 NETWORK TRANSLATOR ASTRO F/	469
19	5	F4544	SITE MANAGER ADVANCED	469
a	5	V240	ADD:24 VDC PS TO SM	469
b	5	VA00221	SDM3000 ASTRO F/W FOR A7.11	469
c	15	V592	AAD TERM BLCK & CONN WI	469

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
20	5	F4528	GMC_PER_DEVICE_SW_LICENSES	382
a	5	V809	GMC_SW_LIC_PER_NFM-RTU_I-O	382
b	25	VA00200	GMC_SW_LIC_PER_GCP8000_CONV_CONTR	382
21	5	F2463	RTU_PER_DEVICE_SW_LICENSES	382
a	5	V839	RTU_SW_LIC_PER_NFM-RTU_I-O	382
b	25	VA00200	RTU_SW_LIC_PER_GCP8000_CONV_CONTR	382

Equipment List **Durham P25 Prime site w 12 channel overlay**

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
1	1	T7321	GCM 8000 COMPARATOR	112
a	2	CA01183AA	ADD: GCM 8000 COMPARATOR	112
b	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	112
c	1	X153AW	ADD: RACK MOUNT HARDWARE	112
2	1	T7321	GCM 8000 COMPARATOR	112
a	2	CA01183AA	ADD: GCM 8000 COMPARATOR	112
b	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	112
c	1	X153AW	ADD: RACK MOUNT HARDWARE	112
3	1	T7321	GCM 8000 COMPARATOR	112
a	2	CA01183AA	ADD: GCM 8000 COMPARATOR	112
b	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	112
c	1	X153AW	ADD: RACK MOUNT HARDWARE	112
4	1	T7321	GCM 8000 COMPARATOR	112
a	2	CA01183AA	ADD: GCM 8000 COMPARATOR	112
b	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	112
c	1	X153AW	ADD: RACK MOUNT HARDWARE	112
5	1	T7321	GCM 8000 COMPARATOR	112
a	2	CA01183AA	ADD: GCM 8000 COMPARATOR	112
b	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	112
c	1	X153AW	ADD: RACK MOUNT HARDWARE	112
6	1	T7321	GCM 8000 COMPARATOR	112
a	2	CA01183AA	ADD: GCM 8000 COMPARATOR	112
b	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	112
c	1	X153AW	ADD: RACK MOUNT HARDWARE	112
7	1	T7321	GCM 8000 COMPARATOR	112
a	2	CA01183AA	ADD: GCM 8000 COMPARATOR	112
b	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	112
c	1	X153AW	ADD: RACK MOUNT HARDWARE	112
8	1	T7321	GCM 8000 COMPARATOR	112
a	2	CA01183AA	ADD: GCM 8000 COMPARATOR	112
b	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	112
c	1	X153AW	ADD: RACK MOUNT HARDWARE	112

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
9	1	T7321	GCM 8000 COMPARATOR	112
a	2	CA01183AA	ADD: GCM 8000 COMPARATOR	112
b	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	112
c	1	X153AW	ADD: RACK MOUNT HARDWARE	112
10	1	T7321	GCM 8000 COMPARATOR	112
a	2	CA01183AA	ADD: GCM 8000 COMPARATOR	112
b	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	112
c	1	X153AW	ADD: RACK MOUNT HARDWARE	112
11	1	T7321	GCM 8000 COMPARATOR	112
a	2	CA01183AA	ADD: GCM 8000 COMPARATOR	112
b	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	112
c	1	X153AW	ADD: RACK MOUNT HARDWARE	112
12	1	T7321	GCM 8000 COMPARATOR	112
a	2	CA01183AA	ADD: GCM 8000 COMPARATOR	112
b	2	CA01185AA	ADD: IP BASED MULTISITE OPERATION	112
c	1	X153AW	ADD: RACK MOUNT HARDWARE	112
13	1	T7038	GCP 8000 SITE CONTROLLER	112
a	1	CA00303AA	ADD: QTY (1) SITE CONTROLLER	112
b	1	CA01194AA	ADD: IP BASED MULTISITE SITE CONTRO	112
c	5	CA02206AA	SIMULCAST REMOTE SITE LICENSE ? IV&	112
d	1	X153AW	ADD: RACK MOUNT HARDWARE	112
14	1	T7038	GCP 8000 SITE CONTROLLER	112
a	1	CA00303AA	ADD: QTY (1) SITE CONTROLLER	112
b	1	CA01194AA	ADD: IP BASED MULTISITE SITE CONTRO	112
c	5	CA02206AA	SIMULCAST REMOTE SITE LICENSE ? IV&	112
d	1	X153AW	ADD: RACK MOUNT HARDWARE	112
15	1	DSTRAK91008E	PRIME/MASTER SITE REDUNDANT MODULAR	207
16	8	DSTRAK91061	FOUR PORT DDM	207
17	50	L1700	CABLE: 1/4" SUPERFLEX POLY JKT PER	207
18	4	DDN9769	1/4" TYPE N MALE CONNECTOR FOR FSJ1	207
19	1	SQM01SUM0205	GGM 8000 GATEWAY	147
a	1	CA01616AA	ADD: AC POWER	147
20	1	ST6202	SRC 24 PORT T1/E1EXP II	147

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
21	2	CLN1856	2620-24 ETHERNET SWITCH	147
22	4	TRN7343	SEVEN AND A HALF FOOT RACK	509
23	4	DSOP820B	PDU, 120V HARDWIRE (8) 20A OUTLET P	207
24	4	DS1101378	RACK MT ADAPTER PLATE, 19 IN FOR DS	207
25	2	DSTSJ100BT	SPD, RJ-48 CONNECTED FOR T1/E1, 10/	207
26	2	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TS	207
27	1	DSTRAK91061	FOUR PORT DDM	207
28	1	SQM01SUM0205	GGM 8000 GATEWAY	147
a	1	CA01616AA	ADD: AC POWER	147
29	1	CLN1856	2620-24 ETHERNET SWITCH	147
30	1	DLN6566	FRU: 700/800 MHZ XCVR	112
31	1	DLN6567	FRU: 700/800 MHZ PA	112
32	1	DLN6569	FRU: GCP 8000/GCM 8000	112
33	1	DLN6781	FRU POWER SUPPLY	112
34	1	DLN6677	FRU: G-SERIES XHUB	112
35	1	DLN6455	CONFIGURATION/SERVICE SOFTWARE	729
36	1	SQM01SUM0205	GGM 8000 GATEWAY	147
a	1	CA01616AA	ADD: AC POWER	147
37	2	CLN1856	2620-24 ETHERNET SWITCH	147
38	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	112
a	1	CA00855AA	ADD: 700/800 MHZ	112
b	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	112
c	6	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO	112
d	1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILIT	112
e	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER	112
f	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU	112
g	2	CA00884AA	ADD: QTY (1) XHUB	112
h	1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	112

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
39	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	112
a	1	CA00855AA	ADD: 700/800 MHZ	112
b	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	112
c	6	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO	112
d	1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK	112
e	1	CA00880AA	ADD: EXPANSION 6 PORT CAVITY COMBIN	112
f	1	CA01058AA	ADD: 700/800 PHASING HARNESS	112
g	2	CA00884AA	ADD: QTY (1) XHUB	112
h	1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	112
40	1	DSTSJ100BT	SPD, RJ-48 CONNECTED FOR T1/E1, 10/	207
41	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TS	207
42	1	DS428B83H01C48	CMU, TTA 48 V, 792-824 MHZ	207
43	1	DS428B83H01T	TTA, COMPACT AUTO QUAD, 792-824 MHZ	207
44	1	DLN6455	CONFIGURATION/SERVICE SOFTWARE	729
45	1	DSSC412HF2LDFE5765	11.5 DBD G 25% NULL F, 746-869 25 K	207
46	15	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05538AA	ADD: TYPE N MALE PS FOR 1/2 IN LDF4	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
47	5	TDN9289	CABLE WRAP WEATHERPROOFING	207
48	5	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05539AA	ADD: TYPE N MALE PS FOR 1/2 IN LDF4	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05538AA	ADD: TYPE N MALE PS FOR 1/2 IN LDF4	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
49	550	L3323	CABLE: 7/8" AVA HELIAX POLY JKT PER	207
a	1	TT05176AA	ADD: 7/8" TYPE N FEMALE POSITIVE ST	207
b	1	TT04969AA	ADD: CONNECTOR ATTACHMENT FEE FOR A	207
c	1	TT05177AA	ADD:7/8" TYPE N FEMALE POSITIVE STO	207
d	1	TT04938AA	ADD: CONNECTOR ATTACHMENT FEE FOR A	207
50	10	DSSG7806B2A	GROUNDING KIT FOR 7/8 IN COAXIAL CA	207
51	3	DSL5SGRIP	7/8" SUPPORT HOIST GRIP	207

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
52	550	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05539AA	ADD: TYPE N MALE PS FOR 1/2 IN LDF4	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05540AA	ADD: TYPE N FEMALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
53	10	DSSG1206B2A	1/2" SURE GROUND GROUNDING KIT	207
54	3	DSL4SGRIP	SUPPORT HOIST GRIP 1/2" LDF	207
55	19	DSSSH12	1/2" SNAPSTAK HANGER 10PK	207
56	19	DSSSH78	7/8" SNAPSTAK HANGER 10PK	207
57	38	DSUA3	UNIVERSAL ANGLE ADAPTOR KIT, KIT OF	207
58	2	DS1090501WA	RF LIGHTNING SUPPRESSOR 700-1000MHZ	207
59	1	DS1090501WA	RF LIGHTNING SUPPRESSOR 700-1000MHZ	207
60	25	L1700	CABLE: 1/4" SUPERFLEX POLY JKT PER	207
a	1	TT04960AA	ADD: CONNECTOR ATTACHMENT FEE FOR F	207
b	1	TT04929AA	ADD: CONNECTOR ATTACHMENT FEE FOR F	207
61	2	DDN9769	1/4" TYPE N MALE CONNECTOR FOR FSJ1	207
62	25	L1702	CABLE: 1/2" SUPERFLEX POLY JKT PER	207
a	1	E704AP	ADD: 1/2" N MALE PLATED ANTENNA EN	207
b	1	TT04962AA	ADD: CONNECTOR ATTACHMENT FEE FOR F	207
c	1	E705AP	ADD: 1/2" N MALE PLATED STATION END	207
d	1	TT04931AA	ADD: CONNECTOR ATTACHMENT FEE FOR F	207
63	1	CDN6579	1/2" TYPE N MALE PLATED CONNECTOR	207
64	1	DDN9743	TORQUE WRENCH KIT FOR 7-16 DIN & TY	207
65	1	DSSC412HF2LDFE5765	11.5 DBD G 25% NULL F, 746-869 25 K	207
66	15	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05542AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
67	2	TDN9289	CABLE WRAP WEATHERPROOFING	207
68	550	L3405	CABLE: 1 5/8" AVA HELIAX POLY JKT P	207

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
69	2	DDN9383	1-5/8" 7-16 DIN FEMALE POSITIVE ST	207
70	10	DSSG15806B2A	1-5/8" SUREGROUND GROUNDING	207
71	3	DSL7SGRIP	1-5/8" SUPPORT HOIST GRIP	207
72	1	DSTSXDFMBF	DC BLOCK, HIGH POW, 698 TO 2700MHZ,	207
73	1	DSGSAKITD	GROUND STRAP KIT - DIN	207
74	25	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05542AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
75	1	DDN9743	TORQUE WRENCH KIT FOR 7-16 DIN & TY	207
76	1	DSSC412HF2LDFE5765	11.5 DBD G 25% NULL F, 746-869 25 K	207
77	15	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05542AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
78	2	TDN9289	CABLE WRAP WEATHERPROOFING	207
79	550	L3405	CABLE: 1 5/8" AVA HELIAX POLY JKT P	207
80	2	DDN9383	1-5/8" 7-16 DIN FEMALE POSITIVE ST	207
81	10	DSSG15806B2A	1-5/8" SUREGROUND GROUNDING	207
82	3	DSL7SGRIP	1-5/8" SUPPORT HOIST GRIP	207
83	1	DSTSXDFMBF	DC BLOCK, HIGH POW, 698 TO 2700MHZ,	207
84	1	DSGSAKITD	GROUND STRAP KIT - DIN	207
85	25	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05542AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
86	1	DDN9743	TORQUE WRENCH KIT FOR 7-16 DIN & TY	207
87	1	SQM01SUM0205	GGM 8000 GATEWAY	147
a	1	CA01616AA	ADD: AC POWER	147
88	2	CLN1856	2620-24 ETHERNET SWITCH	147
89	1	DSTRAK91009E	REMOTE SITE REDUNDANT MODULAR FREQU	207
90	1	DSTRAK91071	FOUR PORT IRIG B TIME CODE FDM	207
91	6	DSTRAK91061	FOUR PORT DDM	207
92	50	L1700	CABLE: 1/4" SUPERFLEX POLY JKT PER	207
93	4	DDN9769	1/4" TYPE N MALE CONNECTOR FOR FSJ1	207
94	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	112
a	1	CA00855AA	ADD: 700/800 MHZ	112
b	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	112
c	6	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO	112
d	1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILIT	112
e	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER	112
f	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU	112
g	2	CA00884AA	ADD: QTY (1) XHUB	112
h	1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	112
95	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	112
a	1	CA00855AA	ADD: 700/800 MHZ	112
b	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	112
c	6	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO	112
d	1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK	112
e	1	CA00880AA	ADD: EXPANSION 6 PORT CAVITY COMBIN	112
f	1	CA01058AA	ADD: 700/800 PHASING HARNESS	112
g	2	CA00884AA	ADD: QTY (1) XHUB	112
h	1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	112
96	1	TRN7343	SEVEN AND A HALF FOOT RACK	509
97	1	DSOP820B	PDU, 120V HARDWIRE (8) 20A OUTLET P	207
100	1	DS1101378	RACK MT ADAPTER PLATE, 19 IN FOR DS	207
101	1	DSTSJ100BT	SPD, RJ-48 CONNECTED FOR T1/E1, 10/	207
102	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TS	207

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
103	1	DS428B83H01C48	CMU, TTA 48 V, 792-824 MHZ	207
104	1	DS428B83H01T	TTA, COMPACT AUTO QUAD, 792-824 MHZ	207
105	1	DLN6455	CONFIGURATION/SERVICE SOFTWARE	729
106	1	DSSC412HF2LDFE5765	11.5 DBD G 25% NULL F, 746-869 25 K	207
107	15	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05538AA	ADD: TYPE N MALE PS FOR 1/2 IN LDF4	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
108	5	TDN9289	CABLE WRAP WEATHERPROOFING	207
109	5	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05539AA	ADD: TYPE N MALE PS FOR 1/2 IN LDF4	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05538AA	ADD: TYPE N MALE PS FOR 1/2 IN LDF4	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
110	400	L3323	CABLE: 7/8" AVA HELIAX POLY JKT PER	207
a	1	TT05176AA	ADD: 7/8" TYPE N FEMALE POSITIVE ST	207
b	1	TT04969AA	ADD: CONNECTOR ATTACHMENT FEE FOR A	207
c	1	TT05177AA	ADD:7/8" TYPE N FEMALE POSITIVE STO	207
d	1	TT04938AA	ADD: CONNECTOR ATTACHMENT FEE FOR A	207
111	10	DSSG7806B2A	GROUNDING KIT FOR 7/8 IN COAXIAL CA	207
112	3	DSL5SGRIP	7/8" SUPPORT HOIST GRIP	207
113	400	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05539AA	ADD: TYPE N MALE PS FOR 1/2 IN LDF4	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05540AA	ADD: TYPE N FEMALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
114	10	DSSG1206B2A	1/2" SURE GROUND GROUNDING KIT	207
115	3	DSL4SGRIP	SUPPORT HOIST GRIP 1/2" LDF	207
116	19	DSSSH12	1/2" SNAPSTAK HANGER 10PK	207
117	19	DSSSH78	7/8" SNAPSTAK HANGER 10PK	207
118	38	DSUA3	UNIVERSAL ANGLE ADAPTOR KIT, KIT OF	207

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
119	2	DS1090501WA	RF LIGHTNING SUPPRESSOR 700-1000MHZ	207
120	1	DS1090501WA	RF LIGHTNING SUPPRESSOR 700-1000MHZ	207
121	25	L1700	CABLE: 1/4" SUPERFLEX POLY JKT PER	207
a	1	TT04960AA	ADD: CONNECTOR ATTACHMENT FEE FOR F	207
b	1	TT04929AA	ADD: CONNECTOR ATTACHMENT FEE FOR F	207
122	2	DDN9769	1/4" TYPE N MALE CONNECTOR FOR FSJ1	207
123	25	L1702	CABLE: 1/2" SUPERFLEX POLY JKT PER	207
a	1	E704AP	ADD: 1/2" N MALE PLATED ANTENNA EN	207
b	1	TT04962AA	ADD: CONNECTOR ATTACHMENT FEE FOR F	207
c	1	E705AP	ADD: 1/2" N MALE PLATED STATION END	207
d	1	TT04931AA	ADD: CONNECTOR ATTACHMENT FEE FOR F	207
124	1	CDN6579	1/2" TYPE N MALE PLATED CONNECTOR	207
125	1	DDN9743	TORQUE WRENCH KIT FOR 7-16 DIN & TY	207
126	1	DSSC412HF2LDFE5765	11.5 DBD G 25% NULL F, 746-869 25 K	207
127	15	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05542AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
128	2	TDN9289	CABLE WRAP WEATHERPROOFING	207
129	400	L3405	CABLE: 1 5/8" AVA HELIAX POLY JKT P	207
130	2	DDN9383	1-5/8" 7-16 DIN FEMALE POSITIVE ST	207
131	10	DSSG15806B2A	1-5/8" SUREGROUND GROUNDING	207
132	3	DSL7SGRIP	1-5/8" SUPPORT HOIST GRIP	207
133	1	DSTSXDFMBF	DC BLOCK, HIGH POW, 698 TO 2700MHZ,	207
134	1	DSGSAKITD	GROUND STRAP KIT - DIN	207

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
135	25	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05542AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
136	1	DDN9743	TORQUE WRENCH KIT FOR 7-16 DIN & TY	207
137	1	DSSC412HF2LDFE5765	11.5 DBD G 25% NULL F, 746-869 25 K	207
138	15	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05542AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
139	2	TDN9289	CABLE WRAP WEATHERPROOFING	207
140	400	L3405	CABLE: 1 5/8" AVA HELIAX POLY JKT P	207
141	2	DDN9383	1-5/8" 7-16 DIN FEMALE POSITIVE ST	207
142	10	DSSG15806B2A	1-5/8" SUREGROUND GROUNDING	207
143	3	DSL7SGRIP	1-5/8" SUPPORT HOIST GRIP	207
144	1	DSTSXDFMBF	DC BLOCK, HIGH POW, 698 TO 2700MHZ,	207
145	1	DSGSAKITD	GROUND STRAP KIT - DIN	207
146	25	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05542AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
147	1	DDN9743	TORQUE WRENCH KIT FOR 7-16 DIN & TY	207
148	1	SQM01SUM0205	GGM 8000 GATEWAY	147
a	1	CA01616AA	ADD: AC POWER	147
149	2	CLN1856	2620-24 ETHERNET SWITCH	147
150	1	DSTRAK91009E	REMOTE SITE REDUNDANT MODULAR FREQU	207
151	1	DSTRAK91071	FOUR PORT IRIG B TIME CODE FDM	207

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
152	6	DSTRAK91061	FOUR PORT DDM	207
153	50	L1700	CABLE: 1/4" SUPERFLEX POLY JKT PER	207
154	4	DDN9769	1/4" TYPE N MALE CONNECTOR FOR FSJ1	207
155	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	112
a	1	CA00855AA	ADD: 700/800 MHZ	112
b	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	112
c	6	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO	112
d	1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILIT	112
e	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER	112
f	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU	112
g	2	CA00884AA	ADD: QTY (1) XHUB	112
h	1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	112
156	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	112
a	1	CA00855AA	ADD: 700/800 MHZ	112
b	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	112
c	6	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO	112
d	1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK	112
e	1	CA00880AA	ADD: EXPANSION 6 PORT CAVITY COMBIN	112
f	1	CA01058AA	ADD: 700/800 PHASING HARNESS	112
g	2	CA00884AA	ADD: QTY (1) XHUB	112
h	1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	112
157	1	TRN7343	SEVEN AND A HALF FOOT RACK	509
158	1	DSOP820B	PDU, 120V HARDWIRE (8) 20A OUTLET P	207
159	1	DS1101378	RACK MT ADAPTER PLATE, 19 IN FOR DS	207
160	1	DSTSJ100BT	SPD, RJ-48 CONNECTED FOR T1/E1, 10/	207
161	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TS	207
162	1	DS428B83H01C48	CMU, TTA 48 V, 792-824 MHZ	207
163	1	DS428B83H01T	TTA, COMPACT AUTO QUAD, 792-824 MHZ	207
164	1	DLN6455	CONFIGURATION/SERVICE SOFTWARE	729
165	1	DSSC412HF2LDFE5765	11.5 DBD G 25% NULL F, 746-869 25 K	207

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
166	15	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05538AA	ADD: TYPE N MALE PS FOR 1/2 IN LDF4	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
167	5	TDN9289	CABLE WRAP WEATHERPROOFING	207
168	5	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05539AA	ADD: TYPE N MALE PS FOR 1/2 IN LDF4	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05538AA	ADD: TYPE N MALE PS FOR 1/2 IN LDF4	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
169	350	L3323	CABLE: 7/8" AVA HELIAX POLY JKT PER	207
a	1	TT05176AA	ADD: 7/8" TYPE N FEMALE POSITIVE ST	207
b	1	TT04969AA	ADD: CONNECTOR ATTACHMENT FEE FOR A	207
c	1	TT05177AA	ADD:7/8" TYPE N FEMALE POSITIVE STO	207
d	1	TT04938AA	ADD: CONNECTOR ATTACHMENT FEE FOR A	207
170	10	DSSG7806B2A	GROUNDING KIT FOR 7/8 IN COAXIAL CA	207
171	3	DSL5SGRIP	7/8" SUPPORT HOIST GRIP	207
172	350	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05539AA	ADD: TYPE N MALE PS FOR 1/2 IN LDF4	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05540AA	ADD: TYPE N FEMALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
173	10	DSSG1206B2A	1/2" SURE GROUND GROUNDING KIT	207
174	3	DSL4SGRIP	SUPPORT HOIST GRIP 1/2" LDF	207
175	19	DSSSH12	1/2" SNAPSTAK HANGER 10PK	207
176	19	DSSSH78	7/8" SNAPSTAK HANGER 10PK	207
177	38	DSUA3	UNIVERSAL ANGLE ADAPTOR KIT, KIT OF	207
178	2	DS1090501WA	RF LIGHTNING SUPPRESSOR 700-1000MHZ	207
179	1	DS1090501WA	RF LIGHTNING SUPPRESSOR 700-1000MHZ	207
180	25	L1700	CABLE: 1/4" SUPERFLEX POLY JKT PER	207
a	1	TT04960AA	ADD: CONNECTOR ATTACHMENT FEE FOR F	207
b	1	TT04929AA	ADD: CONNECTOR ATTACHMENT FEE FOR F	207

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
181	2	DDN9769	1/4" TYPE N MALE CONNECTOR FOR FSJ1	207
182	25	L1702	CABLE: 1/2" SUPERFLEX POLY JKT PER	207
a	1	E704AP	ADD: 1/2" N MALE PLATED ANTENNA EN	207
b	1	TT04962AA	ADD: CONNECTOR ATTACHMENT FEE FOR F	207
c	1	E705AP	ADD: 1/2" N MALE PLATED STATION END	207
d	1	TT04931AA	ADD: CONNECTOR ATTACHMENT FEE FOR F	207
183	1	CDN6579	1/2" TYPE N MALE PLATED CONNECTOR	207
184	1	DDN9743	TORQUE WRENCH KIT FOR 7-16 DIN & TY	207
185	1	DSSC412HF2LDFE5765	11.5 DBD G 25% NULL F, 746-869 25 K	207
186	15	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05542AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
187	2	TDN9289	CABLE WRAP WEATHERPROOFING	207
188	350	L3405	CABLE: 1 5/8" AVA HELIAX POLY JKT P	207
189	2	DDN9383	1-5/8" 7-16 DIN FEMALE POSITIVE ST	207
190	10	DSSG15806B2A	1-5/8" SUREGROUND GROUNDING	207
191	3	DSL7SGRIP	1-5/8" SUPPORT HOIST GRIP	207
192	1	DSTSXDFMBF	DC BLOCK, HIGH POW, 698 TO 2700MHZ,	207
193	1	DSGSAKITD	GROUND STRAP KIT - DIN	207
194	25	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05542AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
195	1	DDN9743	TORQUE WRENCH KIT FOR 7-16 DIN & TY	207
196	1	DSSC412HF2LDFE5765	11.5 DBD G 25% NULL F, 746-869 25 K	207

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
197	15	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05542AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
198	2	TDN9289	CABLE WRAP WEATHERPROOFING	207
199	350	L3405	CABLE: 1 5/8" AVA HELIAX POLY JKT P	207
200	2	DDN9383	1-5/8" 7-16 DIN FEMALE POSITIVE ST	207
201	10	DSSG15806B2A	1-5/8" SUREGROUND GROUNDING	207
202	3	DSL7SGRIP	1-5/8" SUPPORT HOIST GRIP	207
203	1	DSTSXDFMBF	DC BLOCK, HIGH POW, 698 TO 2700MHZ,	207
204	1	DSGSAKITD	GROUND STRAP KIT - DIN	207
205	25	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05542AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
206	1	DDN9743	TORQUE WRENCH KIT FOR 7-16 DIN & TY	207
207	1	SQM01SUM0205	GGM 8000 GATEWAY	147
a	1	CA01616AA	ADD: AC POWER	147
208	2	CLN1856	2620-24 ETHERNET SWITCH	147
209	1	DSTRAK91009E	REMOTE SITE REDUNDANT MODULAR FREQU	207
210	1	DSTRAK91071	FOUR PORT IRIG B TIME CODE FDM	207
211	6	DSTRAK91061	FOUR PORT DDM	207
212	50	L1700	CABLE: 1/4" SUPERFLEX POLY JKT PER	207
213	4	DDN9769	1/4" TYPE N MALE CONNECTOR FOR FSJ1	207

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
214	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	112
a	1	CA00855AA	ADD: 700/800 MHZ	112
b	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	112
c	6	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO	112
d	1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILIT	112
e	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER	112
f	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU	112
g	2	CA00884AA	ADD: QTY (1) XHUB	112
h	1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	112
215	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	112
a	1	CA00855AA	ADD: 700/800 MHZ	112
b	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	112
c	6	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO	112
d	1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK	112
e	1	CA00880AA	ADD: EXPANSION 6 PORT CAVITY COMBIN	112
f	1	CA01058AA	ADD: 700/800 PHASING HARNESS	112
g	2	CA00884AA	ADD: QTY (1) XHUB	112
h	1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	112
216	1	TRN7343	SEVEN AND A HALF FOOT RACK	509
217	1	DSOP820B	PDU, 120V HARDWIRE (8) 20A OUTLET P	207
218	1	DS1101378	RACK MT ADAPTER PLATE, 19 IN FOR DS	207
219	1	DSTSJ100BT	SPD, RJ-48 CONNECTED FOR T1/E1, 10/	207
220	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TS	207
221	1	DS428B83H01C48	CMU, TTA 48 V, 792-824 MHZ	207
222	1	DS428B83H01T	TTA, COMPACT AUTO QUAD, 792-824 MHZ	207
223	1	DLN6455	CONFIGURATION/SERVICE SOFTWARE	729
224	1	DSSC412HF2LDFE5765	11.5 DBD G 25% NULL F, 746-869 25 K	207
225	15	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05538AA	ADD: TYPE N MALE PS FOR 1/2 IN LDF4	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
226	5	TDN9289	CABLE WRAP WEATHERPROOFING	207

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
227	5	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05539AA	ADD: TYPE N MALE PS FOR 1/2 IN LDF4	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05538AA	ADD: TYPE N MALE PS FOR 1/2 IN LDF4	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
228	300	L3323	CABLE: 7/8" AVA HELIAX POLY JKT PER	207
a	1	TT05176AA	ADD: 7/8" TYPE N FEMALE POSITIVE ST	207
b	1	TT04969AA	ADD: CONNECTOR ATTACHMENT FEE FOR A	207
c	1	TT05177AA	ADD:7/8" TYPE N FEMALE POSITIVE STO	207
d	1	TT04938AA	ADD: CONNECTOR ATTACHMENT FEE FOR A	207
229	10	DSSG7806B2A	GROUNDING KIT FOR 7/8 IN COAXIAL CA	207
230	3	DSL5SGRIP	7/8" SUPPORT HOIST GRIP	207
231	300	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05539AA	ADD: TYPE N MALE PS FOR 1/2 IN LDF4	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05540AA	ADD: TYPE N FEMALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
232	10	DSSG1206B2A	1/2" SURE GROUND GROUNDING KIT	207
233	3	DSL4SGRIP	SUPPORT HOIST GRIP 1/2" LDF	207
234	19	DSSSH12	1/2" SNAPSTAK HANGER 10PK	207
235	19	DSSSH78	7/8" SNAPSTAK HANGER 10PK	207
236	38	DSUA3	UNIVERSAL ANGLE ADAPTOR KIT, KIT OF	207
237	2	DS1090501WA	RF LIGHTNING SUPPRESSOR 700-1000MHZ	207
238	1	DS1090501WA	RF LIGHTNING SUPPRESSOR 700-1000MHZ	207
239	25	L1700	CABLE: 1/4" SUPERFLEX POLY JKT PER	207
a	1	TT04960AA	ADD: CONNECTOR ATTACHMENT FEE FOR F	207
b	1	TT04929AA	ADD: CONNECTOR ATTACHMENT FEE FOR F	207
240	2	DDN9769	1/4" TYPE N MALE CONNECTOR FOR FSJ1	207
241	25	L1702	CABLE: 1/2" SUPERFLEX POLY JKT PER	207
a	1	E704AP	ADD: 1/2" N MALE PLATED ANTENNA EN	207
b	1	TT04962AA	ADD: CONNECTOR ATTACHMENT FEE FOR F	207
c	1	E705AP	ADD: 1/2" N MALE PLATED STATION END	207
d	1	TT04931AA	ADD: CONNECTOR ATTACHMENT FEE FOR F	207

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
242	1	CDN6579	1/2" TYPE N MALE PLATED CONNECTOR	207
243	1	DDN9743	TORQUE WRENCH KIT FOR 7-16 DIN & TY	207
244	1	DSSC412HF2LDFE5765	11.5 DBD G 25% NULL F, 746-869 25 K	207
245	15	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05542AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
246	2	TDN9289	CABLE WRAP WEATHERPROOFING	207
247	300	L3405	CABLE: 1 5/8" AVA HELIAX POLY JKT P	207
248	2	DDN9383	1-5/8" 7-16 DIN FEMALE POSITIVE ST	207
249	10	DSSG15806B2A	1-5/8" SUREGROUND GROUNDING	207
250	3	DSL7SGRIP	1-5/8" SUPPORT HOIST GRIP	207
251	1	DSTSXDFMBF	DC BLOCK, HIGH POW, 698 TO 2700MHZ,	207
252	1	DSGSAKITD	GROUND STRAP KIT - DIN	207
253	25	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05542AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
254	1	DDN9743	TORQUE WRENCH KIT FOR 7-16 DIN & TY	207
255	1	DSSC412HF2LDFE5765	11.5 DBD G 25% NULL F, 746-869 25 K	207
256	15	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05542AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
257	2	TDN9289	CABLE WRAP WEATHERPROOFING	207
258	300	L3405	CABLE: 1 5/8" AVA HELIAX POLY JKT P	207

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
259	2	DDN9383	1-5/8" 7-16 DIN FEMALE POSITIVE ST	207
260	10	DSSG15806B2A	1-5/8" SUREGROUND GROUNDING	207
261	3	DSL7SGRIP	1-5/8" SUPPORT HOIST GRIP	207
262	1	DSTSXDFMBF	DC BLOCK, HIGH POW, 698 TO 2700MHZ,	207
263	1	DSGSAKITD	GROUND STRAP KIT - DIN	207
264	25	L1705	CABLE: 1/2" LDF HELIAX POLY JKT PE	207
a	1	TT05543AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
b	1	TT04967AA	ADD: CONNECTOR ATTACHMENT LDF4 ANTE	207
c	1	TT05542AA	ADD: 7-16 DIN MALE PS FOR 1/2 IN LD	207
d	1	TT04936AA	ADD: CONNECTOR ATTACHMENT FEE FOR L	207
265	1	DDN9743	TORQUE WRENCH KIT FOR 7-16 DIN & TY	207

Equipment List **Durham P25 Channel completion**

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
1	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	112
a	1	CA00855AA	ADD: 700/800 MHZ	112
b	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	112
c	6	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO	112
d	1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILIT	112
e	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER	112
f	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU	112
g	2	CA00884AA	ADD: QTY (1) XHUB	112
h	1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	112
2	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	112
a	1	CA00855AA	ADD: 700/800 MHZ	112
b	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	112
c	6	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO	112
d	1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK	112
e	1	CA00880AA	ADD: EXPANSION 6 PORT CAVITY COMBIN	112
f	1	CA01058AA	ADD: 700/800 PHASING HARNESS	112
g	2	CA00884AA	ADD: QTY (1) XHUB	112
h	1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	112
3	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	112
a	1	CA00855AA	ADD: 700/800 MHZ	112
b	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	112
c	6	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO	112
d	1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILIT	112
e	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER	112
f	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU	112
g	2	CA00884AA	ADD: QTY (1) XHUB	112
h	1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	112
4	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	112
a	1	CA00855AA	ADD: 700/800 MHZ	112
b	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	112
c	6	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO	112
d	1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK	112
e	1	CA00880AA	ADD: EXPANSION 6 PORT CAVITY COMBIN	112
f	1	CA01058AA	ADD: 700/800 PHASING HARNESS	112
g	2	CA00884AA	ADD: QTY (1) XHUB	112
h	1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	112

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
5	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	112
a	1	CA00855AA	ADD: 700/800 MHZ	112
b	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	112
c	6	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO	112
d	1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILIT	112
e	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER	112
f	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU	112
g	2	CA00884AA	ADD: QTY (1) XHUB	112
h	1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	112
6	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	112
a	1	CA00855AA	ADD: 700/800 MHZ	112
b	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	112
c	6	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO	112
d	1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK	112
e	1	CA00880AA	ADD: EXPANSION 6 PORT CAVITY COMBIN	112
f	1	CA01058AA	ADD: 700/800 PHASING HARNESS	112
g	2	CA00884AA	ADD: QTY (1) XHUB	112
h	1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	112
7	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	112
a	1	CA00855AA	ADD: 700/800 MHZ	112
b	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	112
c	6	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO	112
d	1	CA00862AA	ADD: SITE & CABINET RMC W/CAPABILIT	112
e	1	CA00879AA	ADD: PRIMARY 6 PORT CAVITY COMBINER	112
f	1	CA00883AA	ADD: 800 MHZ TX FILTER W/PMU	112
g	2	CA00884AA	ADD: QTY (1) XHUB	112
h	1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	112
8	1	SQM01SUM7054	GTR 8000 EXPANDABLE SITE SUBSYSTEM	112
a	1	CA00855AA	ADD: 700/800 MHZ	112
b	1	X306AC	ADD: QTY (6) GTR 8000 BASE RADIOS	112
c	6	CA01193AA	ADD: IP BASED MULTISITE BASE RADIO	112
d	1	CA00877AA	ADD: CABINET RMC FOR EXPANSION RACK	112
e	1	CA00880AA	ADD: EXPANSION 6 PORT CAVITY COMBIN	112
f	1	CA01058AA	ADD: 700/800 PHASING HARNESS	112
g	2	CA00884AA	ADD: QTY (1) XHUB	112
h	1	X882AH	ADD: 7.5 FT OPEN RACK, 48RU	112

Equipment List **Durham Test Equipment**

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
1	2	TT2235	AEROFLEX 3920 SERVICE MONITOR 1MHZ	415
a	2	TT05337AA	SITE MONITORING APPLICATION / 390XO	415
b	2	TT05338AA	NO CHARGE - FACTORY INSTALLED DIGI	415
c	2	TT05339AA	IQ GEN MODULATION / 390XOPT054 / R2	415
d	2	TT05340AA	AUDIO ANALYZER / 390XOPT055 / R2086	415
e	2	TT05342AA	HARMONICS & SPURIOUS MEASUREMENTS /	415
f	2	TT05343AA	TRACKING GENERATOR / 390XOPT061 / R	415
g	2	TT05345AA	P25 CONVENTIONAL WITH DES OFB TYPE	415
h	2	TT05346AA	P25 TRUNKING VHF/UHF/700/800MHZ / 3	415
i	2	TT05347AA	LSM GENERATE AND RECEIVE/ANALYSIS /	415
j	2	TT05348AA	P25 CONTROL CHANNEL LOGGER / 390XOP	415
k	2	TT05350AA	KVL KEYLOADER / 390XOPT209 / R2084A	415
l	2	TT05352AA	EXPLICIT MODE TRUNKING / 390XOPT212	415
m	2	TT05354AA	ADJACENT CHANNEL BROADCAST MESSAGE	415
n	2	TT05355AA	SECONDARY CONTROL CHANNEL BROADCAST	415
o	2	TT05356AA	AUTOTEST II FOR P25 RADIO SYSTEMS /	415
p	2	TT05361AA	OCCUPIED BANDWIDTH FOR P25 / 390XOP	415
q	2	TT05362AA	P25 PERFORMANCE TEST TRIGGERS / 390	415
r	2	TT05371AA	XTS-5000 AUTOTEST AND ALIGNMENT / 3	415
s	2	TT05372AA	XTS-3000 AUTOTEST AND ALIGNMENT / 3	415
t	2	TT05373AA	XTL-2500, XTL-5000 POWER ALIGNMENT	415
u	2	TT05377AA	EXTENDED WARRANTY 36 TOTAL MONTHS W	415
2	2	DDN9837	20 AMP CURRENT SHUNT 0.01 OHM / AC2	415
3	2	DDN9840	SOFT PADDED CARRYING CASE FOR AEROF	415
4	2	DDN9841	KIT, 10/20 DB PADS, TNC / AC25013	415
5	2	DDN9842	SCOPE PROBE KIT / AC25014	415
6	2	DDN9843	FRONT/REAR COVER / AC25023	415
7	2	DDN9844	ADAPTER (BNC-F TO TNC-M) / AC25027	415
8	2	DDN9845	ACCESSORY POUCH / AC25029	415
9	2	DDN9846	DC TO AC CONVERTER, 12VDC TO 110-12	415

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
10	2	DDN9849	ANTENNA BNC 800 MHZ / AC25044	415
11	2	DDN9856	MICROPHONE / AC8645	415
12	2	DDN9861	QMA "QUICK CONNECT" SMA - QMA JACK	415

Equipment List **Durham MCC7500 Consoles**

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
1	1	B1905	MCC 7500 ASTRO 25 SOFTWARE	443
2	18	B1933	MOTOROLA VOICE PROCESSOR MODULE	443
a	18	CA01642AA	ADD: MCC 7500 BASIC CONSOLE FUNCTIO	443
b	18	CA01644AA	ADD: MCC 7500 /MCC 7100 ADV CONVL O	443
c	18	CA01643AA	ADD: MCC 7500 / MCC 7100 TRUNKING	443
d	18	CA01220AA	ADD: MCC 7500 / MCC 7100 OTEK OPERA	443
e	18	CA02073AA	MCC 7500 ENHANCED CONSOLE TELEPHONY	443
f	18	CA00147AF	ADD: MCC 7500 SECURE OPERATION	443
g	18	CA00143AC	ADD: DES-OFB ALGORITHM	443
h	18	CA00182AB	ADD: AES ALGORITHM	443
i	18	CA00245AA	ADD: ADP ALGORITHM	443
j	18	CA00144AC	ADD: DES-XL ALGORITHM	443
k	18	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN	443
l	18	CA00635AN	ENH: MCC 7500 PROMOTION - CENTRACOM	443
3	1	DDN1405	CONSOLE TELEPHONY MEDIA GATEWAY - 8	443
4	18	DS22WBLKTS	22" WIDE FORMAT LCD MONITOR BLACK,	708
5	18	TT2538	Z420 LOW TIER WORKSTATION WINDOWS 7	708
6	18	T7448	WINDOWS SUPPLEMENTAL FULL CONFIG	877
7	18	DSRMP615A	SPD, TYPE 3, 120V RACK MOUNT, 15A P	207
8	36	B1912	MCC SERIES DESKTOP SPEAKER	443
9	18	B1914	MCC SERIES DESKTOP GOOSENECK MICROP	443
10	36	B1913	MCC SERIES HEADSET JACK	443
11	18	DSTWIN6328A	PROVIDES ONE DUAL PEDAL FOOTSWITCH	708
12	18	T7885	MCAFEE WINDOWS AV CLIENT	708
13	18	DDN1245	DUAL IRR SW USB HASP WITH LICENSE (	229
14	18	DDN6493	SOUND CARD AUDIGY SE	708

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
15	18	CDN6673	CREATIVE LABS INSPIRE A60	708
16	2	CLN1856	2620-24 ETHERNET SWITCH	147
17	1	ST6000	S6000 MNR MULTI-PROTOCOL ROUTER	147
18	1	ST6017B	S6000 4 PORT ULTRAWAN II MODULE	147
19	1	F4543	SITE MANAGER BASIC	469
a	1	VA00212	SDM3000 MCC7500 AUX IO F/W FOR A7.1	469
b	1	V266	ADD: 90VAC TO 260VAC PS TO SM	469
c	3	V592	AAD TERM BLCK & CONN WI	469
20	1	T7038	GCP 8000 SITE CONTROLLER	112
a	1	CA00303AA	ADD: QTY (1) SITE CONTROLLER	112
b	1	X153AW	ADD: RACK MOUNT HARDWARE	112
c	1	CA01136AA	ADD: MCC 7500 CONVEN SITE OPER	112
21	5	SQM01SUM0205	GGM 8000 GATEWAY	147
a	5	CA01616AA	ADD: AC POWER	147
b	5	CA02086AA	ADD: HIGH DENSITY ENH CONV GATEWAY	147
22	2	TRN7343	SEVEN AND A HALF FOOT RACK	509
23	2	DSOP820B	PDU, 120V HARDWIRE (8) 20A OUTLET P	207
24	2	DS1101378	RACK MT ADAPTER PLATE, 19 IN FOR DS	207
25	1	DSTSJ100BT	SPD, RJ-48 CONNECTED FOR T1/E1, 10/	207
26	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TS	207
27	1	B1912	MCC SERIES DESKTOP SPEAKER	443
28	1	B1914	MCC SERIES DESKTOP GOOSENECK MICROP	443
29	1	B1913	MCC SERIES HEADSET JACK	443
30	1	TT2538	Z420 LOW TIER WORKSTATION WINDOWS 7	708

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
31	1	B1934	MCC 7500 VOICE PROCESSOR MODULE FRU	443
a	1	CA00147AF	ADD: MCC 7500 SECURE OPERATION	443
b	1	CA00143AC	ADD: DES-OFB ALGORITHM	443
c	1	CA00182AB	ADD: AES ALGORITHM	443
d	1	CA00245AA	ADD: ADP ALGORITHM	443
32	1	CLN1856	2620-24 ETHERNET SWITCH	147
33	1	ST6017B	S6000 4 PORT ULTRAWAN II MODULE	147
34	1	DS22WBLKTS	22" WIDE FORMAT LCD MONITOR BLACK,	708
35	1	B1905	MCC 7500 ASTRO 25 SOFTWARE	443
36	15	B1933	MOTOROLA VOICE PROCESSOR MODULE	443
a	15	CA01642AA	ADD: MCC 7500 BASIC CONSOLE FUNCTIO	443
b	15	CA01644AA	ADD: MCC 7500 /MCC 7100 ADV CONVL O	443
c	15	CA01643AA	ADD: MCC 7500 / MCC 7100 TRUNKING	443
d	15	CA01220AA	ADD: MCC 7500 / MCC 7100 OTEK OPERA	443
e	15	CA02073AA	MCC 7500 ENHANCED CONSOLE TELEPHONY	443
f	15	CA00147AF	ADD: MCC 7500 SECURE OPERATION	443
g	15	CA00143AC	ADD: DES-OFB ALGORITHM	443
h	15	CA00182AB	ADD: AES ALGORITHM	443
i	15	CA00245AA	ADD: ADP ALGORITHM	443
j	15	CA00144AC	ADD: DES-XL ALGORITHM	443
k	15	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN	443
l	15	CA00635AN	ENH: MCC 7500 PROMOTION - CENTRACOM	443
37	1	DDN1405	CONSOLE TELEPHONY MEDIA GATEWAY - 8	443
38	15	DS22WBLKTS	22" WIDE FORMAT LCD MONITOR BLACK,	708
39	15	TT2538	Z420 LOW TIER WORKSTATION WINDOWS 7	708
40	15	T7448	WINDOWS SUPPLEMENTAL FULL CONFIG	877
41	15	DSRMP615A	SPD, TYPE 3, 120V RACK MOUNT, 15A P	207
42	30	B1912	MCC SERIES DESKTOP SPEAKER	443
43	15	B1914	MCC SERIES DESKTOP GOOSENECK MICROP	443
44	30	B1913	MCC SERIES HEADSET JACK	443
45	15	DSTWIN6328A	PROVIDES ONE DUAL PEDAL FOOTSWITCH	708

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
46	15	T7885	MCAFEE WINDOWS AV CLIENT	708
47	15	DDN1245	DUAL IRR SW USB HASP WITH LICENSE (	229
48	15	DDN6493	SOUND CARD AUDIGY SE	708
49	15	CDN6673	CREATIVE LABS INSPIRE A60	708
50	2	CLN1856	2620-24 ETHERNET SWITCH	147
51	1	ST6000	S6000 MNR MULTI-PROTOCOL ROUTER	147
52	1	ST6017B	S6000 4 PORT ULTRAWAN II MODULE	147
53	1	F4543	SITE MANAGER BASIC	469
a	1	VA00212	SDM3000 MCC7500 AUX IO F/W FOR A7.1	469
b	1	V266	ADD: 90VAC TO 260VAC PS TO SM	469
c	3	V592	AAD TERM BLCK & CONN WI	469
54	1	T7038	GCP 8000 SITE CONTROLLER	112
a	1	CA00303AA	ADD: QTY (1) SITE CONTROLLER	112
b	1	X153AW	ADD: RACK MOUNT HARDWARE	112
c	1	CA01136AA	ADD: MCC 7500 CONVEN SITE OPER	112
55	5	SQM01SUM0205	GGM 8000 GATEWAY	147
a	5	CA01616AA	ADD: AC POWER	147
b	5	CA02086AA	ADD: HIGH DENSITY ENH CONV GATEWAY	147
56	2	TRN7343	SEVEN AND A HALF FOOT RACK	509
57	2	DSOP820B	PDU, 120V HARDWIRE (8) 20A OUTLET P	207
58	2	DS1101378	RACK MT ADAPTER PLATE, 19 IN FOR DS	207
59	1	DSTSJ100BT	SPD, RJ-48 CONNECTED FOR T1/E1, 10/	207
60	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TS	207
61	1	B1912	MCC SERIES DESKTOP SPEAKER	443
62	1	B1914	MCC SERIES DESKTOP GOOSENECK MICROP	443
63	1	B1913	MCC SERIES HEADSET JACK	443

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
64	1	TT2538	Z420 LOW TIER WORKSTATION WINDOWS 7	708
65	1	B1934	MCC 7500 VOICE PROCESSOR MODULE FRU	443
a	1	CA00147AF	ADD: MCC 7500 SECURE OPERATION	443
b	1	CA00143AC	ADD: DES-OFB ALGORITHM	443
c	1	CA00182AB	ADD: AES ALGORITHM	443
d	1	CA00245AA	ADD: ADP ALGORITHM	443
66	1	CLN1856	2620-24 ETHERNET SWITCH	147
67	1	ST6017B	S6000 4 PORT ULTRAWAN II MODULE	147
68	1	DS22WBLKTS	22" WIDE FORMAT LCD MONITOR BLACK,	708
69	1	B1905	MCC 7500 ASTRO 25 SOFTWARE	443
70	4	B1933	MOTOROLA VOICE PROCESSOR MODULE	443
a	4	CA01642AA	ADD: MCC 7500 BASIC CONSOLE FUNCTIO	443
b	4	CA01644AA	ADD: MCC 7500 /MCC 7100 ADV CONVL O	443
c	4	CA01643AA	ADD: MCC 7500 / MCC 7100 TRUNKING	443
d	4	CA01220AA	ADD: MCC 7500 / MCC 7100 OTEK OPERA	443
e	4	CA02073AA	MCC 7500 ENHANCED CONSOLE TELEPHONY	443
f	4	CA00147AF	ADD: MCC 7500 SECURE OPERATION	443
g	4	CA00143AC	ADD: DES-OFB ALGORITHM	443
h	4	CA00182AB	ADD: AES ALGORITHM	443
i	4	CA00245AA	ADD: ADP ALGORITHM	443
j	4	CA00144AC	ADD: DES-XL ALGORITHM	443
k	4	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN	443
l	4	CA00635AN	ENH: MCC 7500 PROMOTION - CENTRACOM	443
71	1	DDN1405	CONSOLE TELEPHONY MEDIA GATEWAY - 8	443
72	4	DS22WBLKTS	22" WIDE FORMAT LCD MONITOR BLACK,	708
73	4	TT2538	Z420 LOW TIER WORKSTATION WINDOWS 7	708
74	4	T7448	WINDOWS SUPPLEMENTAL FULL CONFIG	877
75	4	DSRMP615A	SPD, TYPE 3, 120V RACK MOUNT, 15A P	207
76	8	B1912	MCC SERIES DESKTOP SPEAKER	443
77	4	B1914	MCC SERIES DESKTOP GOOSENECK MICROP	443
78	8	B1913	MCC SERIES HEADSET JACK	443

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
79	4	DSTWIN6328A	PROVIDES ONE DUAL PEDAL FOOTSWITCH	708
80	4	T7885	MCAFEE WINDOWS AV CLIENT	708
81	4	DDN1245	DUAL IRR SW USB HASP WITH LICENSE (	229
82	4	DDN6493	SOUND CARD AUDIGY SE	708
83	4	CDN6673	CREATIVE LABS INSPIRE A60	708
84	1	CLN1856	2620-24 ETHERNET SWITCH	147
85	1	SQM01SUM0205	GGM 8000 GATEWAY	147
a	1	CA01616AA	ADD: AC POWER	147
86	1	F4543	SITE MANAGER BASIC	469
a	1	VA00212	SDM3000 MCC7500 AUX IO F/W FOR A7.1	469
b	1	V266	ADD: 90VAC TO 260VAC PS TO SM	469
c	3	V592	AAD TERM BLCK & CONN WI	469
87	1	T7038	GCP 8000 SITE CONTROLLER	112
a	1	CA00303AA	ADD: QTY (1) SITE CONTROLLER	112
b	1	X153AW	ADD: RACK MOUNT HARDWARE	112
c	1	CA01136AA	ADD: MCC 7500 CONVEN SITE OPER	112
88	3	SQM01SUM0205	GGM 8000 GATEWAY	147
a	3	CA01616AA	ADD: AC POWER	147
b	3	CA02086AA	ADD: HIGH DENSITY ENH CONV GATEWAY	147
89	2	TRN7343	SEVEN AND A HALF FOOT RACK	509
90	2	DSOP820B	PDU, 120V HARDWIRE (8) 20A OUTLET P	207
91	2	DS1101378	RACK MT ADAPTER PLATE, 19 IN FOR DS	207
92	1	DSTSJ100BT	SPD, RJ-48 CONNECTED FOR T1/E1, 10/	207
93	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TS	207
94	1	B1912	MCC SERIES DESKTOP SPEAKER	443
95	1	B1914	MCC SERIES DESKTOP GOOSENECK MICROP	443
96	1	B1913	MCC SERIES HEADSET JACK	443

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
97	1	TT2538	Z420 LOW TIER WORKSTATION WINDOWS 7	708
100	1	B1934	MCC 7500 VOICE PROCESSOR MODULE FRU	443
a	1	CA00147AF	ADD: MCC 7500 SECURE OPERATION	443
b	1	CA00143AC	ADD: DES-OFB ALGORITHM	443
c	1	CA00182AB	ADD: AES ALGORITHM	443
d	1	CA00245AA	ADD: ADP ALGORITHM	443
101	1	CLN1856	2620-24 ETHERNET SWITCH	147
102	1	DS22WBLKTS	22" WIDE FORMAT LCD MONITOR BLACK,	708
103	1	B1905	MCC 7500 ASTRO 25 SOFTWARE	443
104	2	B1933	MOTOROLA VOICE PROCESSOR MODULE	443
a	2	CA01642AA	ADD: MCC 7500 BASIC CONSOLE FUNCTIO	443
b	2	CA01644AA	ADD: MCC 7500 /MCC 7100 ADV CONVL O	443
c	2	CA01643AA	ADD: MCC 7500 / MCC 7100 TRUNKING	443
d	2	CA01220AA	ADD: MCC 7500 / MCC 7100 OTEK OPERA	443
e	2	CA00147AF	ADD: MCC 7500 SECURE OPERATION	443
f	2	CA00143AC	ADD: DES-OFB ALGORITHM	443
g	2	CA00182AB	ADD: AES ALGORITHM	443
h	2	CA00245AA	ADD: ADP ALGORITHM	443
i	2	CA00144AC	ADD: DES-XL ALGORITHM	443
j	2	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN	443
k	2	CA00635AN	ENH: MCC 7500 PROMOTION - CENTRACOM	443
105	2	DSE686772	19" LCD, BLACK WITH TOUCH 1928L	708
106	2	TT2538	Z420 LOW TIER WORKSTATION WINDOWS 7	708
107	2	T7448	WINDOWS SUPPLEMENTAL FULL CONFIG	877
108	2	DSRMP615A	SPD, TYPE 3, 120V RACK MOUNT, 15A P	207
109	4	B1912	MCC SERIES DESKTOP SPEAKER	443
110	2	B1914	MCC SERIES DESKTOP GOOSENECK MICROP	443
111	4	B1913	MCC SERIES HEADSET JACK	443
112	2	DSTWIN6328A	PROVIDES ONE DUAL PEDAL FOOTSWITCH	708
113	2	T7885	MCAFEE WINDOWS AV CLIENT	708

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
114	2	DDN1245	DUAL IRR SW USB HASP WITH LICENSE (	229
115	2	DDN6493	SOUND CARD AUDIGY SE	708
116	2	CDN6673	CREATIVE LABS INSPIRE A60	708
117	1	CLN1856	2620-24 ETHERNET SWITCH	147
118	1	SQM01SUM0205	GGM 8000 GATEWAY	147
a	1	CA01616AA	ADD: AC POWER	147
119	1	F4543	SITE MANAGER BASIC	469
a	1	VA00212	SDM3000 MCC7500 AUX IO F/W FOR A7.1	469
b	1	V266	ADD: 90VAC TO 260VAC PS TO SM	469
c	3	V592	AAD TERM BLCK & CONN WI	469
120	1	T7038	GCP 8000 SITE CONTROLLER	112
a	1	CA00303AA	ADD: QTY (1) SITE CONTROLLER	112
b	1	X153AW	ADD: RACK MOUNT HARDWARE	112
c	1	CA01136AA	ADD: MCC 7500 CONVEN SITE OPER	112
121	2	SQM01SUM0205	GGM 8000 GATEWAY	147
a	2	CA01616AA	ADD: AC POWER	147
b	2	CA02086AA	ADD: HIGH DENSITY ENH CONV GATEWAY	147
122	2	TRN7343	SEVEN AND A HALF FOOT RACK	509
123	2	DSOP820B	PDU, 120V HARDWIRE (8) 20A OUTLET P	207
124	2	DS1101378	RACK MT ADAPTER PLATE, 19 IN FOR DS	207
125	1	DSTSJ100BT	SPD, RJ-48 CONNECTED FOR T1/E1, 10/	207
126	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TS	207
127	1	TT2538	Z420 LOW TIER WORKSTATION WINDOWS 7	708
128	1	B1934	MCC 7500 VOICE PROCESSOR MODULE FRU	443
129	1	DSE686772	19" LCD, BLACK WITH TOUCH 1928L	708
130	1	B1905	MCC 7500 ASTRO 25 SOFTWARE	443

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
131	2	B1933	MOTOROLA VOICE PROCESSOR MODULE	443
a	2	CA01642AA	ADD: MCC 7500 BASIC CONSOLE FUNCTIO	443
b	2	CA01644AA	ADD: MCC 7500 /MCC 7100 ADV CONVL O	443
c	2	CA01643AA	ADD: MCC 7500 / MCC 7100 TRUNKING	443
d	2	CA01220AA	ADD: MCC 7500 / MCC 7100 OTEK OPERA	443
e	2	CA00147AF	ADD: MCC 7500 SECURE OPERATION	443
f	2	CA00143AC	ADD: DES-OFB ALGORITHM	443
g	2	CA00182AB	ADD: AES ALGORITHM	443
h	2	CA00245AA	ADD: ADP ALGORITHM	443
i	2	CA00144AC	ADD: DES-XL ALGORITHM	443
j	2	CA00140AA	ADD: AC LINE CORD, NORTH AMERICAN	443
k	1	CA00635AN	ENH: MCC 7500 PROMOTION - CENTRACOM	443
132	2	DS22WBLKTS	22" WIDE FORMAT LCD MONITOR BLACK,	708
133	2	TT2538	Z420 LOW TIER WORKSTATION WINDOWS 7	708
134	2	T7448	WINDOWS SUPPLEMENTAL FULL CONFIG	877
135	2	DSRMP615A	SPD, TYPE 3, 120V RACK MOUNT, 15A P	207
136	4	B1912	MCC SERIES DESKTOP SPEAKER	443
137	2	B1914	MCC SERIES DESKTOP GOOSENECK MICROP	443
138	4	B1913	MCC SERIES HEADSET JACK	443
139	2	DSTWIN6328A	PROVIDES ONE DUAL PEDAL FOOTSWITCH	708
140	2	T7885	MCAFEE WINDOWS AV CLIENT	708
141	2	DDN1245	DUAL IRR SW USB HASP WITH LICENSE (	229
142	2	DDN6493	SOUND CARD AUDIGY SE	708
143	2	CDN6673	CREATIVE LABS INSPIRE A60	708
144	1	CLN1856	2620-24 ETHERNET SWITCH	147
145	1	SQM01SUM0205	GGM 8000 GATEWAY	147
a	1	CA01616AA	ADD: AC POWER	147

ITEM NUM	QTY	NOMENCLATURE	DESCRIPTION	APC CODE
146	1	F4543	SITE MANAGER BASIC	469
a	1	VA00212	SDM3000 MCC7500 AUX IO F/W FOR A7.1	469
b	1	V266	ADD: 90VAC TO 260VAC PS TO SM	469
c	3	V592	AAD TERM BLCK & CONN WI	469
147	1	T7038	GCP 8000 SITE CONTROLLER	112
a	1	CA00303AA	ADD: QTY (1) SITE CONTROLLER	112
b	1	X153AW	ADD: RACK MOUNT HARDWARE	112
c	1	CA01136AA	ADD: MCC 7500 CONVEN SITE OPER	112
148	2	SQM01SUM0205	GGM 8000 GATEWAY	147
a	2	CA01616AA	ADD: AC POWER	147
b	2	CA02086AA	ADD: HIGH DENSITY ENH CONV GATEWAY	147
149	2	TRN7343	SEVEN AND A HALF FOOT RACK	509
150	2	DSOP820B	PDU, 120V HARDWIRE (8) 20A OUTLET P	207
151	2	DS1101378	RACK MT ADAPTER PLATE, 19 IN FOR DS	207
152	1	DSTSJ100BT	SPD, RJ-48 CONNECTED FOR T1/E1, 10/	207
153	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TS	207

Communications System Agreement
(Lease)

Motorola Solutions, Inc. ("Motorola") and Durham, NC ("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 E will be resolved in their listed order.

Exhibit A	Motorola "Software License Agreement"
Exhibit B	"Payment Schedule"
Exhibit C	"Technical and Implementation Documents"
C-1	"System Description" dated _____
C-2	"Equipment List" dated _____
C-3	"Statement of Work" dated _____
C-4	"Acceptance Test Plan" or "ATP" dated _____
C-5	"Performance Schedule" dated _____
Exhibit D	Service Statement(s) of Work and "Service Terms and Conditions" (if applicable)
Exhibit E	"System Acceptance Certificate"

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. “Equipment Lease-Purchase Agreement” means the agreement by which Customer finances all or a portion of the Contract Price

2.9. “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).

2.10. “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.

2.11. “Motorola Software” means Software that Motorola or its affiliated company owns.

2.12. “Non-Motorola Software” means Software that another party owns.

2.13. “Open Source Software” (also called “freeware” or “shareware”) means software that has its underlying source code freely available to evaluate, copy, and modify.

2.14. “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.

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

2.16. “Specifications” means the functionality and performance requirements that are described in the Technical and Implementation Documents.

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

2.18. “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.

2.19. “System Acceptance” means the Acceptance Tests have been successfully completed.

2.20. “Warranty Period” means one (1) year from the date of System Acceptance or Beneficial Use, whichever occurs first.

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.

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 Final Project Acceptance or expiration of the Warranty Period, 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. 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. Title and risk of loss to additional Equipment will pass at shipment, warranty will commence upon delivery, and payment is due within twenty (20) 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 registration and other information may be found at http://www.motorola.com/businessandgovernment/ 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 subscription services. Unless otherwise agreed by the parties in writing, the terms and conditions applicable to those maintenance, support or software subscription 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. Upon request by Customer, Motorola will use commercially reasonable efforts to determine whether any Open Source Software will be provided under this Agreement; and if so, identify the Open Source Software and provide to Customer a copy of the applicable standard license (or specify where that license may be found); and provide to Customer a copy of the Open Source Software source code if it is publicly available without charge (although a distribution fee or a charge for related services may be applicable).

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.

3.9. OPTIONAL EQUIPMENT OR SOFTWARE. This paragraph applies only if a "Priced Options" exhibit is shown in Section 1, or if the parties amend this Agreement to add a Priced Options exhibit. During the term of the option as stated in the Priced Options exhibit (or if no term is stated, then for one (1) year after the Effective Date), Customer has the right and option to purchase the equipment, software, and related services that are described in the Priced Options exhibit. Customer may exercise this option by giving written notice to Seller which must designate what equipment, software, and related services Customer is selecting (including quantities, if applicable). To the extent they apply, the terms and conditions of this Agreement will govern the transaction; however, the parties acknowledge that certain provisions must be agreed upon, and they agree to negotiate those in good faith promptly after Customer

delivers the option exercise notice. Examples of provisions that may need to be negotiated are: specific lists of deliverables, statements of work, acceptance test plans, delivery and implementation schedules, payment terms, maintenance and support provisions, additions to or modifications of the Software License Agreement, hosting terms, and modifications to the acceptance and warranty provisions.

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 $_____. The Contract Price will be paid via the disbursement of the financing proceeds pursuant to the Equipment Lease-Purchase Agreement executed between the parties. For Customer's reference, the Federal Tax Identification Number for Motorola Solutions, Inc. is 36-1115800.

5.2. FREIGHT, TITLE, AND RISK OF LOSS. Motorola will pre-pay and add all freight charges to the invoices. Unless otherwise stated in the Equipment Lease-Purchase Agreement, 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.

5.3. INVOICING AND SHIPPING ADDRESSES. Invoices will be sent to the Customer at the following address:

_____

_____

The address which is the ultimate destination where the Equipment will be delivered to Customer is:

_____

_____

The Equipment will be shipped to the Customer at the following address (insert if this information is known):

_____

_____

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

Section 6 SITES AND SITE CONDITIONS

6.1. ACCESS TO SITES. In addition to its responsibilities described elsewhere in this Agreement, 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. If the Statement of Work so indicates, 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 will 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 as a whole will not postpone System Acceptance or Subsystem acceptance, but will be corrected according to a mutually agreed schedule.

8.3. BENEFICIAL USE. Customer acknowledges that 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 so indicating on the System 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. If System Acceptance is delayed beyond six (6) months after shipment of the Equipment by events or causes within Customer's control, this warranty expires eighteen (18) months after the shipment of the Equipment.

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. If System Acceptance is delayed beyond six (6) months after shipment of the Motorola Software by events or causes within Customer's control, this warranty expires eighteen (18) months after the shipment of the Motorola Software. TO THE EXTENT, IF ANY, THAT THERE IS A SEPARATE LICENSE AGREEMENT PACKAGED WITH, OR PROVIDED ELECTRONICALLY WITH, A PARTICULAR PRODUCT THAT BECOMES EFFECTIVE ON AN ACT OF ACCEPTANCE BY THE END USER, THEN THAT AGREEMENT SUPERCEDES THIS SOFTWARE LICENSE AGREEMENT AS TO THE END USER OF EACH SUCH PRODUCT.

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. If this investigation indicates the warranty claim is not valid, then Motorola may invoice Customer for responding to the claim on a time and materials basis using Motorola's then current labor rates. 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 1) 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 2) 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"). Neither Party may unreasonably withhold consent to the selection of a mediator. 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 a business executive with authority to settle the Dispute.

11.4. LITIGATION, VENUE and JURISDICTION. If a Dispute remains unresolved for sixty (60) days after receipt of the Notice of Mediation, either Party may then submit the Dispute to a court of competent jurisdiction in the state in which the System is installed. Each Party irrevocably 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, 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 price of the Equipment, Software, or services with respect to which losses or damages are claimed. 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. 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; 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 of competent jurisdiction renders any part of this Agreement invalid or unenforceable, that part will be severed and the remainder of this Agreement 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, of 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, UPS, or DHL), or by facsimile with correct answerback received, and will be effective upon receipt:

Motorola Solutions, Inc.	Customer
Attn: Christine Binotti, Commercial Counsel	Attn: _____
1303 E. Algonquin Rd., Schaumburg, IL 60196	_____
fax: 847-576-0721	fax: _____

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**
By: _____	By: _____
Name: _____	Name: _____
Title: _____	Title: _____
Date: _____	Date: _____

Exhibit A

SOFTWARE LICENSE AGREEMENT

This Exhibit A Software License Agreement ("Agreement") is between Motorola Solutions, Inc., (“Motorola"), and _____ (“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. 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

The Contract Price will be paid via the disbursement of the financing proceeds pursuant to the Equipment Lease-Purchase Agreement executed between the parties.

Exhibit C

MOTOROLA PROPOSAL DOCUMENTS

Exhibit D
Service Terms and Conditions

Motorola Solutions, Inc. ("Motorola") and the customer named in this Agreement ("Customer") hereby agree as follows:

Section 1 APPLICABILITY

These Service Terms and Conditions apply to service contracts whereby Motorola will provide to Customer either (1) maintenance, support, or other services under a Motorola Service Agreement, or (2) installation services under a Motorola Installation Agreement.

Section 2 DEFINITIONS AND INTERPRETATION

2.1. "Agreement" means these Service Terms and Conditions; the cover page for the Service Agreement or the Installation Agreement, as applicable; and any other attachments, all of which are incorporated herein by this reference. In interpreting this Agreement and resolving any ambiguities, these Service Terms and Conditions take precedence over any cover page, and the cover page takes precedence over any attachments, unless the cover page or attachment states otherwise.

2.2. "Equipment" means the equipment that is specified in the attachments or is subsequently added to this Agreement.

2.3. "Services" means those installation, maintenance, support, training, and other services described in this Agreement.

Section 3 ACCEPTANCE

Customer accepts these Service Terms and Conditions and agrees to pay the prices set forth in the Agreement. This Agreement becomes binding only when accepted in writing by Motorola. The term of this Agreement begins on the "Start Date" indicated in this Agreement.

Section 4 SCOPE OF SERVICES

4.1. Motorola will provide the Services described in this Agreement or in a more detailed statement of work or other document attached to this Agreement. At Customer's request, Motorola may also provide additional services at Motorola's then-applicable rates for the services.

4.2. If Motorola is providing Services for Equipment, Motorola parts or parts of equal quality will be used; the Equipment will be serviced at levels set forth in the manufacturer's product manuals; and routine service procedures that are prescribed by Motorola will be followed.

4.3. If Customer purchases from Motorola additional equipment that becomes part of the same system as the initial Equipment, the additional equipment may be added to this Agreement and will be billed at the applicable rates after the warranty for that additional equipment expires.

4.4. All Equipment must be in good working order on the Start Date or when additional equipment is added to the Agreement. Upon reasonable request by Motorola, Customer will provide a complete serial and model number list of the Equipment. Customer must promptly notify Motorola in writing when any Equipment is lost, damaged, stolen or taken out of service. Customer's obligation to pay Service fees for this Equipment will terminate at the end of the month in which Motorola receives the written notice.

4.5. Customer must specifically identify any Equipment that is labeled intrinsically safe for use in hazardous environments.

4.6. If Equipment cannot, in Motorola's reasonable opinion, be properly or economically serviced for any reason, Motorola may modify the scope of Services related to that Equipment; remove that Equipment from the Agreement; or increase the price to Service that Equipment.

4.7. Customer must promptly notify Motorola of any Equipment failure. Motorola will respond to Customer's notification in a manner consistent with the level of Service purchased as indicated in this Agreement.

Section 5 EXCLUDED SERVICES

5.1. Service excludes the repair or replacement of Equipment that has become defective or damaged from use in other than the normal, customary, intended, and authorized manner; use not in compliance with applicable industry standards; excessive wear and tear; or accident, liquids, power surges, neglect, acts of God or other force majeure events.

5.2. Unless specifically included in this Agreement, Service excludes items that are consumed in the normal operation of the Equipment, such as batteries or magnetic tapes.; upgrading or reprogramming Equipment; accessories, belt clips, battery chargers, custom or special products, modified units, or software; and repair or maintenance of any transmission line, antenna, microwave equipment, tower or tower lighting, duplexer, combiner, or multicoupler. Motorola has no obligations for any transmission medium, such as telephone lines, computer networks, the internet or the worldwide web, or for Equipment malfunction caused by the transmission medium.

Section 6 TIME AND PLACE OF SERVICE

Service will be provided at the location specified in this Agreement. When Motorola performs service at Customer's location, Customer will provide Motorola, at no charge, a non-hazardous work environment with adequate shelter, heat, light, and power and with full and free access to the Equipment. Waivers of liability from Motorola or its subcontractors will not be imposed as a site access requirement. Customer will provide all information pertaining to the hardware and software elements of any system with which the Equipment is interfacing so that Motorola may perform its Services. Unless otherwise stated in this Agreement, the hours of Service will be 8:30 a.m. to 4:30 p.m., local time, excluding weekends and holidays. Unless otherwise stated in this Agreement, the price for the Services exclude any charges or expenses associated with helicopter or other unusual access requirements; if these charges or expenses are reasonably incurred by Motorola in rendering the Services, Customer agrees to reimburse Motorola for those charges and expenses.

Section 7 CUSTOMER CONTACT

Customer will provide Motorola with designated points of contact (list of names and phone numbers) that will be available twenty-four (24) hours per day, seven (7) days per week, and an escalation procedure to enable Customer's personnel to maintain contact, as needed, with Motorola.

Section 8 PAYMENT

Unless alternative payment terms are stated in this Agreement, Motorola will invoice Customer in advance for each payment period. All other charges will be billed monthly, and Customer must pay each invoice in U.S. dollars within twenty (20) days of the invoice date. Customer will reimburse Motorola for all property taxes, sales and use taxes, excise taxes, and other taxes or assessments that are levied as a result of Services rendered under this Agreement (except income, profit, and franchise taxes of Motorola) by any governmental entity.

Section 9 WARRANTY

Motorola warrants that its Services under this Agreement will be free of defects in materials and workmanship for a period of ninety (90) days from the date the performance of the Services are completed. In the event of a breach of this warranty, Customer's sole remedy is to require Motorola to re-perform the non-conforming Service or to refund, on a pro-rata basis, the fees paid for the non-conforming Service. MOTOROLA DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Section 10 DEFAULT/TERMINATION

10.1. If either party defaults in the performance of this Agreement, the other party will give to the non-performing party a written and detailed notice of the default. The non-performing party will have thirty (30) days thereafter to provide a written plan to cure the default that is acceptable to the other party and begin implementing the cure plan immediately after plan approval. If the non-performing party fails to provide or implement the cure plan, then the injured party, in addition to any other rights available to it under law, may immediately terminate this Agreement effective upon giving a written notice of termination to the defaulting party.

10.2. Any termination of this Agreement will not relieve either party of obligations previously incurred pursuant to this Agreement, including payments which may be due and owing at the time of termination. All sums owed by Customer to Motorola will become due and payable immediately upon termination of this Agreement. Upon the effective date of termination, Motorola will have no further obligation to provide Services.

Section 11 LIMITATION OF LIABILITY

Except for personal injury or death, Motorola's total liability, whether for breach of contract, warranty, negligence, strict liability in tort, or otherwise, will be limited to the direct damages recoverable under law, but not to exceed the price of twelve (12) months of Service provided under this Agreement. 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 OR THE PERFORMANCE OF SERVICES BY MOTOROLA PURSUANT TO THIS AGREEMENT. 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. This limitation of liability will survive the expiration or termination of this Agreement and applies notwithstanding any contrary provision.

Section 12 EXCLUSIVE TERMS AND CONDITIONS

12.1. This Agreement supersedes all prior and concurrent agreements and understandings between the parties, whether written or oral, related to the Services, and there are no agreements or representations concerning the subject matter of this Agreement except for those expressed herein. The Agreement may not be amended or modified except by a written agreement signed by authorized representatives of both parties.

12.2. Customer agrees to reference this Agreement on any purchase order issued in furtherance of this Agreement, however, an omission of the reference to this Agreement will not affect its applicability. In no event will either party be bound by any terms contained in a Customer purchase order, acknowledgement, or other writings unless: the purchase order, acknowledgement, or other writing specifically refers to this Agreement; clearly indicate the intention of both parties to override and modify this Agreement; and the purchase order, acknowledgement, or other writing is signed by authorized representatives of both parties.

Section 13 PROPRIETARY INFORMATION; CONFIDENTIALITY; INTELLECTUAL PROPERTY RIGHTS

13.1. Any information or data in the form of specifications, drawings, reprints, technical information or otherwise furnished to Customer under this Agreement will remain Motorola’s property, will be deemed proprietary, will be kept confidential, and will be promptly returned at Motorola's request. Customer may not disclose, without Motorola's written permission or as required by law, any confidential information or data to any person, or use confidential information or data for any purpose other than performing its obligations under this Agreement. The obligations set forth in this Section survive the expiration or termination of this Agreement.

13.2. Unless otherwise agreed in writing, no commercial or technical information disclosed in any manner or at any time by Customer to Motorola will be deemed secret or confidential. Motorola will have

no obligation to provide Customer with access to its confidential and proprietary information, including cost and pricing data.

13.3. This Agreement does not grant directly or by implication, estoppel, or otherwise, any ownership right or license under any Motorola patent, copyright, trade secret, or other intellectual property, including any intellectual property created as a result of or related to the Equipment sold or Services performed under this Agreement.

Section 14 FCC LICENSES AND OTHER AUTHORIZATIONS

Customer is solely responsible for obtaining licenses or other authorizations required by the Federal Communications Commission or any other federal, state, or local government agency and for complying with all rules and regulations required by governmental agencies. Neither Motorola nor any of its employees is an agent or representative of Customer in any governmental matters.

Section 15 COVENANT NOT TO EMPLOY

During the term of this Agreement and continuing for a period of two (2) years thereafter, Customer will not hire, engage on contract, solicit the employment of, or recommend employment to any third party of any employee of Motorola or its subcontractors without the prior written authorization of Motorola. This provision applies only to those employees of Motorola or its subcontractors who are responsible for rendering services under this Agreement. If this provision is found to be overly broad under applicable law, it will be modified as necessary to conform to applicable law.

Section 16 MATERIALS, TOOLS AND EQUIPMENT

All tools, equipment, dies, gauges, models, drawings or other materials paid for or furnished by Motorola for the purpose of this Agreement will be and remain the sole property of Motorola. Customer will safeguard all such property while it is in Customer's custody or control, be liable for any loss or damage to this property, and return it to Motorola upon request. This property will be held by Customer for Motorola's use without charge and may be removed from Customer's premises by Motorola at any time without restriction.

Section 17 GENERAL TERMS

17.1. If any court renders any portion of this Agreement unenforceable, the remaining terms will continue in full force and effect.

17.2. This Agreement and the rights and duties of the parties will be interpreted in accordance with the laws of the State in which the Services are performed.

17.3. Failure to exercise any right will not operate as a waiver of that right, power, or privilege.

17.4. Neither party is liable for delays or lack of performance resulting from any causes that are beyond that party's reasonable control, such as strikes, material shortages, or acts of God.

17.5. Motorola may subcontract any of the work, but subcontracting will not relieve Motorola of its duties under this Agreement.

17.6. 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.

17.7. THIS AGREEMENT WILL RENEW, FOR AN ADDITIONAL ONE (1) YEAR TERM, ON EVERY ANNIVERSARY OF THE START DATE UNLESS EITHER THE COVER PAGE SPECIFICALLY STATES A TERMINATION DATE OR ONE PARTY NOTIFIES THE OTHER IN WRITING OF ITS INTENTION TO DISCONTINUE THE AGREEMENT NOT LESS THAN THIRTY (30) DAYS OF THAT ANNIVERSARY DATE. At the anniversary date, Motorola may adjust the price of the Services to reflect its current rates.

17.8. If Motorola provides Services after the termination or expiration of this Agreement, the terms and conditions in effect at the time of the termination or expiration will apply to those Services and Customer agrees to pay for those services on a time and materials basis at Motorola's then effective hourly rates.

Exhibit E

System Acceptance Certificate

Customer Name: _____

Project Name: _____

This System Acceptance Certificate memorializes the occurrence of System Acceptance. Motorola and Customer acknowledge that:

1. The Acceptance Tests set forth in the Acceptance Test Plan have been successfully completed.

2. The System is accepted.

Customer Representative:	Motorola Representative:
Signature: _____	Signature: _____
Print Name: _____	Print Name: _____
Title: _____	Title: _____
Date: _____	Date: _____

FINAL PROJECT ACCEPTANCE:

Motorola has provided and Customer has received all deliverables, and Motorola has performed all other work required for Final Project Acceptance.

Customer Representative:	Motorola Representative:
Signature: _____	Signature: _____
Print Name: _____	Print Name: _____
Title: _____	Title: _____
Date: _____	Date: _____