Proposal for
Nassau County, Florida

7.4 to 7.11 Upgrade
Proposal Addendum
April 5, 2012

5208 Pheasant Run Court, Ponte Vedra Beach, FL 32082

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MOTOROLA *SOLUTIONS*

Motorola Solutions, Inc.
1303 E. Algonquin Rd.
Schaumburg, IL 60196
USA

April 5, 2012

Mr. Guy Riner, Systems Administrator
Nassau County Board of County Commissioners
96135 Nassau Place
Yulee, FL 32097

Subject: Proposal Addendum for 7.4 to 7.11 Upgrade

Dear Guy:

Motorola Solutions, Inc. ("Motorola") is pleased to present Nassau County, Florida ("County") with this proposal addendum for:

- All software maintenance options
- All service offerings (individually priced)
- Upgrade cost for 7.4 to 7.11 to include MCC7500 consoles
- Upgrade cost for 7.4 to 7.11 to include MCC7500 consoles and GCM8000 comparators
- SOW documents for all maintenance and software services offered

Motorola's proposal is subject to the Communications System Agreement and its Exhibits or, in the alternative, a negotiated version thereof, a copy of which was included with our original proposal dated October 17, 2011. The team at Motorola will negotiate in good faith to arrive at a contract that best serves the interests of all parties involved.

The information in this proposal is a final design and comprehensive firm pricing valid through and including April 27, 2012. We look forward to your positive review of our proposal, to subsequent discussions, and to helping Nassau County achieve its communications goals and objectives now and into the future. Questions or inquiries may be addressed to Michelle Poole at 904-814-9938.

Sincerely,

Motorola Solutions, Inc.
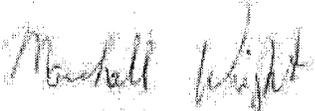
Marshall Wright
MSSSI Vice President & Director, Sales
Government & Public Safety, East Region
North America Government Markets

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Section 1.   System Description

1.1   System Upgrade

The concept is that the current outdated 7.4 Master site that includes the server cabinet 1 and switch rack 3 along with the old PDG (on rack 1) will be replaced with a release 7.11 M2 Master site. Due to virtualization of various servers, the new M2 Master site will be all on a single rack.

Following are the high-level details of the changes that will be made.

7.11 M2 Master Site on a Single Rack Staged and Tested At CCSi:

- Load subscriber data base (~ 600 units) in the field
- New MOSCAD GMC Virtual Server
- New MOSCAD GWS Remote Client (Manager's Office)
- New CORE LAN Switches
- New NM/Zone Controllers
- New Juniper Firewall

Software/Firmware Upgrades for the Following:

- Subsystem refresh:
  - GCP8000 SC Controllers
  - GTR 8000 Base Radios
  - SDM3000 RTUs
  - S6000 routers
  - Replace all HP2626 switches with HP2610 (2626 no longer available)
  - Replace the local NM & Remote NM client (Manager's Office) CPUs with HP Z400s

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The rack drawing in Figure 1-1 illustrates the current Master site rack elevations. Cabinet 1 and rack 3 will be replaced by a single M2 Master rack (Figure 1-2). Some things could be done in advance prior to the installation of the M2 rack. Some components have to be relocated out of cabinet 1 and rack 3. Since this is a "ruthless" upgrade where there will be some site trunking time, the final switch to the new M2 would be done during the least traffic hours (usually means Sunday morning work). For this reason, the following are some of the tasks to get a better understanding of what could be done in advance of the change:

♦ Remove the PDG in rack 1 from service (IV&D not being used at this time)
♦ Move the Elite Server to rack 1 (no change to XP OS just new CDM/ADM to be loaded)
♦ Remove the DMZ & LAN Switch 3, PN, Border & GGSN routers from rack 2 (not used at this time and are being replaced)
♦ Relocate the TRAK to the top of rack 2
♦ Relocate the SSC router to rack 2
♦ Relocate the MOTOBRIDGE RGU to rack 2
♦ Relocate MOSCAD RTU and PBs to rack 1 or 2 (MOSCAD gateway will not be used in the new M2 Master)
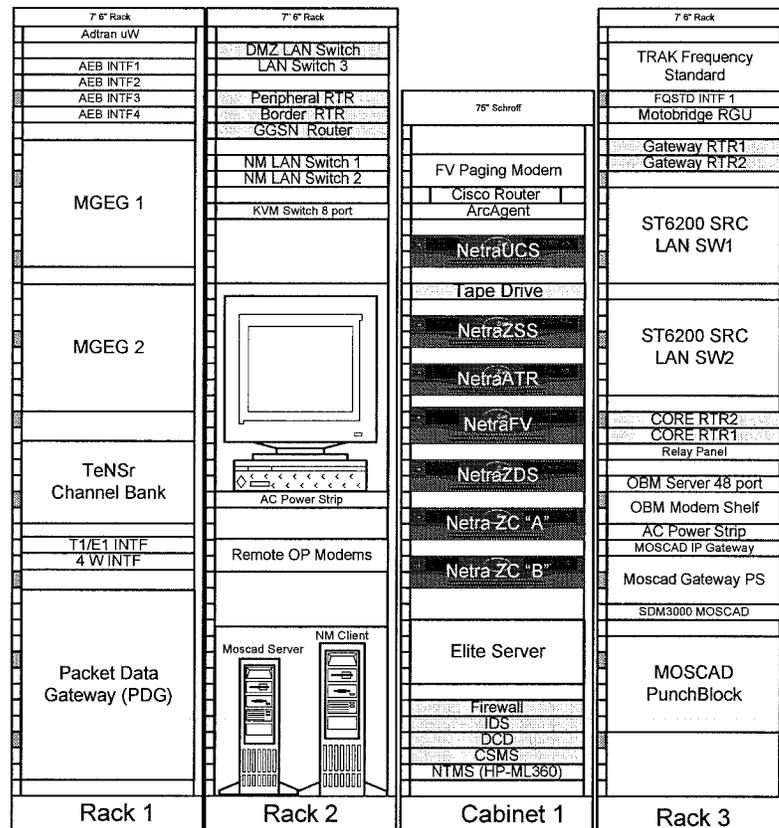
Figure 1-1: Current Master site rack elevations

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1-2   System Description

```
┌─────────────────────────────┐
│         7' 6" Rack          │
├─────────────────────────────┤
│                             │
│         PN RTR              │
│       DMZ LAN Switch        │
│         Border RTR          │
│                             │
│       Gateway RTR1          │
│       Gateway RTR2          │
│                             │
│         VPN/Firewall        │
│                             │
│                             │
│        Relay Panel          │
│         CORE RTR2           │
│         CORE RTR1           │
│                             │
│    Master Site LAN Switch 1 │
│    Master Site LAN Switch 2 │
│                             │
│                             │
│     OBM Terminal Server     │
│                             │
│                             │
│     Nice Data Tape Bkup     │
│     Nice Audio Tape Bkup    │
│       Nice IP Logger        │
│                             │
│      Firewall Mgr Server    │
│                             │
│                             │
│                             │
│                             │
│        Zone Ctr #2          │
│                             │
│      NM / Zone Ctr #1       │
│                             │
│      Virtual Server #2      │
│            NAS              │
│                             │
│      Virtual Server #1      │
│                             │
│                             │
│      Service Server #2      │
│      Service Server #1      │
│                             │
│                             │
├─────────────────────────────┤
│          Rack 3             │
└─────────────────────────────┘
```

Figure 1-2: Single M2 Master rack

1.2 MCC 7500 Solution Overview for Nassau County

Motorola's proposed dispatch solution for Nassau County is our MCC 7500 Dispatch Console, offering IP-based seamless connectivity between Nassau County's dispatch operators and field personnel.

The MCC 7500 Dispatch Console will provide the Nassau County with a scalable, flexible system architecture, sophisticated network management and security, and an easy migration to future capabilities.

Cost Savings and Ease of Use

The MCC 7500 is designed to help reduce the total cost of owning an IP-based, feature-rich dispatch system without compromising quality and reliability. Specific benefits of the MCC 7500 include the following:

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

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MCC 7500 Console Configuration for the Nassau County

The proposed solution offers Nassau County 8 MCC 7500 dispatch consoles to interface with Nassau County's ASTRO 25 system.

Table 1-1 outlines the number of consoles and their location.

Table 1-1: Consoles and Locations

Number of Operator Positions	Location
6	Nassau County Sheriff's Office
2	Fernandina Beach Police Department
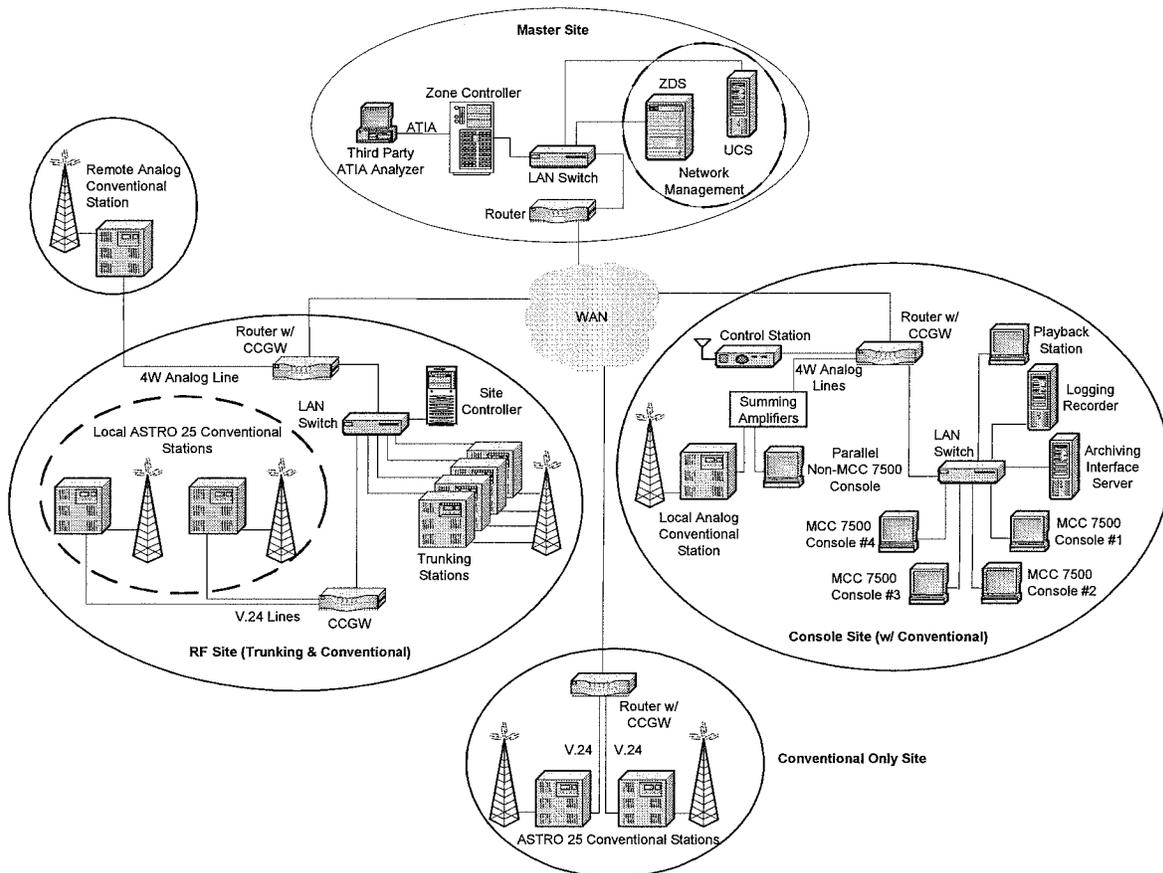
Figure 1-3: Radio System Infrastructure with Motorola MCC 7500 Consoles Sample Block Diagram

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1.2.1　The MCC 7500 Dispatch Experience

As the most advanced dispatch console in Motorola's portfolio of mission-critical communications technologies, the MCC 7500's standard features offer Nassau County state-of-the-art communications, console management and configuration functionality, dispatch operation, and communications security.

The proposed system also offers Nassau County the capability to maintain both audio and data recording of the calls made on the communications system.

1.2.2　Interoperability Features

ASTRO 25 is specifically designed around the APCO P25 standards. All voice messages are digitized, all LMR system features are compliant with P25 standards, and the system uses the P25-defined, 9600-bps control channel format for all control channel commands. As part of ongoing enhancements to this solution, Motorola has joined and actively participated in the P25 interoperability committee to ensure continuously improving interoperability with the radios of other P25 vendors. ASTRO 25 is also fully Common Air Interface (CAI) compliant.

MUTUAL AID INTEROPERABILITY OFFERS FLEXIBILITY AND FUTURE EXPANSION.

Motorola can use multiple customer-furnished (CF) interoperability radios to install, configure, and make operational the necessary hardware and software to provide two-way communications between the MCC 7500 consoles and mutual aid channels.

As shown in Figure 1-4, interoperable communications can be provided through a dispatcher-initiated interface (patch) to the CF mutual aid radios. The Motorola Conventional Channel Gateway (CCGW) forms the bridge between the MCC 7500 dispatch console on the ASTRO 25 trunked radio network and the CF mutual aid radios. This allows the dispatcher to patch together mutual aid radios and required subscribers on the ASTRO 25 system as situations dictate. Each CCGW can connect with up to four conventional or trunked mutual aid channels. Multiple (up to three) CCGWs can be installed per site to support a total of 12 Mutual Aid radios to communicate with various agencies. One CCGW can be placed any RF or console site allowing flexibility of connecting to the MCC 7500 consoles. CCGW interfaces can be installed at any location as long as there is network connectivity back to the Zone Core. Additional CCGWs can easily be added anywhere on the LMR network as mutual aid requirements change.

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As an incident occurs, local mutual aid agencies can initiate radio conversation to a MCC 7500 dispatch location via a programmed channel. By selecting an icon on the console monitor, the dispatcher will initiate a patch to a talkgroup for First Responders as necessary. Incident conversations will be seamless from the moment of the patch and can be recorded like any talk group conversation within the LMR network. The dispatcher will also be able to take part in and monitor conversations for the duration of the incident, as necessary.
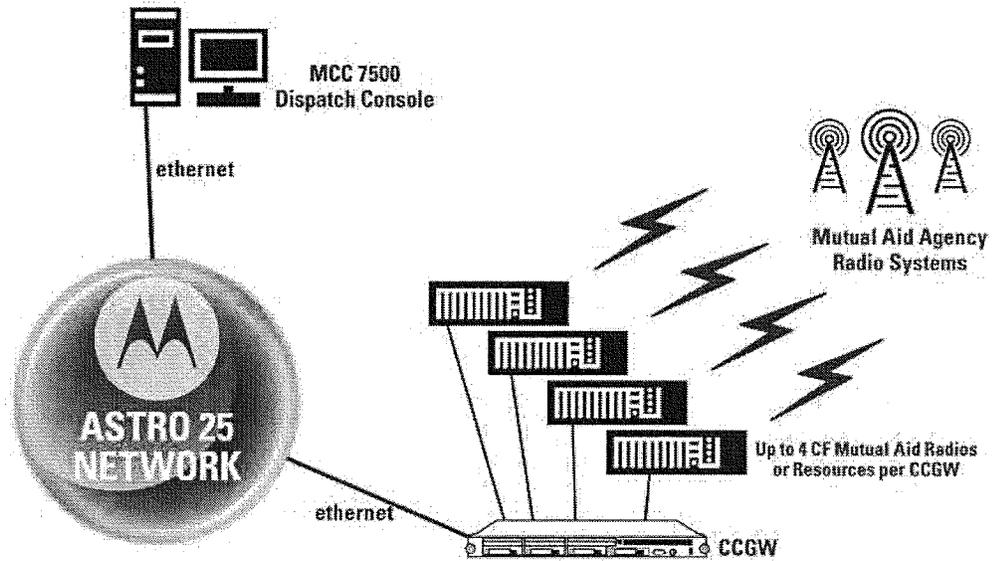
Figure 1-4: Mutual Aid Components

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1.2.2.1 Integration with the ASTRO 25 Network

The MCC 7500 IP Dispatch Console will be seamlessly integrated into Nassau County's ASTRO 25 system, without interface boxes, digital voice gateways or backroom electronics for an integrated mission critical network. This tight union between radio infrastructure and dispatch console equipment has several operational benefits to Nassau County.

This modular IP approach substantially reduces the amount of space needed for backroom electronics. All dispatch activity is performed over IP. The physical space needed to accommodate the MCC 7500 console position is comparable to that required for a personal computer.

Both trunked talkgroups and conventional radio channels can be accessed and controlled from one MCC 7500 IP Dispatch Console over the same network. This reduces overall transport costs and the need for duplicate fixed network equipment. Table 1-2 outlines the benefits of the MCC 7500's seamless integration to the ASTRO 25 network.

THE MCC 7500 CONSOLE'S IMPROVED USE OF BANDWIDTH ENSURES THAT EMERGENCY CALLS WILL MAKE IT THROUGH TO THE DISPATCH OPERATOR, REGARDLESS OF SYSTEM TRAFFIC.

Table 1-2: Benefits of Seamless Integration of the MCC 7500 IP Console
with Nassau County's ASTRO 25 Network

Feature	Benefit to Nassau County
Tight coordination between the IP network and IP console eliminates the potential for audio degradation.	Subscribers and console operators will be able to communicate without loss of information.
Emergency calls are prioritized for successful delivery regardless of network traffic.	Console operators will always be able to hear emergency calls from users in the field.
IP network redundancy ensures call traffic delivery.	No lost communications.
Inherent access to all system resources within the network provides dispatch priority to reach any user when needed.	Console operators will always be able to reach out to users in the field.
Rapid call set up times and quality of service, regardless of the size of the system.	The ability to scale the system to handle future capacity, while maintaining efficient dispatch operations.
True end-to-end encryption from the subscriber to the console operator position, enhancing operational security	Assurance that sensitive, private communications will remain secure, from the user in the field to the console dispatch operator
Improved bandwidth efficiencies reduce transport costs.	Ongoing cost savings for Nassau County.

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Connection to the ASTRO 25 System

To connect to Nassau County's ASTRO 25 system, a remote site router and site LAN switch is provided.

The site router provides an interface that handles all of the IP Network Management traffic between the MCC 7500 Dispatch Console center and the Nassau County's ASTRO 25 system's master site. The site router fragments large IP packets according to industry standards, prioritize packets, and converts Ethernet data to the desired transport medium.

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

1.2.2.2   Agency Partitioning

With Agency Partitioning, Nassau County's agencies will gain the interoperability benefits of being on the same system, be able to leverage cost savings in the maintenance of a shared system, and still maintain control of their own console configurations, encryption keys, and channels.

> **AGENCY PARTITIONING ALLOWS MULTIPLE AGENCIES TO OPERATE DISPATCH CONSOLES ON THE SAME SYSTEM.**

Agency partitioning functionality enables Nassau County's system administrators to control who has access to functionality for the console network as a whole. It controls access for talkgroups, auxiliary I/Os, pre-programmed pages, encryption keys, and configuration data. Agency Partitioning help keep an agency's resources available for its users, while preventing unauthorized people from accessing or modifying the network configuration.

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1.2.2.3 Conventional Base Station Interfaces

The MCC 7500 is capable of accessing and controlling Nassau County's analog and digital conventional base stations through the use of conventional channel gateways (CCGW). This capability lowers Nassau County's cost of ownership in two ways:

- It uses the same transport network, reducing the requirements for dedicated backhaul.
- It reduces the hardware requirements for interoperability, lowering fixed network equipment costs.

The dispatch console processes audio received from the station, and controls various features on the stations, such as frequency selection, private line selection, and repeater on/off.

There are two different types of CCGWs utilized with the S2500 Router; analog, and digital. The analog CCGW provides up to four 4-wire interfaces, while the digital CCGW supports up to two v.24 interfaces for Nassau County's digital channels.

Provided at each site, each GGM 8000 router can support up to 10 IP interfaced base stations. With the optional CCGW interface card, up to 4 additional conventional resources can be integrated using any combination of 4-wire analog, and v.24 interfaces. Through the use of one of the analog ports, and one of the v.24 ports, a digital and analog mixed mode channel may be interfaced to the system, utilizing one of the four available channel slots of the CCGW. Additionally, the GGM 8000 CCGWs allow for recovery of MDC1200 and digital signaling, such as unit ID, and emergency alarm, which is in turn, passed to the MCC 7500 dispatch operator position(s).

1.2.3 Console Operations

RELIABLE AUDIO IN REAL TIME

The MCC 7500 IP Console is designed to provide mission-critical audio between the dispatch console and users in the field. It is optimized for real-time audio, prioritizing emergency calls over other traffic, minimizing voice queuing, and transmitting calls in 450 milliseconds or less.

Using robust error mitigation to maintain call quality even when the system is heavily loaded, the MCC 7500 IP Console reduces communication errors that may force dispatch console operators to repeat their transmissions.

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1.2.3.1   Dispatch Interface

The MCC 7500's graphical user interface (GUI) optimizes user efficiency. It is designed to display the maximum number of resources a dispatch operator is able to easily view and control. The Nassau County can customize the MCC 7500's GUI by agency or by individual user to meet their dynamic needs and requirements.

EASY TO USE, FLEXIBLE, AND CUSTOMIZABLE USER INTERFACE

Elite Dispatch Graphical User Interface

The MCC 7500 Elite Dispatch GUI is an enhanced version of Motorola's Gold Elite Dispatch GUI.
For existing Gold Elite users, the GUI allows a smooth transition and minimal training for radio dispatch operators. For new users, the graphical icons and customization options make the MCC 7500 IP console GUI easy to learn and operate.

An example of the MCC 7500's GUI is shown in Figure 1-5.
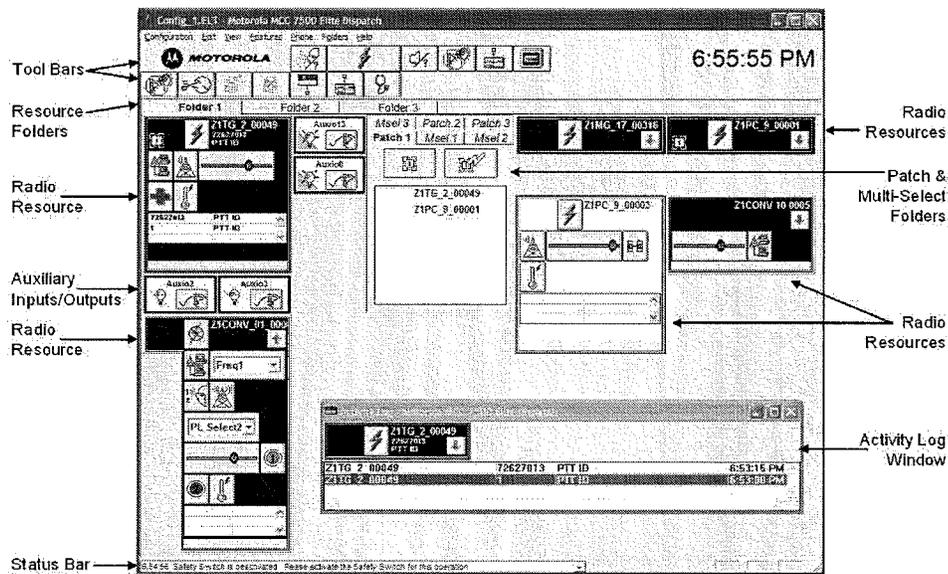
Figure 1-5: The MCC 7500's GUI delivers critical real-time information is delivered to the console operator when and where they need it

Based on operator preference, the MCC 7500 GUI can be customized to show details of trunked and conventional channels on a per-channel basis. Various controls can be highlighted, such as patch status, frequency select, coded/clear select, and individual volume control. Per-channel controls can be fully or partially shown, or hidden to save space on the screen. Busy dispatch operators can respond to a missed call by simply clicking on an entry in the Activity Log. The number of calls and call

information displayed in the Activity Log is customizable to suit the needs of the user. The status of auxiliary inputs and outputs can be conveniently interpreted from the GUI with the use of familiar graphical icons, such as a door shown open or closed.

1.2.3.2 Standard Radio Transmission and Reception

A typical MCC 7500 console has two speakers, one for selected audio and the second for all remaining unselected audio. Additional speakers can be added to the console, allowing dispatch operators to configure a specific speaker for a set of designated audio sources. This simplifies multitasking between multiple audio sources, allowing flexibility in the way the audio is presented to the dispatch operator.

Receiving Calls from the Field and Other Dispatch Operators

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

Initiating Calls to the Field and Other Dispatch Operators

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

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

Making Calls to the Field and Other Dispatch Operators

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

The MCC 7500 system enables dispatch operators to make private calls to individual field radio users or dispatch operators. Once this private call is established, it can be patched in with another resource at the dispatch operator's discretion.

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Controlling Console Audio

The MCC 7500 IP Dispatch Console offers the operator several different ways of controlling or muting the audio on their console. The operator can change the audio volume of any specific resource routed to a selected speaker and, if they desire, can mute and un-mute all non-selected resources on the console ("All Mute") for 30 seconds.

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

Controlling Network Audio

Dispatch operators can control the audio on the ASTRO 25 network. Using the console, the operator can enable or disable radio users in a talkgroup from hearing transmissions of other radio users in that talkgroup, in order to compartmentalize traffic, reduce interruptions, and maintain communications between dispatch and the field. When this function is enabled or disabled, all dispatch consoles with this resource assigned are updated with the current status of the feature. This feature can be controlled from any dispatch console.

1.2.3.3　Dispatch Audio Experience

Emergency Alarms

The MCC 7500 IP Dispatch Console is capable of monitoring radio subscribers for user initiated emergency activations. On subscriber radios that are equipped and programmed to transmit an emergency alarm, the MCC 7500 detects that this emergency has occurred and displays the emergency on operator positions that are preprogrammed to receive the emergency notification.

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

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

In the event of a system that all channels are busy at the RF site that receives the emergency, that event is automatically given a Priority Level 1. This is the highest priority possible, putting the emergency call at the top of any busy queue. The

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emergency call will be given the next available voice channel at that site bumping all non-emergency calls in the queue.

Headset Jack

Each dispatch console is capable of supporting up to two headset jacks. A headset jack allows a dispatch console user to use a headset while operating the dispatch console. Each headset can either be connected to the console for supervisory applications, or to a desk telephone.

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

The headset jack supports headsets which use either PJ7 (6-wire) or PJ327 (4-wire) longframe connectors (6-wire headsets have a PTT button while 4-wire headsets do not have a PTT button).

Desktop Speakers

Each dispatch console is capable of supporting up to 8 audio speakers. These speakers supply audio for select/unselect, as well as pre-determined audio sources to specific monitor speakers., each of which transmits unique audio—that is, an audio source cannot appear in multiple speakers at a single dispatch console. Each position supports up to eight audio speakers. Monitor speakers – can tie specific talkgroups to a certain speaker, such as all fire resources to speaker 3.

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

Footswitch

Each dispatch console is capable of a dual pedal footswitch. The footswitch can be configured to control general transmit and monitor functions.

Telephone/Headset Port

The telephone/headset port allows an external telephone set to be connected to the dispatch console. The dispatch console's headset can then be used to communicate on both the radio system and a telephone system (i.e. a 911 system).

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

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

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back to the telephone. During the transmission, the dispatch operator continues to hear the telephone audio through the headset.

Instant Recall Recorder Port (for Radio)

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 (typically about 60 minutes) and is easily played back by the dispatch console user. This allows the dispatch console user to replay received audio that the user may have missed.

The instant recall recorder port (for radio) allows an instant recall recorder to be connected to a dispatch console. The port provides an output containing the receive radio audio on the selected channels. Transmit audio of any type (from either this dispatch console or a parallel dispatch console) as well as tones generated by the dispatch console (emergency tones, callback tones, busy tones) are not included in the audio output.

Dispatch console generated tones (e.g., emergency alarm tones, trunking busy tones, error tones, etc.) are not included in the audio appearing at the analog audio output. This is done so that they do not interfere with the dispatch console user's ability to understand the voice audio that was recorded.

1.2.3.4 Emergency Radio Transmission and Reception

As part of a mission-critical communications network, the MCC 7500 facilitates immediate prioritization and resolution of emergency communications between Nassau County's dispatch and first responders in the field. This enables dispatch operators and first responders to focus on their mission, not their equipment—especially during critical situations.

When a field user or another dispatch operator makes a trunking emergency call, the console emits both visual and audible indications ("Emergency Alarm"). The operator can then "recognize" the emergency call, which ends the audible emergency indication and notifies all console operators that the emergency is being addressed ("Emergency Recognize"). The audible emergency indication may also be muted by a console operator without recognizing the emergency alarm ("Mute Tones at a Single Op"). When an emergency is over, the dispatch console user can end the Emergency Alarm. The emergency mode remains active on the initiating radio unit until it is ended (reset) by the radio user.

Receiving an Emergency Call

When a field user or another dispatch operator makes a trunking emergency call, the console emits both visual and audible indications ("Emergency Alarm"). The audible indication works to alert the dispatch operator that an emergency is underway; the visual indication directs the dispatch operator's attention to the specific resource on

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which the emergency call is being made. The dispatch operator can immediately reserve a voice channel for the duration of the emergency.

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

Responding to an Emergency Call

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

The audible emergency indication may also be muted by a console operator without recognizing the emergency alarm ("Mute Tones at a Single Op"). This would be used in a situation where one agency is monitoring a channel that belongs to another agency. If an emergency alarm comes in on the second agency's channel, the first agency could mute the tones at their dispatch consoles without having to wait for the second agency to recognize it.

Ending an Emergency Call

When an emergency is over, the dispatch console user can end the Emergency Alarm. The visual indication on the console GUI is removed, and the console informs the trunking controller and other consoles that the emergency is over ("Emergency End/Knockdown").

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

1.2.3.5   Radio Patch Control

MCC 7500 console users can patch communication between trunked and/or conventional radios that are normally unable to communicate with each other due to different features, programming, or even different frequency bands. A patch group is a group of linked resources that can both receive messages from a console and transmit to all other members of the patch group. The MCC 7500 supports a maximum of 16 active patch groups.

Setting up a Standard Patch

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

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Patched radio users see the ID or alias of the other patched radio(s), as opposed to that of the console, provided that the radio subscriber is capable of displaying IDs. This minimizes confusion and the need for the dispatch operator to intervene in the call. Patches are automatically re-established if interrupted so the MCC 7500 user can concentrate on continuing operations.

Pre-Defined Patches

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

Using Multi-Select

The Multi-Select feature allows a dispatch console to define groups of selected radio resources. When a Multi-Select group is opened, all of the resources in the group are simultaneously selected. Resources can be added or removed from a Multi-Select group while it is open or while it is closed.

The Multi-Select feature

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

> Note: This operation is different than that of the patch folders. A dispatch console can only have one multi-select group active at a time, but it can have multiple patch groups simultaneously active.

1.2.3.6   Call Management and Control

Automatic Prioritization of Calls

Calls on the MCC 7500 Dispatch Console are prioritized through a transmission hierarchy. Calls from primary supervisors take priority over those from secondary supervisors, which in turn take priority over non-supervisors. Instant Transmit or All-Points Bulletin (APB) transmissions, regardless of whether they are from a supervisor, will take priority over general or patch transmissions.

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

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

Manual Prioritization of Calls

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

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calls have a higher priority than tactical. When the System Access Priority status of a resource is changed, it is updated at all dispatch consoles in the systems that are monitoring that trunked resource.

Standard Call Indications

The MCC 7500 Console indicates the availability of any given trunking resource, whether or not it is being transmitted on at the moment. It will also give an inbound call indication that provides the console operator with a visual cue of audio activity on a radio resource. This functionality makes it easy for an operator to see at a glance what the status of a resource is at any moment.

Resource Identification

To identify a resource, the console reads its unit ID, a string of digits that uniquely represent that resource. The console makes it easy for operators to read unit IDs by replacing them with user-friendly 16-character aliases. These aliases, which are defined during the configuration of the console system, can replace the unit IDs of the following resources:

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

On large systems, unit IDs can be conserved by grouping all individual call resources on a specific trunking talkgroup together under a certain ID. This flexibility simplifies the daily work of Nassau County's dispatch operators.

Call Alerting

When an operator needs to reach a radio user or dispatch operator and they are not near their radio or console, the dispatch operator can "page" the unattended radio or console through a series of beeps and an indication of the sender's ID. When the radio user or dispatch operator becomes available, they will see the unit ID of the calling dispatch operator's console, and be able to return the call. Additionally, a Call Alert can be used to trigger an activity. For instance, a Call Alert may cause a vehicle's horn to sound and its lights to flash.

The console operator can even send a call alert to a user who is involved in voice and data communications over the network.

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1.2.4   Console Logging

The MCC 7500 Dispatch Console system proposed to Nassau County includes a logging recorder subsystem that enables the recording and replay of audio and other information associated with real-time conversations over the network. These capabilities will provide Nassau County's personnel with clear audio and enough information to easily understand the context and content of any recorded transmission.

In addition to recording audio, the logging recorder captures the following information:

- Talkgroup and channel information
- User identification such as unit ID and alias
- Call type such as talkgroup call, emergency call, etc.
- Non-voice events such as Call Alerts, radio Status Check, radio Message, etc.

This information is available for display to the user upon playback, and can be searched by the user in order to retrieve the desired call.

The logging recorder's capacity is based on the number of radio transmissions it needs to record simultaneously, not on the number of channels that it will record.

A call can be saved either as a complete call (audio and any information associated with the call) or as a simple .wav file. Files saved as complete calls must be played using the Scenario Replay application included with the logging recorder. Files saved as .wav files can be played on any application that supports them.

Record and Replay of Archived Calls

The logging recorder provided to the Nassau County is an IP-based recorder that will record all IP traffic sent to it. It will provide Nassau County with the capability to record audio at the same level of quality as that heard at the console position. In addition, it will record information associated with the call beyond just the audio.

A replay station can access recordings on multiple recorders, even ones that are not being used with AISs. This provides the user with a complete view of everything being recorded from a single point.

Management of the Logging Recorder Subsystem

Security and fault management for the logging recorder subsystem are configured and managed by a common administration application, residing on either a playback station or a dedicated PC. Administrative personnel can use the management controls of the logging recorder subsystem to configure how calls are recorded.

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On a global level, administrators can define which calls are recorded by which agency or department; on a more granular level, administrators can define the following recording behavior:

♦ Which talkgroups and conventional resources are to be recorded
♦ Whether or not secure calls are recorded
♦ Which talkgroups and conventional resources are critical and which are not
♦ Access rights for replay station user accounts

Configures various operational characteristics of the recorders (watermark limits for the recording media, what to do when the recording media fills up, etc)

Long Term Logging Port

Long term audio recording is used to record a portion of the inbound and outbound audio present on a specific dispatch console. These recordings are typically archived for long-term storage, and provide a historical record of the radio communications made at a given dispatch console.

The long term logging port allows an external logging recorder to be connected to a dispatch console. The audio that appears on this output is configurable, but is typically the audio that was transmitted and/or received at that dispatch console.

The configuration of audio to be presented at this port is tied to the physical dispatch console, so that no matter what user is logged into the console, the same type of audio is logged. The long term logging port can be configured to log any combination of the audio sources listed below:

♦ Audio received from the currently selected radio resources (note that 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 this dispatch console user
♦ Microphone audio being transmitted to unselected radio resources by this dispatch console user
♦ Any tones generated by the dispatch console that appear in its speakers (trunking tones, emergency tones, etc.)
♦ Tones generated by the Zetron external paging encoder

Note that this output may be used with an instant recall recorder as well as a long term logging recorder.

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1.2.5 Console System Security

The MCC 7500 Console supports the Information Assurance capabilities of the ASTRO 25 network by enabling end-to-end encryption from the operator position, so that at no point will Nassau County's communications be undermined by unencrypted transmissions. Each dispatch operator will be able to fully participate in secure communications while being confident that sensitive, vital information will not be heard by unauthorized individuals.

Secure Access to the Console

To use the dispatch console, an operator must enter a valid radio system user account name and password. The dispatch console validates that information with the radio system's network manager and allows the user to access only the resources for which the user has access rights. This also applies to third party applications that use the dispatch console's API.

Secure Communications at the Console

The console itself encrypts and decrypts radio voice messages. Thus, radio voice messages are encrypted end-to-end, from the field radio user to the dispatch console. The console operator can choose whether or not to encrypt their transmissions on a particular trunked resource. Console operators can interface with agencies that have different encryption configurations without any manual intervention or delay. The MCC 7500 Console can support up to 60 calls simultaneously, using up to four different algorithms and multiple encryption keys.

To help reduce potential errors when managing encrypted communications, the MCC 7500 interface provides alerts when the console mode does not match that of a received call, and when a patch or multi-select group is being set up between a mix of clear and secure channels.

The set of alerts available on the console are in Table 1-3.

Table 1-3: Security Indications

Indication/Alert	Indication/Alert Description
Receive Cross-Mode Indication	Indicates when an inbound call's secure mode does not match the console's outbound mode, so that the console operator can respond in the correct mode.
Clear Audio Alert	Provides visual and audible indication that a trunked radio transmission or reception is unencrypted.
Multi-Select Cross-Mode Alert	Indicates that different trunked resources in a multi-select group have different secure modes, preventing console operators from transmitting audio in both secure and non-secure modes.
Patch Cross-Mode Alert	Indicates that different trunked resources in a patch group have different secure modes, preventing console operators from transmitting audio that is intended to be secure in an

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Indication/Alert	Indication/Alert Description
	unencrypted state.
Key Fail Indication	Indicates that a console cannot decrypt or encrypt a call due to a problem with an encryption key.
Panic Key Zeroizing	Erases all encryption keys at a specific console or AIS at the push of a button. The button is recessed in a panel to reduce the chance of accidentally pressing it.
Keyset/Indexset Selection via GUI	Enables the dispatch operator to manually select the keyset/indexset the dispatch console uses.
Key Management via KVL	Enables the operator to use the KVL to manage all keys for a dispatch console or archiving interface server.
Key Management via Store and Forward	Enables the operator to use a KVL and KMF to manage all keys for a console or archiving interface server.

Securing Communications at the Logging Recorder

Not only are real-time communications encrypted, MCC 7500 encryption extends to call logging—ensuring that even recorded communications are not vulnerable to retrieval by unauthorized people.

Like the console itself, the Archiving Interface Server also requires a valid radio system user account name and password be entered and validated by the radio system's network manager before it allows access to recorded information. After gaining access, a user can view and listen to only the recordings for which the user has access rights. This enables agencies to keep their logs private from other agencies on the same system.

The AIS is capable of supporting up to four different encryption algorithms simultaneously.

1.2.6 Console Configuration and Management

The MCC 7500 console system is configured and managed by the same configuration manager, fault manager, and performance reporting applications as the radio system. The user can define exactly which resources are available and how they are presented to the dispatch console user. This provides Nassau County with a single point for configuring and managing the entire ASTRO 25 system. Changes are automatically distributed throughout the system. This centralized approach saves valuable time and effort for system administrators and technicians, and reduces the errors that can occur when radio IDs and other data are entered at multiple locations.

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

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1.2.7 Interface with Nassau County's Computer-Aided-Dispatch (CAD) System

The Motorola MCC 7500 Dispatch Console interfaces with Nassau County's CAD system through Application Programming Interfaces (APIs). These APIs are designed to support both the dispatch console user interface and the CAD application simultaneously, so that the dispatch/CAD operators for Nassau County will be able to control all communications from the console at the same time.

Supported APIs

Three APIs are available for use by third parties who wish to integrate their application with the MCC 7500 Dispatch Console. Each of these APIs performs a different function in the console/CAD interface, allowing for control of the console through the CAD system and information transfer between the console and the CAD system.

Table 1-4: APIs supported by the MCC 7500 Dispatch Console

API	Functionality
Console Dispatch Interface API	- Used for the overall management and maintenance of the connections between a software application and the dispatch system - Authenticates the dispatch console user's login account and associates it with the security groups defined in the radio system's network manager - Allows a CAD application to interface to the MCC 7500 console system - Delivers API messages either directly to the CAD application or enables retrieval of API messages upon request by the CAD application
Resource Configuration API	- Retrieves configuration information such as lists of radio resources (conventional or trunked talkgroups), capabilities/features available on each radio resource, and lists of accessible auxiliary input/output signals - Retrieves aliasing information such as the end user radio unit IDs (e.g., Unit 4352 = "Division ABCD") and end user radio unit status (e.g., Status 7 = "En Route")
Console Features API	- Monitors and controls subscriber and console activity on the radio system - Initiates voice and data radio communications with a subscriber unit; and controls access to external equipment

Software Developer Kit for the APIs

To aid in the integration of the dispatch console system with the CAD system, Motorola can provide a Software Developer Kit (SDK) that contains all information necessary to be able to access and use the APIs described above.

The SDK's manuals document the supported Motorola MCC 7500 Dispatch APIs, including access to various dispatch features, configuration information, and aliasing information. The SDK also includes various files needed by software developers as

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they create applications that use the APIs. These files include source code header/include (.h) files, library (.LIB) files, and dynamic link libraries (DLLs).

The SDK can be quoted to the Nassau County as an option. All software development costs associated with CAD integration with the MCC 7500 dispatch console through APIs are the responsibility of Nassau County and its selected CAD vendor.

1.2.8   MCC 7500 Dispatch Console Component Description

An MCC 7500 Dispatch IP Console consists of the following elements:

- Operator position computer
- Voice Processing Module (VPM)
- Auxiliary Input/Outputs
- Logging equipment
- Network equipment
- Conventional Channel Interface equipment

This section discusses the various components that make up the proposed MCC 7500 Dispatch Console system. These components are connected together and to the rest of the ASTRO 25 system on an IP network via console site routers and switches. The MCC 7500 Dispatch Console functions as an integrated component of the total radio system, fully participating in system level features such as end-to-end encryption and agency partitioning.

Since the network is IP-based, the system's interfaces and components can be distributed physically throughout the network. Logging components can be centrally located at the zone core or distributed at console sites. CCGWs can be located at conventional-only RF sites, at trunking RF sites, the master site, or at console sites with conventional stations. Aux I/O Servers can be placed anywhere in the zone, closest to where they are needed.
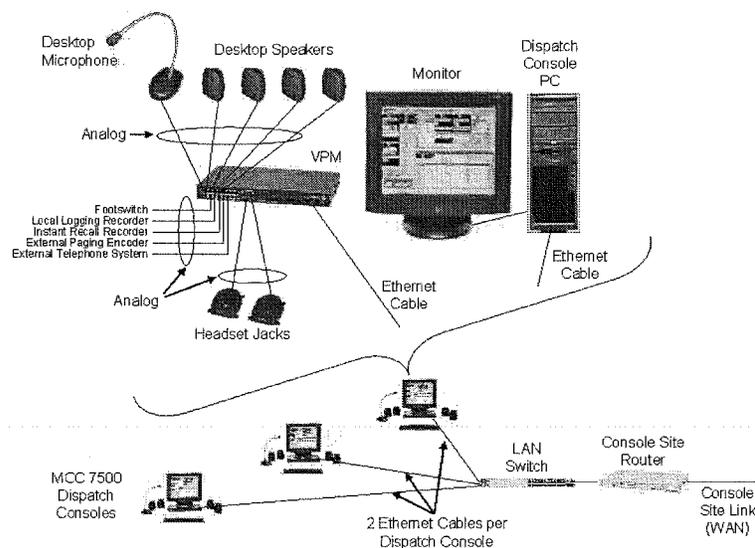
Figure 1-6: Motorola MCC 7500 Dispatch Console Hardware Architecture

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1.2.8.1   Operator Position Components

MCC 7500 operator positions connect directly to the radio system's IP transport network without gateways or interface boxes. Audio processing, encryption, and switching intelligence for dispatch are performed within each software-based operator position, without additional centralized electronics.
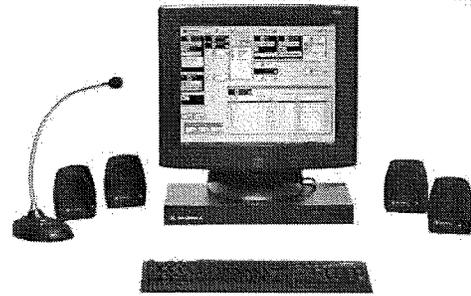
MCC 7500 Operator Position Components

An MCC 7500 operator position consists of a computer, a Voice Processing Module (VPM), one select speaker, up to three unselect speakers, a desktop gooseneck microphone and/or headset jack box with in-line PTT amplifier and headset, and optional footswitch.

Voice Processing Module (VPM)

The VPM provides vocoding and audio processing services for the dispatch console. It connects to the console site LAN switch and communicates with the dispatch console PC via Ethernet. Each operator position includes a PC and a dedicated VPN. The VPM also provides connections for analog devices to be connected to the digital console.

The VPM has connectors for the following devices:

- One desktop microphone
- Two headset jacks
- Eight desktop speakers (four speakers max supported in the initial releases)
- Logging recorder
- Radio instant recall recorder
- Telephone instant recall recorder (not supported in initial releases)
- External telephone set
- External paging encoder
- Footswitch
- Generic transmit audio input

Some of the connectors listed above can be used to provide audio inputs and outputs for connecting other types of dispatch consoles to the Motorola radio system in conjunction with the Motorola MCC 7500 Dispatch APIs.

An optional secure card provides encryption and decryption services for the dispatch console. It is capable of supporting multiple, simultaneous encryption/decryption sessions using multiple algorithms and multiple secure keys.

Personal Computer (PC)

The dispatch console uses a customized Motorola-certified PC running the Microsoft Windows operating system and containing a Motorola-designed voice card and a

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Motorola-designed secure card. The PCs used in ASTRO 25 systems have a mini-tower form factor.

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

1.2.8.2 Archiving Interface Server (AIS)

The Archiving Interface Server (AIS) provides an interface between the radio system and the logging recorder. This allows calls on the radio system to be recorded together with information associated with the calls.

An AIS is comprised of a personal computer with Voice Card(s) or Secure Card(s). Each Voice Card or Secure Card has a network connection to the trunking system transport network. Multiple AIS/recorder pairs may be deployed in a radio system (refer to Figure 1-7).
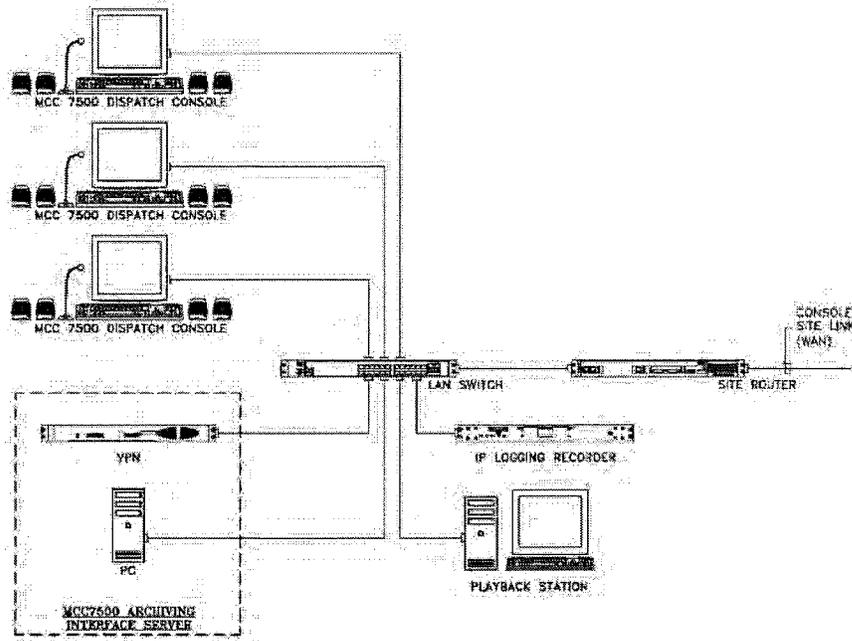
Figure 1-7: Motorola MCC 7500 VPM-Based AIS Hardware Architecture with Logging Recorder

The logging subsystem provides a user interface capable of allowing a user to identify actions/calls that occurred on the radio system, choose the desired call they wish to review, and play back the audio for that call through a logging playback station. The logging subsystem reconstructs the playback audio from the vocoded samples that had been sent to the logging subsystem when the call occurred.

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1.2.8.3 Auxiliary Inputs and Outputs

An Auxiliary Input/Output server enables console operators to control and monitor external devices, such as doors and lights, from the console user interface. Multiple dispatch consoles anywhere in the network may monitor and control the same relay output and/or external inputs. Changes are indicated across all dispatch consoles simultaneously. Customizable graphic icons are also used to provide a visual indication of both the function and state of external inputs.

The contact closures and input buffers required to interface to these devices are housed in Remote Terminal Units (RTUs). These RTUs can be physically located close to where they are needed, at any console site or RF site. The dispatch consoles and RTUs communicate with each other across the radio system's IP transport network. Individual relay outputs can be configured so that they require a safety switch to be pressed before they respond to any commands from the dispatch console user.

Supported Aux I/O Configurations

The following Aux I/O configurations are supported.

Aux I/O Configuration	Description
Momentary Input	This is an input where the user interface always shows the true state of the input.
Latched Input	This is an input where the user interface does not necessarily show the true state of the input. When the input goes active, the user interface shows the state as active. The display will continue to show the state as active even if the input changes to the inactive state. A dispatch console user must manually reset the display to return it to the inactive state.
Momentary Output	This output relay is activated when the dispatch console user presses the button on the user interface and deactivated when the dispatch console user releases the button.
Latched Output	This output relay changes state only when the dispatch console user presses the button.
Interlocked Latched Output	This latched output relay is part of a group of latched output relays. Only one of the relays in the group may be active at a time. Interlocked relays work in a "break before make" fashion; that is, the previously active relay is deactivated before the new relay is activated.

1.2.8.4 Conventional Channel Gateway Equipment

The MCC 7500 Dispatch Console system includes analog and digital conventional channel gateway (CCGW and DCCGW, respectively) equipment that interfaces with both analog and digital conventional channels into their dispatch operations, without a separate hardware network and channel banks. Conventional audio is transported by

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the same IP network used for trunked audio between the CCGW and the dispatch console.

The analog CCGW provides E&M and tone remote station control and supports the 4-wire analog connections for conventional. Each CCGW in Nassau County's system can support up to four analog channels. The digital CCGW provides digital control of the station via a V.24 connection. Each DCCGW can support up to two ASTRO 25 conventional channels.

The MCC 7500 Dispatch Console system includes a GGM 8000 router, which can support up to 10 IP interfaced base stations. With the addition of the optional CCGW interface card, up to 4 additional conventional resources can be integrated using any combination of 4-wire analog, and v.24 interfaces. Mixed-mode channels occupy 2 of the physical resource ports; one analog, and one v.24, but only one of the 4 channel slots. As such, you may have up to four channels in any combination of analog, v.24 digital, or mixed mode.

1.3   Simulcast IP Equipment

Replace the ASTRO-TAC Comparators with IP Simulcast GCM 8000 Comparators:

- Assumes that the first upgrade to an M2 master has been done or being done at the same time.
- 5 new GCM 8000 IP Simulcast Comparators at the Yulee Prime Site.
- Add IP Simulcast Software to the existing GTR 8000 stations.
- Requires re-configuring the existing network bandwidth of the TeNSr HSU cards from 64kbps to at least 384 kbps.

GCP 8000 Site Controller

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

The GCP 8000 provides the following functions:

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

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Additionally, the GCP 8000 provides the following functions at the simulcast site:

- ◆ Provides a time and frequency reference signal to the base stations maximizing frequency stability and allowing for further site separation in a simulcast configuration
- ◆ Provides IP simulcast capability, enabling true end-to-end IP connectivity in a simulcast configuration.

GCM 8000 Comparator

The GCM 8000 Comparator ensures the broadcast of the best possible voice signal by combining the best parts of a single signal that has been received by multiple sites in a Multisite (simulcast) system.

The comparator features a state-of-the-art digital voting methodology: Frame Diversity Reception. The comparator selects the data frame or signals with the lowest BER and forwards it. By using the best pieces of each input signal, the result is the best possible composite signal.

1.4　System Block Diagrams

Motorola has provided system block diagrams on the following pages.

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