System Release 7.17
ASTRO® 25
INTEGRATED VOICE AND DATA

HPD GTR 8000 Site Subsystem

NOVEMBER 2016

MN003297A01-A

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Document History

Version	Description	Date
MN003297A01-A	Original release of the *HPD GTR 8000 Site Subsystem* manual.	November 2016

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About This Manual

This manual provides descriptive and procedural information on the GTR 8000 Site Subsystem. Included in the manual are descriptions of the components of the GTR 8000 Site Subsystem and their function, specifications for the various configurations, and procedures on installation, configuration, optimization, operation, troubleshooting, and FRU/FRE replacement. Finally, a reference section provides information on LED indicators and RFDS equipment specifications.

This manual is intended for technicians and system operators as a resource for understanding and installing the GTR 8000 Site Subsystem, after they have attended the Motorola Solutions formal High Performance Data training. The manual should be used with the ASTRO® 25 system documentation and *Standards and Guidelines for Communication Sites*.

What Is Covered in This Manual?

This manual contains the following chapters:

- GTR 8000 Site Subsystem Description on page 27. This chapter provides a high-level description of GTR 8000 Site Subsystem and the function it serves on your system.
- GTR 8000 Site Subsystem Theory of Operations on page 39. This chapter explains how the GTR 8000 Site Subsystem works in the context of your system.
- GTR 8000 Site Subsystem Installation on page 55. This chapter details installation procedures relating to the GTR 8000 Site Subsystem.
- GTR 8000 Site Subsystem Configuration on page 93. This chapter details configuration procedures relating to GTR 8000 Site Subsystem.
- GTR 8000 Site Subsystem Optimization on page 117. This chapter contains optimization procedures and recommended settings relating to GTR 8000 Site Subsystem.
- GTR 8000 Site Subsystem Maintenance on page 127. This chapter describes periodic maintenance procedures relating to GTR 8000 Site Subsystem.
- GTR 8000 Site Subsystem Operation on page 129. This chapter details tasks that you perform once the GTR 8000 Site Subsystem is installed and operational on your system.
- GTR 8000 Site Subsystem Troubleshooting on page 131. This chapter provides fault management and troubleshooting information relating to GTR 8000 Site Subsystem.
- GTR 8000 Site Subsystem FRU Procedures on page 139. This chapter lists the Field Replaceable Units (FRUs) and Field Replaceable Entities (FREs) and includes replacement procedures applicable to GTR 8000 Site Subsystem.
- GTR 8000 Site Subsystem Reference on page 177. This chapter contains supplemental reference information relating to GTR 8000 Site Subsystem.
- GTR 8000 Site Subsystem Disaster Recovery on page 187. This chapter provides references and information that enables you to recover the GTR 8000 Base Radio and GCP 8000 Site Controller in the event of a failure.

Helpful Background Information

Motorola Solutions offers various courses designed to assist in learning about the system. For information, go to http://www.motorolasolutions.com/training to view the current course offerings and technology paths.

Related Information

See the following documents for associated information about the radio system.

Related Information	Purpose
Standards and Guidelines for Communication Sites	Provides standards and guidelines to follow when setting up a Motorola Solutions communications site. This may be purchased on CD 9880384V83, by calling the North American Parts Organization at 800–422–4210 or the international number at 302–444–9842.
System Overview and Documentation	Provides an overview of the ASTRO® 25 new system features, documentation set, technical illustrations, and system-level disaster recovery that support the ASTRO® 25 radio communication system.
Dynamic System Resilience Feature Guide	Provides information necessary to understand, operate, maintain, and troubleshoot the Dynamic System Resilience (DSR) feature that adds a geographically separate backup zone core to an existing zone core to protect against catastrophic zone core failures.
HPD Standalone System Infrastructure	Includes high-level information required to implement and manage ASTRO® 25 HPD standalone systems that provide RF coverage for subscriber units that use the High Performance Data (HPD) service.

Chapter 1

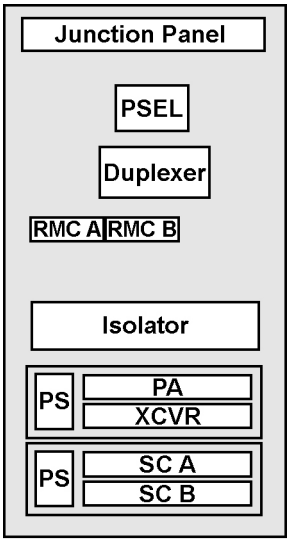
GTR 8000 Site Subsystem Description

This chapter provides a high-level description of GTR 8000 Site Subsystem and the function it serves on your system.

1.1 Overview – GTR 8000 Site Subsystem

The GTR 8000 Site Subsystem includes a GCP 8000 Site Controller (with redundant modules), one GTR 8000 Base Radio, and Radio Frequency Distribution System (RFDS) components in a rack. The site controller and base radio in the rack are the same as the standalone versions, with similar internal connections within the rack between the site controller, base radio, and RFDS equipment.

Figure 1: GTR 8000 Site Subsystem - Components

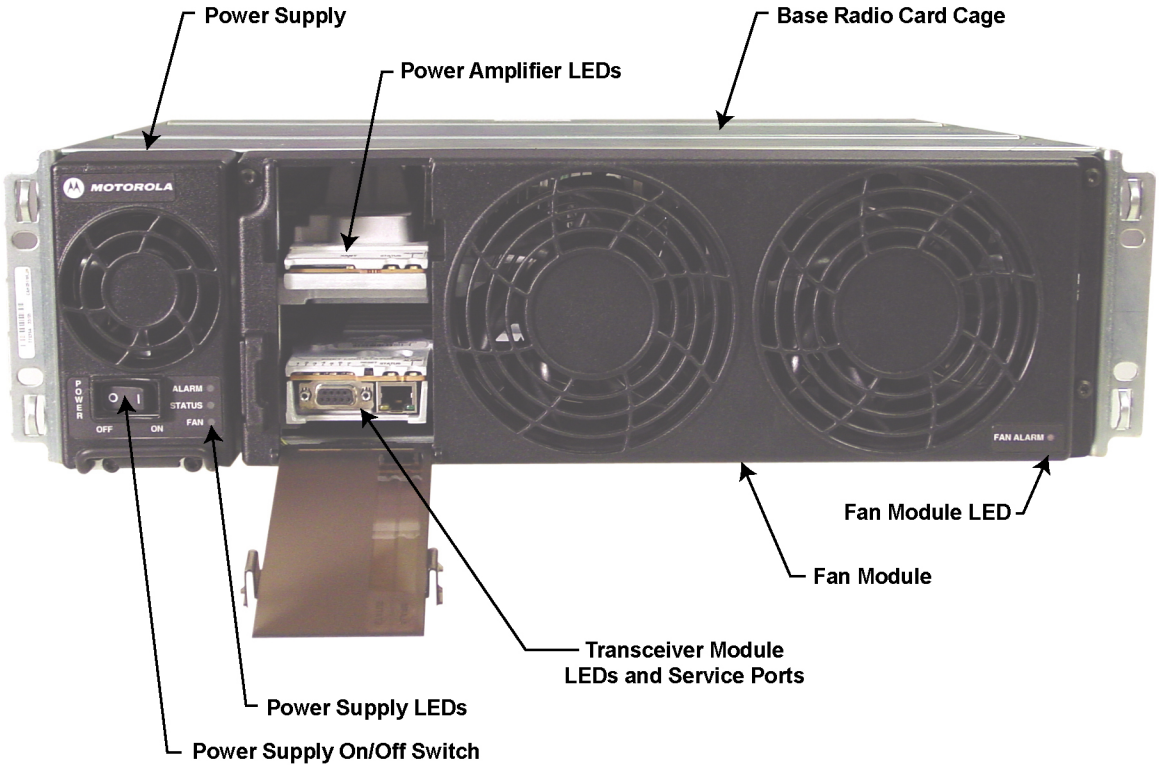


HPD_site_subsystem_config

1.2 GTR 8000 Base Radio Overview

The term "base radio" or "BR" is used to denote the transceiver and associated modules providing the functionality for **one** channel. As viewed in these applications, one "base radio" is in a GTR 8000 Site Subsystem configuration.

Figure 2: GTR 8000 Base Radio



The GTR 8000 Site Subsystem provides the radio frequency (RF) link between the system GCP 8000 Site Controller and the subscriber/mobile radios. The base radio captures inbound signals through external receive (Rx) antennas from the subscriber / mobile radios and then amplifies, filters, and demodulates the signals into data packets which are forwarded to the site controller. The site controller routes these packets upstream to a base site zone controller for further processing and routing.

The site controller receives digitized data and control packets from the zone controller and routes them to a specified base radio. The base radio extracts the control instructions from the packets and uses them for internal management such as channel frequency assignment. The base radio maps the digital 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) antenna(s).

The base radio home channel must be assigned a home channel preference level through the channel record in the Unified Network Configurator (UNC) for the zone controller. Settings for the base radio are made through the UNC and Configuration/Service Software (CSS). See the Configuration chapter.

The base radio consists of a transceiver module, power amplifier module, fan module, and power supply. The transceiver module includes the functionality for the exciter, receiver, and station control. The base radio software, configuration, and network management, as well as inbound/outbound traffic handling, are performed through this transceiver module. On-board serial and Ethernet ports are on this module for local servicing through CSS and 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, and also provides auxiliary power to a connected site controller or a receive multicoupler/low noise amplifier (RMC/LNA).

Radio Frequency Distribution System (RFDS) provides the interface between the base radio and the site antennas and between the power amplifier and the site antennas.

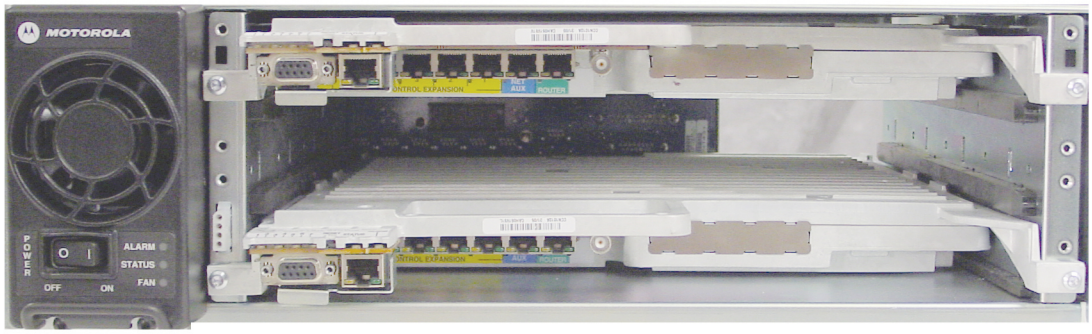
NOTICE: RFDS information provided in this documentation pertains to the RFDS equipment supplied by Motorola Solutions.

1.3 GCP 8000 Site Controller Modules

The GTR 8000 Site Subsystem is designed to work with the GCP 8000 Site Controller modules. For HPD applications, the site controller modules manage resources at the site, support frequency referencing, and the base radio data channel, handle the mobile subscriber unit (MSU) mobility messaging to/from the zone controller, and handle data messaging to/from the Radio Network Gateway (RNG).

One site controller module acts as the active module and the second module as the standby. The redundancy ensures that any single point of failure at the site does not reduce overall functionality.

Figure 3: GCP 8000 Site Controller Module



HPD_GCP8000_site_controller_front_wo_cover5

For details on the GCP 8000 Site Controller modules and configuration, see the *GCP 8000 Site Controller* documentation.

1.4 RFDS Components

The RFDS components provide the conditioning and distribution of inbound/outbound signaling between the base radio and the antennas. The RF distribution components within the GTR 8000 Site Subsystem consist of the following:

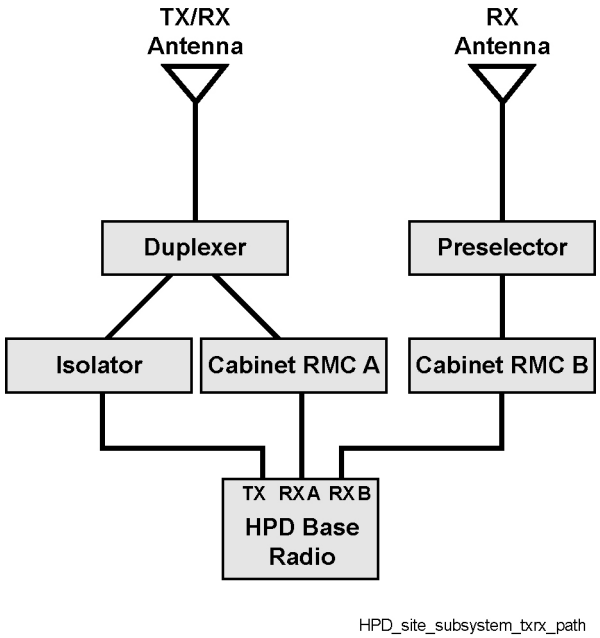
- **External Dual Circulator/Isolator tray:** The tray includes an External Dual Circulator, Circulator Load, and Low Pass/Harmonic Filter to provide high isolation against intermodulation.
- **Duplexer:** Sends transmission to a full-duplex transmit/receive antenna as shown in the figure. Also receives input for one of the inbound paths from the full-duplex transmit/receive antenna, as described in the following section.
- **Receive Multicouplers/low noise amplifiers (RMCs/LNAs):** Cabinet RMCs A and B as shown in the figure.
- **Preselector:** For inbound path B.

One inbound path (receive path A) is captured through the full-duplex transmit/receive antenna (receive path A), and the other inbound path comes through the receive antenna (receive path B). On path A, the inbound signaling is received over the duplex antenna and passes through the duplexer which provides bandpass filtering on the receive signal. The inbound signal is sent to the RMC/LNA

module A, which provides low noise amplification and a 4-way splitter. From the splitter, the receive signal is then sent to the base radio's RX-A port.

The second inbound path (path B) originates at the receive antenna and passes into a preselector which filters undesired energy from the receive signal. The output of the preselector is routed to the second receive multicoupler in the rack (RMC B). The RMC/LNA module amplifies, levels, and divides the signal before distribution to the base radio's RX-B port. This figure illustrates the transmit and receive paths of the GTR 8000 Site Subsystem.

Figure 4: GTR 8000 Site Subsystem - Transmit/Receive Paths



A junction panel near the top of the rack is used for connection to receive and duplex antennas.

1.5 GTR 8000 Base Radio in an HPD Application

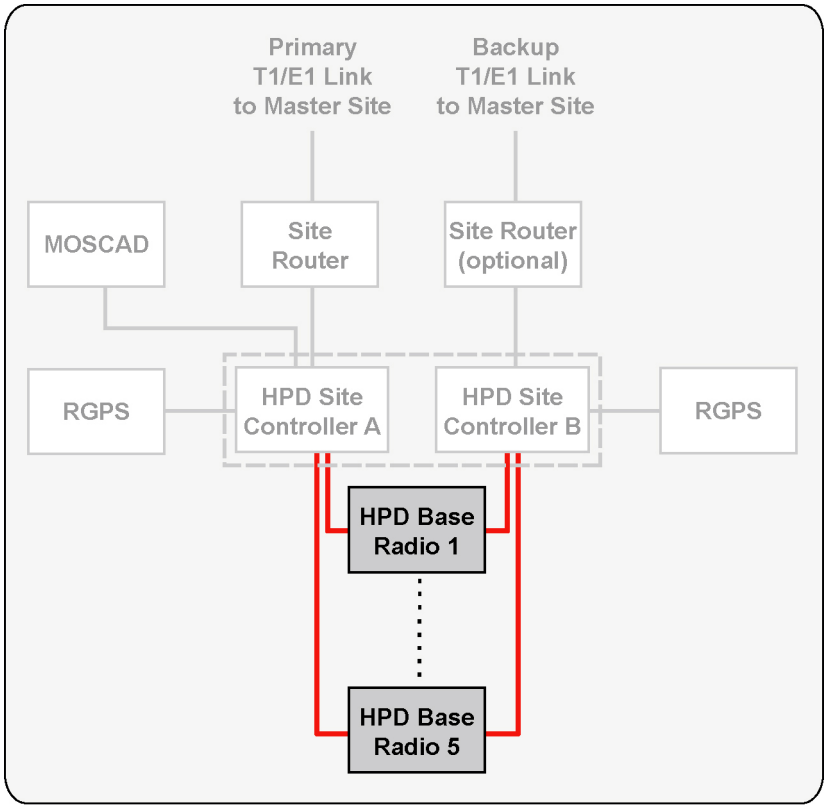
The ASTRO® 25 High Performance Data (HPD) system is a wireless data network designed for delivering mission-critical IP traffic between mobile data subscribers and customer host equipment. The high performance data system provides an efficient and reliable wireless transport medium for standard IP packet transfer, with raw data rates up to 96 kbps. This data rate allows service for medium bandwidth applications, including still image transfers, vehicle location services, and constrained web browsing services.

The base radio provides a full-duplex RF interface to Mobile Subscriber Units (MSUs). The base radio is available for 25 kHz HPD operation in the 700 MHz or 800 MHz bands. The base radio has an Ethernet connection to the redundant site controller.

The base radio uses Radio Link Adaptation (RLA) to provide high-speed, reliable, enhanced data performance when communicating traffic with MSUs. RLA uses adaptive modulation techniques, with slower, and more reliable modulation for control signaling and retries, and faster modulation methods when traffic is successfully being delivered between the base radio and MSUs.

The base radio is implemented with 2X receiver diversity. This receiver diversity enhances the inbound signals from the MSUs on the channel.

Figure 5: GTR 8000 Base Radios in HPD Remote Site



The base radio uses Time Division Multiplex (TDM) frames for random access channels, reserved access channels, and broadcast messages. All carriers in the system are synchronized by a Global Navigation Satellite System (GNSS) so that transmission slots are synchronized across sites. The base radio is able to schedule inbound/outbound traffic for half-duplex MSUs so that outbound traffic intended for the MSU does not conflict with inbound random or reserved access traffic from the MSU.

1.6 GTR 8000 Site Subsystem Specifications

This section details the GTR 8000 Base Radio and GTR 8000 Site Subsystem specifications. For the specifications for the GCP 8000 Site Controller, see the *GCP 8000 Site Controller* manual.

The following G-Series Product Specifications reference the TIA specifications for the base radio. This includes the following Methods and Performance recommendations:

Phase 1 (includes Linear Simulcast):

- Methods: TIA-102.CAAA-C, “Digital C4FM/CQPSK Transceiver Measurements Methods”
- Performance: TIA-102.CAB-C, “Land Mobile Radio Transceiver Performance Recommendations, Project 25 – Digital Radio Technology, C4FM/CQPSK Modulation”

Phase 2:

- Methods: TIA-102.CCAA, “Two-Slot Time Division Multiple Access Transceiver Measurement Methods”
- Performance: TIA 102.CCAB, “Two-Slot Time Division Multiple Access Transceiver Performance Recommendations”

1.6.1
Specifications for GTR 8000 Base Radio (700/800 MHz)

The following lists the general, transmitter, receiver, FCC ID, and Industry Canada specifications for the GTR 8000 Base Radio.

1.6.1.1
General Specifications for GTR 8000 Base Radio (700/800 MHz)

Table 1: General Specifications for GTR 8000 Base Radio (700/800 MHz)

General Specifications	
Model Number	T7039A
Number of Channels	1
Size (H x W x D)	133mm x 483 x 457mm (5.25" x 19" x 18")
Weight	21 kg (46 lbs)
Temperature Range	
Operating:	-22 to 140 °F (-30 to 60 °C)
Storage:	-40 to 185 °F (-40 to 85 °C)
Operating Altitude	Up to 1800 meters (6000 ft) above mean sea level
Power Requirements	AC: 90-264 VAC, 47-63 Hz DC: 43.2-60 VDC
Power Consumption	AC: 450 W DC: 410 W
Power Supply Type	Switching
Battery Revert	Included
Input/Output Impedance	50 Ohms
Antenna Connector Types	
Tx:	N female
Rx:	BNC female
Frequency Stability	External Reference
Frequency Generation	Synthesized

1.6.1.2
Transmitter Specifications GTR 8000 Base Radio (700/800 MHz)

Table 2: Transmitter Specifications for GTR 8000 Base Radio (700 MHz and 800 MHz)

Transmitter Specifications	
Frequency Range	769-775, 775-776, 851-870 MHz
Power Output*	2-50 W

Table continued…

Transmitter Specifications	
Channel Spacing	25 kHz
Modulation	QPSK, 16 QAM, 64 QAM
Electronic Bandwidth	Full Bandwidth
Error Vector Magnitude	10%
Spurious and Harmonic Emissions Attenuation	90 dB
Emissions Designators	17K7D7D
Adjacent Channel Power Ratio	
25 kHz offset, 22 kHz BW:	58 dB
37.5 kHz offset, 25 kHz BW:	65 dB
Tx Noise in Rx Band	-142 dBc/Hz
Intermodulation Attenuation	80 dB

* Full transmitter output power is available during battery revert.

NOTICE: The output power reference plane is the output connector of the power amplifier. The loss of the transmitter output cable (PA output to back of base radio) is 4% at 800 MHz. However, the base radio software allows the transmitter output power to be set at 10% above rated value.

1.6.1.3

Receiver Specifications GTR 8000 Base Radio (700/800 MHz)

Table 3: Receiver Specifications for GTR 8000 Base Radio (700 MHz and 800 MHz)

Receiver Specifications	
Frequency Range	792-825 MHz
Sensitivity 1% Bit Error Rate Static (BER)	
64 QAM:	-98 dBm
QAM/QPSK:	-104 dBm
QPSK:	-111dBm
Faded Sensitivity 1% Bit Error Rate TU50 (BER)	
64 QAM:	-90 dBm
QAM/QPSK:	-96 dBm
QPSK:	-101 dBm
Faded Sensitivity 5% Bit Error Rate HT200 (BER)	
64 QAM:	-90 dBm
Faded Sensitivity 2% Bit Error Rate HT200 (BER)	
QAM/QPSK:	-94 dBm

Table continued…

Receiver Specifications	
Faded Sensitivity 1% Bit Error Rate HT200 (BER)	
QPSK:	-98 dBm
Intermodulation Rejection*	80 dB
Adjacent Channel Rejection*	50 dB
Spurious and Image Response Rejection*	85 dB
Intermediate Frequencies	
1st:	73.35 MHz
2nd:	2.16 MHz
Electronic Bandwidth	Full Bandwidth
Blocking Immunity	90 dB
Conducted Spurious	-57 dBm
Bit Error Rate Floor	0.01%
Co-Channel Rejection QPSK	11 dB

* Reference signal is QPSK

1.6.1.4
FCC ID GTR 8000 Base Radio (700/800 MHz)

Table 4: FCC ID for GTR 8000 Base Radio (700 MHz and 800 MHz)

FCC Identification			
Frequency Range	**Type**	**Power Output**	**Type Acceptance Number**
769-775, 775-776 MHz	Transmitter	2-50 W	ABZ89FC5812B
851-870 MHz	Transmitter	2-50 W	ABZ89FC5810B
792-825 MHz	Receiver	N/A	ABZ89FR5811B

1.6.1.5
Industry Canada GTR 8000 Base Radio (700/800 MHz)

Table 5: Industry Canada for GTR 8000 Base Radio (700 MHz and 800 MHz)

IC Approval Number	Frequency Range	Type	Power Output	IC Model Number
109AB-5812B	Tx 768–776 MHz, Rx 798–806 MHz	HPD	Variable 2–50 Watts (average)	T7039–700B
109AB-5810B	Tx 851–869 MHz, Rx 806–824 MHz	HPD	Variable 2–50 Watts (average)	T7039–800B

1.6.2

Specifications for GTR 8000 Site Subsystem (700/800 MHz)

The following lists the general, transmitter, receiver, and FCC ID specifications for the GTR 8000 Site Subsystem.

1.6.2.1

General Specifications for GTR 8000 Site Subsystem

Table 6: General Specifications for GTR 8000 Site Subsystem (700 MHz and 800 MHz)

General Specifications		
Model Number		T7133A
Number of Channels		1
Height		27 RU, 50.4 in. (128 cm)
Footprint (W x D)		20.8 x 24.8 in. (52.8 x 62.9 cm)
Weight (fully configured)		225 lbs (102 kg)
Temperature Range		
	Operating:	-22 to 140 °F (-30 to 60 °C)
	Storage:	-40 to 185 °F (-40 to 85 °C)
Operating Altitude		Up to 1800 meters (5900 ft) above mean sea level Above 1800 meters (5900 ft), the derating is 1.5 °C/km (0.8 °F/1000 ft) Above 3000 meters (9800 ft), the peak power derating for the Tx filter and phasing harness is 1 dB/1km (0.3 dB/1000 ft) Maximum operational altitude is 5000 meters (16900 ft)
Power Supply Input		AC: 90-264 VAC, 47-63 Hz DC: 43.2–60 VDC
Power Consumption		AC: 631 W DC: 490 W
Power Supply Type		Switching
Battery Revert		Included
Input/Output Impedance		50 Ohms
Antenna Connector Type		N female
Channel Spacing		25 kHz
Modulation		64 QAM, 16 QAM, QPSK
Frequency Stability		GNSS synchronized
Frequency Generation		Synthesized

1.6.2.2
Transmitter Specifications for GTR 8000 Site Subsystem

Table 7: Transmitter Specifications for GTR 8000 Site Subsystem (700 MHz and 800 MHz)

Transmitter Specifications, including RFDS	
Frequency Range	764-776, 851-870 MHz
Average power output per channel	1-27 W
Error Vector Magnitude	10%
Spurious and Harmonic Emissions Attenuation	90 dB
Emissions Designators	17K7D7D
Adjacent Channel Power Ratio	
25 kHz offset, 22 kHz BW:	58 dB
37.5 kHz offset, 25 kHz BW:	65 dB
Intermodulation Attenuation	90 dB

Full transmitter output power is available during battery revert at the junction panel.

1.6.2.3
Receiver Specifications for GTR 8000 Site Subsystem

Table 8: Receiver Specifications for GTR 8000 Site Subsystem (700 MHz and 800 MHz)

Receiver Specifications, including RFDS	
Frequency Range	792-825 MHz
Electronic Bandwidth	Full Bandwidth
Sensitivity 1% Bit Error Rate Static (BER)	
64 QAM:	-101 dBm
16 QAM:	-108 dBm
QPSK:	-115 dBm
Faded Sensitivity 1% Bit Error Rate TU50 (BER)	
64 QAM:	-93 dBm
16 QAM:	-99 dBm
QPSK:	-104 dBm
Faded Sensitivity 5% Bit Error Rate HT200 (BER)	
64 QAM:	-93 dBm
Faded Sensitivity 2% Bit Error Rate HT200 (BER)	
16 QAM:	-97 dBm

Table continued…

Receiver Specifications, including RFDS	
Faded Sensitivity 1% Bit Error Rate HT200 (BER)	
QPSK:	-101 dBm
Intermodulation Rejection*	75 dB
Adjacent Channel Rejection*	50 dB
Spurious and Image Response Rejection*	90 dB
Intermediate Frequencies	
1st:	73.35 MHz
2nd:	2.16 MHz
Blocking Immunity	90 dB
Conducted Spurious	-57 dBm
Bit Error Rate Floor	0.01%
Co-Channel Rejection QPSK	11 dB

* Reference signal is QPSK

1.6.2.4
FCC ID for GTR 8000 Site Subsystem

Table 9: FCC ID for GTR 8000 Site Subsystem (700 MHz and 800 MHz)

FCC Identification			
Frequency Range	**Type**	**Power Output**	**Type Acceptance Number**
769-776 MHz	Transmitter	2-27 W	ABZ89FC5812
851-870 MHz	Transmitter	2-27 W	ABZ89FC5810
792-825 MHz	Receiver	N/A	ABZ89FR5811

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Chapter 2

GTR 8000 Site Subsystem Theory of Operations

This chapter explains how the GTR 8000 Site Subsystem works in the context of your system.

For an understanding of the way that GTR 8000 Site Subsystem components contribute to a base station; review the modules that provide the Base Radio functionality, the modules that provide RF distribution functionality (RFDS), and the modules that connect GTR 8000 Site Subsystems to the rest of the site (backplanes and junction panels).

2.1 Functions of the GTR 8000 Base Radio Modules

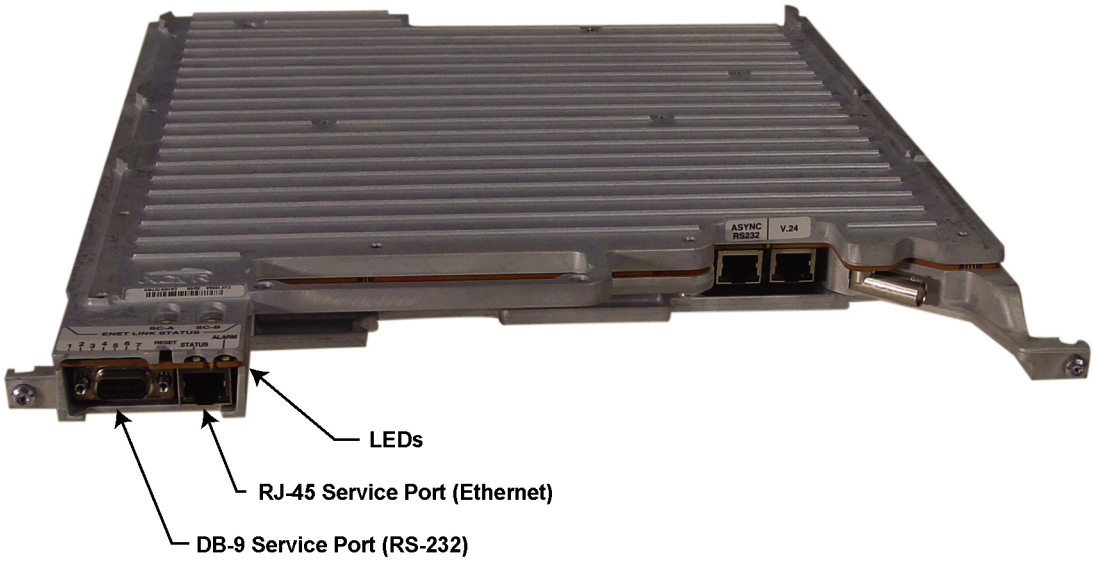
The GTR 8000 Base Radio modules include:

- Transceiver (XCVR) module
- Power amplifier module
- Fan module
- Power supply module

2.1.1 Function of the Transceiver Module

The transceiver (XCVR) module provides the control, exciter, and receiver functions for the base radio.

Figure 6: Transceiver Module (Front View)



GTR8000_XCVR_Front1

The XCVR generates the station reference, which typically must be locked on to one of many possible external sources. The external source can be either the site controller (Time Division Multiplier) TDM clocks or the external reference operating at 5 and 10 MHz.

The XCVR SPI bus allows communication with its receiver and exciter circuitry, as well as the power supply and power amplifier modules.

There are two circuit boards in the XCVR:

- **XCVR Control Board**: Performs the control management, digital signal processing, and transmit and receive data formatting for the base radio.
- **XCVR RF Board**: Contains DC power conversion/regulation and performs receiver and exciter functions.

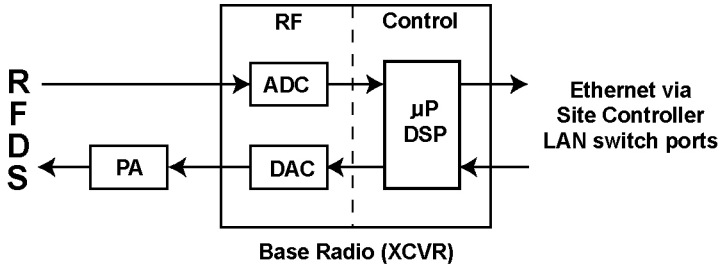
2.1.1.1
Transceiver Control Board

The main operating software for the base radio is loaded in the XCVRs control section. As the main manager for the base radio, the XCVR control board provides operational control over the other station modules. It handles three types of information flow, in the following ways:

- Serves as a gateway between the network and RF functionality, by distributing the RF payload to and from the network.
- Supports operational and diagnostic functions with digital control data (for example: site information, channel assignments, and identification numbers for call processing).
- Ensures the flow of other network management configuration information.

This figure shows the information flow through the transceiver control and RF sections for HPD systems.

Figure 7: GTR 8000 Base Radio HPD Information Flow



2.1.1.2
Transceiver RF Board

In addition to DC power conversion/regulation, the XCVR RF board provides circuitry for the following exciter and receiver functions.

2.1.1.2.1
Exciter

The exciter on the XCVR RF board provides the transmitter functions for the base radio. The exciter circuitry generates a low-level, modulated RF signal that passes to the power amplifier. It supports various modulation types as well as bandwidths up to 25 kHz, through software programming.

The exciter also provides a controlled output power level to the power amplifier.

2.1.1.2.2
Receiver

The receiver provides dual receiver inputs for dual diversity. The receiver also provides enhanced diagnostic capabilities using an on board noise source generator. It includes a wide tuning range (electronic varactor-tuned) preselector. The preselector is electronically tuned to the desired receive frequency anywhere between 792 MHz and 825 MHz. The preselector is best suited for:

- Low density RF environments
- Stations with external multicouplers
- Stations with requirements for multi-frequency operation beyond 14 MHz.

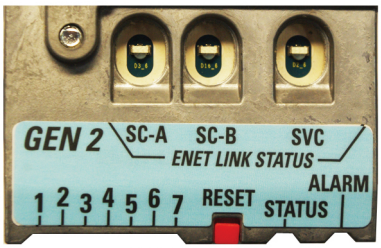
2.1.1.3
Transceiver External Interfaces

The transceiver external interfaces include seven external ports, a switch, and LEDs. See GTR 8000 Base Radio Front Connections on page 74 for the service ports. See GTR 8000 Base Radio LEDs on page 177 for the LED states.

2.1.1.3.1
Transceiver Switch

The multifunction RESET switch on the front of the transceiver module is accessible through the drop-down door to the left of the fans. The RESET switch has two functions:

Figure 8: Transceiver RESET Switch (viewable through the drop-down door)



GTR8000_XCVR_LED_Closeup_4

Table 10: Transceiver Front RESET Switch Functions

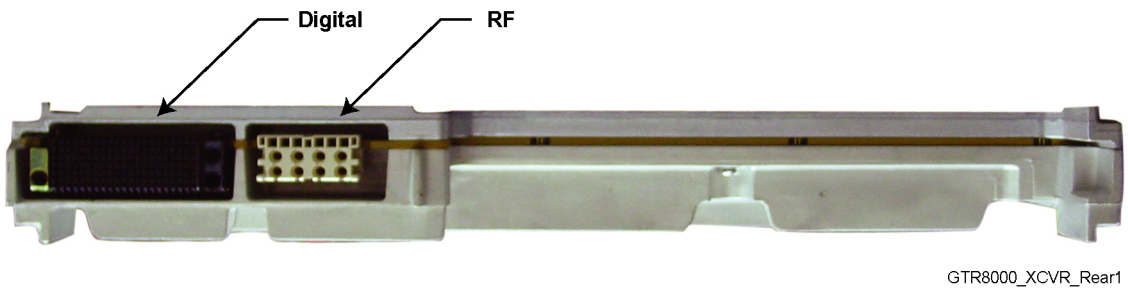
User Action	Result
Press switch for less than 1 second	Toggles between Tx Inhibit and Tx Enable (LED 3 blinks amber)
Press switch for more than 3 seconds, then release	Transceiver Control Module Reset

2.1.1.3.2
Transceiver Ports (Rear)

The transceiver interconnects to the backplane using a 120-pin HVDML digital connector and 8-pack RF connector, as shown in the figure. These connections handle multiple signals including power supply communications, power amplifier communications, fan interface, and peripheral interface. The

digital connection receive alarm data and the site controller Time Division Multiplexer (TDM) signals are used to pass reference and control data to the base radio.

Figure 9: Transceiver Module (Backplane Connections)



Single Receiver Input

An RJ-45 Ethernet port on the backplane is cabled to a site LAN switch for this channel. The backplane also provides an RF connection to the transceiver for receive (Rx) path A.

Dual Receiver Input

RJ-45 Ethernet ports on the backplane are cabled to corresponding ports on the site controller backplanes (HPD). The backplane also provides RF connections to the transceiver for receive (Rx) paths A and B (HPD and TDMA).

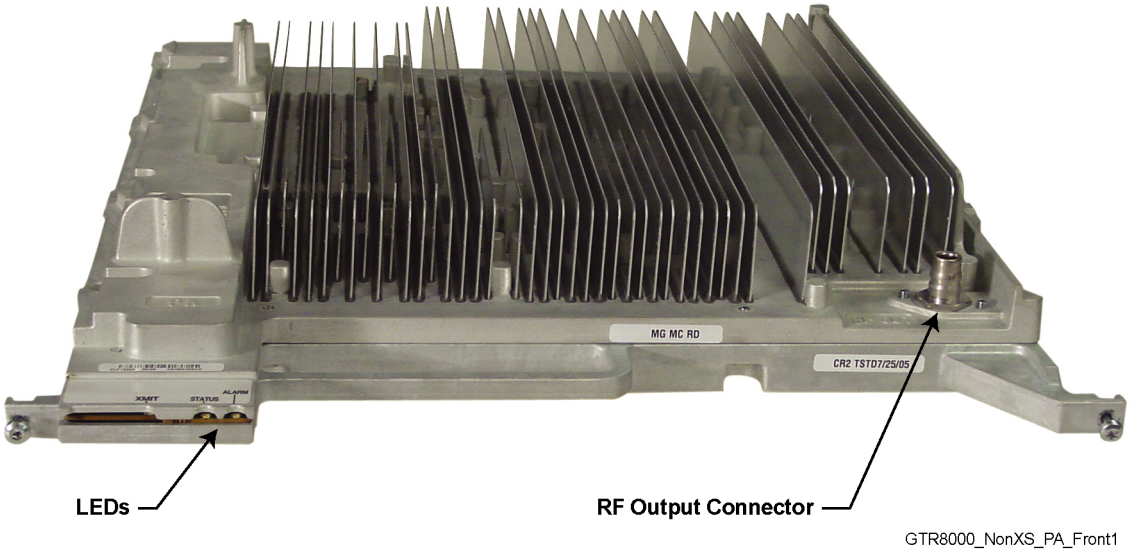
2.1.2
Function of the Power Amplifier Module

The Power Amplifier (PA) is a forced convection-cooled RF power amplifier. It accepts a low-level modulated RF signal from the transceiver module, and amplifies it for transmission through the site transmit antenna. To complete the Cartesian correction loop (linearization method), the PA provides a low-level RF feedback signal to the transceiver module to achieve the required transmitter linearity.

Transmit power output is set using Configuration/Service Software (CSS). See Configuring Tx Power Values and Battery Type on page 110 in the Configuration chapter.

The power amplifier also performs functions related to the fan module, including reporting of the fan module status and supplying power to the fan power bus.

Figure 10: Power Amplifier Module



The power amplifier is comprised of six internal modules:

- Core Board
- Converter Board
- Driver Amplifier Board
- Final Amplifier Board
- Distribution Board
- Output Circuitry

2.1.2.1
Power Amplifier Input/Output Connections

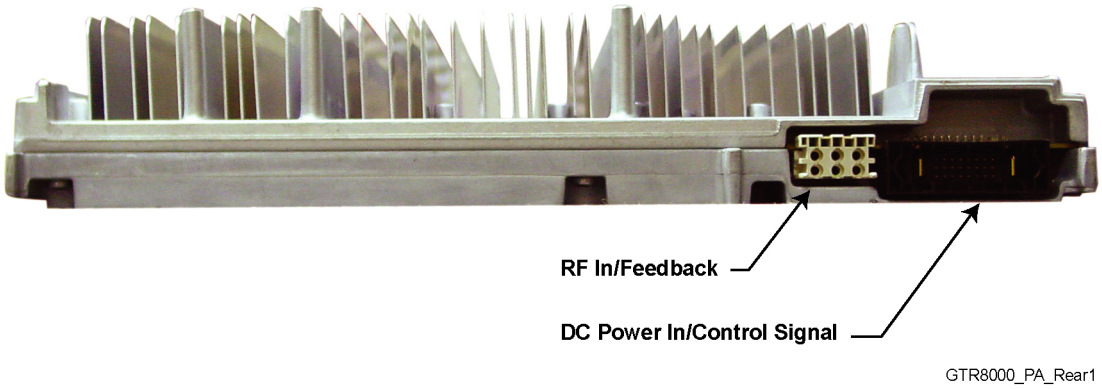
There are three electrical connection assemblies on the power amplifier:

- RF output (front QN "quick-N" connector) on the front of the power amplifier module

  NOTICE: This is cabled to the N-type female bulkhead connection at the rear of the base radio housing.

- DC power supply/control signal (backplane connection)
- RF input/feedback (backplane connection).

Figure 11: Power Amplifier (Backplane Connections)



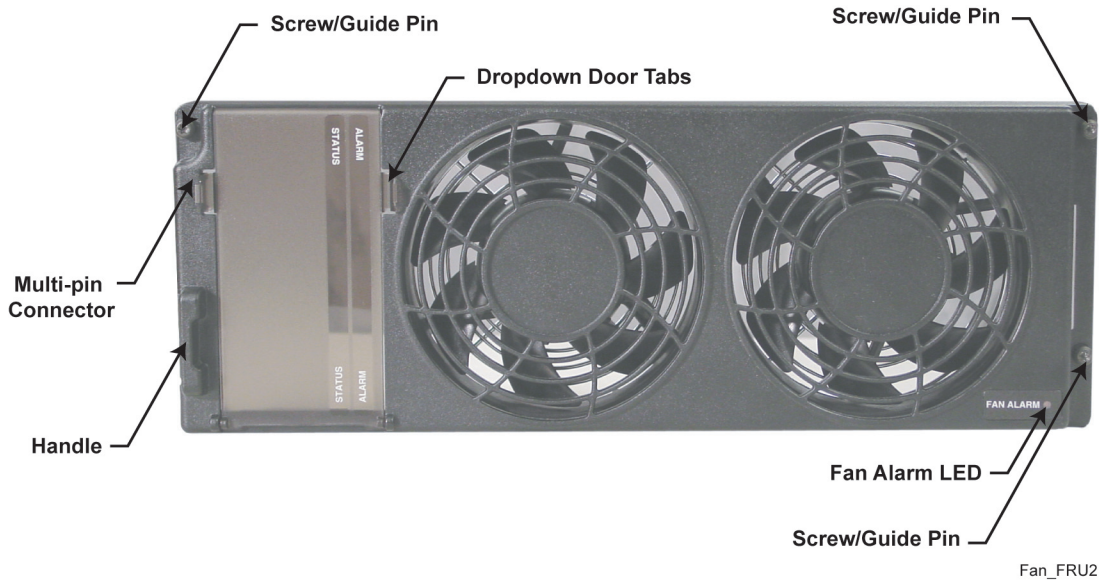
2.1.3
Function of the Fan Module

The fan module provides intermittent forced air cooling for the power amplifier, and transceiver modules. The fan module houses two 119 mm axial fans which deliver a total of approximately 160 cubic feet per minute of airflow. Nominal fan speed is 4100 revolutions per minute. A thermostat behind the fan module controls each fan. If the fan speed for either fan falls below 30% of the rated speed, a built-in speed sensor on each fan turns on the red Fan Alarm LED.

The fan module connects to the base radio backplane through a 4-pin port on the front of the base radio chassis.

NOTICE: The power supply module has its own fan which provides independent airflow.

Figure 12: Fan Module



2.1.4
Function of the Power Supply

The power supply operates from either an AC or DC input and provides the DC operating voltage for the base radio.

Figure 13: Power Supply

When operating from an AC source (90 to 264 VAC, 47-63 Hz), the supply generates two DC output voltages of 29 V with respect to output ground. The power supply automatically adjusts to AC input ranges and supplies a steady output.

In AC mode, the power supply provides a separate battery charger which can be used to maintain the charge on a 48 VDC nominal system, positive or negative ground, if installed. The supply generates two DC output voltages of 29 V with respect to output ground, when operating from a DC source (43.2 VDC to 60 VDC maximum, positive or negative ground. This voltage limit includes consideration of the

battery charging "float voltage" associated with the intended supply system, regardless of the marked power rating of the equipment. Whether in AC, Battery Revert, or DC Only mode, at a voltage of 42 V or lower, the power supply shuts down in order to not damage any connected battery bank. Once this condition occurs, the power supply starts only after the applied voltage exceeds 45 V.

The battery charger is not usable when operating from a DC input power source. This DC source must be located in the same building as the base radio / repeater, and it must meet the requirements of a SELV circuit.

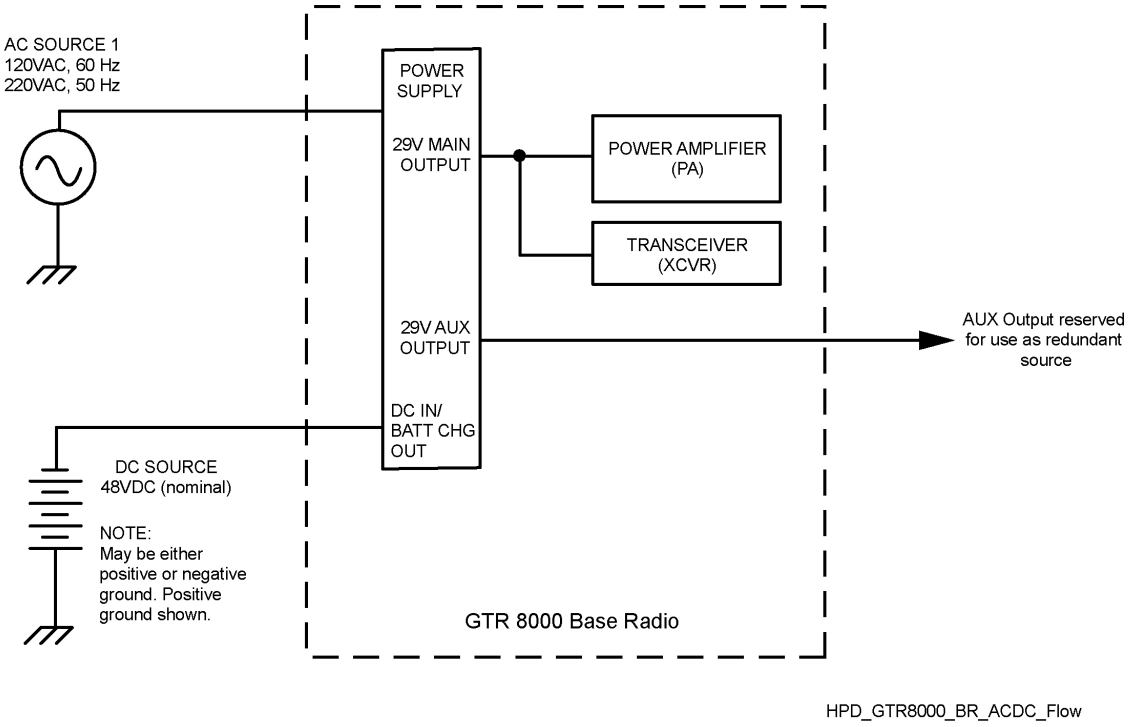
The power supply contains several switching-type power supply circuits as follows:

- Power factor correction circuitry
- Battery charging circuitry
- Diagnostics and monitoring circuitry

The power supply controls its own continuously running fan, changing its speed to fast, or slow as needed.

2.1.4.1
AC/DC Power Distribution – Base Radio

Figure 14: AC and DC Power Distribution in the GTR 8000 Base Radio



If present, the base radio operates from AC power as the preferred power source. When AC power is not available, the base radio switches to operate from the DC source. Operation returns to the AC source when the AC source is restored. Switchover from AC to DC and back again is fully automatic.

The Main DC output of the power supply is used to provide power to the power amplifier and the transceiver. The Auxiliary output of the power supply is not used within the base radio, but is reserved for use as a redundant power input to other site components such as the site controller.

2.1.4.2
Power Supply Battery Charger

The power supply may include an integrated battery charger. The battery charger is controlled through software residing on the associated device module. Software contains the information on supported battery types and obtains user-specific information pertaining to the particular site. The device software receives battery bus voltage and battery temperature information from the power supply, and uses these variables with supported battery charging profiles to return a signal which sets the charger output voltage appropriately. The battery charge and temperature conditions are viewed through Configuration/Service Software (CSS) and Unified Network Configurator (UNC), or through alarms to Unified Event Manager (UEM).

The maximum charging current available from the integrated charger is 3 A (48 VDC nominal system). A battery with capacity no larger than 60 Ah should be connected to a single charger to ensure that the charger maintains an adequate state-of-charge on the backup battery, and the backup battery is restored to full capacity within a reasonable amount of time following operation on battery backup power.

In addition to standard sealed lead-acid batteries (valve-regulated lead acid or gel cells), the power supply supports charging of vented lead-acid and NiCd batteries.

2.1.4.3
Battery Temperature Sensor Cable

The integrated charger in the power supply performs temperature compensated battery charging when a temperature sensor is connected. If the sensor is disconnected, the charger continues to operate as an uncompensated charger with the charging profile following the minimum charger voltage specified by the battery manufacturer.

Included is a 40 ft battery temperature sensor cable, which attaches to a battery pack, supplied by your organization, and to the backplane of the device. This three-wire cable carries a voltage signal to the power supply from the sensor element, which must be mounted close to the storage battery. Voltage is proportional to the battery temperature, and the diagnostic circuitry in the power supply module. This cable is extended to a total length of 190 ft using 50 ft extensions. See Battery Temperature Sensor Mounting on page 71.

IMPORTANT: Continuous operation with a disconnected sensor is not recommended.

2.1.4.4
ON/OFF Switch for Power Supply and Battery Charger

This table identifies the switch states for the power supply and battery charger.

Table 11: ON/OFF Switch - States for Power Supply and Battery Charger

Switch Position	Power Supply State	Battery Charger State
ON (1)	• Power Factor Correction (PFC) section is active (AC input only)	DLN6781A can be started if desired (AC input only) DLN6805A Disabled

Table continued…

Switch Position	Power Supply State	Battery Charger State
	• Main DC converter runs to create the MAIN and AUX DC outputs	
OFF (0)	• Main DC converter is turned OFF and the MAIN and AUX DC outputs become 0.0 VDC	Disabled (AC input only)

2.1.4.5

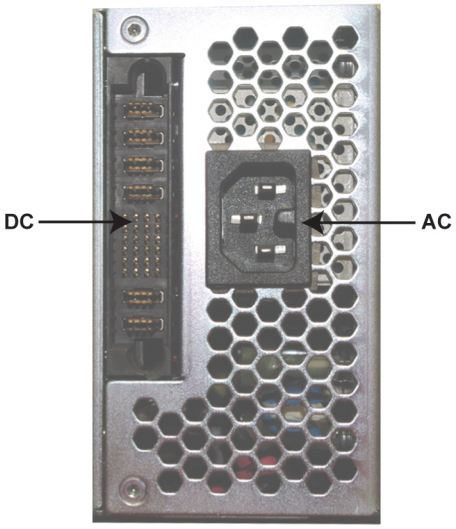
Power Supply Module Backplane Connections

This table provides descriptions and functions of the power supply backplane connections.

Table 12: Power Supply Module Backplane Connections

Port/Type	Description
AC	Input only
Battery / DC Power and Control Signal	**48 VDC:** • Provides the DC input to the power supply when operating from a DC source. • Connects the charger output to the standby battery when operating from an AC input with a standby DC battery. **29 VDC:** • Provides the Main and Auxiliary DC outputs of the power supply for use by the power amplifier, transceiver, and site controller. Other signals this connector handles include control interface and battery temperature interface.

Figure 15: Power Supply Connections (Rear)



G_Series_PS_Rear1

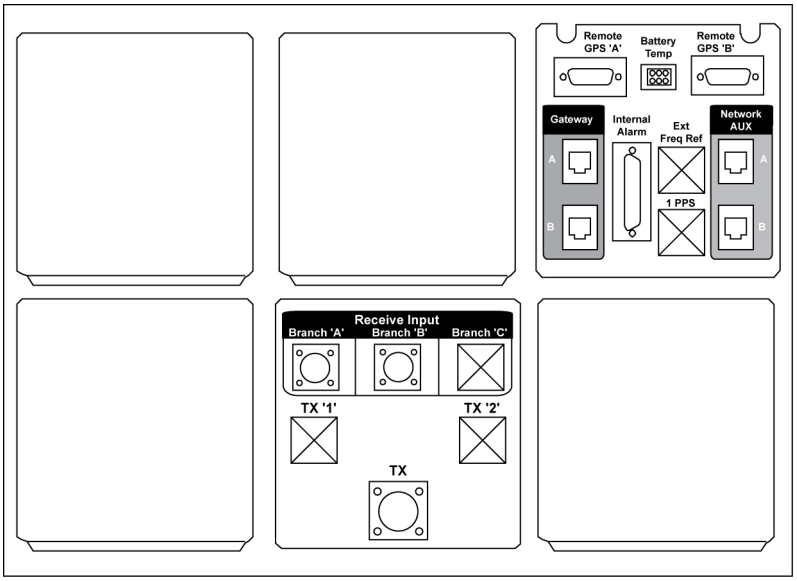
2.2
Function of the GCP 8000 Site Controller

See “GCP 8000 Site Controller Functions” in the *GCP 8000 Site Controller* manual for functions of the site controller used in a GTR 8000 Site Subsystem at an HPD site.

2.3
Junction Panels

The junction panels for the GTR 8000 Site Subsystem provides locations for all the connections to external devices. Locations for receive (Rx) and transmit (Tx) connectors are integrated in the junction panel in the lower center position as shown in the figure.

Figure 16: Junction Panel with Primary Subpanel #1



GTR8000_panel

All other connector locations are provided through additional subpanels, such as the Primary Subpanel #1, in the top right position as shown in the figure.

2.4
Power Distribution Module

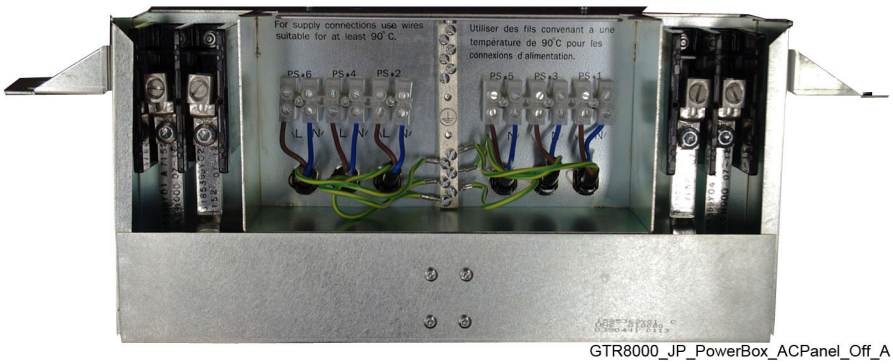
The power distribution module located with the junction panel in a GTR 8000 Site Subsystem provides connections for customer-provided AC and DC inputs. One or two DC inputs can be connected to the DC section of the power distribution module. For each base radio, there must be a single, separate AC source with the proper power rating connected to the appropriate terminals in the AC section, where it is then fed to the corresponding AC power supply input.

The number of **outputs** from the power distribution module depends on the configuration purchased. Two AC outputs from the power distribution module are used (one for the base radio and one for the site controller).

For additional information about power distribution in a GTR 8000 Site Subsystem, see the following sections:

- AC/DC Power Distribution – Base Radio on page 45
- Backplanes and Card Cages on page 51

Figure 17: Power Distribution Module (Access Panel Removed)

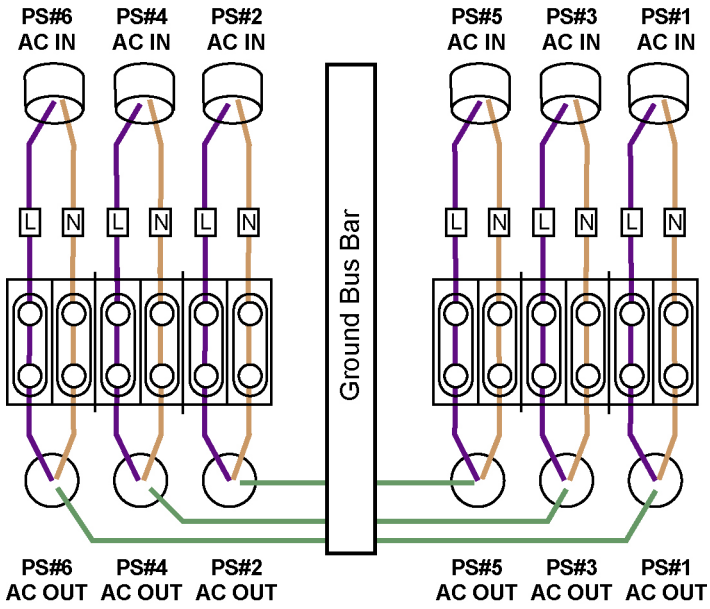


GTR8000_JP_PowerBox_ACPanel_Off_A

This block diagram shows the AC distribution block of the power distribution module. In the diagram:

- "L" indicates "Line" or "Hot" AC power feed.
- "N" indicates "Neutral" AC power feed.
- Input cable ground wires should be terminated to the ground bus bar.

Figure 18: Power Distribution Module- AC Distribution Block Diagram



GTR8000_JP_PowerBox_AC_DistrBlock

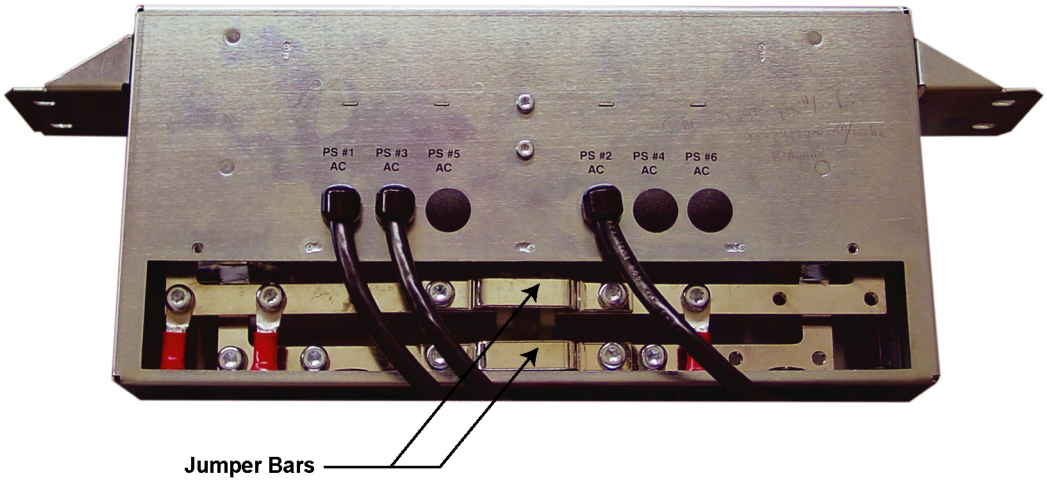
2.4.1
Splitting the Battery Pack

The GTR 8000 Site Subsystem is designed to receive DC power from a single DC source. The power distribution module at the junction panel is shipped with the DC busses interconnected to ensure that the single source is available for all power supplies contained within the subsystem.Two sets of DC input terminals are provided to reduce the current supplied through any one set of DC input cables to a value within the rating of the DC cables maximum size (2 AWG).

NOTICE: Each DC input termination is rated for a maximum of 108A.

If only one DC power source is connected, the jumpers must be in place to provide DC power to the entire subsystem. This figure shows the jumpers in place (the power distribution module has six AC output cables. There are only three shown in this figure).

Figure 19: Power Distribution Module with Jumper Bars in Place



2.4.1.1

Removing the DC Bus Bars in the Power Distribution Module

Prerequisites: The procedure assumes the following service access clearances:

- At least 2 ft access at the rear of the rack
- At least 2 ft access on one side of the rack, and at least 6 inches at the rear of the rack

When and where to use: If operation with a split DC bus is desired, the DC jumpers can be easily removed from the bus bars by performing the following task.

CAUTION: Potentially hazardous voltages are present in the power distribution panel. Input power sources should be de-energized before removing access covers. If input power cannot be de-energized at the source, this procedure should only be performed by properly trained service personnel using appropriate safety precautions for working on energized equipment.

NOTICE: Motorola Solutions does not recommend operating with a split DC bus. The customer should consider the impacts on system availability when operating with a split DC bus.

Procedure:

1. Locate the access cover on the junction panel power distribution module (accessible from the rear of the rack, immediately below the AC power output cables).
2. Remove the access cover by removing the two retaining screws.
3. Remove the two screws that secure each jumper to the bus bars.
4. Carefully remove each jumper from the assembly.
5. Retain the jumpers and screws in a secure location in case jumper reinstallation is needed at a later date.
6. Reinstall the cover plate removed in step 1.

2.5 Backplanes and Card Cages

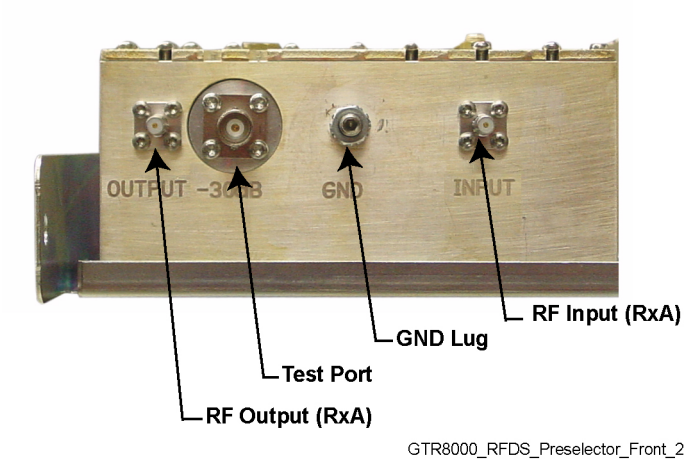
Card cages for the base radio are created with a welded and riveted design. Each card cage has a backplane. For base radios, customers make the connections to the backplane. See GTR 8000 Base Radio Rear Connections on page 73 in the Installation chapter.

2.6 RFDS Modules

The Radio Frequency Distribution System (RFDS) equipment included in your base radio depends on what options were purchased from Motorola Solutions. The following lists all RFDS equipment available for your system.

2.6.1 RFDS - Site Preselector

Figure 20: Preselector Filter



The preselector provides a first level of band pass filtering for inbound RF signals. RF input and output connectors on the front of the device are cabled to the junction panel and a receive multicoupler.

The site preselector also has a built-in 30 dB coupler attached to a BNC connector on the front of the filter. That coupler port can be used for diagnostics and test purposes. For instance, a test signal can be injected on that port without having to disconnect the site from the antenna.

2.6.2
RFDS - (RMCs/LNAs)

RMC and LNA are used interchangeably in this documentation when referring to the receive multicoupler/low noise amplifier modules. This table describes components that are common to both Site RMCs/LNAs and Cabinet RMCs/LNAs.

Table 13: Receive Multicoupler (RMC) Internal Components

Circuit	Description
Balanced Amplifier	A balanced amplifier design has been chosen, in order to achieve redundancy, improved intercept point, and improved input matching. It splits the receive signal into two identical branches. Each branch contains a low noise amplifier, a programmable attenuator and a driver. At the output, the two branches are combined.
Splitter	The splitter provides multiple outputs. Each output is isolated from the others to prevent unwanted interactions between the receivers. The programmable step attenuator used to adjust output level is at the input of the splitter.
Alarm Circuit	Measured current is compared to a threshold and an alarm signal is set if the threshold is exceeded. The status and alarm LED are controlled by the digital circuit block as well.
Power Supply	Each amplifier branch has its own 5 V regulator for redundancy reasons. The alarm circuitry is fed by a separate 5 V regulator as well.

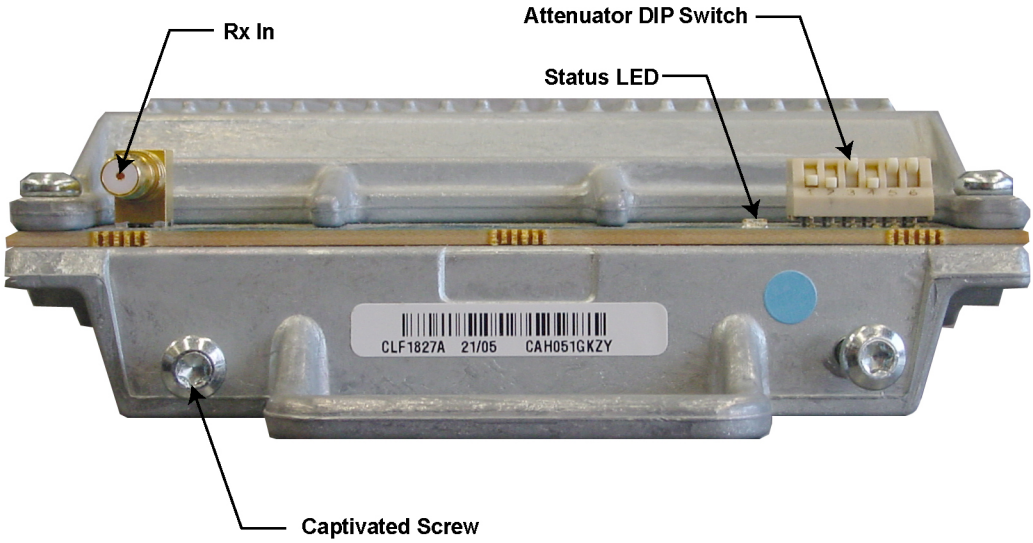
The following are additional features for the Cabinet RMCs/LNAs:

- Each RMC/LNA has a built-in 29 V to 7.5 V DC/DC converter.
- Power sharing between the two RMC/LNAs provides PSU redundancy.
- A green and a red LED visible from the front of the module indicate power supply and alarm state.

2.6.2.1
Cabinet Receive Multicouplers/Low Noise Amplifiers (Cabinet RMCs/LNAs)

The Cabinet RMC/LNA module employs a balanced amplifier, selectable attenuators, and a balanced divider to route Rx signals to the base radio module in the cabinet.

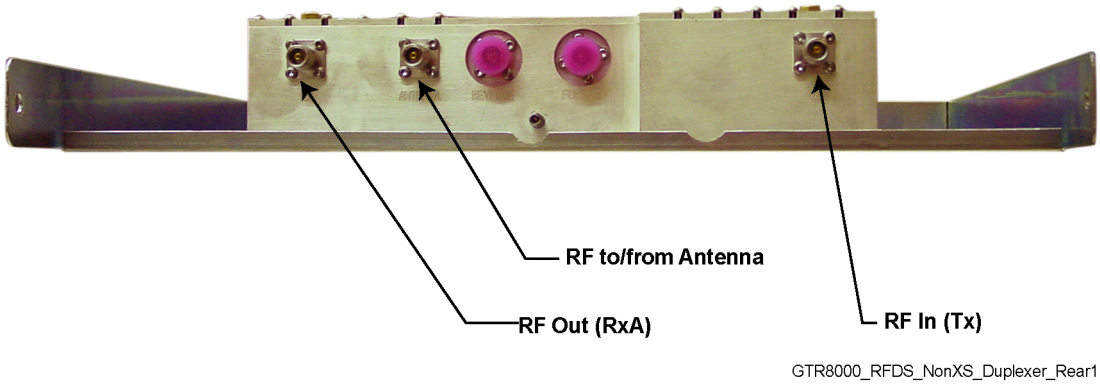
Figure 21: Cabinet RMC/LNA Module (Front View)



2.6.3
RFDS - Duplexer

In GTR 8000 Site Subsystems, the duplexer prepares transmit (Tx) signals for the duplex (Tx/Rx) antenna. It also processes inbound path A receive (RX-A) signals.

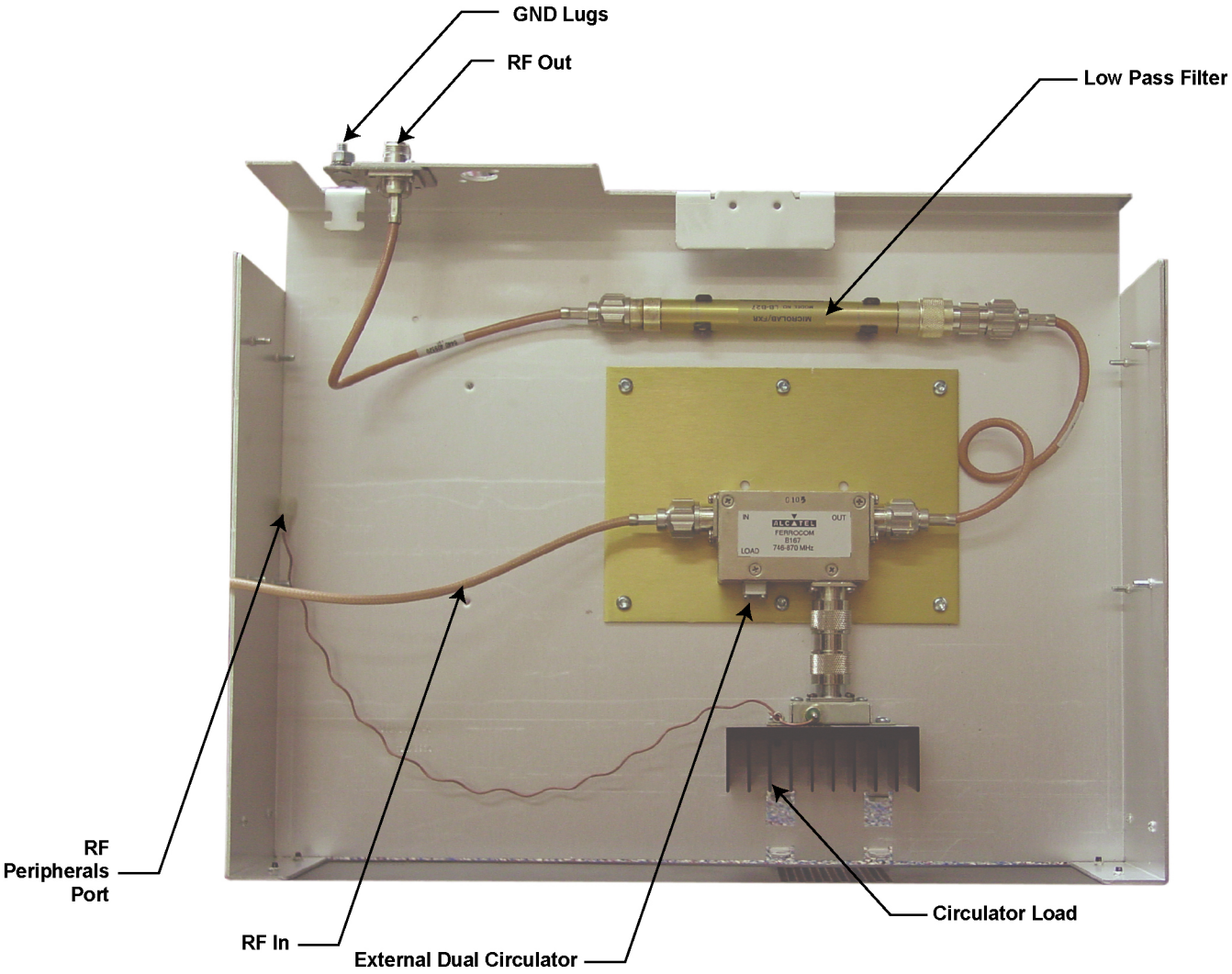
Figure 22: Duplexer (Rear View)



2.6.4
RFDS - External Dual Circulator/ Isolator Tray

In GTR 8000 Site Subsystems, the External Dual Circulator module isolates the base radio equipment from any intermodulation. A low pass filter and circulator load are on the tray with the External Dual Circulator. The circulator load dissipates reflected power. It includes a cable that connects to the RF Peripherals port on the base radio backplane to provide temperature monitoring.

Figure 23: External Dual Circulator/Isolator Tray



Chapter 3

GTR 8000 Site Subsystem Installation

This chapter details installation procedures relating to the GTR 8000 Site Subsystem.

3.1 Pre-Installation Tasks

Follow this process to perform the installation tasks. Ensure that you have the following:

- Appropriate cables
- Access to Software Download Manager (SWDL), Configuration/Service Software (CSS), and the Unified Network Configurator (UNC)
- IP/DNS information
- Login and password information

3.1.1 Equipment Installation Process

Process:

1. Prepare the site to comply with the Motorola Solutions requirements and specifications for the equipment, as listed in the Motorola Solutions *Standards and Guidelines for Communication Sites* manual. The base radio may be installed in a suitable, restricted access, indoor enclosure in any location suitable for electronic communications equipment. Other codes and guidelines that may apply to the location must also be met. See General Safety Precautions on page 56.
2. Inspect and inventory all racks, cabinets, cables, and other equipment with a Motorola Solutuions representative to ensure that the order is complete. See General Installation Standards and Guidelines on page 59.
3. Various tools are used to install and service the equipment. If information is needed regarding where to obtain the equipment and tools listed, contact the Motorola Solutions Support Center (SSC). See General Installation/Troubleshooting Tools on page 65 for a list of general recommended tools for installing and servicing the hardware.
4. Install all equipment using the site drawings and other documents provided by the Field Engineer. Use the installation standards and guidelines for placing and installing equipment.
5. Properly ground all the racks and cabinets to protect against ground faults, electrical surges, and lightning. See GTR 8000 Site Subsystem Hardware Installation on page 67.
6. Connect all necessary cables within a rack and between the racks for system interconnection. See GTR 8000 Base Radio Front Connections on page 74, GTR 8000 Base Radio Rear Connections on page 73, and Junction Panel Connections on page 79.
7. Before applying power, run a preliminary check of the site.
8. For a list of items you need access to before installing the software, see Installing Device Software Prerequisites on page 81.
9. To discover the base radio and to load OS software images from the UNC, see Installing Devices in the UNC on page 84.

10 To program the configurations into the base radio using CSS, see Device Configuration in CSS on page 95.

11 To program the base radio using UNC, see Configuring Centralized Authentication on Devices in VoyenceControl on page 115.

3.2 General Safety Precautions

WARNING: Compliance with FCC guidelines for human exposure to Electromagnetic Energy (EME) at Transmitter Antenna sites generally requires that personnel working at a site must be aware of the potential for exposure to EME, and can exercise control of exposure by appropriate means, such as adhering to warning sign instructions, using standard operating procedures (work practices), wearing personal protective equipment, or limiting the duration of exposure. For more details and specific guidelines, see “Appendix A” of the Motorola Solutions *Standards and Guidelines for Communications Sites* manual.

Observe the following general safety precautions during all phases of operation, service, and repair of the equipment described in this manual. Follow the safety precautions listed and all other warnings and cautions necessary for the safe operation of all equipment. See the appropriate section of the product service manual for additional pertinent safety information. Due to the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modifications of equipment.

NOTICE: The installation process requires preparation and knowledge of the site before installation begins. Review installation procedures and precautions in the Motorola Solutions *Standards and Guidelines for Communications Sites* manual before performing any site or component installation.

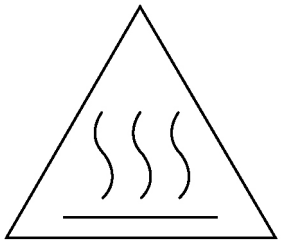
Always follow all applicable safety procedures, such as Occupational Safety and Health Administration (OSHA) requirements, National Electrical Code (NEC) requirements, local code requirements, and safe working practices. Also, all personnel must practice good judgment. General safety precautions include the following:

- Read and follow all warning notices and instructions marked on the product or included in this manual before installing, servicing, or operating the equipment. Retain these safety instructions for future reference.
- If troubleshooting the equipment while power is on, be aware of the live circuits.
- Do not operate the radio transmitters unless all RF connectors are secure and all connectors are properly terminated.
- Ground all equipment properly in accordance with the Motorola Solutions *Standards and Guidelines for Communications Sites* manual and specified installation instructions for safe operation.
- Slots and openings in the cabinet are provided for ventilation. Do not block or cover openings that protect the devices from overheating.
- Only a qualified technician familiar with similar electronic equipment should service equipment.
- Some equipment components can become hot during operation. Turn off all power to the equipment and wait until sufficiently cool before touching.
- Maintain emergency first aid kits at the site.
- Direct personnel to call in with their travel routes to help ensure their safety while traveling between remote sites.
- Institute a communications routine during certain higher risk procedures where the on-site technician continually updates management or safety personnel of the progress so that help can be dispatched if needed.

- Never store combustible materials in or near equipment racks. The combination of combustible material, heat, and electrical energy increases the risk of a fire safety hazard.
- Equipment installed at the site meeting the requirements of a "restricted access location," per UL60950-1, is defined as follows: "Access can only be gained by service persons or by a user who has been warned about the possible burn hazard on equipment metal housing. Access to the equipment is by using a tool or lock and key, or other means of security, and is controlled by the authority responsible for the location."

WARNING: Burn hazard. The metal housing of the product may become extremely hot. Use caution when working around the equipment.

Figure 24: Warning Label on Hot Modules



warning_hot

WARNING: DC input voltage must be no higher than 60 VDC. This maximum voltage includes consideration of the battery charging "float voltage" associated with the intended supply system, regardless of the marked power rating of the equipment. Failure to follow this guideline may result in electric shock.
RF energy burn hazard: disconnect power in the cabinet to prevent injury while disconnecting and connecting antennas.

CAUTION: All Tx and Rx RF cables outer shields must be grounded per Motorola Solutions *Standards and Guidelines for Communications Sites* manual requirements.
All Tx and Rx RF cables must be connected to a surge protection device according to the Motorola Solutions *Standards and Guidelines for Communications Sites* manual. Do not connect Tx and Rx RF cables directly to an outside antenna.

IMPORTANT: All equipment must be serviced by Motorola Solutions-trained personnel.

3.2.1
GTR 8000 Base Radio Supplemental Safety Installation Requirements

The Supplemental Safety and Installation Requirements include the following:

- The GTR 8000 Base Radio must be installed in a suitable, in-building enclosure. A restricted access location is required when installing this equipment into the end system.
- The base radio contains a Class 1 built-in power supply component. This component is equipped with an appliance inlet for connecting to an AC input, as well as DC input terminals which meet SELV DC circuit requirements.
- When installing the equipment, all requirements of relevant standards and local electrical codes must be fulfilled.
- The maximum operating ambient temperature of this equipment is 60 °C. The maximum operating altitude is 3000 meters above sea level.

- The 28.6 VDC output from the power supply to the PA is at an energy hazard level (exceeds 240 VA). When installing into the end system, care must be taken so as not to touch the output wires.
- When the base radio is used in a DC reverting system, the DC power supply must be located in the same building as the base radio, and it must meet the requirements of a SELV circuit.

3.2.2
DC Mains Grounding Connections

CAUTION: This equipment is designed to permit the connection of the earthed conductor of the DC supply circuit to the earthing conductor at the equipment. If this connection is made, you must meet all following conditions:

- Connect this equipment directly to the DC supply system earthing electrode conductor or to a bonding jumper from an earthing terminal bar or bus in which the DC supply system earthing electrode conductor is connected.
- Locate this equipment in the same immediate area (such as adjacent cabinets) as any other equipment that has a connection between the earthed conductor of the same DC supply circuit and the earthing conductor (and also the point of earthing of the DC system). Do not earth the DC system elsewhere.
- Locate the DC supply source within the same premises as the equipment.
- Do not install switching or disconnecting devices in the earthed circuit conductor between the DC source and the point of connection of the earthing electrode conductor.

3.2.2.1
Disconnect Device Permanently Connected

Incorporate a readily accessible disconnect device (circuit breaker or switch) in the building installation wiring.

3.2.2.2
Multiple Power Source

This product has multiple power sources. If service requires the removal of a power source, disconnect all inputs (AC and DC powers) to remove power completely to the equipment before servicing.

3.2.2.3
Connection to Primary Power

For supply connections, use wires suitable for at least 75 °C.

3.2.2.4
Replaceable Batteries

WARNING: Risk of Explosion if you replace the battery with an incorrect type. Dispose of used batteries according to the instructions.

3.2.3
Maintenance Requiring Two People

Identify maintenance actions that require two people to perform the repair. Two people are required when:

- A repair has the risk of injury that would require one person to perform first aid or call for emergency support. An example is work around high-voltage sources. If an accident occurs to one person, another person may be required to remove power and call for emergency aid.
- Heavy lifting is involved. Use the National Institute of Occupational Safety and Health (NIOSH) lifting equation to determine whether one or two persons are required to lift a system component when it must be removed and replaced in its rack.

3.2.4
Equipment Racks

Lift equipment racks without the use of lifting equipment only when sufficient personnel are available to ensure that regulations covering health and safety are not breached. Use an appropriately powered mechanical lifting apparatus for moving and lifting the equipment racks. In addition to these points, comply with any local regulations that govern the use of lifting equipment.

WARNING: Crush Hazard could result in death, personal injury, or equipment damage. Equipment racks can weigh up to 360 kg (800 lb). See the following instructions for proper lifting procedures.

3.3
General Installation Standards and Guidelines

This section provides several guidelines to ensure a quality installation. Review these guidelines before unpacking and installing the system. Additionally, review the installation information in the Motorola Solutions *Standards and Guidelines for Communication Sites* manual for more details, including:

- Equipment installation
- Antenna installation

Review installation information specifically for the GTR 8000 Site Subsystem in GTR 8000 Site Subsystem Hardware Installation on page 67.

3.3.1
General Site Preparation Overview

Perform the activities listed in this table to ensure proper site preparation. The table references specific chapters in the Motorola Solutions *Standards and Guidelines for Communication Sites* manual for more information.

Table 14: Activities for Site Preparation

Activity	Description of Activity	Chapter Reference
Review the site plan.	• Prevents potential on-site and off-site interference by local trunked systems. • Minimizes cable lengths. • Determines the location of telecom equipment.	• Chapter 2 "Site Design and Development"
Determine site access and security.	Outlines of site access and security measures.	• Chapter 2 "Site Design and Development"

Table continued…

Activity	Description of Activity	Chapter Reference
Review safety considerations.	Outlines general, installation, and environmental safety guidelines and requirements and OSHA-related considerations.	• Chapter 3 "Communications Site Building Design and Installation"
Schedule installation of telephone service.	Ensures options and functions of on-site, two-way communications for personnel safety and maintenance.	• Chapter 3 "Communications Site Building Design and Installation"
Review grounding specifications.	Ensures that the site meets or exceeds the Quality Audit Checklist in Appendix F as well as the Power and Grounding Checklist in Appendix D.	• Appendix D. “Grounding (Earthing) Electrode System Testing/ Verification” • Appendix F. “R56 Compliance Checklist”
Schedule installation of site power.	Covers grounding, power sources, and surge protection.	• Chapter 4 "External Grounding (Earthing)" • Chapter 5 "Internal Grounding (Earthing)" • Chapter 6 "Power Sources" • Chapter 7 "Surge Protective Devices"

3.3.2
General Equipment Inspection and Inventory Recommendations

Take an inventory of all equipment with a Motorola Solutions representative to ensure that the order is complete. Carefully inspect all equipment and accessories to verify that they are in good condition. Promptly report any damaged or missing items to a Motorola Solutions representative.

CAUTION: Do not tamper with factory configuration settings for these devices. These settings include software configuration, firmware release, password, and physical connections. Motorola Solutions has configured and connected these devices to meet specific performance requirements. Tampering with these devices may result in unpredictable system performance or catastrophic failure.

3.3.3
General Placement and Spacing Recommendations

When placing equipment at a site, perform the following:

- Place each rack on a firm, level, and stable surface, and bolt the racks together.
- Use correct mounting hardware and shims to prevent rack movement.
- Use strain relief when installing and positioning cables and cords to help ensure that no interruption of service occurs.
- Provide an appropriate amount of space around all components to allow for proper air flow, cooling, and safe access to equipment.
- Locate the site racks and other equipment with enough spacing to allow access for service.

NOTICE: Proper spacing of equipment is essential for ease of maintenance and safety of personnel. Spacing requirements have been established to meet the National Fire Protection Associations (NFPA) code, and the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) standards. Adhere to any local regulations that apply to the installation.

- Locate the system in an area free of dust, smoke, and electrostatic discharge (ESD).
- See the Motorola Solutions *Standards and Guidelines for Communication Sites* manual for details on these space requirements.

3.3.4
General Cabinet Bracing Recommendations

Use all supplied bracing hardware when installing a rack or cabinet, and secure all equipment within a rack or cabinet.

If additional equipment is installed, see the system design document the field engineer provided, or consult the Motorola Solutions Field Representative.

Subsystem cabinets are self-supporting structures. In areas subject to seismic activity, additional bracing of the cabinet may be required to prevent it from tipping. However, the bracing hardware must be locally procured. No specific procedures are provided within this manual for bracing cabinets in active seismic areas. See the Motorola Solutions *Standards and Guidelines for Communication Sites* manual for details on seismic conditions.

3.3.5
Mounting Cabinets or Racks to a Floor

When and where to use: Perform the following steps to properly install a cabinet or open rack within a site building. Secure the cabinets and racks to the floor for optimum stability. This procedure is written so that the cabinet or rack is moved only once.

Procedure:

1. Carefully mark the mounting holes with a pencil, as indicated on the appropriate cabinet or rack footprint.
2. Drill the marked mounting holes to the appropriate depth of the mounting hardware with a hammer drill and bit.
3. Insert an anchor into the drilled hole. If necessary, tap the anchor into place using a hammer.
4. For cabinets, remove the four screws securing the bottom kick panel to the front and back of the cabinet. Remove the kick panel and set aside during installation.
5. Carefully move the cabinet or rack into the position indicated by the holes in the floor.

   WARNING: Equipment cabinets and racks are heavy and may tip. Use extreme caution when moving. Lift from top eyenuts with the appropriate apparatus, or secure the cabinet or rack from tipping if lifting from the bottom. Failure to do so could result in death or serious injury or equipment damage.
6. Adjust and level the cabinet or rack as necessary to position the cabinet mounting holes with the pre-drilled holes.
7. Secure the cabinet or rack to the site floor with the locally procured mounting hardware.

   IMPORTANT: If securing the cabinet or rack to a concrete floor, use 1/2-inch grade 8 bolts with anchors.

3.3.6
General Bonding and Grounding Requirements

Cabinets and racks include a Rack Grounding Bar (RGB) with the capacity to terminate numerous ground wires. Attach equipment added to the cabinet or rack to the ground bar using solid or stranded 6 AWG copper wire.

The RGB uses dual-hole lugs to terminate ground wires. The minimum number of dual-hole attachments is system-dependent and specified by the customer. This bar provides electrical continuity between all bonds and ground wire with a current-carrying capacity equal to or exceeding that of a 6 AWG copper wire.

See the Motorola Solutions *Standards and Guidelines for Communication Sites* manual for more information on proper bonding and ground at a site.

3.3.7
General Cabling Requirements

Diagrams for cabling are typically included in the system-specific configuration documentation Motorola Solutions provides. Also see the Motorola Solutions *Standards and Guidelines for Communication Sites* manual for cabling standards.

IMPORTANT: System certification was completed using shielded cables. To prevent emission problems, use only shielded cables. Do not substitute other cable types.

- Position the equipment to avoid excessive tension on cables and connectors. Cables must be loose with absolutely no stress on the connectors. Careful cable routing and securing the cables with tie wraps (or other devices) is one way to provide this protection. Set up preventive maintenance loops .
- Dress the cables neatly using cable ties. Do not tighten the cable ties until you are sure that the required service length and bend radius requirements are met. Leave cable ties loose enough to allow adjustment.
- Verify that all cables are properly labeled to match System-specific configuration documentation Motorola Solutions provided.
- Ensure that cables do not exceed the minimum bend radius as outlined in the Motorola Solutions *Standards and Guidelines for Communication Sites* manual.

CAUTION: Use only Category 5 Shielded Twisted Pair (or higher) for cabling Ethernet connections. Motorola Solutions has engineered this system to meet specific performance requirements. Using other cabling and connectors may result in unpredictable system performance or catastrophic failure.

NOTICE: For more information on cabling guidelines, see the documentation supplied with components from each equipment manufacturer.

3.3.8
General Power Guidelines and Requirements

See the Motorola Solutions *Standards and Guidelines for Communication Sites* manual for information on providing electrical service, power budgeting, selecting batteries, and other topics for supplying power at the site.

Perform electrical installation work in accordance with the current edition of the NFPA 70 and local building codes. Where required, use a qualified and licensed electrician for all electrical installations.

3.3.8.1

General AC Power Guidelines and Requirements

The Motorola Solutions *Standards and Guidelines for Communication Sites* manual defines the guidelines and requirements for cabinets and racks which house equipment that requires AC power input. Some of the guidelines and requirements are as follows:

- The cabinet or rack is designed to accept 120/240 V, single-phase power with an amperage service size as required by the electronic equipment.
- Cabinets and racks powered by commercial power must be equipped with a Nationally Recognized Test Laboratory (NRTL) certified power distribution module that contains a main circuit breaker or individual circuit breakers of the correct size as required for the electronic equipment or as the customer specified.
- A decal showing an electrical schematic of the power wiring is affixed to the inside surface of the cabinet.
- All AC power equipment and electrical components must conform to National Electrical Manufacturers Association (NEMA) and National Electrical Code (NEC). The AC power equipment must also be listed by an NRTL.
- A surge arrestor, designed to protect equipment systems from a 120/240 V service and load center, is placed on the power feed ahead of all individual load center circuit breakers. This gapless arrestor must be listed by an NRTL for the purpose intended.
- Selection of a surge arrestor is based on the susceptibility of the equipment powered by the electrical service, with margin provided for locally generated disturbances. See ANSI/IEEE C62.41 (21) for more details.
- At least one 120 VAC, 15 A duplex convenience outlet equipped with Ground Fault Interrupter (GFI) protection must be provided in the electronic equipment compartment.

CAUTION: Do not use surge/transient suppressors without careful and expert power system analysis.

NOTICE: Redundant devices could be terminated on different AC main phases so that a single phase failure does not result in a power loss for both devices.

3.3.8.2

General Breaker Recommendations

To ensure that a fault which causes the breaker to open does not result in the loss of multiple transmit channels, each power supply should have its own supply breaker. The breaker recommendations for AC and DC supply breakers are as follows:

- For a 120 VAC, 60 Hz application, the AC supply breaker must be rated for a continuous current of 20 A. For a 220 VAC, 50 Hz application, the AC supply breaker must be rated for a continuous current of 10 A minimum, not to exceed 20 A.
- Individual DC breakers are not used. For information involving the sizing of cables and DC power distribution, see the *Standards and Guidelines for Communication Sites* manual.
- Site installation must include a single current interrupting device on the DC input distribution (fuse or circuit breaker) rated for the application loading, not to exceed 200 A. For each standalone device, the DC supply breaker should be rated for a continuous current of 25 A.

3.3.8.3
General Battery Installation Recommendations

The batteries and charger should be as close as possible to the rectifier system using the cables. A heavy gauge stranded cable is advised to minimize voltage drop. Examples of the resistance of some heavy gauge wire are:

Table 15: Heavy Gauge Wire Resistance Examples

Gauge	Resistance
#6 gauge	0.3951 /1000 ft
#4 gauge	0.2485 /1000 ft
#2 gauge	0.1563 /1000 ft

The maximum voltage drop can be calculated by knowing the peak current drawn by the radio system. Use the following formula:

Total Voltage drop = [/1000 ft] x [total loop length (ft)] x [Ipeak (A)] + [connector(s) voltage drop(s)]

See DC Power Connection Wire Gauge Calculations on page 70 for additional guidelines on the cable sizing.

3.3.9
General Electrostatic Discharge Recommendations

Electronic components, such as circuit boards and memory modules, can be sensitive to Electrostatic Discharge (ESD). Use an antistatic wrist strap and a conductive foam pad when installing or upgrading the system.

If an ESD station is not available, wear an antistatic wrist strap. Wrap the strap around the wrist and attach the ground end (usually a piece of copper foil or an alligator clip) to an electrical ground. An electrical ground can be a piece of metal that literally runs into the ground (such as an unpainted metal pipe), or the metal part of a grounded electrical appliance. An appliance is grounded if it has a three-prong plug and is plugged into a three-prong grounded outlet.

NOTICE: Do not use a computer as a ground, because it is not plugged in during installation.

3.3.10
FCC Requirements

Radio frequency (RF) transmitters installed at sites within the US must be in compliance with the following FCC regulations:

- The station licensee is responsible for the proper operation of the station at all times and is expected to provide observations, servicing, and maintenance as often as may be necessary to ensure proper operation.
- The transmitter ERP must not exceed the maximum power specified on the current station authorization.
- The frequency of the transmitter must be checked during initial installation of the transmitter, when replacing modules, or when making adjustments that affect the carrier frequency or modulation characteristics.

This equipment has been tested and found to comply with the limits for a Class A digital device, according to part 15 of the FCC Rules. These limits are designed to provide reasonable protection

against harmful interference to radio communications when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy. If not installed properly and used in accordance with the instruction manuals, the equipment may cause harmful interference to radio communications. Operation of some compliant equipment in a residential area may cause harmful interference to radio communications, in which case the interference must be corrected.

3.3.11
Networking Tools

Use the following networking tools for installing and servicing the network:

- Fluke® OneTouch Assistant LAN tester
- NiMH rechargeable battery for Fluke
- T1/E1 or E1 test set (such as the Hewlett-Packard® HP37702A)
- Serialtest® software with the ComProbe® and SerialBERT option

3.3.12
General Installation/Troubleshooting Tools

If information is needed regarding where to obtain any of the equipment and tools listed, contact the Motorola Solutions Support Center (SSC). See Motorola Solutions Support Center on page 136.

3.3.12.1
General Tools

Use the following general tools to install, optimize, and service equipment in the system:

- 150 MHz 4 Channel Digital Storage Oscilloscope
- Transmission Test Set (TIMS Set)
- Aeroflex 3900 Series Service Monitor or equivalent
- 50 Ohm Terminated Load
- Digital Multimeter (DMM)
- Terminal Emulation Software
- DB-9 Straight through serial cable
- RS-232 Cables with Connectors
- Punch Block Impact Tool
- MODAPT – RJ-45 Breakout Box
- Remote RJ-11/ RJ-45 Cable Tester (1200 ft length maximum)
- PC Cable Tester (RG-58, 59, 62, BNC, RJ-45, RJ-11, DB-9, DB-15, DB-25, Centronics 36-pin connectors)
- ESD field service kit
- Amprobe Instruments GP-1 Earth Tester
- AEMC 3730 Clamp-on Ground Resistance Tester

3.3.12.2
Rack Tools

Use the following tools to install, optimize, and service the equipment:

- Service Monitor: Aeroflex 3900 Series Service Monitor with P25 Options installed (plus High Performance Data (HPD) and Time Division Multiple Access (TDMA) options as required)
- Personal Computer meeting the following specifications:
  - Operating Systems:
    + Windows 10 (Server 2012 R2)
- Hardware Requirements:
  - Processor:
    + 1 GHz or higher Pentium grade
  - Processor Memory:
    + 2 GB RAM recommended for Windows 10
  - Hard Disk Space:
    + 300 MB minimum free space (for a Typical Installation, including Help Text and Software Download Manager) or 100 MB minimum free space (for a Compact Installation)
  - Peripherals:
    + Microsoft Windows supported mouse or trackball
    + Microsoft Windows supported serial port for product communication
    + Microsoft Windows supported Ethernet port for product communication
    + Microsoft Windows supported printer port for report printing
    + CD-ROM for software installation
- Configuration/Service Software (CSS) DLN6455
- CSS serial programming cable
- Ethernet cable
- Antenna tester
- 50 Ohm terminated load
- Rohde & Schwarz NRT-Z14 Directional Power Sensor, 25-1000 GHz, 0.1-120 W. Recommended for all uses when a service monitor is not available.

3.3.13
Technical Support for Installation

Technical support is available from the site-specific documents the Field Engineer or Motorola Solutions Field Representative provided for the system, one of the Motorola Solutions Support Centers (SSC), or qualified subcontractors.

- SSC can help technicians and engineers resolve system problems and ensure that warranty requirements are met. Check your contract for specific warranty information. See Motorola Solutions Support Center on page 136.
- The Motorola Solutions System Service Subcontractor Assessment program ensures that service people contracted by Motorola Solutions meet strict minimum requirements before they can work on any system. For more information on this program, contact the Motorola Solutions representative.

3.3.13.1
Site-Specific Information

When the Motorola Solutions Center for Customer Solution Integration (CCSi) stages a system, the Field Engineer assigned to the system creates all site-specific system documentation to document how the system was staged. Site-specific information includes the following:

- Site design drawings showing the location of racks, cabinets, cable trays, and other components
- Rack drawings showing the location of the equipment in each rack
- Cable matrix in a table format that shows each cable and its connections
- Interconnect wiring diagrams to show the cable connections between devices
- Pre-programmed parameters of each site component
- Templates used to program each device
- All firmware and software revisions of each site component
- Test data from each device that requires operational verification
- Optimization requirements and settings of each electrical path
- Acceptance Test Plan for the site components

NOTICE: Maintain this site-specific information to reflect the current site configuration and layout for the system.

3.4
GTR 8000 Site Subsystem Hardware Installation

The following is information specific to the GTR 8000 Base Radio and GTR 8000 Site Subsystem.

3.4.1
Placement and Spacing

Racks allow equipment to be added to a site. Always consider room for expansion when setting up a site. Racks may be installed next to each other or to other equipment. However, all racks must have sufficient floor space to permit access for installation and service.

For the GTR 8000 Site Subsystem, recommended clearance for service and installation is at least 2 ft in the front and rear.

Front access:

- At least 2 ft floor access in front of the rack.

Side and rear access:

- At least 2 ft floor access at the rear of the rack
- At least 2 ft access on at least one side of the rack, plus 6 inches at the rear of the rack.

To maintain this clearance, the following is recommended:

- If there is less than 2 ft rear access, do not install more than two racks side by side, and allow at least 2 ft access on at least one side of each rack.

3.4.2
Floor Mounting of the GTR 8000 Site Subsystem

Figure 25: GTR 8000 Site Subsystem - Floor Mounting Detail on page 68 is the footprint diagram for the GTR 8000 Site Subsystem.

Figure 25: GTR 8000 Site Subsystem - Floor Mounting Detail

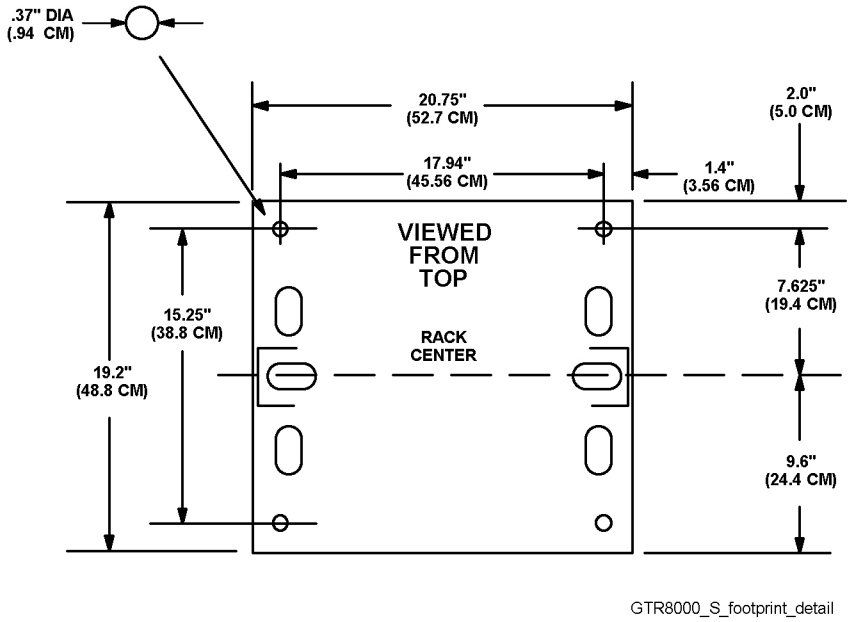
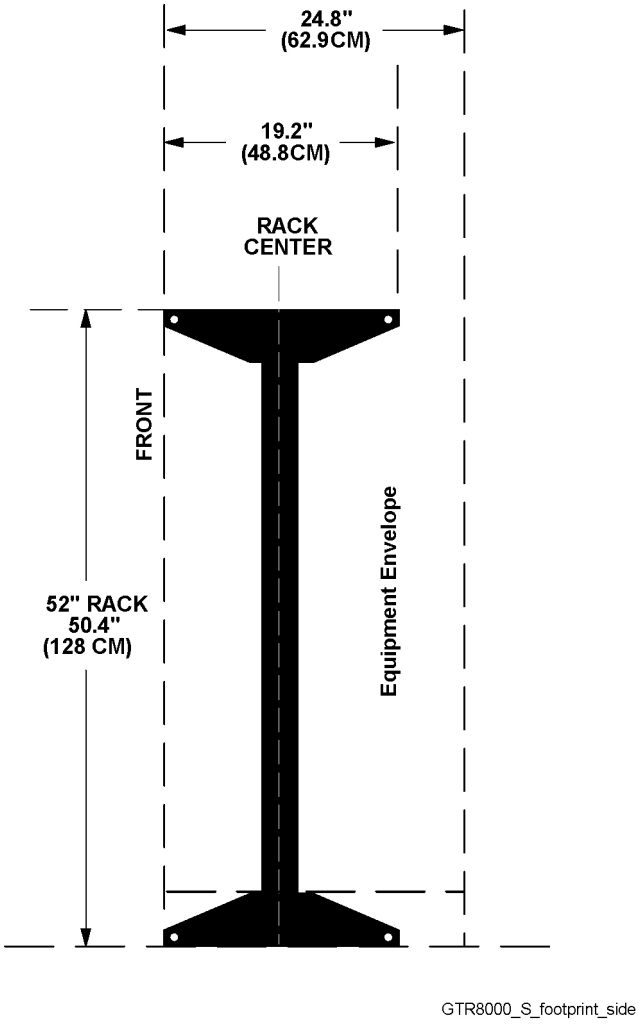


Figure 26: GTR 8000 Site Subsystem (Open Rack Version) - Side View on page 69 provides a side view.

Figure 26: GTR 8000 Site Subsystem (Open Rack Version) - Side View



3.4.3
Connecting Power

This section covers topics on connecting power cables to the base radio and the power distribution module, calculating the length of wire for various gauges, and mounting the battery temperature sensor.

3.4.3.1
Connecting Power Cables to a GTR 8000 Base Radio

For the base radio, customer-provided AC and DC inputs connect to the power supply through the backplane of the base radio. See GTR 8000 Base Radio Rear Connections on page 73.

3.4.3.2
Connecting Power Cables to a Power Distribution Module

In a GTR 8000 Site Subsystem, the power distribution module located with the junction panel provides connections for customer-provided AC and DC inputs. One or two DC inputs can be connected to the DC section of the power distribution module. For the base radio, there must be a single, separate AC

source with the proper power rating connected to the appropriate terminals in the AC section, where it is then fed to the corresponding AC power supply input.

NOTICE: Each DC input termination is rated for a maximum of 54A.

For additional information about power distribution in GTR 8000 Site Subsystems, see the following sections:

- AC/DC Power Distribution – Base Radio on page 45
- Power Distribution Module on page 48.

3.4.3.3
DC Power Connection Wire Gauge Calculations

Since the power supply disconnects itself from the DC input when it senses that DC voltage has dropped to 42 VDC, it is important to minimize the voltage drop in the DC power supply loop (the total length of the 48 VDC "hot" wire and the DC return wire) to no more than 1 V total. Minimizing the voltage drop ensures that the maximum energy is removed from the battery before disconnecting the power supply from the DC input line.

A GTR 8000 Site Subsystem transmitting at 50 W draws up to 7.4 A current when operating from a 54 V source (nominal 48 VDC system). As voltage decreases (due to the standby battery discharging) the current increases proportionally (since the base radio appears to be a constant power load). At the low voltage disconnect point (42 V for a nominal 48 VDC system), the current is up to 9.5 A. If a single pair of 2 AWG wire is used to connect the battery to the junction panel, the maximum length of a single conductor would be 335 ft. Use of smaller gauge wire would reduce this length depending on the resistance of the wire. To determine the maximum length of wire for wire other than 2 AWG, the following relationship can be used:

- Length (ft) = V/I/R

where:

- V = voltage drop in one leg of the loop (max = 0.5 V)
- I = current drawn by the base radio during DC operation (12A)
- R = resistance of the wire being considered (in Ohms per ft)

3.4.3.3.1
Power Connection Wire Gauge Maximum Distances

For common wire sizes, the maximum distances shown in this table apply.

Table 16: Power Connection Wire Gauge Maximum Distances

AWG	Resistance (ohm/1000 ft)	Maximum Distance (meter/ft)
2	0.1563	102.1m (335 ft)
3	0.1970	81m (265 ft)
4	0.2485	64m (210 ft)
5	0.3133	51m (165 ft)
6	0.3951	40m (130 ft)

In some installations, local codes may require the installation of wire heavier than 2AWG. In these situations, a local splice box can be used to reduce the incoming wire to the 2AWG needed for

connection to the input terminal box. The splice box should be located as close as possible to the junction panel.

3.4.3.4
Battery Temperature Sensor Mounting

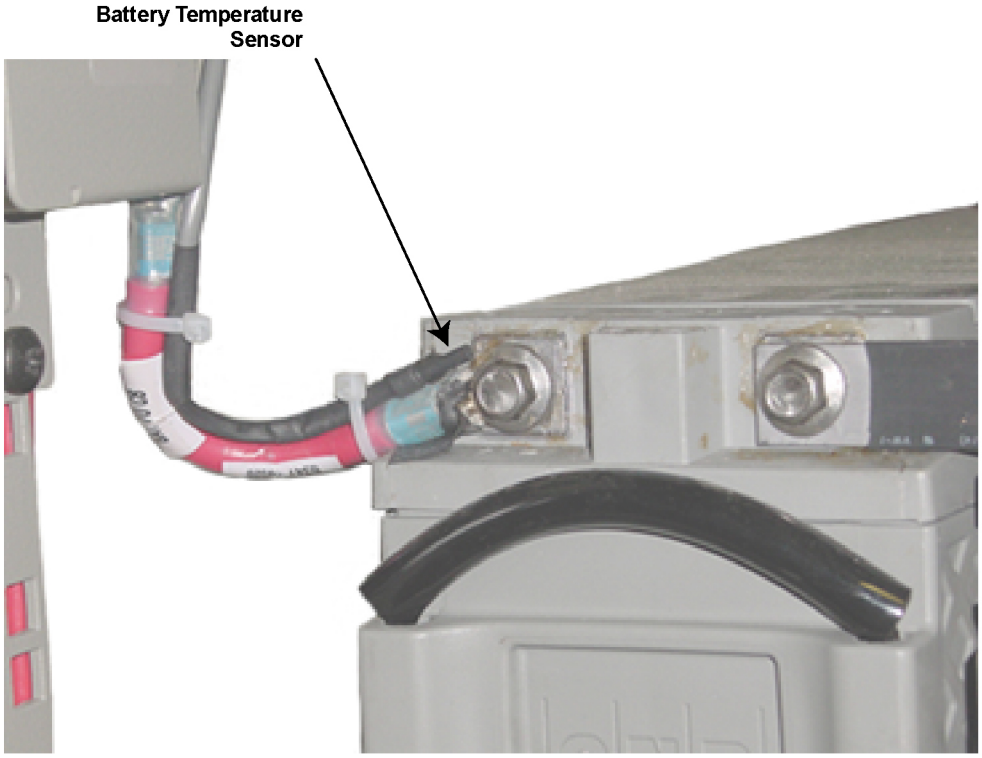
A 40 ft battery temperature sensor cable is shipped with your device. This three-wire cable carries a voltage signal to the power supply from a sensor element which must be mounted close to the storage battery. Voltage is proportional to the battery temperature and the diagnostic circuitry in the power supply module. The 40 ft cable can be extended to a total length of 190 ft using 50 ft extensions (Motorola Solutions part number 3084827Y04. See Motorola Solutions Support Center on page 136.

Mount the sensing element of the temperature sensor so that it detects the actual battery temperature (or the ambient temperature as close as possible to the batteries being charged). The two examples of mounting are as follows:

Example 1

Use cable ties to attach the sensing cable to the positive (or negative) power cable. A minimum of two cable ties should be used (spaced 6 inches apart), with one of the cable ties not more than 2 inches from the sensing element. Mount the sensing element not more than 2 inches from the battery post where the power cable connects. See Figure 27: Battery Temperature Sensor Example 1 on page 71.

Figure 27: Battery Temperature Sensor Example 1



Example 2

Attach the sensing cable to an existing battery tray support bracket using cable ties or nylon loop straps of the proper size. Mount the sensing element not more than 2 inches from the surface of the

batteries being monitored. Use a minimum of two cable ties and/or loop straps to secure the sensing cable to the bracket. Place the cable ties/ loop straps no more than 6 inches apart with one placed no more than 2 inches from the sensing element. See Figure 28: Battery Temperature Sensor Example 2 on page 72.

Figure 28: Battery Temperature Sensor Example 2

3.4.4
Grounding

Detailed grounding information is beyond the scope of this manual. See the Motorola Solutions *Standards and Guidelines for Communication Sites* manual for detailed information about grounding and lightning protection.

IMPORTANT: Ground the battery system, either positive or negative, at the battery. The DC input (battery charger output) of the power supply is floating with respect to earth ground. The power supply can therefore be used in either positive ground or negative ground DC systems. The appropriate terminal (+ or -) of the DC system should be connected to protective earth at the battery. These instructions assume that all telephone lines, antenna cables, and AC or DC power cables have been properly grounded and lightning-protected.

3.4.4.1
Grounding the GTR 8000 Base Radio and GCP 8000 Site Controller

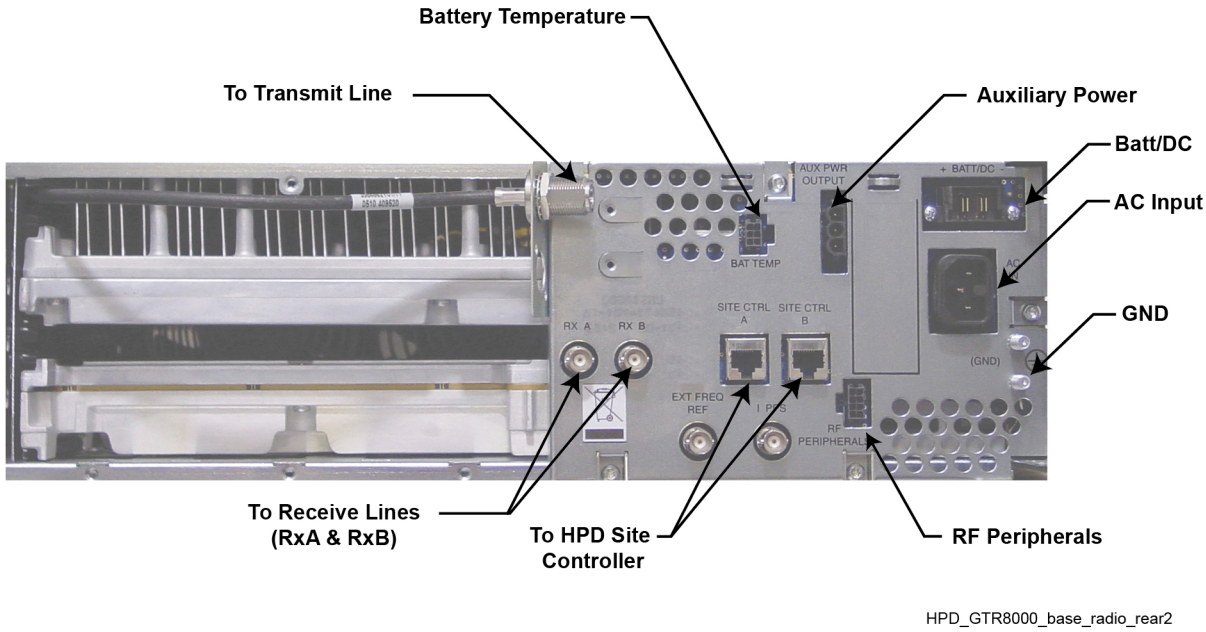
Procedure:

1. Take the ground wire already attached to the two grounding lugs at the rear of the device, and connect the other end to the rack grounding bar.
2. Tighten the ground lock nut to 60 in-lbs (6.94 newton-meters).

3.4.5
GTR 8000 Base Radio Rear Connections

The GTR 8000 Base Radio connects with each of the site controllers and to the transmit and receive paths.

Figure 29: Base Radio – HPD Backplane



HPD_GTR8000_base_radio_rear2

Table 17: GTR 8000 Base Radio Connections (Backplane)

Port / Type	Device it connects to:	Port / Type	Description
SC A port, RJ-45	Site Controller module A	Base radio port, RJ-45	Connects to site controller A base radio port for this channel. **NOTICE:** The length of the cable between the site controller and the base radio should be no greater than 30 ft.
SC B port, RJ-45	Site Controller module B	Base radio port, RJ-45	Connects to site controller B base radio port for this channel.
RX-A, BNC	Receive line A	BNC	RF coax to receive path for Rx antenna.

Table continued…

Port / Type	Device it connects to:	Port / Type	Description
RX-B, BNC	Receive line B	BNC	RF coax to receive path for antenna B.
Transmit port, N-type	Transmit line	N-type	RF coax to transmit antenna.
Aux Pwr Output	Site Controller or RMC/LNA	Aux Pwr Input	The auxiliary output power can be used to provide secondary power to the site controller or receive multicouplers (Site RMCs/LNAs).
Bat Temp, 6-pin	Battery temperature sensor		Connection to temperature sensor, allowing for temperature compensated battery charging.
RF Peripherals	RF peripheral sensor ports		Antenna relay and presence detect, external circulator load temperature (external wattmeter not supported).
Batt/DC	DC power supply or battery	Batt/DC	Input from and output to a 48 VDC power supply or backup battery. When AC power is not available, the device switches to operate from a DC source if the optional DC power (8AWG; length 9 ft), CA01400AA is ordered and installed. One end connects into the Batt/DC port and the other end connects into the DC source. The contacts are 39-83503N02 (AMP #53880-2), the receptacle housings are 15-83502N01 (AMP #53884-1) and the mounting ears are 07-83504N01 (AMP #53887-1). 3084869Y06 cable is used for a positive ground system. 3084869Y02 cable is used for a negative ground system.
AC	120/240 VAC power source.		Input from 120/240 VAC nominal power source.
Rx-C			Not in use
EXT FREQ REF			Not in use
1PPS			Not in use

3.4.6
GTR 8000 Base Radio Front Connections

Two service ports are accessible through a drop-down door to the left of the fans. The remaining ports are behind the fan module.

Figure 30: GTR 8000 Base Radio – Front

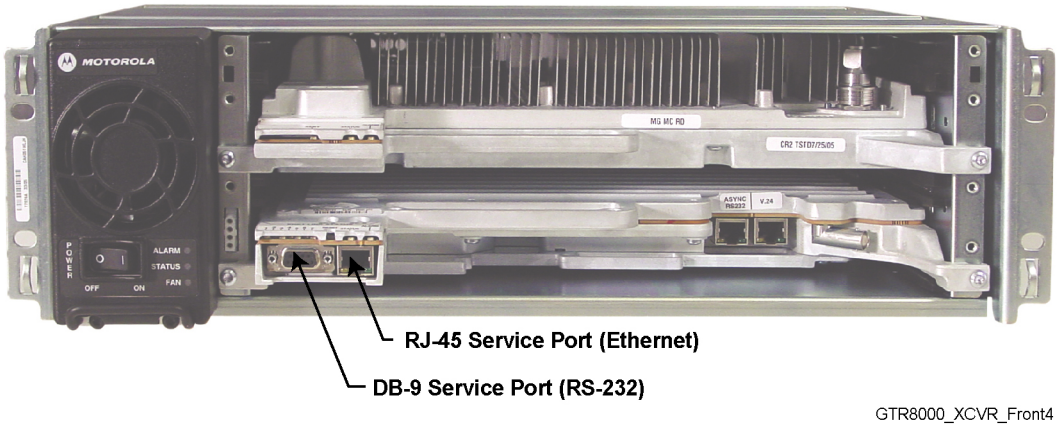


Table 18: GTR 8000 Base Radio Connections (Front)

Port / Type	Description
Service port, RJ-45	Connects to service PC for local access using Configuration/Service Software. Also may be used for localized software downloads. **NOTICE:** The RJ-45 service port supports only 10 Mb half duplex operation.
Service port, DB-9	Connects to service PC for initial configuration of the base radio IP address.
Reference frequency input, BNC	Connection port to service monitor for frequency calibration.

3.4.7
GCP 8000 Site Controller Rear Connections

Figure 31: GCP 8000 Site Controller Ports Rear Connections

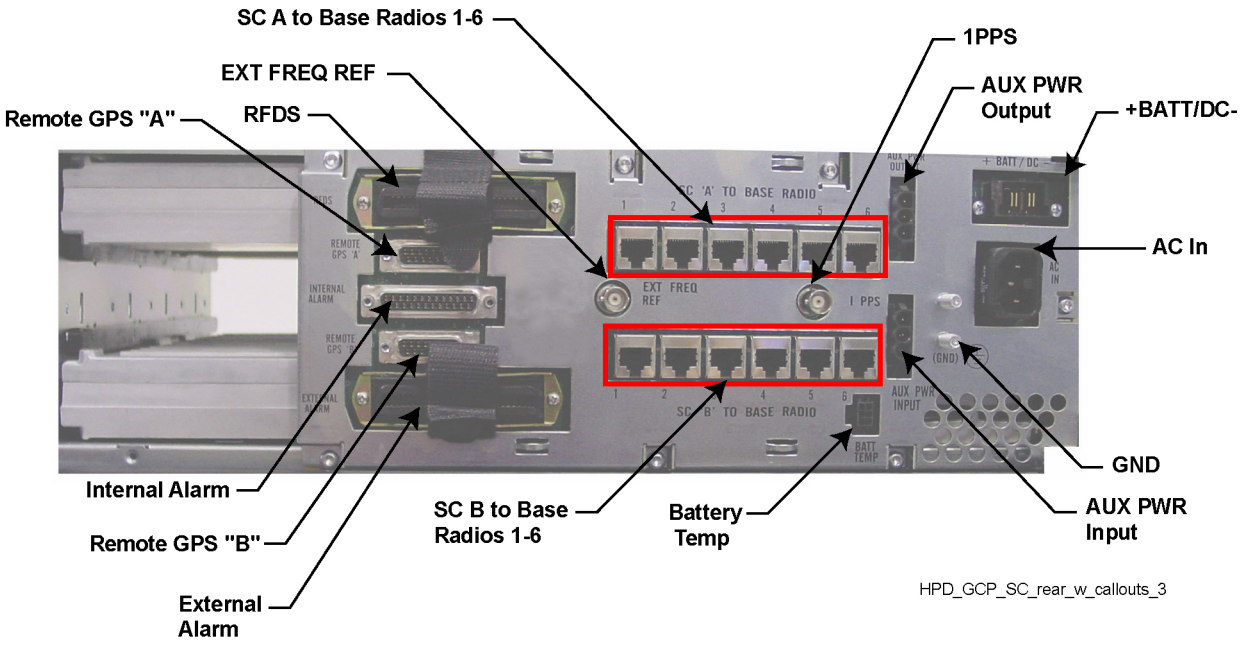


Table 19: GCP 8000 Site Controller Ports Rear Connections

Port / Type	Device it connects to:	Port / Type	Description
RFDS	PMU and receiver multi-coupler		Monitors RFDS alarms from the power monitor and receiver multi-coupler in an HPD system.
Remote GPS A	GNSS antenna		Connection between the RGPS A and the site controller in an HPD system.
Internal Alarm			Not in use
Remote GPS B	GNSS antenna		Connection between the RGPS B and the site controller in an HPD system.
External Alarm			Not in use
SC ‘A’ to Base Radio 1-6, RJ-45	GTR 8000 Base Radio	GTR = SC-A port, RJ-45	Connection between the site controller A and GTR 8000 Base Radios at the site. Use only port 1.
SC ‘B’ to Base Radio 1-6, RJ-45	GTR 8000 Base Radio	GTR = SC-A port, RJ-45	Connection between the site controller B and GTR 8000 Base Radios at the site. Use only port 1.

Table continued…

Port / Type	Device it connects to:	Port / Type	Description
EXT FREQ REF			Not in use
1PPS, BNC			Not in use
Battery Temp, 6-pin	Battery temperature sensor		Connection to temperature sensor, allowing for temperature compensated battery charging.
AUX PWR OUPUT			Not in use
AUX PWR INPUT	GCP 8000 Site Controller	AUX PWR OUTPUT	The auxiliary input is connected with a GTR 8000 Base Radio as a secondary power source in an HPD system.
+ Batt/DC	DC power supply or battery		Input from and output to a 48 VDC power supply or backup battery. When AC power is not available, the device switches to operate from a DC source if the optional DC power (8 AWG; length 9 ft), CA01400AA is ordered and installed. One end connects into the Batt/DC port and the other end connects into the DC source. The contacts are 39-83503N02 (AMP #53880-2), the receptacle housings are 15-83502N01 (AMP #53884-1) and the mounting ears are 07-83504N01 (AMP #53887-1). 3084869Y06 cable is used for a positive ground system. 3084869Y02 cable is used for a negative ground system.
AC	120/240 VAC Power source		Input from 90/264 VAC nominal power source.
GND			Two grounding lugs and cable.

3.4.8
GCP 8000 Site Controller Front Connections

Figure 32: GCP 8000 Site Controller Ports Front View)

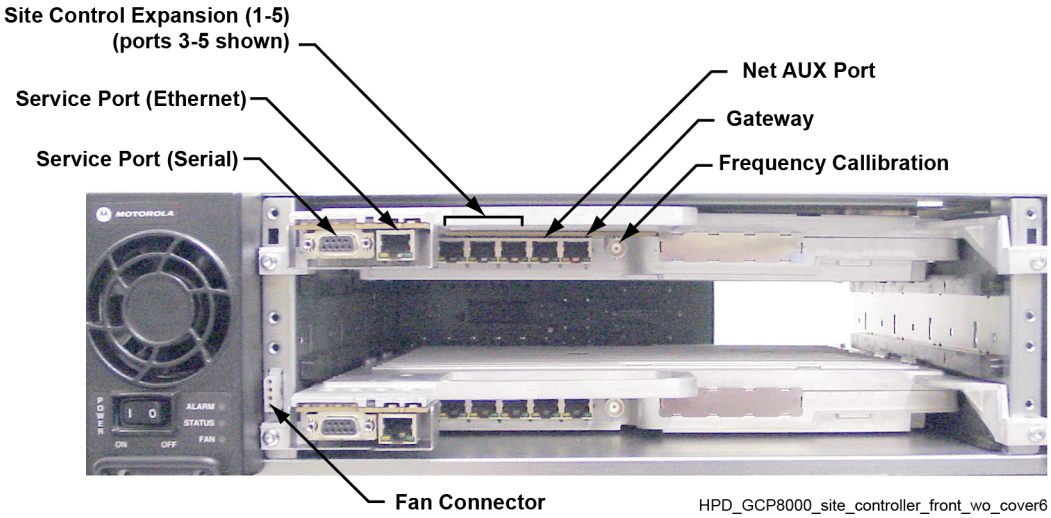


Table 20: GCP 8000 Site Controller Front Connections

Port / Type	Device it connects to:	Port / Type	Description
Service Port, DB-9	Service PC	RS-232 port	Service port for initial configuration of the site controller IP address.
Service Port, RJ-45	Service PC	LAN port	Connects to service PC for local access using Configuration/ Service Software. Also may be used for localized software downloads.
Gateway port, RJ-45	Site router or site gateway	RJ-45	Connection to the site router or site gateway.
NET AUX, RJ-45	External LAN Switch	LAN 1, RJ-45	LAN connection to the SDM RTU for local fault monitoring. Or, external switch connection.
Frequency Calibration	Service monitor	BNC	Port available on the site controller module for measuring and calibrating the frequency reference.
Fan Connector, 4-port	Fan assembly		Plug-in connection when the fan assembly is mounted.

3.4.9
Junction Panel Connections for the GTR 8000 Site Subsystem

The junction panels for the GTR 8000 Site Subsystem provides locations for all the connections to external devices. Cables provided by Motorola Solutions include the specific connectors for the junction panel on one end and the subsystem equipment on the other end.

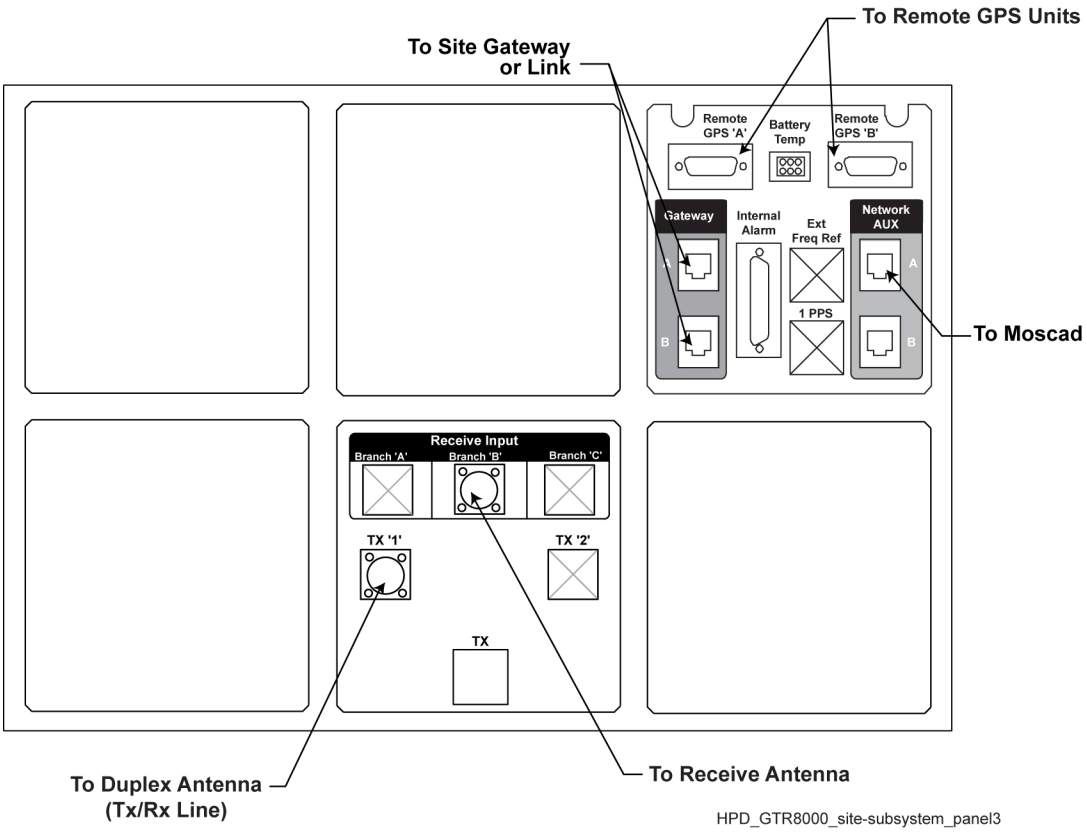
IMPORTANT: Do not remove the label from a connector location until you insert the connector.

3.4.9.1

Junction Panel Connections

External connections can be made at the GTR 8000 Site Subsystem. The RF connections are also illustrated in the Rx and Tx path diagrams in RFDS Components on page 29.

Figure 33: Junction Panel for the GTR 8000 Site Subsystem



NOTICE: For HPD Overlay sites, the Gateway A and B connections link directly to Site Switches A and B instead of Gateways.

Table 21: GTR 8000 Site Subsystem Junction Panel Connections

Port / Type	Device this connects to:	Port / Type	Description
GatewayA port, RJ-45	Primary Site Gateway	LAN 1, RJ-45	Ethernet link between site controller A and the primary site gateway.
GatewayB port, RJ-45	Secondary Site Gateway (optional)	LAN 1, RJ-45	Ethernet link between site controller B and secondary site gateway (if installed).

Table continued…

Port / Type	Device this connects to:	Port / Type	Description
Network AUX A, RJ-45	SDM RTU	LAN Port 1, RJ-45	Ethernet link for SDM RTU device.
Network AUX B, RJ-45	Auxiliary site equipment such as a site gateway	LAN 1, RJ-45	This port is available for devices that need to be connected to the network, including a site gateway, if it is included at the site.
Battery Temp	Backup Battery Temperature Sensor		See battery temperature sensor instructions for connection requirements.
Remote GPS A, DB-15	Lightning Arrestor / RGPS Unit A	Line terminals	See the *GCP 8000 Site Controller* manual for terminal connection details on the lightning arrestor.
Remote GPS B, DB-15	Lightning Arrestor / RGPS Unit B	Line terminals	See *GCP 8000 Site Controller* manual for terminal connection details on the lightning arrestor.
Rx-B, N-type	Receive antenna		RF coax to receive antenna.
Rx-A, N-type	Transmit/receive antenna		RF coax to transmit/receive antenna.
Internal Alarm, DB-25			Not in use.

3.5 Installation/Troubleshooting Tools

In addition to the general tools needed for site installation activities, a service monitor is used specifically for testing the equipment.

To place an order, contact Motorola Solutions at:
Phone: 1-800-422-4210 ext. 6883
TTY Phone: 1-866-522-5210
Motorola Online users: Web: https://businessonline.motorolasolutions.com
Fax: 1-800-622-6210

3.5.1
Quick Connect RF Coaxial Adapters for GTR 8000 Base Radio Support

The GTR 8000 Base Radio employs a number of "QN" and "QMA" Quick-Connect RF connectors in its design. The following RF adapters are available from Motorola Solutions and can be used to connect test equipment to the various station devices for troubleshooting purposes.

Table 22: Quick-Connect RF Coaxial Adapters for GTR 8000 Base Radio Support

Type	Adapter / Connector description	Motorola Solutions Part Number
"N"/QN	Female "N" to Male QN	5886055Y01
"N"/QN	Female "N" to Female QN	5886055Y10
"N"/QN	Male "N" to Male "QN"	5886055Y05
QN	Right Angle Male QN cable plug for RG-400 coax	2871002H01
QN	Right Angle Male QN cable plug for RG-213 coax	2886067Y01
N/QMA	Female "N" to Male QMA	5886055Y06
N/QMA	Female "N" to Female QMA	5886055Y07
QMA/QMA	Female QMA to Female QMA	5886055Y08
QMA/QMA	Male QMA to Male QMA	5886055Y09
7/16/QN	Female 7/16 to male QN	5886055Y03
7/16/QN	Male 7/16 to Male QN	5886055Y02
7/16/QN	"Female 7/16 to female QN Intermod test adaptor"	5886055Y04
7/16/QN	"Male 7/16 to female QN Intermod test adaptor"	5886055Y11

3.6
Installing Device Software Prerequisites

When and where to use: The following tasks are required before you can complete the device software installation and begin the configuration procedures in the “Configuration” chapter.

Process:

1. Transfer and install new software to a device using the Software Download Manager. See Software Download Manager on page 83.
2. Obtain the ASTRO® 25 media. Specifically, you need the Motorola Solutions Device OS Image media. See Loading Device OS Images to the UNC on page 86.
3. Obtain user names, passwords, and procedures required to access the devices on the network. For specific user names and passwords to access devices on the network, contact your system administrator.
4. Set up the users in the IT Admin group in Active Directory Users and Computers. See the *Authentication Services* manual.

5 Obtain the following values from the system administrator:

- Line interface number
- Zone Controller (ZC) site link path 1 IP address
- ZC site link path 2 IP address
- Host name to access the Unified Network Configurator (UNC) server application using Secure SHell (SSH) (**<*username*>** @IP address format)
- Site ID number
- IP address 1 and 2
- Primary and secondary NTP IP addresses

  NOTICE: The following are applicable to systems with Authentication, Authorization, and Accounting (AAA) Servers, Domain Controllers, or Syslog Servers.
- Primary, secondary, and tertiary Domain Name Services (DNS) IP addresses
- Requested DNS Domain Name
- Requested DNS Host Name
- System Name
- Primary SYSLOG Service Name Fully Qualified Domain Name (FQDN)
- Backup SYSLOG Service Name Fully Qualified Domain Name (FQDN)
- Remote Authentication Dial-In User Service (RADIUS) FQDN parameter value
- RADIUS Row Status parameter value
- RADIUS Service Time Out (seconds) parameter value
- RADIUS Service Retransmits Attempts parameter value
- RADIUS Service Dead Timer (min) parameter value
- RADIUS Specific Key parameter value
- RADIUS Service Global Key parameter value

6 Obtain the default credentials (local accounts, central authentication, and SNMPv3) for the device being installed, as well as the updated passwords for those types of accounts (so that you can change the password after you install the device). Contact your system administrator, if you do not have this information. See the *SNMPv3* manual or see Local Password and SNMPv3 Passphrase Troubleshooting on page 135 for more information.

7 Configure the device as a RADIUS client on the RADIUS server. When these devices are configured with a RADIUS key that matches a shared secret for that device in Microsoft Windows Internet Authentication Service (IAS), they become RADIUS clients. They do not join the Active Directory domain. See the *Authentication Services* manual for more information.

8 **NOTICE:** This step is applicable to systems with AAA Servers, Domain Controllers, or Syslog Servers.

To use the VoyenceControl component of the Motorola Solutions centralized configuration application for any of the site device procedures, set up the UNC. Depending on your organizational policies, you may also need to implement a secure protocol between the UNC and the site device. Before performing any procedures using VoyenceControl, the device must be discovered in VoyenceControl, and the device configurations must be recently pulled to the UNC database. See the following ASTRO® 25 system documentation: *Unified Network Configurator* manual and *Securing Protocols with SSH* manual.

3.7
Software Download Manager

The Software Download Manager (SWDL) is an application that can transfer only, install only, or transfer and install new software to devices. The new software can be installed either locally at a site or on the Network Management subsystem. Individual devices not connected to the system can be downloaded using single device mode.

NOTICE: Throughout this manual, the name SWDL is used to refer to the Software Download Manager application.

Software Download Security Transfer Modes

A software download can be performed using the following security transfer modes:

Clear SWDL
Transfers the software without security, based on the File-Transfer Protocol (FTP)

Secure SWDL
Transfers the software as encrypted, based on the Secure File-Transfer Protocol (SFTP)

NOTICE: All secure sequential and simultaneous transfers use the Diffie-Hellman group exchange. The Diffie-Hellman group exchange is used for devices supporting Diffie-Hellman group exchange. The Diffie-Hellman group exchange enhances the security of Secure Shell (SSH) protocol initial key exchange. See the *Software Download Manager* manual for details.

Before initiating transfer, SWDL connects to the site in the zone to discover all devices. The transfer mode of all devices is displayed in the SWDL window. It is important that all devices have the same SWDL transfer mode. Otherwise, SWDL flags a mismatch of the SWDL transfer modes across site devices.

SWDL provisions the credentials for Secure SWDL as part of initiating the SWDL operation. No user intervention is required. For a single device, Secure or Clear SWDL is configured based on the SWDL Transfer Mode configuration within the Configuration/Service Software (CSS). The Unified Network Configurator (UNC) can be used to schedule and configure all devices in the system at once.

For information on how to configure the secure or clear SWDL transfer mode, see the *Unified Network Configurator* manual and “Configuring Devices for Security” in the *CSS Online Help*.

Software Download Transfer Methods

A software download can be accomplished in two ways:

Site Software Download
Allows you to transfer and install application software from any location within a network. The Software Download Manager resides on the Network Management Client computer and a service computer/laptop loaded with the CSS application. From either of the computers, you can select device types to download software. Site Software Download allows you to select the zone, site, device types, and software download operation to perform. When performing a site software download, the site controller coordinates the software transfer for all trunked base radios, receivers, comparators, and reference distribution modules installed at the site. A site software download can only be performed on a trunked ASTRO® 25 system.

NOTICE: Trunked GPW 8000 Receivers in a circuit simulcast configuration are not supported using a site software download.

Single Device Software Download
Allows you to transfer and install software to a single instance of a device (such as one base radio). This feature gives the technician the ability to install different versions of software. Single device software download is done from a service computer/laptop loaded with the CSS application either connected directly to the device or connected to the network.

NOTICE: Conventional devices and 3600 base radios are supported only in single device software download.

Site Software Download Functionality

When SWDL is connected from a central remote location, SWDL performs a site software download to the site controllers, then to the comparators and base radios or receivers installed at the site. Both active and standby site controller modules have two flash memory banks for storing software. The device application is run from RAM, and is loaded from the active flash memory bank after a reset. One bank is active while the other bank is inactive. The transfer of the software using SWDL is a background process, without interruption of services at the site, that loads the software into the inactive bank. The site controller executes the software from one bank, while software is simultaneously downloaded to the inactive bank. The transfer and install are done in the background. An install causes the site controller to reset and load the RAM from the bank that was installed with the new software.

NOTICE: For geographically redundant prime sites, a site software download should not be attempted while the third Site Controller (SC3) is in the active state.

SWDL communicates with the site controllers to determine the number of existing remote sites and the number of channels. SWDL considers a channel or remote site to be accessible if its status is “Not Unconfigured.” This term means that the site must be set up with a service computer/laptop with CSS or a network management client before software download is performed on the site.

The system downloads software to the site controllers, comparators, base radios, or receivers as a unit. Use SWDL to transfer software to each device type, then perform an install operation. During the transfer, the operation designates a proxy for each device type at each LAN. Site controllers proxy for comparators, and base radios or receivers proxy for each other. The proxy cross-transfers the software to other devices on the LAN. Using proxies minimizes system downtime. Transfers to the LAN are done simultaneously except for the site controller and comparators.

Software installation is done on a channel-by-channel basis, starting with the highest number channel. When a channel software download occurs, the base radio or receiver which incorporates that channel is processed along with the comparator for that channel. For example, if channel 3 was being downloaded, comparator 3 and the base radios or receivers for channel 3 at each of the remote sites would be installed simultaneously.

SWDL operation can be fault managed through Unified Event Manager (UEM), syslog, local SWDL log files, user messages, and device reports.

For further information on SWDL, see the *Software Download Manager* manual.

The operating software can also be loaded using the UNC. See the *Unified Network Configurator* manual to perform single device software downloads (ruthless download) to the devices.

See the *G-Series Equipment System Release User Guide* for SWDL instructions specific to the operating characteristics of your existing system release.

3.8 Installing Devices in the UNC

When and where to use: The Unified Network Configurator (UNC) is the Network Manager used to discover a device and load Operating System images. This process lists the basic steps involved using the UNC on a device.

NOTICE: The UNC is not applicable for K core or non-networked sites.

Process:

1 Discover the device in the UNC. See Discovering a Device in the UNC on page 85.

2 Log in to the UNC server application using PuTTY. See the *Securing Protocols with SSH* manual.

3 Load the operating system images to the UNC. See Loading Device OS Images to the UNC on page 86.

4 Enable FTP services on the UNC. See Enabling FTP Service on page 87.

5 Transfer and install the OS image to the device. See Transferring and Installing the OS Image on page 87.

6 Inspect the device properties for the transferred and installed software. See Inspecting Device Properties for Transferred and Installed Software on page 90.

7 Disable FTP services for the UNC. See Disabling FTP Service on page 91.

3.8.1
Discovering a Device in the UNC

When and where to use:
The discovery process allows the Unified Network Configurator (UNC) to manage the site devices. Once the device is installed, configured through the Configuration/Service Software (CSS), and security parameters are enabled, follow this procedure to discover the device. The configuration information can then be updated using this configuration management application.

The UNC network management solution consists of two applications. Both the UNC Wizard and the VoyenceControl applications are used in this procedure.

NOTICE: The names EMC Smarts™ Network Configuration Manager and VoyenceControl are used interchangeably for this product.

Once the device is discovered in the UNC, the OS images and CSS configuration files can be loaded to add a device to a site, which then connects the site to the current ASTRO® 25 zone core.

Procedure:

1 Ensure that Domain Name Services (DNS) is functional on your system. DNS is supplied by a specific server application, which must be operational before you can discover the device.

2 Log on to the UNC Wizard from the Network Management (NM) client, by double-clicking the **Internet Explorer** icon on the desktop.

The Internet Explorer browser opens.

3 In the **Address** field, enter: `http://ucs-unc0<Y>.ucs:9443/UNCW`

where <Y> is the number of the UNC server (01 for primary core UNC server, and 02 for backup core UNC server).

The UNC Wizard launches and a login dialog box appears.

4 Type the administrative user name and password. Click **OK**.

The UNC Wizard appears.

5 From the list of available wizards on the left side, select **Subnet Discovery**.

The right side of the window is updated with the **Subnet Discovery** form.

6 Select **RF Site** by clicking the **Discovery Type** drop-down list.

7 Enter the **Zone ID** and the **Site ID**. Click **Submit**.

An auto-discovery job is created in the UNC Schedule Manager.

8 Log on to the UNC from the NM client by entering:

`http://ucs-unc0<Y>.ucs`

where <Y> is the number of the UNC server (01 for primary core UNC server, and 02 for backup core UNC server).

The UNC client launches and a login dialog box appears.

9 Type the administrative user name and password. Click **OK**.

VoyenceControl launches.

NOTICE: The names EMC Smarts™ Network Configuration Manager and VoyenceControl are used interchangeably for this product.

10 Press F7 (Schedule Manager).

The **Schedule Manager** window appears in the UNC with the discovery jobs.

11 Verify that the **Zone** and **Site** containers include any devices discovered.

IMPORTANT: No site devices should be in the **Lost and Found** folder. If any devices are in the folder, see the *Unified Network Configurator* manual for troubleshooting guidance.

12 In the UNC Wizard, verify the devices by selecting **Channel** under **RF Site Level Configuration**. If multiple zones exist, choose **Zone**.

The device sites are listed, which means they are available for channel configuration.

3.8.2
Loading Device OS Images to the UNC

Prerequisites: This procedure requires the Motorola Solutions device Operating System (OS) Image media. Locate the Transport OS Image media packaged with the Network Management media.

When and where to use: This procedure loads the OS images for the devices for distribution through the Unified Network Configurator (UNC). Once OS images are distributed to the UNC, you can update the device Configuration/Service Software (CSS) configuration files to the UNC.

Procedure:

1 Launch a Secure SHell (SSH) terminal server session in PuTTY to access the UNC **Server Administration** menu. See the *Securing Protocols with SSH* manual.

2 From the UNC **Server Administration** menu, select **OS Images Administration**. Press ENTER.

3 From the OS **Images Administration** menu, select **Load new OS images**. Press ENTER.

A message appears indicating there are two methods for loading OS Images.

4 Insert the **Motorola Solutions Device OS Images** media into the CD/DVD-ROM drive of the server.

The drive light starts blinking on the server.

5 When the drive light stops blinking, press ENTER.

The OS images load on the UNC.

6 From the menu, select **View OS Images**. Press ENTER.

The device software image appears.

7 From the menu, select **Eject CD**. Press ENTER.

The media ejects from the drive on the server.

8 Remove the **Motorola Solutions Device OS Images** media from the CD/DVD-ROM drive of the server.

9 To log out of the server, press ENTER.

The **User Configuration Server Administration** menu appears.

10 Press ENTER again.

The prompt appears.

3.8.3
Loading Software to a Device

NOTICE: These procedures are for a single device download. For a site download, see Software Download Manager on page 83.

The following procedures describe how to load software images onto Unified Network Configurator (UNC) and download and install this software to the device. Secure protocols for software download is the preferred approach to transfer operations. However, as a backup option, FTP service can be enabled before installing the software.

3.8.3.1
Enabling FTP Service

When and where to use: Follow this procedure to enable FTP service before installing the OS software.

Procedure:

1 Launch a Secure Shell (SSH) terminal server session in PuTTY to access the Unified Network Configurator (UNC) **Server Administration** menu. See the *Securing Protocols with SSH* manual.

2 From the Server Administration menu, select **Unix Administration**. Press ENTER.

3 From the Unix Administration menu, select **FTP Services**. Press ENTER.

4 From the FTP Services menu, select **Enable FTP service**. Press ENTER.

The FTP Services are enabled and available for software transfer and install operations.

3.8.3.2
Transferring and Installing the OS Image

When and where to use: Use this procedure to download the OS from the Unified Network Configurator (UNC) to the device.

Procedure:

1 On the Private Network Management (PNM) client where you set up VoyenceControl, double-click the UNC shortcut on the desktop.

You can also paste the following address into an IE web browser: `http://ucs-unc0<Y>.ucs`, where <Y> is the number of the UNC server (01 for primary core UNC server, and 02 for backup core UNC server).

Internet Explorer opens to the URL of the application server, and a VoyenceControl client session launches with the welcome page.

Figure 34: VoyenceControl Welcome Page

NOTICE: The names EMC Smarts™ Network Configuration Manager and VoyenceControl are used interchangeably for this product.

2 Click the **launch VoyenceControl™** link.

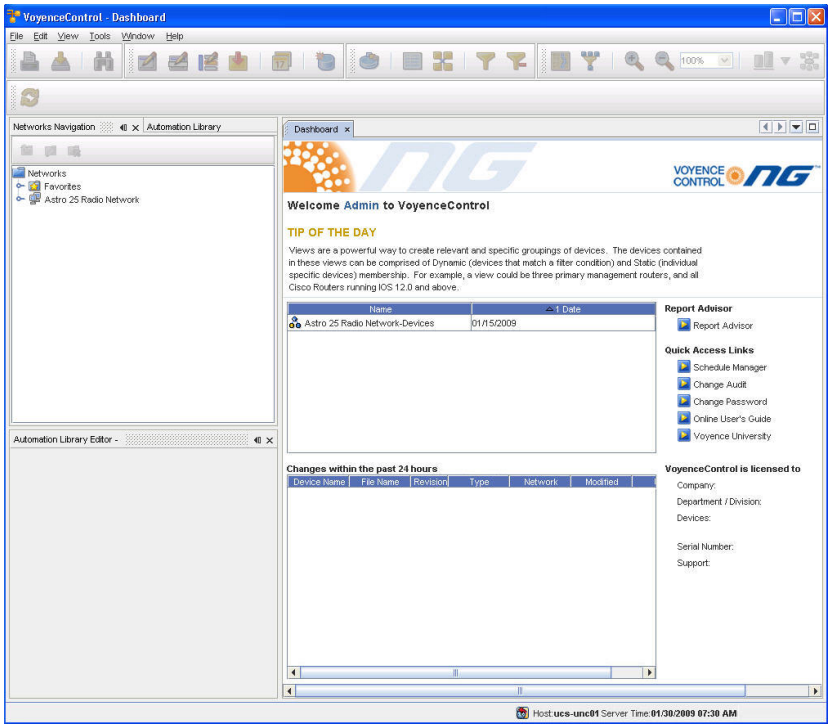
A VoyenceControl client session launches with the login window.

Figure 35: VoyenceControl Login Window

3 Enter the User ID and Password. Click **OK**.

The **VoyenceControl Dashboard** appears.

Figure 36: VoyenceControl Dashboard



4 In the left navigation pane, expand **Networks**, then select **ASTRO 25 Radio Network**, then **Views**.

The list of options expands.

5 From the navigation pane, double-click **Motorola <device>**.

The view opens and all currently discovered devices appear.

6 From the menu, select **Tools** → **OS Inventory**.

A list of the OS images appears.

7 Verify OS images loaded on the UNC server appear in the OS inventory.

NOTICE: These images were automatically created during the Loading Device OS Images to the UNC on page 86 procedure.

8 Under **Networks** in the navigation pane, select one or more devices from the same device class by right-clicking the selections.

9 From the menu, select **Update OS Image**.

10 From the **Select OS Image** window, select **Software Image**. Click **Next**.

11 From the **Update OS Image** window, select each device that appears in the **Selected Devices** section.

This action associates a version to a device instance.

NOTICE: In most cases, the “summary of device partitions” is already set up and the values in step 11 through step 14 must be verified.

12 Select **nvm partition** from the **Manage Partition for Device** section.

NOTICE: Selecting **nvm partition** defines where the OS image is transferred and is the only choice for the device.

13 From the **Selected Image** section, select the image for this device.

NOTICE: Ignore the **Install** and **Copy** check boxes.

The **Image Info** tab is populated and informs the application which image to use.

14 Click **Add**.

The **Summary of Device Partitions for Device** populates and confirms the proper setup.

15 Select the **Device Options** section, **Software Operations**, then choose **transfer**, **install**, or **both**.

These selections indicate which operations occur when the job is executed.

NOTICE: If **transfer** is chosen, select the install option later to complete the installation. If **both** is chosen, the software is transferred and installed. There are up to two resets of the device during installation.

16 Click **Schedule**.

17 From the **Schedule Push Job** window, configure the schedule information. Click **Approve and Submit**.

The job is approved and can be viewed in the **Schedule Manager** window.

NOTICE: If only **Submit** is chosen, the job must be approved later.

18 Verify the job status by pressing F7 (Schedule Manager).

The **Schedule Manager** window appears in the UNC with the discovery jobs.

3.8.3.3
Inspecting Device Properties for Transferred and Installed Software

When and where to use: When the software has been transferred and installed, follow this procedure to inspect the device properties before assuming the installation was a success and disabling FTP service

Procedure:

1 From the **Device** view, right-click the device, select **Pull**, and then **Pull Hardware Spec**.

The current software version information is updated in the Unified Network Configurator (UNC).

NOTICE: Skip this step if a Pull All or Pull Hardware Spec has already occurred.

2 From the **Device** view, right-click on the device, and then choose **Properties**.

The **Device Properties** window appears.

NOTICE: Select the **Properties** icon to view the device properties appear directly within the **Device** view.

3 Choose the **Configuration** tab, and then the **Hardware** tab.

4 Double-click the **Chassis** object from the **Physical Hardware** properties.

5 From the **Chassis** property tree, view the following properties and their values:

- **Bnk1:<*device*>**: Transferred software in bank 1.
- **Bnk2:<*device*>**: Transferred software in bank 2.
- **<*device*>**: Installed and Running Software.

NOTICE: The Table format can be used (instead of the Diagram format) to view the Installed and Running Software in the **Device** view.

3.8.3.4 Disabling FTP Service

When and where to use: Follow this procedure to disable the FTP service after the transfer and installation of the software is completed.

Procedure:

1 Launch a Secure SHell (SSH) terminal server session in PuTTY to access the Unified Network Configurator (UNC) **UNC Server Administration** menu. See the *Securing Protocols with SSH* manual.

2 From the **UNC Server Administration** menu, select **Unix Administration**. Press ENTER.

3 From the Unix Administration menu, select **FTP Services**. Press ENTER.

4 From the **FTP Services** menu, select **Disable FTP service**. Press ENTER.

The FTP services are disabled and unavailable for software transfer and install operations.

5 To back out of the menus, press Q three times.

6 At the prompt, enter: `exit` to return to the previous menu.

7 To log out of the application, enter: `exit`.

8 Close the PuTTY connection.

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Chapter 4

GTR 8000 Site Subsystem Configuration

This chapter details configuration procedures relating to GTR 8000 Site Subsystem.

Proper software/hardware configuration for the GTR 8000 Site Subsystem requires the following activities:

- Updating factory-installed HPD base radio application software
- Setting parameters in a configuration file stored on the transceiver module that impacts both base radio and RF Distribution System (RFDS) functionality
- Setting DIP switches on RFDS receive multicoupler/low noise amplifier (RMC/LNA) modules

NOTICE: For configuration of the GCP 8000 Site Controller, see the *GCP 8000 Site Controller* manual.

4.1 Configuration Software

Configuration of a device can be done on two software applications: Configuration/Service Software (CSS) and Unified Network Configurator (UNC).

CSS
is used to configure the parameters on the device. CSS can access devices remotely over the network, or locally through an Ethernet/serial connection to the service port on the device or through a LAN switch. CSS also can be used to view status information, equalize batteries, and check internal logs of the equipment at the site. See the *CSS Online Help* for configuration details.

UNC Wizard
is a component of UNC used to configure the parameters of a site, subsite, and channel. See the *UNC Wizard Online Help* for configuration details.

VoyenceControl
is a component of UNC used to pull and push configurations and configure the parameters of the device. See the *Unified Network Configurator* manual for general information about using VoyenceControl functions.

NOTICE: While it is possible to configure a conventional device using the UNC, it is preferable to use CSS because configuration dependencies are enforced.
The UNC is not applicable for K core or non-networked sites.

All parameters are programmed locally when the site is installed but not linked to a network. Test all parameters before making the site available. The ability to locally program provides the means to test the site before making it available for system operation.

4.2 Discovering a Device in the UNC

When and where to use: Use these high-level steps to discover the devices in the Unified Network Configurator (UNC). See the *Unified Network Configurator* manual for details on discovering devices.

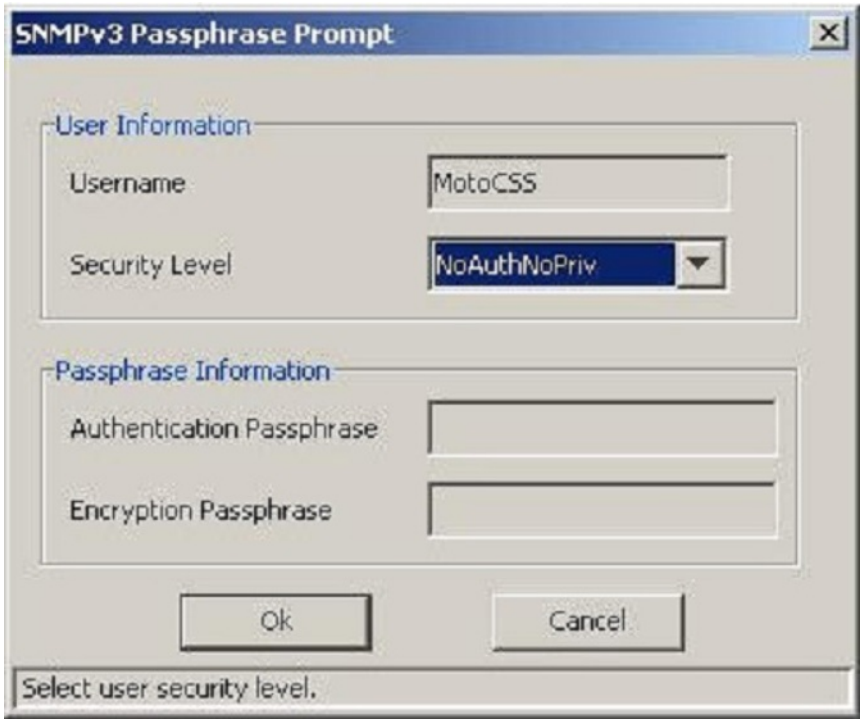
Process:

1. Use the UNC Discovery Wizard to:
   - Discover the devices.
   - Upload configurations for the devices.
   - Generate changes for non-compliant devices.
2. Approve jobs (if any).

4.3 Security/Authentication Services

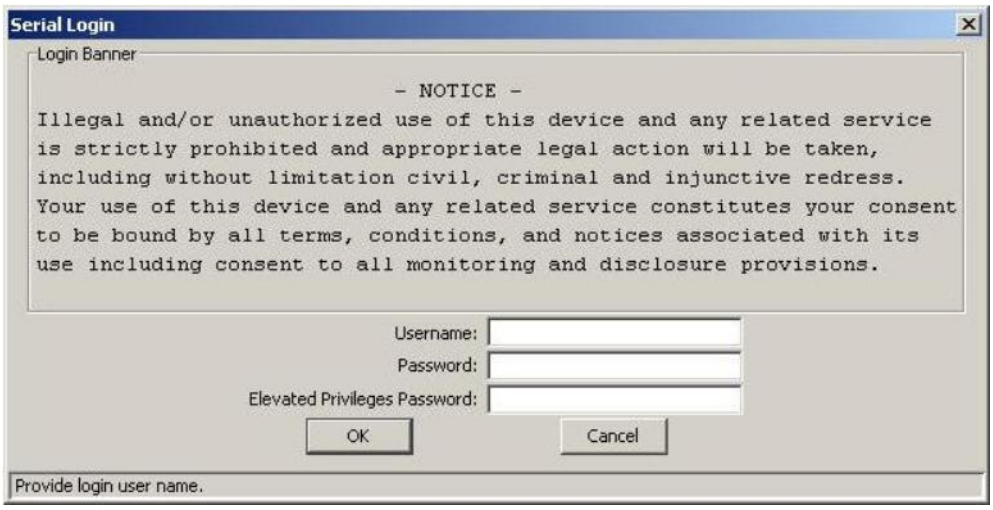
If the device supports SNMPv3 protocol, a pop-up dialog box appears displaying the SNMPv3 Password Prompt when logging in to a device through Configuration/Service Software (CSS) using an Ethernet connection. For configuration details, see the *Information Assurance Features Overview*, *Software Download Manager*, and *SNMPv3* manuals. See Figure 37: SNMPv3 Security Level Option Prompt on page 94.

Figure 37: SNMPv3 Security Level Option Prompt



A pop-up window appears displaying the File Transfer Access Services for CSS. Use this logon when communicating to a device through CSS using either an Ethernet or DB-9 Serial Port connection. See Figure 38: CSS Login Banner on page 95.

Figure 38: CSS Login Banner



4.4 Device Configuration in CSS

This section covers configuration of a device using the Configuration/Service Software (CSS).

NOTICE: The IP address for the device is available through a serial port connection in the **Tools** → **Set IP Address** from the CSS menu.

4.4.1 Initial Configuration of a Device in CSS

Prerequisites: CSS must be loaded on the service computer/laptop.

When and where to use: Follow this process to initially configure a device using CSS.

Process:

1. Perform the following configuration steps that require a serial connection. See Connecting Through a Serial Port Link on page 96.
   - **a** Set the IP address of the device. See Setting the Device IP Address in CSS on page 97.
   - **b** Set the serial security services. See Setting the Serial Security Services in CSS on page 98.
2. Perform the following configuration steps that require an Ethernet connection. See Connecting Through an Ethernet Port Link on page 100.
   - **a** Set the current date and time. See Setting the Date and Time in CSS on page 102.
   - **b** Change the SNMPv3 configuration and user credentials on a selected device in the site. See Changing SNMPv3 Configuration and User Credentials in CSS on page 103.
   - **c** Create, update, or delete an SNMPv3 user. See Adding or Modifying an SNMPv3 User in CSS on page 105.
   - **d** Verify the SNMPv3 credentials. See Performing an SNMPv3 Connection Verification in CSS on page 106.
   - **e** Configure DNS. See “Configuring DNS with CSS” in the *Authentication Services* manual.
   - **f** Set the SWDL transfer mode. See Setting the SWDL Transfer Mode in CSS on page 107.

g Configure for SSH. See “SSH Configuration for RF Site Devices and VPMs Using CSS – Overview” in the *Securing Protocols with SSH* manual.

h Enable RADIUS Authentication. See “Configuring RADIUS Sources and Parameters with CSS” in the *Authentication Services* manual. Make sure that the devices have been added to the RADIUS servers on the domain controllers as RADIUS clients.

i Enable Centralized Authentication. See “Enabling/Disabling Centralized Authentication with CSS” in the *Authentication Services* manual.

j Set the Local Cache Size for Centralized Authentication. See “Setting the Local Cache Size for Central Authentication with CSS” in the *Authentication Services* manual.

k Customize the login banner text (optional). See Customizing the Login Banner in CSS on page 106.

l Enable Centralized Event Logging (if required by your organization). See “Enabling/Disabling Centralized Event Logging on Devices with CSS” in the *Centralized Event Logging* manual.

m Set the NTP Server Settings. See NTP Server Settings in CSS on page 108.

3 Set up the local Password Configuration (optional). See Setting the Local Password Configuration in CSS on page 108.

4 Program the device. See Setting CSS Configuration Parameters for the HPD GTR 8000 Base Radio Process on page 109.

4.4.2
Connecting Through a Serial Port Link

Prerequisites: This procedure assumes that the Configuration/Service Software (CSS) application is loaded on your service computer/laptop. See the *Private Network Management Client* manual.

When and where to use: This procedure describes the steps required to connect through a serial port link to set the IP address of the device and to set the serial security services. Perform all other device function and feature configurations through an Ethernet port connection in the CSS.

Procedure:

1 Connect a serial cable to a service computer/laptop running CSS, and the serial connector on the device module. The serial cable is an RS232, female DB-9 to male DB-9 straight through cable. If the service computer/laptop does not have a serial port, use a USB-to-serial converter external device.

2 Open the CSS application.

3 From the menu, select **Tools** → **Connection Configuration**.

The **Connection Screen** dialog box appears.

4 In the **Connection Type** area, select **Serial**.

The **Serial Settings** area on the dialog box becomes enabled.

5 In the **Serial Port** field, select the communication port that matches the one selected on the service computer/laptop.

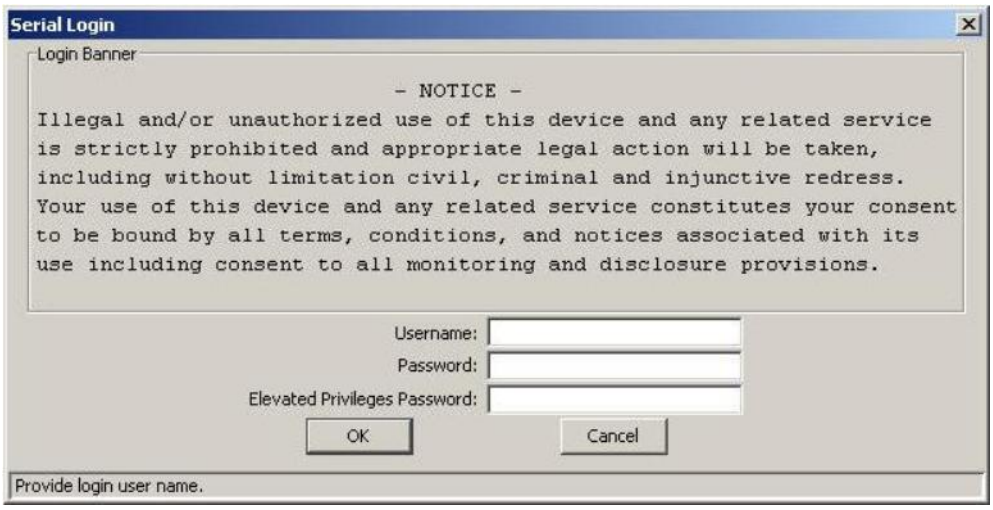
6 In the **Baud Rate** field, select the baud rate with which you want to communicate with the device.

- Baud Rate 19200

7 Click **Connect**.

A login/password prompt screen appears.

Figure 39: CSS Login Banner



8 Provide the required credentials. Perform one of the following actions:

- If a domain controller is available on the network, enter the **Username** and **Password** for the RADIUS service user account assigned to the netwadm group in the Active Directory. (The default service user is `serviceuser`.)
- If a domain controller is not available on the network, enter the **Username** and **Password** for the local bts_service account.
- If the **Elevated Privileges Password** field is active, enter the **Elevated Privileges Password** that was set up for this device.

When accessing the device, if the default passwords do not work, the passwords may have been set to default values by a different system release of software. See "Resetting Device Passwords" in the *CSS Online Help* to reset the passwords to the current software release defaults. If Authentication Services are not enabled on a device, type any alphanumeric characters to populate the [**Username**, **Password**, and **Elevated Privileges Password**] fields, as they cannot be left blank.

9 To access the device and close the dialog box, click **OK**.

The blank CSS main window appears.

NOTICE: The **Service** menu is not available until you read the configuration file from the device using an Ethernet connection.

4.4.3
Serial Connection Configurations

The following procedures set configuration parameters in the Configuration/Service Software (CSS) using a serial connection.

4.4.3.1
Setting the Device IP Address in CSS

Prerequisites: Ensure that you have the required credentials information (local service account password and elevated privileges password) to configure the site devices before proceeding. The user credentials information includes both the current and new credentials. Without the current credentials,

you cannot access the device and cannot change the user credentials. See Local Password and SNMPv3 Passphrase Troubleshooting on page 135.

NOTICE: Setting or changing the device IP Address causes the SNMPv3 configuration and user credentials to automatically reset.

Procedure:

1. Connect to the device using Configuration/Service Software (CSS) through a serial port link. See Connecting Through a Serial Port Link on page 96.
2. From the menu, select **Tools** → **Set IP Address/Box Number**.

   The **Set IP Address and Box Number** dialog box appears.
3. Enter the device box number. Click **Set Box Number**.
4. Enter the device IP address in the **Device IP Address** field. Click **Set Device IP Address**.
5. To close the dialog box, click **OK**.
6. Initiate a hardware restart. Click **Reset**.

   SNMPv3 user credentials reset to their factory default values.
7. To close the dialog box, click **Close**.
8. To reconfigure the SNMPv3 user credentials, go to Changing SNMPv3 Configuration and User Credentials in CSS on page 103.

4.4.3.2
Serial Security Services in CSS

The Serial Security Services in Configuration/Service Software (CSS) enables the secure services and changes the device password.

NOTICE: The Serial Security Services must be set before changing the SNMPv3 configuration and user credentials on a selected device in the site.

Before enabling this parameter, any login and password may be used on the File Transfer Access Services login window to access a device. After Authentication Services are enabled, the login and password provided is checked against the following authentication sources:

Stored password
RF site devices support a configurable password for the Local Service and Elevated Privileges accounts. The password is verified against the stored password for these accounts.

Built-in logins and passwords
RF site devices support built-in login/password combinations for a login by services such as the software downloads. Only certain software download login names are authenticated in this way.

Centralized Authentication
For authentication through centralized accounts instead of Local Service, Elevated Privileges, and built-in user accounts, use the **Configure the Centralized Authentication** parameter in CSS for the Challenge Handshake Authentication Protocol (CHAP). See “Enabling/Disabling Centralized Authentication with CSS” in the *Authentication Services* manual. This procedure requires an Ethernet connection to the device being configured.

4.4.3.2.1
Setting the Serial Security Services in CSS

Prerequisites: Obtain the required credentials information (local service account password and elevated privileges password) to configure the site devices before proceeding. The user credentials

information includes both the current and new credentials. Without the current credentials, you cannot access the device and cannot change the user credentials. See Local Password and SNMPv3 Passphrase Troubleshooting on page 135. Changing to the incorrect user credentials may lead to not being able to access the device through Configuration/Service Software (CSS) or Secure Shell (SSH).

Procedure:

1. Connect to the device using CSS through a serial port link. See Connecting Through a Serial Port Link on page 96.
2. From the menu, select **Security** → **Device Security Configuration** → **Security Services (Serial)**.
3. From the **Security Services Configuration** dialog box, set the **Test Application Configuration** field according to your organizational policies. The recommended secure configuration is **Disabled**.
4. Set the **Authentication Services** field to **Enabled**. Click **Apply**.

   This field enables local authentication services and must be enabled as a prerequisite for centralized authentication.
5. Set the **Password Reset Mechanism** field.

   This field allows a reset of the passwords for two built-in device accounts to their default values.
6. To update the password for the device, select either **Service Account** or **Elevated Privilege** from the drop-down list. Click **Update password**.
7. In the **Change Account Password** dialog box, enter the old password, then enter a new password, and confirm the new password before clicking **Change Password**.
8. To save the new password, click **OK**.

   The **Change Account Password** dialog box closes.

4.4.3.3
Resetting SNMPv3 User Credentials to Factory Defaults in CSS

Prerequisites: Obtain the required credentials information (local service account password and elevated privileges password) to configure the site devices before proceeding. The user credentials information includes both the current and new credentials. Without the current credentials, you cannot access the device and cannot change the user credentials. To obtain the keys for resetting either password or SNMPv3 passphrases for the device, contact Motorola Solutions Support Center (SSC). Changing to the incorrect user credentials may lead to not being able to access the device through Configuration/Service Software (CSS) or Secure SHell (SSH).

Procedure:

1. Connect to the device using CSS through a serial port link. See Connecting Through a Serial Port Link on page 96.
2. From the menu, select **Security** → **SNMPv3 Configuration** → **Reset SNMPv3 Configuration (Serial)**.

   The **Reset SNMPv3 Configuration** dialog box opens.
3. Click **Reset SMPv3 Configuration**.

   The SNMPv3 configuration is reset to factory defaults in the device.
4. Click **Exit**.

   The **Reset SNMPv3 Configuration** dialog box closes.

5 To reboot the device for the SNMPv3 user credentials to take effect, perform the following actions:

   a From the menu, select **Tools** → **Set IP Address/Box Number** or **Set IP Address/BR_CM Pairing Number**.

   b In the dialog box, click **Reset**.

      The device reboots.

6 Proceed to Changing SNMPv3 Configuration and User Credentials in CSS on page 103.

4.4.4
Connecting Through an Ethernet Port Link

Prerequisites: Load Configuration/Service Software (CSS) on the service computer/laptop. See the *Private Network Management Client* manual if necessary or see the instructions in the CSS DVD jewel box for instructions on loading the CSS onto the service computer/laptop.

When and where to use: Use the Ethernet port link to configure all CSS parameters for the device.

Procedure:

1 Connect a service computer/laptop to a device using one of the following methods:

   NOTICE: Normally the service computer/laptop is connected through the local site switch or remotely through the network. Do not connect directly to the Ethernet service port of the device unless downloading software or individually configuring the device.

   a **Remote Connection to Network or Local Site Switch:**

      1 Connect remotely to the network or to the local site switch using a straight-through an Ethernet straight-through Ethernet cable.

      2 If connecting to the local site switch, configure the Ethernet interface of the service computer/laptop to a Speed/Duplex setting of **Auto-Negotiate**. Set the IP address of the service computer/laptop to an unused IP address on the subnet of the local site. The IP address on the subnet varies depending on the site and zone numbers.

   b **Direct Connection to Front Ethernet Service Port:**

      1 Connect directly to the front panel Ethernet service port with a straight-through Ethernet cable.

      2 If connecting to a base radio or receiver, set the IP address of the service computer/laptop to 192.168.x, where x is any number between 2 and 253.

      3 If connecting to a site controller or reference distribution module, set the IP address of the service computer/laptop to an unused IP address on the subnet of the local site. The IP address on the subnet varies depending on the site and zone numbers.

      4 Configure the Ethernet interface of the service computer/laptop to a Speed/Duplex setting of **Auto-Negotiate**

      NOTICE: The comparator does not support a direct connection to the front panel Ethernet service port. The connection must be done remotely through the network or through the local site switch.

2 Open the CSS application.

3 From the menu, select **Tools** → **Connection Configuration**.

4 From the **Connection Screen**, in the **Connection Type** area, select **Ethernet**.

5 If connected directly to the front panel Ethernet service port of a base radio or receiver, click **Front Panel Ethernet** and go to step 7.

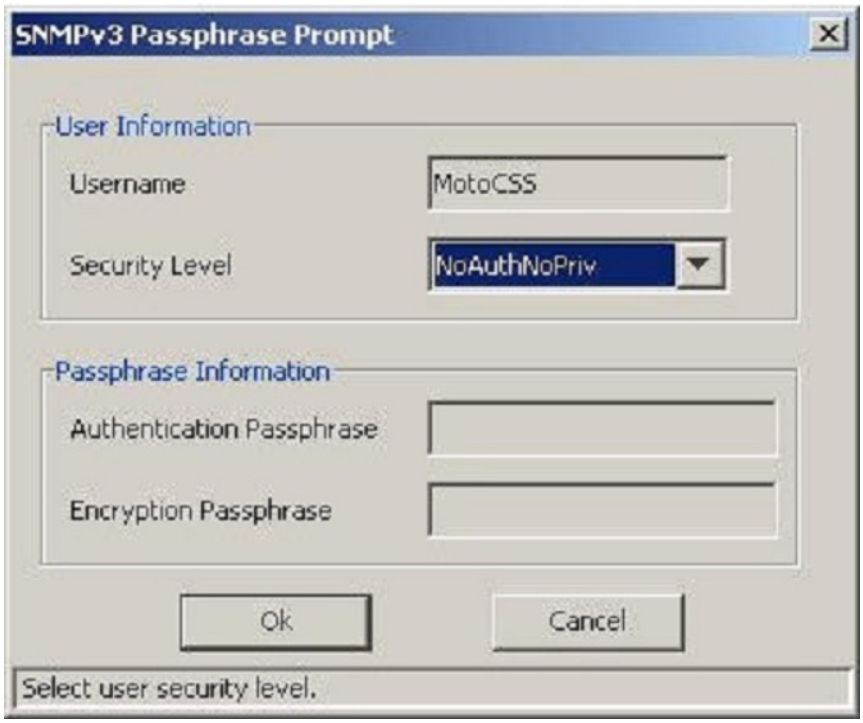
6 Perform one of the following actions:

If…	Then…
If you know the IP address for the device,	perform the following actions: **a** In the **Device IP Address** field, enter the IP address for the device. **b** Click **Connect**. **c** Go to step 7.
Trunked Device: If you do not know the IP address, but know the system identification of the device (the zone, physical site, subsite, and device ID of the device),	perform the following actions: **a** Click **Device Name Wizard** to open the **Device Name Wizard** dialog box. **b** From the **Device** drop-down list, select the relevant device type. **c** In the **Zone**, **Physical Site**, **Subsite**, and **Device ID** fields, enter the proper values. **NOTICE:** Some fields, such as **Subsite**, do not allow entries for some devices. Therefore, select the device first. **d** Click **OK**. The Domain Name Services (DNS) information of the device automatically appears in the **Device IP Address** field. **e** Click **Connect**. **f** Go to step 7.
Conventional Device: If you do not know the IP address,	perform the following actions: **a** Establish a serial connection to the device. See Connecting Through a Serial Port Link on page 96. **b** For a base radio, receiver, or comparator, from the menu, select **Tools** → **Set IP Address/BR_CM Pairing Number**. For a site controller or reference distribution module, select **Set IP Address/Box Number**. **c** In the **Device IP Address** field, record the IP address. **d** Re-establish an Ethernet connection and repeat steps 1 through 4. **e** In the **Device IP Address** field, enter the IP address for the device. **f** Go to step 7.

7 To make the connection, click **Connect**.

If this device is SNMPv3-capable, the **SNMPv3 Passphrase Prompt** dialog box appears.

Figure 40: SNMPv3 Passphrase Prompt



8 In the **SNMPv3 Passphrase Prompt** dialog box, enter the **User Information** and **Passphrase Information**. Click **OK**. If Authentication Services are not enabled on a device, click **OK** when the dialog box appears.

9 From the menu, select **File** → **Read Configuration From Device**.

The parameters download from the device to the service computer/laptop. When the download is complete, the CSS main window opens. Use the map on the left side of the screen to view configuration information for the device.

4.4.5
Ethernet Connection Configurations

The following procedures set configuration parameters in the Configuration/Service Software (CSS) using an Ethernet connection.

4.4.5.1
Setting the Date and Time in CSS

This procedure provides the date and time to the device.

When and where to use: During installation, the date and time is set through an Ethernet cable connected directly to the Ethernet port of the device. After installation, this procedure may be performed remotely.

NOTICE: If a power outage occurs, the device does not retain the date and time settings.

Procedure:

1 Connect to the device using CSS through an Ethernet port link. See Connecting Through an Ethernet Port Link on page 100.

2 From the menu, select **Tools** → **Set Device Date and Time**.

3 Enter the current date and time. Click **OK**.

The date and time are set.

4.4.5.2

Changing SNMPv3 Configuration and User Credentials in CSS

Prerequisites: Obtain the required SNMPv3 credentials information (Authentication passphrase, Encryption passphrase, and Authoritative Engine ID) to configure the device before proceeding. The user credentials information includes both the current and new credentials. Without the current credentials, you cannot access the device and cannot change the user credentials. See Local Password and SNMPv3 Passphrase Troubleshooting on page 135. Changing to the incorrect user credentials may lead to not being able to access the device from the Unified Network Configurator (UNC), or for the device to be unable to send alarms to the Unified Event Manager (UEM) (for fault management).

When and where to use: This procedure changes the SNMPv3 configuration and user credentials from Configuration/Service Software (CSS) on a selected device in the site. For more information on this feature, see the *SNMPv3* manual.

NOTICE: During installation, perform this procedure through an Ethernet cable connected directly to the Ethernet port of the device. After installation, this procedure may be performed remotely from CSS.

Procedure:

1 Connect to the device using CSS through an Ethernet port link. See Connecting Through an Ethernet Port Link on page 100.

2 From the menu, select **Security** → **SNMPv3 Configuration** → **Configure SNMPv3 Users (Ethernet)**.

The **SNMPv3 Passphrase Prompt** dialog box appears with **MotoAdmin** as the selected SNMPv3 user.

3 In the **SNMPv3 Passphrase Prompt**, enter the appropriate **Authentication** and **Encryption Passphrases** in the text fields.

NOTICE: When accessing the device for the first time, if the default passphrases do not work, the passphrases may have been set to default values by a different system release of software. See “Reset SNMPv3 Configuration (Serial)” in the *CSS Online Help* to reset the passphrases to the current software release defaults.

4 If connecting remotely through the network to a different device, perform one of the following actions. Otherwise, go to step 5.

If…	Then…
If you know the IP address for the device,	perform the following actions: **a** In the **Device IP Address** field, enter the IP address for the device. **b** Go to step 5.
If you do not know the IP address, but know the system identification of the	perform the following actions: **a** Click **Device Name Wizard**. **b** From the **Device** list box, select the desired device type.

If…	Then…
device (the zone, physical site, subsite, and device ID of the device),	**c** In the **Zone**, **Physical Site**, **Subsite**, and **Device ID** fields, enter the proper values. **NOTICE:** Some fields, such as **Subsite**, do not allow entries for some devices. Therefore, select the device first. **d** Click **OK**. The Domain Name Services (DNS) information of the device automatically appears in the **Device IP Address** field. **e** Click **Connect**. **f** Go to step 5.

5 Click **OK**.

If the passphrases are authenticated, the **Configure SNMPv3 Users** window appears. If the connection fails, a message appears.

6 To update the SNMPv3 credentials for a selected user, from the **User Information** section, select a Username in the **Username** drop-down list.

The CSS retrieves the current credentials from the device for a selected user.

NOTICE: Depending on the user selected, some fields on this dialog box become read-only or disabled. Click **Cancel** at any time to discard changes made to a selected user.

7 To change or update the SNMPv3 security level for a selected user, from the **User Information** section, select the security level in the **Security Level** drop-down list.

The security level options are:

NoAuthNoPriv
Neither the **Authentication Passphrase** nor **Encryption Passphrase** are needed for communicating with the device.

AuthNoPriv
Authentication Passphrase is needed; but no **Encryption Passphrase** is needed for communicating with the device.

AuthPriv
Both **Authentication Passphrase** and **Encryption Passphrase** are needed for communicating with the device.

The **User Status** field reflects the current operational status of the selected SNMPv3 User. The **Status Types** include:

Active
User configured on the device; the **Update** and **Delete** options are enabled.

Not in service
User configured on the device; the **Update** and **Delete** options are enabled.

Not ready
User configured on the device; the **Update** and **Delete** options are enabled.

Not present
Not present on the device; the **Create** option is enabled.

The security level of the selected user is set.

8 To change the Authentication Passphrase for the selected SNMPv3 user, if applicable to the selected security level, perform the following actions:

a From the **Authentication Passphrase** section, enter the passphrase into the **Old Passphrase** field.

NOTICE: If you do not know the passphrase, select the **I do not remember old passphrase** check box.

b Enter the new passphrase into the **New Passphrase** field.

NOTICE: The passphrase must be between 8 and 64 characters in length and consist of upper or lowercase alphanumeric characters (excluding the @ # $ ^ or _ characters).

c Enter the same new passphrase into the **Confirm New Passphrase** field.

9 To change the encryption passphrase for the selected SNMPv3 user, if applicable to the selected security level, perform the following actions:

a From the **Encryption Passphrase** section, enter the old passphrase into the **Old Passphrase** field.

NOTICE: If you do not know the passphrase, select the **I do not remember old passphrase** check box.

b Enter the new passphrase into the **New Passphrase** field.

c Enter the same new passphrase into the **Confirm New Passphrase** field.

10 To change the Authoritative Engine Identifier, applicable to MotoInformA and MotorInformB users only, perform the following actions:

a From the **Authoritative Engine ID** section, select the desired current engine ID from the **Current Engine ID** drop-down list.

b In the **New Engine ID** field, enter the new engine ID.

NOTICE: The new engine ID must be between 1 and 27 characters and comply with the Engine ID Domain Name Syntax.

11 To create, update, or delete SNMPv3 users, go to Adding or Modifying an SNMPv3 User in CSS on page 105.

4.4.5.2.1
Adding or Modifying an SNMPv3 User in CSS

When and where to use: Use this procedure to create, update, or delete an SNMPv3 user from the **Configure SNMPv3 Users** window.

Procedure:

1 From the **Configure SNMPv3 Users** window, to add or modify the selected SNMPv3 user, click one of the following:

- **Create:** Creates a user when the status is Not Present.
- **Update:** Updates an existing user.
- **Delete:** Removes an existing user.

NOTICE: The MotoZSS Username is used only in an ASTRO® 25 repeater site or Multisite subsystem.

A **Confirmation** dialog box appears and prompts if you want to continue.

2 Click **Yes**.

The **Processing Requests** dialog box appears and processes the request. A green square X indicates OK and a red square X indicates failure.

3 After reviewing the processing status, click **OK**.

NOTICE: If you encounter any errors, go back to the appropriate step and correct the information entered.

4 Repeat these steps for any SNMPv3 users you wish to create, update, or delete.

5 Click **Cancel** to exit the **Configure SNMPv3 Users** window.

The **Configure SNMPv3 Users** window closes, and the CSS main window returns.

4.4.5.2.2
Performing an SNMPv3 Connection Verification in CSS

When and where to use: When the SNMPv3 user credentials have been created, modified, or deleted, ensure that the device is properly configured for SNMPv3. Follow this procedure to verify the SNMPv3 connection.

Procedure:

1 Connect to the device using Configuration/Service Software (CSS) through an Ethernet port link. See Connecting Through an Ethernet Port Link on page 100.

2 When the passphrase prompt screen opens, select the configured security level and enter the required passphrases.

3 If the connection was successful, click **OK**.

4.4.5.3
Customizing the Login Banner in CSS

This procedure describes how to edit the login banner security notice.

Procedure:

1 Connect to the device using Configuration/Service Software (CSS) through an Ethernet port link. See Connecting Through an Ethernet Port Link on page 100.

2 From the menu, select **Security** → **Device Security Configuration** → **Remote Access/Login Banner (Ethernet)**.

3 From the **Remote Access/Login Banner** screen, **Remote Access Configuration** tab, click the **Login Banner** tab.

4 Edit the text of the banner.

5 Click one of the following:

- **Refresh:** re-reads the original Login Banner text.
- **Apply:** saves the changes and keep the screen open.
- **OK:** saves the changes and close the screen.
- **Cancel:** closes the screen without saving the changes.

4.4.5.4

Setting the SWDL Transfer Mode in CSS

This procedure sets the Software Download Manager (SWDL) transfer mode.

When and where to use: Follow this procedure to set the SWDL transfer mode to Ftp (clear) or Sftp (secure) before performing a software download on the device.

NOTICE: The SWDL transfer mode must be set to **Ftp** (clear) if any PSC 9600, STR 3000, QUANTAR®, or ASTRO-TAC® 9600 device is present at a site.

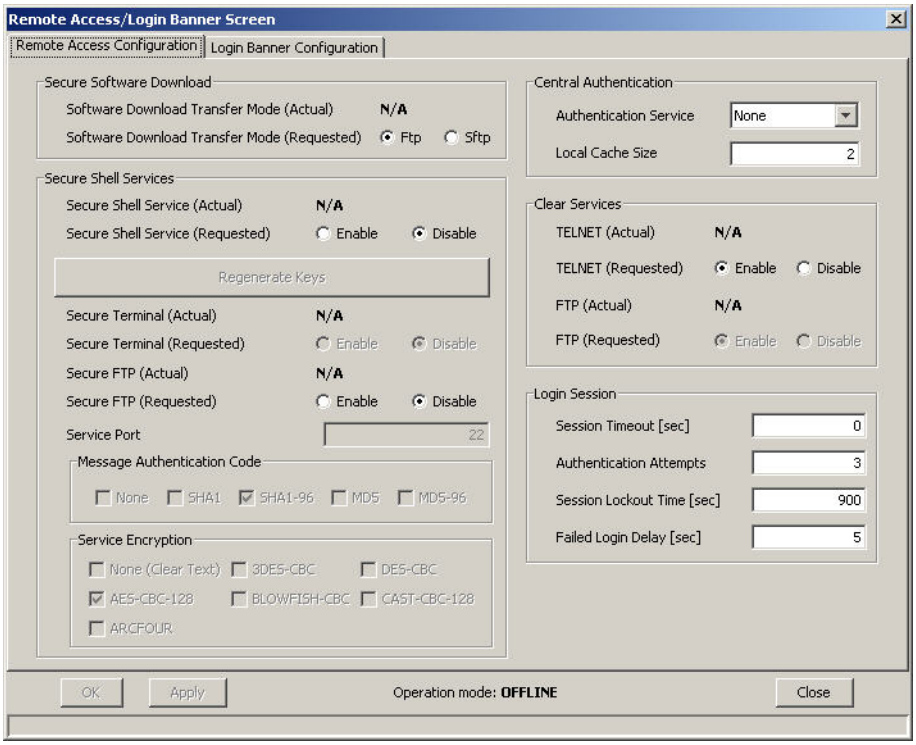
Procedure:

1 Connect to the device using Configuration/Service Software (CSS) through an Ethernet port link. See Connecting Through an Ethernet Port Link on page 100.

2 From the menu, select **Security** → **Device Security Configuration** → **Remote Access/Login Banner (Ethernet)**.

The **Remote Access/Login Banner** screen appears displaying the **Remote Access Configuration** tab.

Figure 41: Remote Access Configuration Tab



3 In the **Software Download Transfer Mode (Requested)** field, choose either **Ftp** (clear) or **Sftp** (secure). Click **OK**.

NOTICE: Secure Shell Service (Requested) and Secure FTP (Requested) are automatically set to **Enabled** and grayed out when you choose **Sftp**.

4.4.5.5
Manager IP Address Settings in CSS

When IP addresses exceed the allowed total, remove the IP addresses that are no longer used at the site. This removal allows the Unified Event Manager (UEM) to be identified as the current manager and handles traps for the device.

See “Clearing Manager IP Addresses in CSS” in the *CSS Online Help* for removing these IP addresses.

4.4.5.6
NTP Server Settings in CSS

Network Time Protocol (NTP) provides a clock synchronization mechanism for various network devices and computers, and allows the NTP server to provide the date and time synchronization for a particular device. The NTP server IP address must be entered on the **Manager / NTP Definition** screen.

For security purposes, the base radio can restrict NTP messages from only the site controller. This restriction can be accomplished by configuring two site controller IP addresses into the **NTP Server IP Address** fields on the base radio.

See “Configuring the NTP Servers” in the *CSS Online Help* for defining, editing, and removing these settings.

4.4.5.7
Setting the Local Password Configuration in CSS

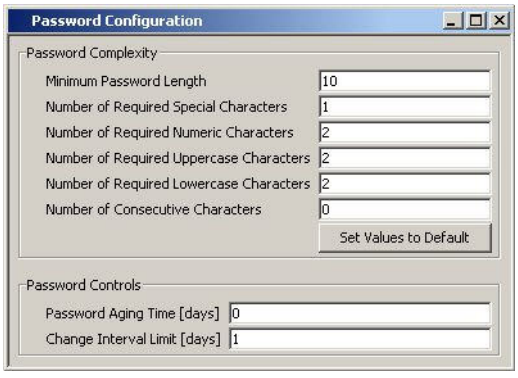
When and where to use: Use this procedure to set the complexity requirements and controls for the local service account password. The updated password criteria is enforced on the next password change for the device local service account. Password Configuration is an optional feature. For information, see “Password Configuration" in the *CSS Online Help*.

Procedure:

1. Connect to the device using Configuration/Service Software (CSS) through an Ethernet port link. See Connecting Through an Ethernet Port Link on page 100.
2. In the navigation pane, click the **Password Configuration** element.

   The **Password Configuration** window appears.

   Figure 42: Password Configuration Window



3. Complete the following fields:

Minimum Password Length
This field allows you to enter a value as the minimum length for the password. The minimum can be between 8 and 255 characters, with a default of 10 characters.

Number of Required Special Characters
This field allows you to enter a value for the required number of special characters which must be included in the password. The value can be between 0 and 255, with a default of 1.

Number of Required Numeric Characters
This field allows you to enter a value for the required number of numeric characters which must be included in the password. The value can be between 0 and 255, with a default of 2.

Number of Required Uppercase Characters
This field allows you to enter a value for the required number of uppercase alphabetic characters which must be included in the password. The value can be between 0 and 255, with a default of 2.

Number of Required Lowercase Characters
This field allows you to enter a value for the required number of lowercase alphabetic characters which must be included in the password. The value can be between 0 and 255, with a default of 2.

Number of Consecutive Characters
This field allows you to enter the maximum number of consecutive repeated characters permitted in the password.

Set Values to Default
This field returns all fields to their system default values.

Password Aging Time [days]
This field allows you to enter a value between 0 and 65535 for the maximum number of days a local password is valid. After the **Password Aging Time** has elapsed, the password must be changed. The default value is 0.

Change Interval Limit [days]
This field allows you to enter a value between 0 and 65535 for the number of days which must elapse before a local password can be changed. The default value is 1.

4.4.6
Setting CSS Configuration Parameters for the HPD GTR 8000 Base Radio Process

Prerequisites: Before proceeding with this process, complete the initial configuration of the device in Initial Configuration of a Device in CSS on page 95.

When and where to use: Use this process as a guide to configure the base radio for the HPD GTR 8000 Site Subsystem. For configuration parameters, see the following in the *CSS Online Help*:

- **GTR 8000 Base Radios:** Trunking Site - HPD Remote/Expandable Site > Configuring an HPD Remote/Expandable Site
- **GCP 8000 Site Controllers:** Site Controller > Configuration & Service Help > HPD Site Controller

Process:

1. Connect to the base radio through an Ethernet port link and read the configuration file from the base radio. See Connecting Through an Ethernet Port Link on page 100.
2. In the **System** tree, click **System** and the field.
3. In the **System** tree, click **Site** and complete the fields.
4. In the **System** tree, click **Channel** and complete the fields.
5. In the **System** tree, click **Configuration** and complete the fields on all four tabs.

As part of RMC configuration, the DIP switches must be set on the RMC/LNA modules. See Setting RMC System Gain on page 114.

6 In the **System** tree, click **Network Services Configuration** i and complete the fields on the three tabs.

For configuration details for DNS and RADIUS Services, see the *Authentication Services* manual. For configuration details for SYSLOG Services, see the *Centralized Event Logging*, manual.

7 In the **System** tree, click **Password Configuration** and complete the fields.

NOTICE: Password Configuration is only required if you have passwords entered for local accounts. Password Configuration sets the password complexity and controls. For details on password complexity and controls, see “Password Configuration” in *CSS Online Help*.

8 From the menu, select **File** → **Save As** to save the configuration data to a new archive file or select **File** → **Save As** to overwrite an existing archive file.

IMPORTANT: Be sure to save any configuration changes to a local or network drive so that if the device fails, you can load your settings to a replacement device. If the configuration file is not saved to a local or network drive, you will need to repeat the setup steps after replacing a device.

9 From the menu, select **File** → **Write Configuration to Device** to write the configuration data to the device.

4.4.7
Configuring Tx Power Values and Battery Type

When and where to use: As part of the site configuration process, the **Battery Type**, **Tx Power Level (Battery Backup**), and **Tx Power Out** on the **Hardware Configuration** tab in Configuration/Service Software (CSS) must be configured.

Procedure:

1 Connect to the device through an Ethernet port link and read the configuration file from the device. See Connecting Through an Ethernet Port Link on page 100.

2 From the navigation tree, select **Configuration**.

The **Configuration** window appears.

3 Select the **Hardware Configuration** tab.

4 In the **Tx Power Out (Watts)** field, enter a value.

5 In the **Tx Power Level Battery Backup (Watts)** field, enter a value.

6 Select the **Battery Type** (manufacturer and model, or select the generic listing for the class of battery).

7 From the menu, select **File** → **Save**, or select**File** → **Save As** to save the configuration to an archive on your local or network drive.

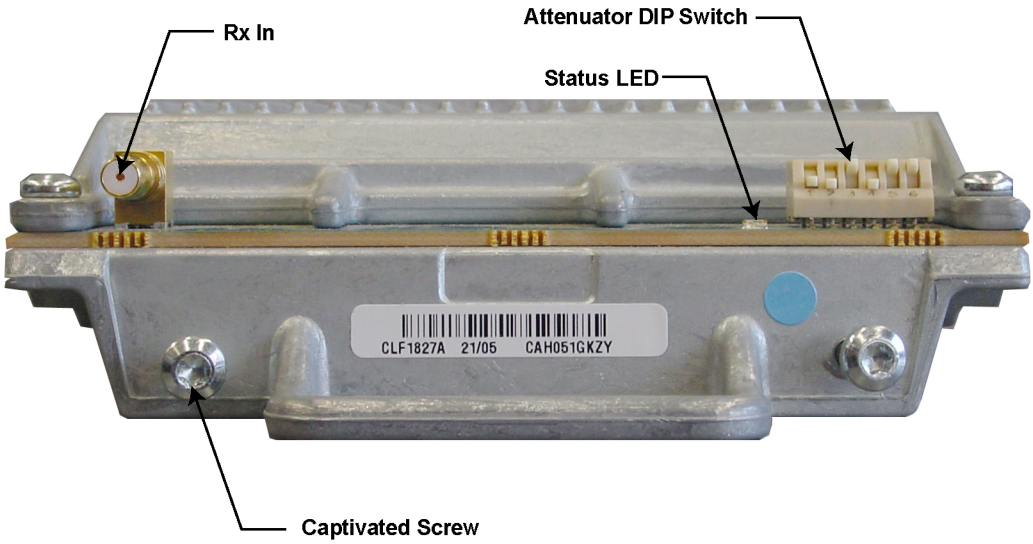
8 From the menu, select **File** → **Write Configuration to Device** to write the configuration to the device.

4.4.8

RMC Attenuation

To adjust the RF gain for different configurations, the attenuation level applied to receivers can be set from the DIP switches (on the front of Cabinet RMC/LNA modules).

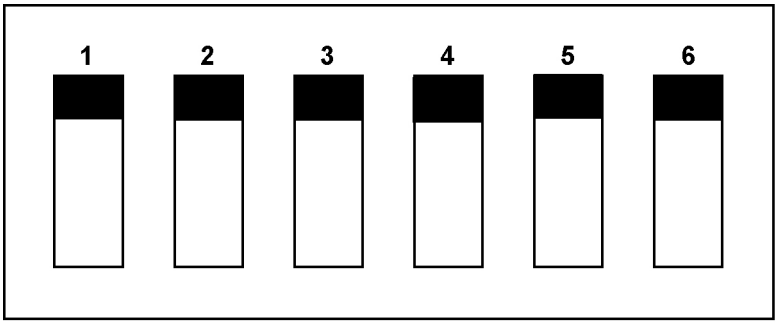
Figure 43: Cabinet RMC/LNA Module (Front View)



GTR8000_RFDS_XS_RMC_Cabinet_Front1

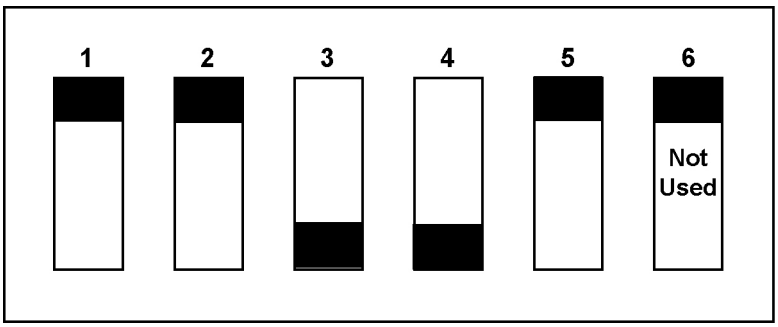
The following are examples of how the DIP switch positions (0 and 1) create a binary system for setting dB attenuation values.

Figure 44: RMC DIP Switch Example: 0 dB



HPD_GTR8000_RFDS_RMC_Dipswitch2

Figure 45: RMC DIP Switch Example: 12 dB



HPD_GTR8000_RFDS_RMC_Dipswitch1

To determine how to set each DIP switch for your configuration, see Table 23: RMC Attenuator DIP Switch Settings on page 112.

- **RMC Attenuator for Single Cabinet Sites with No Site RMC:** If your configuration displays in the Single Cabinet with No Site RMC Switch Settings table, set the DIP switches on your Cabinet RMC/LNA modules to the positions indicated in that table for your configuration. If your configuration does **not** display in this table, it does not include Cabinet RMC/LNA modules or it does not use the DIP switch settings on your Cabinet RMC/LNA modules. See Table 24: RMC Attenuator Settings for Single Cabinet Sites with No Site RMC on page 113.

4.4.8.1
RMC Attenuator DIP Switch Settings

NOTICE: Although the DIP switches on the RMC/LNA modules are numbered starting with the number 1 on the left, as shown in the RMC DIP Switch examples, this table starts with the number 5 on the left because switch 5 represents the most significant digit in the binary system that the switches provide for setting a dB value.

Table 23: RMC Attenuator DIP Switch Settings

Required Attenuation (dB)	Position 5	Position 4	Position 3	Position 2	Position 1
0dB	0	0	0	0	0
1dB	0	0	0	0	1
2dB	0	0	0	1	0
3dB	0	0	0	1	1
4dB	0	0	1	0	0
5dB	0	0	1	0	1
6dB	0	0	1	1	0
7dB	0	0	1	1	1
8dB	0	1	0	0	0
9dB	0	1	0	0	1
10dB	0	1	0	1	0
11dB	0	1	0	1	1

Table continued…

Required Attenuation (dB)	Position 5	Position 4	Position 3	Position 2	Position 1
12dB	0	1	1	0	0
13dB	0	1	1	0	1
14dB	0	1	1	1	0
15dB	0	1	1	1	1
16dB	1	0	0	0	0
17dB	1	0	0	0	1
18dB	1	0	0	1	0
19dB	1	0	0	1	1
20dB	1	0	1	0	0
21dB	1	0	1	0	1
22dB	1	0	1	1	0
23dB	1	0	1	1	1
24dB	1	1	0	0	0
25dB	1	1	0	0	1
26dB	1	1	0	1	0
27dB	1	1	0	1	1
28dB	1	1	1	0	0
29dB	1	1	1	0	1
30dB	1	1	1	1	0
31dB	1	1	1	1	1

4.4.8.2
RMC Attenuator Settings for Single Cabinet Sites with No Site RMC

The required attenuation dB values shown in this table are also displayed on the Receive Multicoupler (RMC) Configuration tab in Configuration/Service Software (CSS), which must be used to set up system gain according to your configuration.

Cabinet RMC Settings must be the same in each cabinet. These settings provide maximum system dynamic range.

Table 24: RMC Attenuator Settings for Single Cabinet Sites with No Site RMC

System Noise Figure (dB)	System Input Intercept (dBm)	RFDS Gain (dB)	Cabinet RMC Attenuator Setting (dB)
4.5	4.8	13	0
4.8	5.8	12	1
5.2	6.7	11	2
5.6	7.7	10	3

Table continued…

System Noise Figure (dB)	System Input Intercept (dBm)	RFDS Gain (dB)	Cabinet RMC Attenuator Setting (dB)
6.1	8.6	9	4
6.6	9.6	8	5
7.2	10.5	7	6
7.8	11.3	6	7
8.5	12.2	5	8
9.3	13.0	4	9
10.1	13.8	3	10
10.9	14.6	2	11
11.7	15.3	1	12
12.6	15.9	0	13
13.5	16.5	–1	14
14.4	17.1	–2	15
15.4	17.6	–3	16
16.3	18.0	–4	17
17.3	18.4	–5	18
18.2	18.7	–6	19
19.2	19.0	–7	20
20.2	19.2	–8	21

4.4.9
Setting RMC System Gain

When and where to use: Use this procedure to set up the Receive Multicoupler (RMC) system according to your organization's GTR 8000 Base Radio configuration, in addition to the DIP switch settings for the Receive Multicoupler (RMC) attenuation. System gain is automatically calculated when GTR 8000 Site Subsystem is selected as the configuration. The system gain entered differs depending on whether a Tower Top Amplifier (TTA) for this base radio is installed:

- **With a TTA**, calculate system gain from the antenna to the transceiver.
- **Without a TTA**, calculate system gain from the junction panel to the base radio.

Procedure:

1. Connect to the device using Configuration/Service Software (CSS) through an Ethernet port link. See Connecting Through an Ethernet Port Link on page 100.
2. From the menu, select **File** → **Read Configuration from Device**.
3. From the navigation tree, select **Configuration**.

   The **Configuration** window appears.
4. Select the **Receive Multicoupler (RMC) Configuration** tab.

5 In the **GTR 8000 Configuration** field, select **GTR 8000 Site Subsystem**.

The **Site RMC Attenuation** is automatically calculated and displayed. **System Gain** is automatically calculated and displayed as 9 dB.

6 From the menu, select **File** → **Save**, or select **File** → **Save as** to save your RMC configuration to an archive on your local or network drive.

7 From the menu, select **File** → **Write Configuration to Device** to save your RMC configuration to the device.

The resulting system gain and site RMC attenuation are automatically used by the RMCs.

4.5 Configuring Centralized Authentication on Devices in VoyenceControl

When and where to use: This process provides the procedures for configuring centralized authentication on devices using the VoyenceControl component of the Unified Network Configurator (UNC) application.

NOTICE: VoyenceControl does not apply for a K core or non-networked site.

Process:

1 Configure Domain Name Service (DNS) on the device. See “DNS Configuration on RF Site and VPM Devices with VoyenceControl” in the *Authentication Services* manual.

2 Configure Authentication Sources for the device. See “Centralized Authentication Configuration on RF Site and VPM Devices with VoyenceControl" in the *Authentication Services* manual.

3 Configure RADIUS parameters for the device. See “Configuring RADIUS on RF Site and VPM Devices with VoyenceControl” in the *Authentication Services* manual.

4 Set the Local Cache Size for Centralized Authentication for the device. See “Setting the Local Cache Size for Central Authentication on RF Site and VPM Devices with VoyenceControl” in the *Authentication Services* manual.

5 Enable/Disable Centralized Authentication for the device. See “Centralized Authentication Configuration on RF Site and VPM Devices with VoyenceControl” in the *Authentication Services* manual.

6 Enable/Disable Centralized Event Logging for the device. See “Enabling/Disabling Centralized Event Logging on RF Site Devices and VPMs with EMC Smarts” in the *Centralized Event Logging* manual.

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Chapter 5

GTR 8000 Site Subsystem Optimization

Your Motorola Solutions Field Representative or Motorola Solutions Support Center (SSC) can advise you on optimization activities required for your system, if any. See Motorola Solutions Support Center on page 136 in the Troubleshooting section of the documentation.

This chapter contains optimization procedures and recommended settings relating to GTR 8000 Site Subsystem.

5.1 Transmitter Testing

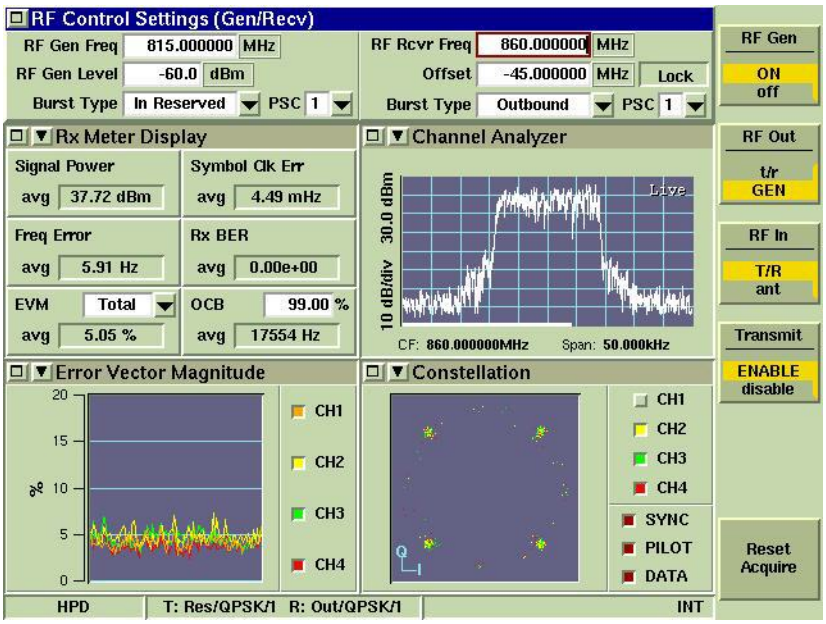
The Metering Screen displays current values for power supply and transmitter metering points on HPD base radios.

See "**Base Radio Service Help** → **Service Screens** → **Metering Screen**" in the *CSS Online Help* for the procedures for testing the transmitter.

5.2 Testing the GTR 8000 Site Subsystem Performance with a Service Monitor (for HPD)

The HPD Service Monitor is a diagnostic tool that may be used with an HPD base radio or HPD modem to test and measure the transmitter and receiver characteristics. The HPD service monitor can generate HPD signaling and can provide diagnostic information for received signaling.

Figure 46: HPD Service Monitor - Test Screen (Aeroflex 3900 Series Service Monitor)



The HPD Service Monitor may be connected with an HPD base radio to perform the following diagnostic tests (for additional tests, see the HPD service monitor manual). These tests are designed to determine whether the equipment is operating within specification. If it fails to meet specification, service may be required on an HPD base radio.

- **Measure Transmit Power:** See Measuring HPD BR Tx Power, Frequency Accuracy, and Tx EVM on page 120.
- **Measure Frequency Accuracy:** See Measuring HPD BR Tx Power, Frequency Accuracy, and Tx EVM on page 120.
- **Measure Error Vector Magnitude (EVM) for Transmitter:** See Measuring HPD BR Tx Power, Frequency Accuracy, and Tx EVM on page 120.
- **Measure Receiver Sensitivity:** See Measuring HPD BR Rx Sensitivity and Rx BER on page 122.
- **Measure Bit Error Rate (BER) for Receiver:** See Measuring HPD BR Rx Sensitivity and Rx BER on page 122.

For additional information about using the service monitor, see the HPD service monitor manual or online help (accessed through the **Help** button on the front of the service monitor).

5.2.1
Setting Up the HPD Service Monitor for Testing the Base Radio

Prerequisites: The following procedures assume that a USB mouse is connected. If not, for instructions to **click** or **select** you can use the **TAB** and **arrow** buttons on the front of the service monitor. For instructions to select a soft key on the right side of the screen, use the unlabeled buttons on the front of the service monitor, pressing the button located next to the soft key on the screen.

When and where to use: Follow these procedures for setting up the HPD service monitor before testing the base radio.

Procedure:

1. Plug a power cable into the AC port at the rear of the service monitor.
2. Connect a USB mouse to one of the two USB ports in the rear of the Service Monitor.
3. Configure the Speed/Duplex setting in the PC's Ethernet interface to 10 Mb Half Duplex.
4. Connect to the transceiver module in CSS through an Ethernet connection. See Connecting Through an Ethernet Port Link on page 100.
5. If the base radio is not already in service mode perform the follows substeps, otherwise go to step 6.
   a. From the menu, select **Service** → **Test and Measurement Screen**.

      The **Test and Measurement Screen** screen appears.

   b. Click **Change to Service Mode**.
   c. At the confirmation screen, click **OK**.

      The base radio halts activity in the current mode and switches operation to the requested mode.

   d. R-open the **Test and Measurement Screen**.
6. If measuring the base radio transmit signal, connect the Tx connector on the rear of the base radio to the T/R (Transmit/Receive) port on the front of the service monitor. (Both are N-type RF connectors.)

7 If measuring the base radio receive signal, connect the RX-A and RX-B ports on the rear of the base radio to the GEN port on the front of the service monitor, using a splitter.

8 Press the green **Power** button on the front of the service monitor.

9 If the Test Screen is not displayed (see Figure 46: HPD Service Monitor - Test Screen (Aeroflex 3900 Series Service Monitor) on page 117), press the **Test** button on the front of the service monitor.

10 Locate the specifications for the base radio being tested. See Specifications for GTR 8000 Base Radio (700/800 MHz) on page 32.

5.2.2
Performing In-band Power Meter User Calibration

When and where to use:
The Aeroflex 3900 series High Performance Data (HPD) service monitor has two forms of power measurement:

- Broadband is similar to the working of an in-line wattmeter.
- In-band is performed after the RF signal is down converted to baseband by a Digital Signal Processor (DSP).

If the HPD service monitor runs continuously, it requires periodic calibration. Re-calibration is required only if the User Calibration Threshold is exceeded. The service monitor displays a flag at the bottom indicating to re-calibrate to maintain the accuracy indicated in the User Calibration Threshold.

For an HPD signal, only the in-band power meter is available. The in-band power measurement accuracy without a user calibration is ±1 dB. User calibration improves the accuracy at a specific frequency, bandwidth, and temperature by using the broadband power meter to correct the in-band power measurement. This correction occurs when an in-band user calibration is performed.

Procedure:

1 Press the **UTILS** button on the service monitor twice.

NOTICE: Wait for approximately 1 second or more before pressing the **UTILS** button the second time.

The **Utility Menu** screen appears.

2 From the menu, select **User Calibration**.

The **User Calibration** screen appears.

3 Click **Run User Calibration** in the upper right corner of the **User Calibration** screen.

NOTICE: The default user calibration setting is 1.0 dB. This setting means that a user re-calibration is not indicated on the HPD service monitor until the in-band power measurement has a potential of 1.0 dB error in the measurement (same as the basic in-band power meter accuracy). For HPD, a 0.5 dB value or lower is more appropriate. This value may require more frequent re-calibrations, but it provides better performance.

A **User Calibration** message box appears instructing you to remove all connectors from the ports.

4 Remove all connectors from the ports. Click **Continue**.

A progress bar appears showing the progress of the calibration process. The calibration completes in approximately 2 min.

NOTICE: Failure to remove all connectors and cables from the ports causes an inaccurate user calibration. Any connectors present causes a variation on the impedance seen by the instrument during calibration.

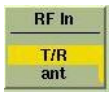
5.2.3
Measuring HPD BR Tx Power, Frequency Accuracy, and Tx EVM

Prerequisites: Setting Up the HPD Service Monitor for Testing the Base Radio.

When and where to use: Follow this procedure to view the readings of the service monitor from the transmissions of the base radio.

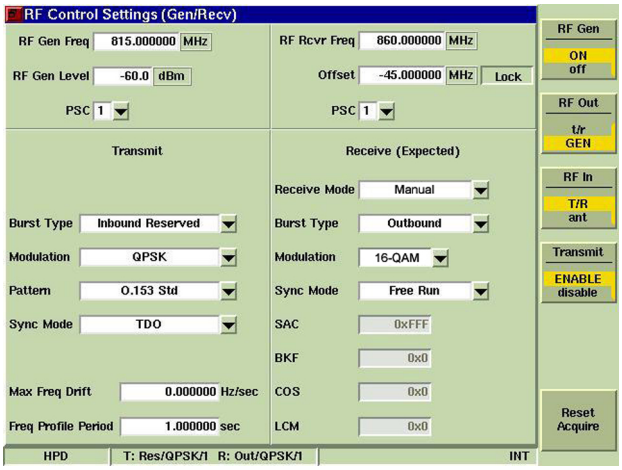
Procedure:

1. Perform the service monitor setup steps in Setting Up the HPD Service Monitor for Testing the Base Radio on page 118.
2. Configure the service monitor T/R port to receive transmissions from the base radio, as follows:
   - Click the **T/R** soft key under **RF In** on the right side of the screen.



3. Maximize the RF Control Settings window, by clicking the upper left corner of the window.

Figure 47: HPD Service Monitor - RF Control Settings Window (Aeroflex 3900 Series Service Monitor)



4. Set RF Receiver Frequency, as follows:
   a. Click the **RF Rcvr Freq** field in the upper right quadrant of the **RF Control Settings** window.
   b. Press the number buttons on the front of the service monitor to enter a value in the **RF Rcvr Freq** field.

      The value entered should be within the frequency range specification for the GTR 8000 Base Radio configuration being tested. See Specifications for GTR 8000 Base Radio (700/800 MHz) on page 32 in the Description chapter of this documentation.
   c. If **MHz** is not already displayed to the right of the **RF Rcvr Freq** value you entered, press the unlabeled button on the front of the service monitor next to the **MHz** soft key.
5. From the drop-down list for Pilot Sync Code **(PSC)** in the upper right quadrant of the **RF Control Settings** window, select **1**.

6 Make the following selections in the "Receive (Expected)" quadrant of the RF Control Settings window:

a From the drop-down list for **Receive Mode**, select **Manual**.

b From the drop-down list for **Burst Type**, select **Outbound**.

c From the drop-down list for **Modulation**, select **16-QAM**.

d From the drop-down list for **Sync Mode**, select **Free Run**.

7 Minimize the **RF Control Settings** window, by clicking the upper left corner of the window.

(See Figure 46: HPD Service Monitor - Test Screen (Aeroflex 3900 Series Service Monitor) on page 117.)

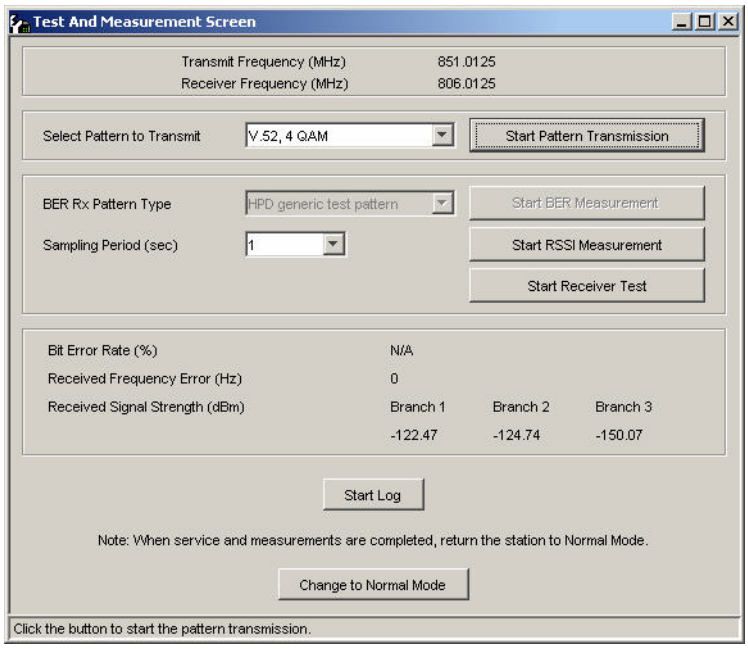
The minimized **RF Control Settings** window is visible at the top of the screen as long as all subscreens are minimized. **Modulation Type** is not visible in the minimized **RF Control Settings** window but displays with **Burst Type** and **PSC** at the bottom of the screen.

8 Set up the test on the **Test and Measurement Screen**, as follows.

a In the **Select Pattern to Transmit** field, key up the base radio for 16-QAM modulation by selecting **16-QAM**.

b Click **Start Pattern Transmission**.

Figure 48: CSS Test and Measurement Screen



9 Display the base radio transmission readings on the service monitor **Rx Meter** subscreen, as follows:

a Click the **Rx Meter** subscreen.

A panel of soft keys displays on the right side of the screen, including two **Reset** keys.

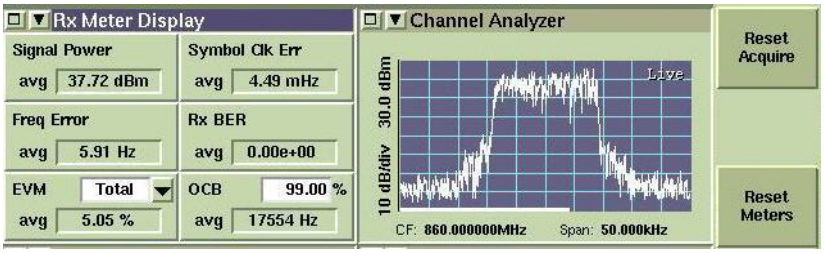
b On the right side of the screen, click the **Reset Acquire** soft key.

This re-synchronizes the test set with the incoming signal.

c On the right side of the screen, click the **Reset Meters** soft key.

This stops, clears, and restarts the acquisition of data for the data display fields.

Figure 49: HPD Service Monitor - Rx Meter Subscreen, Reset Soft Keys (Aeroflex 3900 Series Service Monitor)



10 Compare the value that displays in the **Signal Power** field to the base radio Tx Power Out specification that matches your base radio configuration. See Specifications for GTR 8000 Base Radio (700/800 MHz) on page 32 in the Description chapter of this documentation.

NOTICE: Account for cable loss in this comparison.
The output power reference plane is the output connector of the power amplifier. The loss of the transmitter output cable (PA output to the back of the base radio) is 4% at 700 MHz and 800 MHz. However, the base radio software allows the transmitter output power to be set at 10% above rated value.

11 Note the value that displays in the **Freq. Error** field. Tolerance should be +/- 50 Hz.

12 Note the value that displays in the **EVM avg** field. The value should be less than or equal to 10%.

13 If no further testing is needed, place the base radio in Normal Mode, as follows.

a Click **Change to Normal Mode**.

b At the confirmation screen, click **OK**.

The base radio halts activity in the current mode and switches operation to the requested mode.

5.2.4
Measuring HPD BR Rx Sensitivity and Rx BER

When and where to use: Use this procedure to test:

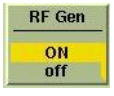
- **Rx Sensitivity:** Does the 1% Bit Error Rate (BER) meet specifications for the GTR 8000 Base Radio configuration?
- **Rx BER:** Does -70 dBm produce a 0.01% Bit Error Rate (BER) or better, as expected?

Procedure:

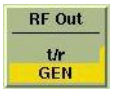
1 Perform the service monitor setup steps in Setting Up the HPD Service Monitor for Testing the Base Radio on page 118.

2 Using the soft keys on the right side of the screen, configure the service monitor GEN port to generate inbound signaling to the base radio, as follows:

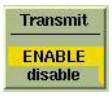
a Under **RF Gen**, click the **on** soft key.



b Under **RF Out**, click the **gen** soft key.

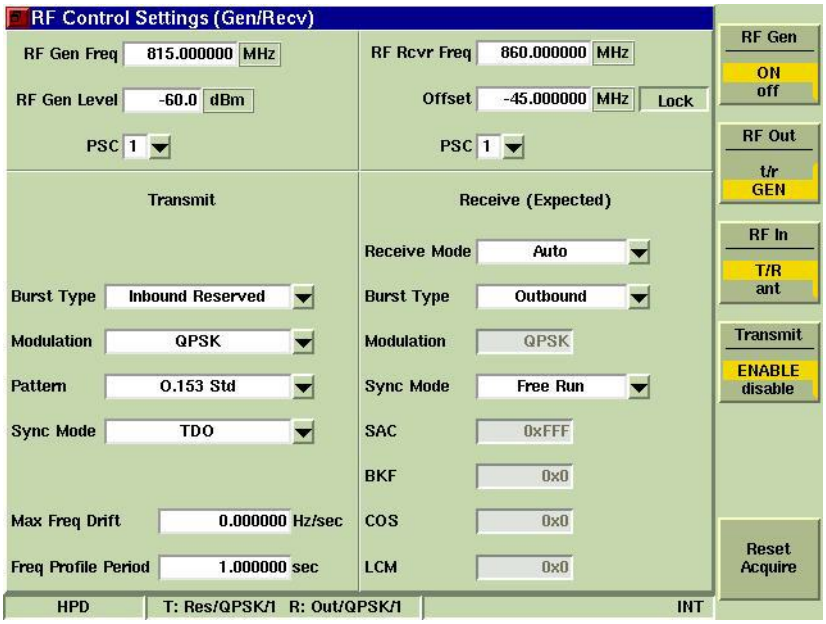


c Under **Transmit**, click the **enable** soft key.



3 Maximize the **RF Control Settings** window, by clicking the upper left corner of the window.

Figure 50: HPD Service Monitor - RF Control Settings Window (Aeroflex 3900 Series Service Monitor)



4 Select the following values in the Transmit quadrant of the **RF Control Settings** window:

a For the **Burst Type**, select **Inbound Reserved**.

b Select a **Modulation Type**.

The selection should be a modulation type from HPD Receive Sensitivity 1% BER specifications, which include:

- 64 QAM (Quadrature Amplitude Modulation)
- 16 QAM
- QPSK (Quadrature Phase Shift Keying)

See GTR 8000 Site Subsystem Specifications on page 31.

c For the **Sync Mode**, select **TDO**.

d For the **Pattern**, select **0.153 Std**.

5 For the **Sync Mode**, select **Free Run**.

6 Select the following values in the upper left quadrant of the **RF Control Settings** window:

a Click the **RF Gen Freq** field and use the number buttons on the front of the service monitor to enter a value.

The value entered should be within the Frequency Range specification for the HPD base radio configuration being tested. See Specifications for GTR 8000 Base Radio (700/800 MHz) on page 32 in the Description chapter of this documentation.

b Click the **RF Gen Level** field and enter a dBm value, depending on the length of cable between the service monitor and the base radio.

The value you enter should match the Receive Sensitivity 1% BER specifications for the HPD base radio configuration, for the Modulation Type you selected. See Specifications for GTR 8000 Base Radio (700/800 MHz) on page 32.

c From the drop-down list for Pilot Sync Code **(PSC)**, select **1**.

7 Minimize the **RF Control Settings** window, by clicking the upper left corner of the window.

The minimized **RF Control Settings** window is visible at the top of the screen as long as all subscreens are minimized. See Figure 46: HPD Service Monitor - Test Screen (Aeroflex 3900 Series Service Monitor) on page 117. **Modulation Type** is not visible in the minimized **RF Control Settings** window but displays with **Burst Type** and **PSC** at the bottom of the screen.

8 Setup the **Test and Measurement Screen** to display the received BER, as follows:

a Select a pattern that matches the **Modulation Type** selection for the **RF Control Settings** in the service monitor.

NOTICE: To match the **QPSK Modulation Type** on the service monitor screen, select the 4 QAM pattern in CSS.

b Click **Start Pattern Transmission**.

c Click **Start BER Measurement**.

9 Display the base radio transmission readings on the service monitor **Rx Meter** subscreen, as follows:

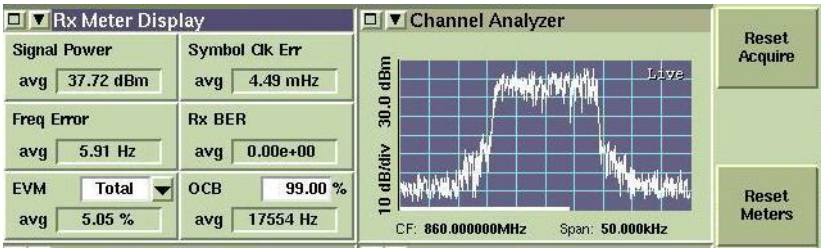
a Click the **Rx Meter** subscreen.

A panel of soft keys displays on the right side of the screen, including two **Reset** keys.

b Click the **Reset Acquire** soft key on the right side of the screen. This re-synchronizes the test set with the incoming signal.

c Click the **Reset Meters** soft key on the right side of the screen. This stops, clears, and restarts the acquisition of data for the data display fields.

Figure 51: HPD Service Monitor - Rx Meter Subscreen and Soft Keys (Aeroflex 3900 Series Service Monitor)



10 On the **RF Control Settings** window of the service monitor, enter lower values in the **RF Gen Level** field until 1% BER is displayed on the CSS **Test and Measurement** screen. Compare the value in the **RF Gen Level** field to the Receive Sensitivity 1% BER specifications for the HPD base radio configuration. See Specifications for GTR 8000 Base Radio (700/800 MHz) on page 32 in the Description section of this documentation.

NOTICE: Take the cable and splitter loss into account.

11 In the **RF Gen Level** field, enter -70 dBm.

This should produce a 0.01% or better BER on the Test and Measurement screen in CSS. If it does not, contact Motorola Solutions Support Center (SSC). See Motorola Solutions Support Center on page 136 in the Troubleshooting chapter of this document.

12 When finished testing, perform the following steps in CSS in the **Test and Measurement Screen**:

a Click **Stop BER Measurement**.

b Click **Stop Pattern Transmission**.

13 If no further testing is needed, place the base radio in Normal Mode.

a Click **Change to Normal Mode**.

b At the confirmation screen, click **OK**.

The base radio halts activity in the current mode and switches operation to the requested mode.

5.2.5
Checking Receiver Sensitivity (Self-test Method)

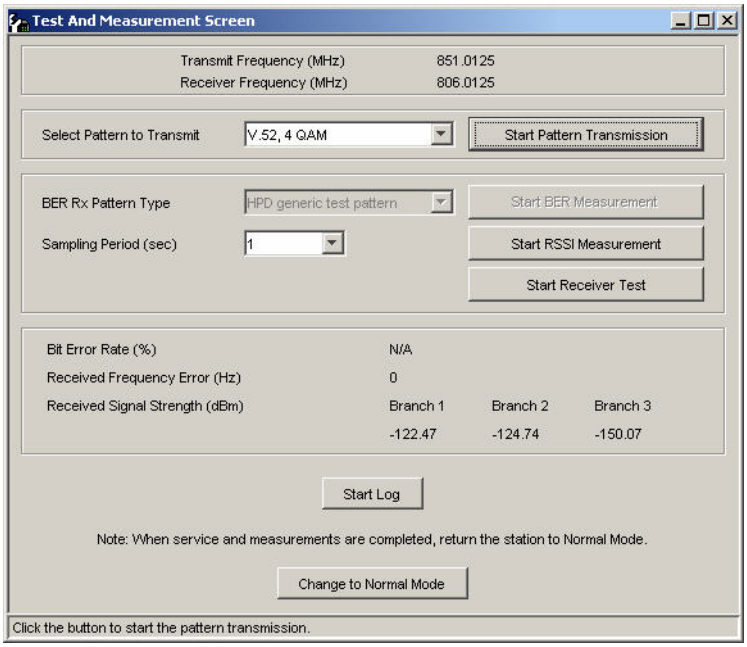
When and where to use: This procedure explains how to check the receiver sensitivity for the station without any test equipment. The receiver uses a factory calibrated low-level noise source at the receiver input to check performance. This procedure can be performed remotely.

Procedure:

1 Connect to the transceiver module in CSS through an Ethernet connection. See Connecting Through an Ethernet Port Link on page 100.

2 From the menu, select **Service → Test and Measurement Screen**.

Figure 52: CSS Test and Measurement Screen



3 If the base radio is not already in service mode perform the follows substeps, otherwise go to step 4

a Click **Change to Service Mode**.

b At the confirmation screen, click **OK**.

The base radio halts activity in the current mode and switches operation to the requested mode.

c Re-open the **Test and Measurement Screen**, as described in step 2.

4 Select **Start Receiver Test**.

A confirmation dialog box appears indicating the test progress. After a few seconds, the test concludes with a pass or fail message.

5 Click **OK**.

6 If no further testing is needed, place the base radio in Normal Mode.

a Click **Change to Normal Mode**.

b At the confirmation screen, click **OK**.

The base radio halts activity in the current mode and switches operation to the requested mode.

Chapter 6

GTR 8000 Site Subsystem Maintenance

This chapter describes periodic maintenance procedures relating to GTR 8000 Site Subsystem.

6.1 Fan Grill Cleaning Instructions

If the station equipment is installed in a dusty environment, take precautions to filter the air used for a forced cooling of the station. Excessive dust drawn across and into the device circuit modules by the cooling fans can adversely affect heat dissipation and circuit operation. In such installation, be sure to clean or replace external filtering devices periodically.

If dust has accumulated on the fan grills, cleaning the fan grills is recommended. When cleaning, take care to prevent dust from being pulled into the modules. Use a damp cloth to wipe the front of the fan grills. When removing the power supply, turn off the unit before proceeding.

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Chapter 7

GTR 8000 Site Subsystem Operation

This chapter details tasks that to perform once the GTR 8000 Site Subsystem is installed and operational on your system.

7.1 Base Radio Operational States for HPD

The base radio can be in one of four operational states, depending on how it is currently handling packets from the site controller.

- Standby
- Idle
- Assigned
- Isolated

During initialization, the base radio powers up into the **standby** state and waits for a status packet from the site controller. After initial contact with the site controller has been made, the base radio will enter **idle** mode and send a status message back to the site controller (indicating that it is ready for assignment). The site controller responds with a channel grant message, and the base radio is enabled for service. If the base radio has a greater home channel preference setting (than other base radios at the site), then the zone controller assigns the base radio as the home channel at the site.

After a base radio has been **assigned**, it can begin to handle inbound/outbound traffic. In case where the base radio fails to receive a number of consecutive status packets from the site controller, it enters **isolated** mode and dekeys. This isolated mode is reported in Unified Event Manager.

If the base radio becomes operational again and receives status packets from the site controller, it replies again with a channel status message. The site controller may then respond with a channel grant, and the base radio becomes enabled for service again.

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Chapter 8

GTR 8000 Site Subsystem Troubleshooting

This chapter provides fault management and troubleshooting information relating to GTR 8000 Site Subsystem.

GTR 8000 Site Subsystem troubleshooting requires an understanding of hardware-based and software-based diagnostics, as well as testing tools. Support is available from Motorola Solutions to assist with all steps in the troubleshooting process.

8.1 General Troubleshooting

The following table describes steps for general GTR 8000 Site Subsystem troubleshooting.

Table 25: GTR 8000 Site Subsystem General Troubleshooting

Problem	Troubleshooting
General connectivity problems	**1** If you have access to the equipment, check the LEDs to verify that each piece of equipment is connected and operational. See GTR 8000 Base Radio LEDs on page 177. **2** In CSS, check the alarms of the base radio and all associated devices and links. **3** Verify the configuration of the base radio through CSS. Verify that the IP address for the base radio is correct. In CSS, send a diagnostic command to enable the base radio. **4** Verify that the DNS Hostname for the base radio is correct. If the DNS Hostname was incorrect and then corrected, further corrections may be needed on the DNS server, UNC, and UEM. See the Troubleshooting chapter in the *Authentication Services* manual. **5** Verify that the physical cabling is firmly connected and in good condition. Check for any sharp bends or kinks in cabling. Test suspected cabling for noise, continuity, attenuation, and crosstalk. Replace the cabling if necessary. **6** Run ping, traceroute, pathping, and other network administration commands to identify any link or intermediate devices (switch or routers) with high latency or connection problems. **7** If the connection fails to operate normally, send a restart command to the base radio through CSS. Consider cycling power to the base radio if necessary. **8** If the base radio still fails to operate properly, create a backup of the current configuration, then reinstall the software and reconfigure the base radio. **9** Replace the base radio if necessary.

Table continued…

Problem	Troubleshooting
Unit will not power up	**1** If you have access to the equipment, check the LEDs to determine which equipment is connected and operational. See GTR 8000 Base Radio LEDs on page 177. **2** In CSS, check the alarms for the base radio. **3** Check the power cabling and verify that the power source for the base radio is supplying the appropriate voltage. Try connecting the base radio to another power source or replace the power cabling if necessary. **NOTICE:** Check all power sources as there may be more than one. **4** Check for any physical damage to the modules and check whether the modules were properly grounded. **5** Replace any defective modules.
Unable to perform a password reset	If the device module has been replaced and serial port access is not available to configure the IP address, the device may have the account locked out or the backplane slot has passwords enabled. Connect to the front-panel local Ethernet service port using a fixed IP address and perform the password reset. See Connecting Through an Ethernet Port Link on page 100 and Setting the Local Password Configuration in CSS on page 108.

8.2 GTR 8000 Base Radio Troubleshooting Tools

Several tools are available for viewing and monitoring equipment and troubleshooting suspecting problems:

- LEDs
- Unified Event Manager (UEM) to monitor links and components
- Unified Network Configurator (UNC)
- Configuration/Service Software (CSS)
- MOSCAD Network Fault Management (NFM)

NOTICE: The Unified Event Manager (UEM) can be established as a more centralized fault management solution replacing the MOSCAD GMC. See the *Unified Event Manger* and the *UEM/GMC Transition Setup Guide* for details.

In addition, see Quick Connect RF Coaxial Adapters for GTR 8000 Base Radio Support on page 81 for testing system performance.

8.2.1 Links and Components Monitoring in Unified Event Manager

The Unified Event Manager (UEM) monitors critical links and components in the system. Monitoring may take place remotely from a central operations center. Two types of monitoring include:

- Real-time monitoring of UEM Topology Maps, which alert faults as they occur.
- Evaluation of UEM Active Alarms Window on a regularly scheduled basis.

8.2.1.1

Unified Event Manager Active Alarm Window Analyzation

The Unified Event Manager (UEM) **Active Alarms Window** is useful for troubleshooting because it captures alarms that may occur intermittently or during off-hours. For example, you can review the **Active Alarms Window** to correlate reported loss of service with patterns of critical alarms for links and equipment.

When analyzing the **Active Alarms Window**, look for the following patterns:

- Failures sent with time stamps on or about the same time
- Failures from related equipment:
  - Cards in the same device
  - Equipment part of the same subsystem

Many devices send out events that report both critical and non-critical events. Learn to distinguish between critical and non-critical events.

See the *Unified Event Manager* manual or *UEM Online Help* for further details.

8.2.1.2

Diagnostic Options in Unified Event Manager

This table summarizes the base radio diagnostic options in the Unified Event Manager (UEM).

Table 26: Base Radio Diagnostic Options in UEM

Option	Description
Restart	Requests that the base radio performs a reset.
Service	Requests that the base radio enters service mode, allowing a technician to make alignment adjustments and run other tests while the base radio is offline.
Enabled	Requests that the base radio enters the enabled mode and handle traffic.

8.2.2

MOSCAD Network Fault Management

If MOSCAD Network Fault Management (NFM) equipment is supported at the site, additional status, and alarm information for a device can be viewed through the MOSCAD NFM.

Figure 53: MOSCAD Network Fault Management – Example

When an alarm condition occurs, the alarm device for one of the modules begins to flash red. Selecting the LED box opens an alarm pop-up window indicating details of the alarm. To view the status of all alarms for a particular module within the device, select the alarm LED box corresponding to the particular module. Alarms can be acknowledged by pressing the **Acknowledge** button on the screen.

See the *MOSCAD Network Fault Management Feature Guide* for details.

NOTICE: The Unified Event Manager (UEM) can be established as a more centralized fault management solution replacing the MOSCAD GMC. See the *Unified Event Manger* manual and the *UEM/GMC Transition Setup Guide* for details.

8.2.3
Device Troubleshooting in Unified Network Configurator

Use the Unified Network Configurator (UNC) to verify configuration data during system commissioning and later when you maintain or expand the system. Use UNC to do the following to the device:

- Verify configuration
- Correct configuration errors

See the *Unified Network Configurator* manual for further details.

8.2.4
GTR 8000 Base Radio Troubleshooting in Configuration/Service Software

The GTR 8000 Base Radio can be locally or remotely configured or serviced through Configuration/ Service Software (CSS). CSS provides access to alarms, status information, and configuration settings for the base radio.

Use CSS for the following tasks which may be useful when troubleshooting the base radio. See the *CSS Online Help* for specific details and instructions when performing these tasks.

- Enable and disable channels and services
- View and save a log of alarms

- Verify the configuration
- Gather troubleshooting information that can be escalated to Motorola Solutions for evaluation

8.2.4.1
Internal Diagnostic Test Alarm Log

The base radio has been designed with internal diagnostic tests that occur on power up and reset. Diagnostic tests are available for the control module and power supply. If a problem occurs during operation, it is reported as an alarm. All alarms are stored in the Alarm Log, accessible with Configuration/Service Software (CSS). The alarm log contains the name of the diagnostic test that failed and the time since the last power up.

8.2.4.2
Local Password and SNMPv3 Passphrase Troubleshooting

The password reset mechanism in the Configuration/Service Software (CSS) application can be enabled/disabled. See “Secure Remote Access Configuration > Device Security Configuration - Security Services (Serial)” in the *CSS Online Help* for information. To obtain the keys for resetting either password or SNMPv3 passphrases for the device, contact Motorola Solutions Support Center (SSC).

NOTICE: The default values for the local passwords and SNMPv3 passphrases, as well as the keys for the local password reset procedure, may vary by system release. These default values and keys are treated as sensitive information and are provided to your organization through secured communication.

Table 27: Local Password and SNMPv3 Passphrase Troubleshooting

Scenario	SNMPv3 Passphrase Known	Local Password Known	To Reset SNMPv3 Passphrase	To Reset Local Login Password
User is locked out of the local login, but knows SNMPv3 passphrases	✓	✗	See the *CSS Online Help* “SNMPv3 User Configuration”.	See the *CSS Online Help* “Resetting Device Passwords.”
User knows the local login, but not the SNMPv3 passphrases	✗	✓	See the *CSS Online Help* “Reset SNMPv3 Configuration (Serial)”.	See the *CSS Online Help* “Device Security Configuration – Security Services (Serial)”.
User knows both passphrases and local service password	✓	✓	See the *CSS Online Help* “SNMPv3 User Configuration”.	See the *CSS Online Help* “Device Security Configuration – Security Services (Serial)”.
User does not know SNMPv3 passphrase nor service account password	✗	✗	Contact Motorola Solutions SSC.	Contact Motorola Solutions SSC.

8.3 Site Controller Failure Impact on GTR 8000 Base Radio for Trunked Operation

If the link fails between the base radio and the site controller, the base radio dekeys and does not handle any MSU traffic. MSUs attempt to operate on another channel at the site. If another channel is not available, the MSUs attempt to register at another site.

For HPD and repeater site operation, the base radio receives external frequency reference and network time synchronization from the active site controller over the Ethernet link. If there is a loss of the external time and frequency reference source, the base radio continues to maintain its own time and frequency stability to continue operations for a specified amount of time without degradation. Afterwards, operation continues with minimal degradation.

8.4 Motorola Solutions Support Center

Motorola Solutions Support Center (SSC) can help technicians and engineers resolve system problems, and ensure that warranty requirements are met. Check your contract for specific warranty information.

Motorola Solutions assigns a tracking ticket number that identifies each support call. This ticket number allows Motorola Solutions to track problems, resolutions, and activities for the call, and if possible, communicate the resolution and a status of call so that the SSC can note the resolution and close the ticket.

8.4.1 Information Necessary to Contact Motorola Solutions Support Center

Before calling the Motorola Solutions Support Center (SSC), log all steps taken to troubleshoot the problem and any results of those steps. The SSC can use this information to determine the appropriate support actions.

Listed is the following information to collect before calling the SSC:

- System ID number (such as 2CB5). Each zone in the system has a unique system ID number
- Location of the system
- Date the system was put into service
- Software and firmware versions
- Symptom or observation of the problem, such as:
  - When did it first appear?
  - Can it be reproduced?
  - Are there any other circumstances contributing to the problem (for example, loss of power)?
- Maintenance action preceding the problem, such as:
  - Upgrade of software or equipment
  - Changes to hardware or software configuration
  - Reload of software from a backup disk, CD, or DVD with the version and date

Dispatch Support:

- Site ID
- Description of problem
- Severity of issue

Tech Support:

- Site ID
- Billing information (If not being billed under contract)
- Name or model number of product causing the issue (Helps get you over to proper tech support group)

Return Authorization:

- Site ID
- Part Number and/or description of part
- How being billed
- Where it is being billed
- Where it is being shipped

8.4.2
Where to Call for Service

After collecting the required information and writing a detailed problem report, contact the Motorola Solutions Support Center (SSC) to help with the problem.

8.4.2.1
Motorola Solutions Support Center

The Motorola Solutions Support Center (SSC) is the primary Motorola Solutions contact. Call Motorola Solutions SSC:

- Before any software reload
- To confirm troubleshooting results and analysis before removing and replacing a Field Replaceable Unit (FRU) or Field Replaceable Equipment (FRE) to repair the system

Motorola Solutions SSC contact information:

- Phone: (800) 221-7144 for domestic calls and (302) 444–9800 for international calls
- Fax: (847) 725-4073

8.4.3
Subcontractors

The Motorola Solutions Service Subcontractor Assessment program ensures that service people Motorola Solutions contracts meet strict minimum requirements before they can work on any system. For more information on this program, contact the Motorola Solutions representative.

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Chapter 9

GTR 8000 Site Subsystem FRU Procedures

This chapter lists the Field Replaceable Units (FRUs) and Field Replaceable Entities (FREs) and includes replacement procedures applicable to GTR 8000 Site Subsystem.

GTR 8000 Site Subsystem is comprised of numerous field replaceable units (FRUs) and field replaceable parts. If a FRU or part must be replaced, it is essential to obtain the precise FRU kit number or part number and to review the replacement procedures provided, including all safety precautions and system impact information.

9.1 Field Replaceable Units and Parts

When ordering field replaceable units (FRUs), you need the FRU Kit Number. When ordering field replaceable parts, you need the Part Number. Contact Motorola Solutions Support Center (SSC) as needed for numbers not provided here. For cables that are internal to a GTR 8000 Site Subsystem, the part numbers are not listed in this documentation, but you can locate the part number on the cable itself before contacting the SSC. See Motorola Solutions Support Center on page 136 in the Troubleshooting section of this documentation.

WARNING: To guard against personal injury and/or damage to equipment, switch the base radio to Service Mode when performing service. The GTR 8000 Base Radio periodically keys up to pseudo train its linear transmitter autonomously when it is not assigned by the zone controller. Tx Inhibiting the base radio also prevents the transmitter from keying. Remember to switch the base radio back to Normal Mode when service is complete.

9.1.1 GTR 8000 Site Subsystem Field Replaceable Units

Table 28: GTR 8000 Site Subsystem Field Replaceable Units

Component Type	FRU Kit Number	Replacement Procedure
Transceiver Module (700/800 MHz)*	DLN6885A	Replacing a Transceiver Module on page 144
Fan Module	DLN6898A	Replacing the Fan Assembly on page 152
AC/48V DC Power Supply	DLN6781A (0182516W14) DLN6793B (0182516W19)	Replacing a Power Supply on page 153
Power Amplifier Module (700/800 MHz)	DLN6895A	Replacing a Power Amplifier on page 157
GCP 8000 Site Controller	DLN6966A	See the *GCP 8000 Site Controller* manual.

Table continued…

Component Type	FRU Kit Number	Replacement Procedure
Power Distribution Module	0184847Y01	Replacing the Power Distribution Module on page 169

* The transceiver field replacement units are not compatible with ASTRO® 25 base radio software distributed before July 2013. BEFORE installing the replacement transceiver, ensure that all base radios at the site meet the minimum software version requirements listed. Contact Motorola Customer Support at 800-422-4210 if you do not have access to compatible software. See Transceiver Software and Feature Compatibilities on page 141 for details.

9.1.2
GTR 8000 Site Subsystem Field Replaceable Parts

Table 29: GTR 8000 Site Subsystem Field Replaceable Parts

Component Type	Part Number	Replacement Procedure
Power Supply Fan Module	5985167Y02	Replacing a Power Supply Fan on page 155
GTR 8000 Base Radio Backplane	0180706K30	Replacing the GTR 8000 Base Radio Backplane on page 171
Site Preselector	CFF6056A	Replacing Filters/Preselectors in a GTR 8000 Site Subsystem on page 160
Cabinet LNA Module (Cabinet RMC)	DLN1306A	Replacing a Cabinet RMC/LNA Module on page 161
External Dual Circulator Tray	DLN1317A	Replacing the Dual Circulator/Isolator Modules on page 163
Duplexer 700 MHz	9184718Y01	Replacing a Duplexer on page 167
Duplexer, 800 MHz	9184718Y02	Replacing a Duplexer on page 167

9.1.3
GTR 8000 Site Subsystem Individual Customer Replacement Parts on External Dual Circulator Tray

Table 30: GTR 8000 Site Subsystem Individual Customer Replaceable Parts on External Dual Circulator Tray

Component Type	Part Number	Replacement Procedure
Dual Circulator	0185172Y01	Replacing the Dual Circulator/Isolator Modules on page 163
Circulator Load	TLN3391A	Replacing the Dual Circulator/Isolator Modules on page 163
Low Pass/Harmonic Filter	9185202U04	Replacing the Dual Circulator/Isolator Modules on page 163

9.2 Required Tools and Equipment

The following items are necessary to bring to the replacement site when replacing any equipment:

- Electrostatic discharge (ESD) strap (Motorola Solutions part number RSX4015A, or equivalent)
- Service computer/laptop with Configuration/Service Software and Software Download Manager applications installed
- DB-9 Straight through serial cable
- Ethernet patch cable
- Crosstip and slotted screwdrivers
- TORX® driver set
- 1/2 drive torque wrench capable of torque settings to 110 in/lbs.

9.3 Transceiver Hardware Generations

As of July 2013, the GTR 8000 Base Radio is shipped with a new generation of transceiver hardware (referred to in this manual as GEN 2). The hardware updates are intended to extend the life of the device as seamlessly as possible. This section details relevant differences and compatibility requirements for GEN 1 and GEN 2 hardware.

9.3.1 Transceiver Software and Feature Compatibilities

The GEN 2 transceiver hardware is backwards compatible and interchangeable with GEN 1 transceiver hardware on ASTRO® 25 7.11 and later systems. GEN 1 transceivers can no longer be ordered; however, spare inventory of GEN 1 transceivers can still be used as FRU replacements.

All ASTRO® 25 system features are supported on GEN 1 and GEN 2 transceivers, with the following exceptions.

Table 31: System Feature Exceptions

Feature	GEN 1 Transceiver	GEN 2 Transceiver
X2 TDMA	Supported	Not Supported

GEN 2 transceiver hardware is not compatible with ASTRO® 25 GTR 8000 Base Radio software distributed before July 2013. The transfer operation fails if you perform a software download using a Software Download (SWDL) Package that was released before July 2013.

BEFORE installing a FRU replacement or expansion channel at an existing site, ensure that you are using the latest available Software Download (SWDL) Package and that all base radios at the site meet the minimum software version requirements listed. Contact Motorola Solutions Customer Support at 800-422-4210 if you do not have access to compatible software.

Table 32: Minimum Software Download Version Requirements

ASTRO® 25 System Release	HPD BR
7.11	HPDBR_R07.BX.098

Table continued…

ASTRO® 25 System Release	HPD BR
7.12	HPDBR_R07.CX.051
7.13	HPDBR_R07.DX.073
7.14 and later	Any Version

CAUTION: It is crucial that a site software download is performed at a trunked ASTRO® 25 site to ensure that all devices are on the same software version, VLAN, and active bank. Failure to perform this step, results in the replacement transceiver or expansion channel to have a mismatch in software versions. If a mismatch in software versions occurs, the transceiver may go into a configuration mode of operation with a reason of 'Invalid Software Version'.

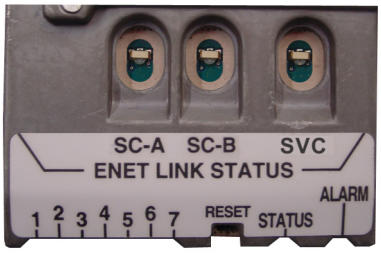
9.3.2

Identifying Transceiver Hardware Generation

Label

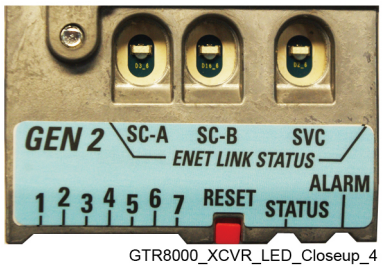
GEN 1 and GEN 2 transceiver modules can be identified by examining the physical hardware label. GEN 2 modules have a light blue label with 'GEN 2' clearly noted on it, while GEN 1 modules have a white label with no GEN identification.

Figure 54: GEN 1 Transceiver Module



GTR8000_XCVR_LED_Closeup_1

Figure 55: GEN 2 Transceiver Module



GTR8000_XCVR_LED_Closeup_4

Configuration/Service Software

GEN 1 and GEN 2 transceiver modules already installed in a system can be identified through the **Hardware Version** screen of the Configuration/Service Software (CSS).

9.3.3
Transceiver FRU Number Mappings

Table 33: Transceiver FRU Number Mappings

Transceiver FRU Number	GEN 1 (Shipped before Nov 2013)	GEN 2 (Shipped starting July 2013)
Transceiver Module (700/800 MHz)	DLN6566A	DLN6885A

9.4
Power Amplifier Hardware Generations

Starting in July 2013, the GTR 8000 Base Radio is shipped with a new generation of power amplifier hardware (referred to in this manual as GEN 2). The hardware updates extend the life of the base radio as seamlessly as possible. This section details relevant differences and compatibility requirements for GEN 1 and GEN 2 hardware.

9.4.1
Power Amplifier Software and Feature Compatibilities

The GEN 2 power amplifier hardware is fully backwards compatible and completely interchangeable with GEN 1 power amplifier hardware. GEN 1 power amplifiers can no longer be ordered; however, spare inventory of GEN 1 power amplifiers can be used as Field Replaceable Unit (FRU) replacements.

All ASTRO® 25 system features are supported on GEN 1 and GEN 2 power amplifiers. All ASTRO® 25 system release software is supported on GEN 1 and GEN 2 power amplifiers.

9.4.2
Identifying Power Amplifier Hardware Generation

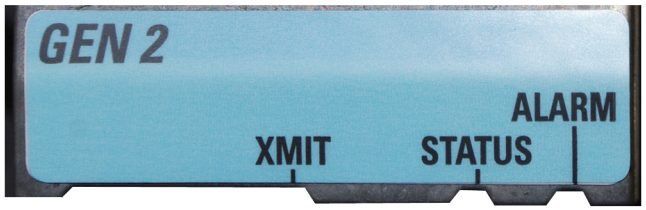
Label

GEN 1 and GEN 2 power amplifier modules can be identified by examining the physical hardware label. GEN 2 modules have a light blue label with ‘GEN 2’ clearly noted on it, while GEN 1 modules have a white label with no GEN identification.

Figure 56: GEN 1 Power Amplifier Module

GTR8000_PA_LED_Closeup

Figure 57: GEN 2 Power Amplifier Module



GTR8000_PA_LED_Closeup1

CSS

GEN 1 and GEN 2 power amplifier modules already installed in a system can be identified through the **Hardware Version** screen of the Configuration/Service Software (CSS).

9.4.3
Power Amplifier FRU Number Mappings

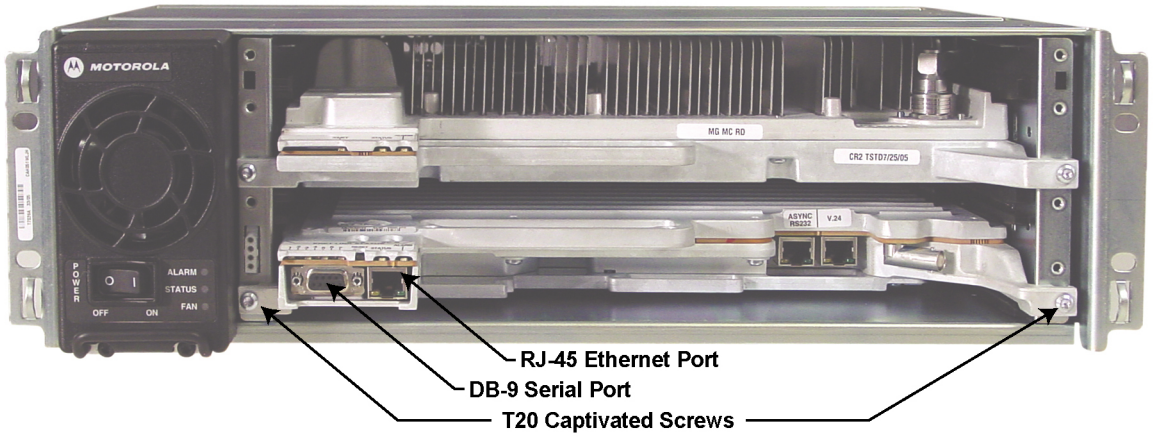
Table 34: Power Amplifier FRU Number Mappings

Power Amplifier FRU Number	GEN 1 (Shipped before Nov 2013)	GEN 2 (Shipped starting July 2013)
Power Amplifier Module (700/800 MHz)	DLN6567A	DLN6895A

9.5
Replacing a Transceiver Module

Prerequisites: Before replacing the transceiver, pull configuration and hardware information from the transceiver into the Unified Network Configurator (UNC) by performing a “Pull All” procedure. See the “Scheduling the Pull of Device Configurations” section in the *Unified Network Configurator* manual. This step may not be possible if communication is severed between the transceiver and the UNC. The following figure shows the captive screws that secure the transceiver module to the chassis.

Figure 58: Transceiver Module (Inside Chassis)



GTR8000_XCVR_NonXS_BR_NoFan1

Procedure:

1. Wear an electrostatic discharge (ESD) strap and connect its cable to a verified good ground.

   CAUTION: Wear this ESD strap throughout this procedure to prevent ESD damage to any components.

2. Locate the transceiver module being replaced.
3. If the transceiver module is not operational, go to step 9.
4. Connect to the transceiver module Ethernet service port using Configuration/Service Software (CSS). See Connecting Through an Ethernet Port Link on page 100.
5. Save the base radio configuration to the service computer/laptop as follows:
   a. From the menu, select **File** → **Read Configuration From Device**.
   b. At the confirmation screen, click **OK**.
   c. When the **Progress Monitor** screen is complete, click **OK**.
   d. From the menu, select **File** → **Save As**. On the **Properties Screen**, enter the IP address of the base radio. Click **OK**.
   e. On the **Save** window, select the directory where you want to save the configuration file, type a meaningful name for the file (use `.cpl` as the extension or do not type an extension). Press ENTER.

   The base radio configuration is saved to the location you indicated. The configuration file is reloaded later to the replacement transceiver.

6. Place the base radio in Service Mode before replacing the module, so that the system does not attribute the loss of channel to a failure.
   a. From the menu, select **Service** → **Test and Measurement Screen**.

      The **Test and Measurement Screen** appears.

   b. Click **Change to Service Mode**.
   c. At the confirmation screen, click **OK**.

   The base radio halts activity in the current mode and switches operation to the requested mode.

7. Disconnect the Ethernet cable from the service port on the transceiver being replaced.
8. It is not necessary to turn off the power supply for the transceiver module being replaced, as the modules can be swapped out with the power on. If you choose to turn off the power, set the rocker switch on the front of the associated power supply to the Off (O) position.
9. Remove the fan assembly to gain access to the transceiver module. See Replacing the Fan Assembly on page 152.

   IMPORTANT: Although the transceiver module can be swapped out without shutting the power off, minimize the amount of time that the fan module is removed, so the circuitry that remains powered on does not overheat and shut down.

10. Using a T20 bit, loosen the two captive screws on the front of the transceiver module to disengage them from the chassis.
11. Using the handle, gently pull the transceiver module straight out along the guides on which it sits.
12. Slide in the replacement transceiver module along the guiding rails until it is engaged. A slight push may be needed to securely engage the module.

IMPORTANT: If the transceiver module stops well before it is engaged, it is in an incorrect position. Either it is in the wrong slot or it is rotated 180°. The module has a keying feature that prevents it from going all the way into an incorrect slot, or going into the correct slot but rotated 180°. Do not try to force the module.

LEDs on the transceiver turn on when it is engaged.

13 Using a T20 bit, tighten the two captive screws on the front of the module to secure the transceiver module to the chassis.

14 Reinstall the fan module. See Replacing the Fan Assembly on page 152.

NOTICE: If you chose to turn off the power, set the rocker switch on the front of the associated power supply to the On (I) position.

15 Perform basic device configuration using the serial port in CSS. See Connecting Through a Serial Port Link on page 96.

a Set the **IP Address** and the **Box Number** for device. See Setting the Device IP Address in CSS on page 97.

b Set the Serial Security Services. See Setting the Serial Security Services in CSS on page 98.

16 Disconnect the service computer/laptop from the transceiver serial port.

17 Perform basic device configuration using the Ethernet port in CSS. See Connecting Through an Ethernet Port Link on page 100.

a Set the current date and time. See Setting the Date and Time in CSS on page 102.

b Set up the local Password Configuration (optional). See Setting the Local Password Configuration in CSS on page 108.

NOTICE: If the device module has been replaced and serial port access is not available to configure the IP address, the device may have the account locked out or the backplane slot has passwords enabled. Connect to the front-panel local Ethernet service port using a fixed IP address and perform the password reset.

18 Complete the configuration of the Information Assurance features in CSS, as follows:

a Change the SNMPv3 configuration and user credentials. See Changing SNMPv3 Configuration and User Credentials in CSS on page 103.

b Create, update, or delete an SNMPv3 user. See Adding or Modifying an SNMPv3 User in CSS on page 105.

c Verify the SNMPv3 credentials. See Performing an SNMPv3 Connection Verification in CSS on page 106.

d Set the SWDL transfer mode. See Setting the SWDL Transfer Mode in CSS on page 107.

e Configure DNS. See “Configuring DNS with CSS” in the *Authentication Services* manual.

f Configure for Secure SHell (SSH). See “Configuring SSH for Devices at an RF Site” in the *Securing Protocols with SSH* manual or see “Device Security Configuration – Remote Access/Login Banner (Ethernet)” in the *CSS Online Help*.

NOTICE: Restore the Clear Protocols parameters.

g Enable RADIUS Authentication. See “Configuring RADIUS Sources and Parameters with CSS” in the *Authentication Services* manual.

h Enable Centralized Authentication. See “Enabling/Disabling Centralized Authentication with CSS” in the *Authentication Services* manual.

i Set the Local Cache Size for Centralized Authentication. See “Setting the Local Cache Size for Central Authentication with CSS” in the *Authentication Services* manual.

j Enable Centralized Event Logging (if required by your organization). See “Enabling/Disabling Centralized Event Logging on Devices with CSS” and “Event Logging Client Configuration” for proper hostnames in the *Centralized Event Logging* manual.

k Set the NTP Server Settings. See NTP Server Settings in CSS on page 108.

19 Perform a site software download and installation. See Performing a Site Download on page 187.

CAUTION: It is crucial that a site software download is performed at the site to ensure that all devices are on the same software version, VLAN, and active bank. Failure to perform this step, results in the replacement transceiver or expansion channel to have a mismatch in software versions. If a mismatch in software versions occurs, the transceiver may go into a configuration mode of operation with a reason of ‘Invalid Software Version’.

20 Restore the Codeplug Archive from backup. Reload the configuration file on to the new device, as follows:

a From the menu, select **File** → **Open**.

b Locate and open the previously saved configuration file for the base radio.

NOTICE: If you were not able to back up the base radio configuration from the previous base radio, you can use the configuration from your system build book or use the default base radio configuration file. Specific settings for the base radio must still be configured. See the *CSS Online Help* for GTR 8000 Base Radio for detailed configuration instructions.

c On the **Properties** window, click **OK**.

d When the **Progress Monitor** screen is complete, click **OK**.

e From the menu, select **File** → **Write Configuration To Device**. Click **OK**.

f On the Ethernet connection confirmation screen, click **OK**.

g On the **Connection** screen, enter the ***<IP Address>*** and click **Connect**.

h On the **SNMPv3 PassPhrase Prompt** dialog box, enter the **User Information** and **Passphrase Information**. Click **OK**. If Authentication Services are not enabled on a device, click **OK** when the dialog box appears.

i On the confirmation screen, click **OK**.

j When the **Progress Monitor** screen is complete, click **OK**.

The configuration from the file selected is loaded into the base radio. Communication with the base radio is not available until the reset is complete.

21 Read the base radio, as follows:

a From the menu, select **File** → **Read Configuration From Device**.

b On the confirmation screen, click **OK**.

c When the **Progress Monitor** screen is complete, click **OK**.

22 Place the base radio into Normal Mode, as follows:

a From the menu, select **Service** → **Mode Screen**.

The **Mode Screen** appears.

b Click **Change to Normal Mode**.

c At the confirmation screen, click **OK**.

The base radio goes through a reset sequence, which takes a few minutes, and switches operation to the requested mode.

23 On systems with MAC Port locking, disable the locking and then re-enable the locking with the MAC address of the base radio. The device being replaced may be connected to an Ethernet port on a switch which implements MAC Port locking (HP switch or site controller). If so, the Ethernet switch port must be unlocked and relocked to the MAC address of the replacement device. See the *MAC Port Lockdown* manual for instructions on how to disable and enable MAC Port locking.

NOTICE: Following the device restoration, if it was connected to an HP switch port, the HP switch port may have been disabled due to an unexpected MAC address. If so, re-enable the port on the HP switch.

24 Replace the base radio in the Unified Network Configurator (UNC). See “Replacing a Device” in the *Unified Network Configurator* manual.

25 Discover the base radio in the UEM, see the *Unified Event Manager* manual.

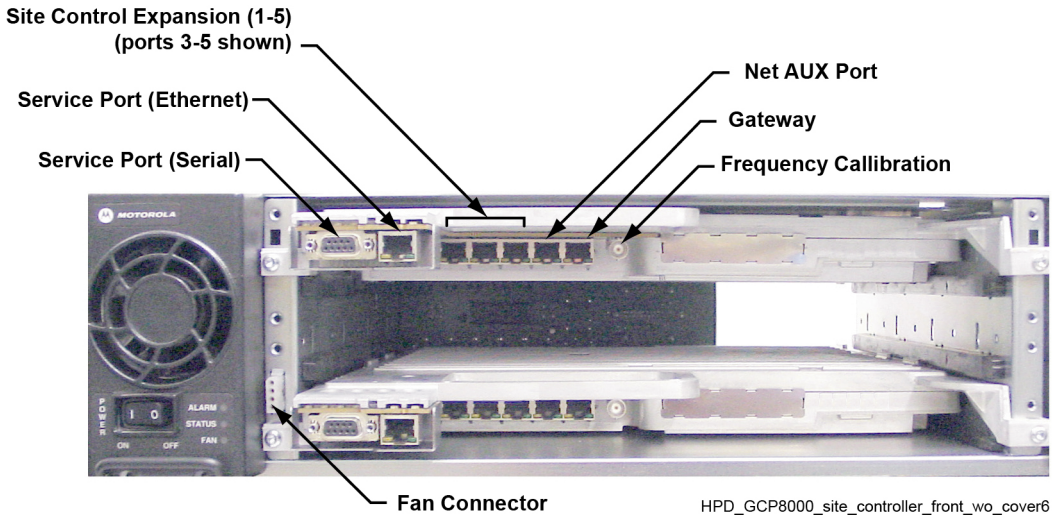
26 Verify that the base radio is operating properly:

- The Status LED on the front of the transceiver is green.
- Proper operation is confirmed using software tools, such as UEM, and the **Transmitter Metering Screen** in Configuration/Service Software (CSS).

9.6 Replacing the GCP 8000 Site Controller Module

IMPORTANT: The site controller module can be hot swapped out without losing functionality. The standby site controller automatically becomes the active site controller and takes over if the active site controller is the one being swapped out.

Figure 59: GCP 8000 Site Controller Module



Prerequisites: Before replacing the site controller, pull configuration and hardware information from the site controller module into the Unified Network Configurator (UNC) by performing a “Pull All” procedure. See the “Scheduling the Pull of Device Configurations” section in the *Unified Network Configurator* manual. This step may not be possible if communication is severed between the site controller and the UNC.

Procedure:

1 Wear an Electrostatic Discharge (ESD) strap and connect its cable to a verified good ground.

CAUTION: Wear the ESD strap throughout this procedure to prevent ESD damage to any components.

2 Locate the site controller module being replaced.

3 If the site controller module is non-operational, go to step 8.

4 Connect to the site controller Ethernet service port using Configuration/Service Software (CSS). See Connecting Through an Ethernet Port Link on page 100.

5 Save the site controller configuration to the service computer/laptop as follows:

   a From the menu, select **File** → **Read Configuration From Device**.

   b At the success message, click **OK**.

   c From the menu, select **File** → **Save As**.

   d On the **Properties** window, enter the ***<IP address>*** of the device. Click **OK**.

   e Specify the directory location where you want to save the configuration file, type a meaningful name for the file. Press ENTER.

   The site controller configuration is saved to the location indicated. The configuration file is reloaded later to the replacement site controller module.

6 Disable the site controller module, as follows:

   a From the menu, select **Service** → **Status Panel Screen**.

   The **Status Panel Screen** appears.

   b Select the **Site Controller** tab.

   c From the **User Requested Site Controller State** list box, select **User Disabled**.

   The site controller module resets, after approximately two minutes, it is disabled. If this is the active site controller module, control of trunking switches over to the standby site controller module.

7 Disconnect the Ethernet cable from the service port on the site controller to be replaced.

8 Remove the fan assembly to gain access to the site controller module. See Replacing the Fan Assembly on page 152.

IMPORTANT: The site controller module can be swapped out without shutting the power off. The fan assembly, however, must be in place within a reasonable amount of time so the other site controller module does not overheat and shut down.

9 Label and disconnect any cabling on the front of the site controller module.

10 Loosen the two captive screws holding the site controller module to the chassis.

11 Using the handle, gently pull the used module straight out, along the guides on which it sits.

12 Slide in the replacement site controller module along the guiding rails until it is engaged. A slight push is needed to engage the module. For a replacement standalone site controller in a circuit simulcast subsystem, use the upper slot for the module. For a replacement standalone site controller in an IP simulcast subsystem, the site controller that has been assigned as site controller 1 must have the site controller module in the upper slot within the chassis, and the site controller that has been assigned as site controller 2 must have the site controller module in the lower slot within the chassis.

IMPORTANT: If the site controller module stops well before it is engaged, it is in an incorrect position. Either it is in the wrong slot or it is rotated 180 °. The module has a keying feature that prevents it from going all the way into an incorrect slot, or going into the correct slot but rotated 180 °. Do not try to force the module.

13 Secure the site controller module with the two captive screws.

14 Reconnect all the cabling to the correct ports as previously labeled.

15 Reinstall the fan assembly. See Replacing the Fan Assembly on page 152.

16 Perform basic device configuration through the serial port in CSS. See Connecting Through a Serial Port Link on page 96.

- **a** Set the **IP Address** and the **Box Number** for the new device. See Setting the Device IP Address in CSS on page 97.
- **b** Set the Serial Security Services. See Setting the Serial Security Services in CSS on page 98.

17 Perform basic device configuration through the Ethernet port in CSS. See Connecting Through an Ethernet Port Link on page 100.

- **a** Set the current date and time. See Setting the Date and Time in CSS on page 102.
- **b** Set up the local Password Configuration (optional). See Setting the Local Password Configuration in CSS on page 108.

  An IP address must be configured to set up the local password. If the serial port access is not available to configure the IP address, the device may have the account locked out or the backplane slot has passwords enabled. Perform the following:

  1. Move the device module to a different slot in the backplane where local passwords are not configured.
  2. Configure the IP address and reset the device through the front panel RS-232 serial service port using CSS.
  3. Perform the local password reset operation (to clear account information stored in the FRU) through and Ethernet port link using CSS.
  4. Move the device module back to the original slot.
  5. Perform the local password reset operation again (to clear account information stored in the backplane).

18 Complete the configuration of the Information Assurance features in CSS, as follows:

- **a** Change the SNMPv3 user credentials. See Changing SNMPv3 Configuration and User Credentials in CSS on page 103.
- **b** Create, update, or delete an SNMPv3 user. See Adding or Modifying an SNMPv3 User in CSS on page 105.
- **c** Verify the SNMPv3 credentials. See Performing an SNMPv3 Connection Verification in CSS on page 106.
- **d** Set the SWDL transfer mode. See Setting the SWDL Transfer Mode in CSS on page 107.
- **e** For a trunked site controller, configure DNS. See “Configuring DNS with CSS” in the *Authentication Services* manual.
- **f** Configure for SSH. See "Configuring SSH for Devices at an RF Site" in the *Securing Protocols with SSH* manual or see “Device Security Configuration – Remote Access/Login Banner (Ethernet)” in the *CSS Online Help*.
- **g** Restore the following Clear Protocols parameters in the Remote Access Configuration tab on the Device Security Configuration screen in CSS. See “Device Security Configuration – Remote Access/Login Banner (Ethernet)” in the *CSS Online Help*.
- **h** Enable RADIUS Authentication. See “Configuring RADIUS Sources and Parameters with CSS” in the *Authentication Services* manual.
- **i** Enable Centralized Authentication. See “Enabling/Disabling Centralized Authentication with CSS” in the *Authentication Services* manual.

j Set the Local Cache Size for Centralized Authentication. See “Setting the Local Cache Size for Central Authentication in CSS” in the *Authentication Services* manual.

k Enable Centralized Event Logging (if required by your organization). See “Enabling/Disabling Centralized Event Logging on Devices with CSS” and “Event Logging Client Configuration” for proper hostnames in the *Centralized Event Logging* manual.

19 Perform a site software download (SWDL) with the SNMPv3 package (if SNMPv3 is desired) of the device and associated site devices. See Performing a Site Download on page 187.

CAUTION: Load the correct version of the software. There is a possibility of a mismatch in software versions when replacing the transceiver module with an on-hand spare. If a mismatch in software versions occurs, this mismatch may cause the base radio at the site to go into a configuration mode of operation with a reason of 'Invalid Software Version'. To exit out of configuration mode, see “CSS Procedures > Changing from Configuration to Normal Mode” in the *CSS Online Help*.
If a mismatch in software versions occurs with a site controller, this mismatch may cause a 'critical malfunction', or if it becomes active, to bring the entire site into a configuration mode of operation.

20 Restore the Codeplug Archive from backup. Reload the configuration into the replacement site controller module from CSS as follows:

a From the menu, select **File** → **Open**.

NOTICE: If you were not able to back up the configuration from the previous site controller module, you can use the configuration from your system build book, the default configuration file for the site controller module, the stored backup configuration file, or the configuration from the other site controller module. Specific settings for the site controller module must still be configured. See the *CSS Online Help* for site controller detailed configuration instructions.

b Locate and open the previously saved configuration file for the device.

c On the **Properties** window, click **OK**.

d When the **Progress Monitor** screen is complete, click **OK**.

e From the menu, select **File** → **Write Configuration To Device**. Click **OK**.

The configuration from the file you selected is loaded into the new site controller module.

21 Enable the site controller module as follows:

a From the menu, select **Service** → **Status Panel Screen**.

The **Status Panel Screen** appears.

b Select the **Site Controller** tab.

c From the **User Requested Site Controller State** list box, select **Enabled**.

The site controller module is enabled after approximately two minutes.

22 Restore the 802.1x / MAC Port Lockdown feature as follows:

NOTICE: Substeps a, b, c apply only to HPD and repeater site configurations.

a Capture the MAC address on the switch for all devices connected to the site controller. See "Capturing the MAC Address of a Device Connected to a GCP 8000 Controller or GPB 8000 Reference Distribution Module" in the *MAC Port Lockdown* manual.

b Update/verify the site controller MAC Port Lockdown Configuration. See "Enabling/Disabling 802.1x and MAC Port Lockdown for GCP 8000 in CSS" and “Validating MAC Port Lockdown

on a GCP 8000 or GPB 8000 Reference Distribution Module” in the *MAC Port Lockdown* manual.

c Update/verify the site controller 802.1x configuration on HPD and repeater site controllers. See "Enabling/Disabling 802.1x and MAC Port Lockdown for GCP 8000 Site Controller or GPB 8000 Reference Distribution Module with CSS" in the *802.1x Service Ports on Switches* manual.

NOTICE: Substep d can only be performed through VoyenceControl. It cannot be performed in CSS.

d (Optional), Enable the site controller 802.1x configuration on the Ethernet port for the simulcast site controller or conventional site controller devices. See "Enabling/Disabling 802.1x on a GCP 8000 Site Controller/GBP 8000 Reference Distribution Module Ethernet Service Port with VoyenceControl" in the *802.1x Service Ports on Switches* manual.

23 Replace the site controller in the UNC. See “Replacing a Device” in the *Unified Network Configurator* manual.

24 Discover the site controller in the UEM, see the *Unified Event Manager* manual.

25 Verify that the site controller module is operating properly:

- The Link Status LED for the RJ-45 Service port on the front of the new site controller module is green.
- The Status LED on the front of the site controller is green.
- Use software tools, such as UEM and CSS, to verify the status of the equipment.

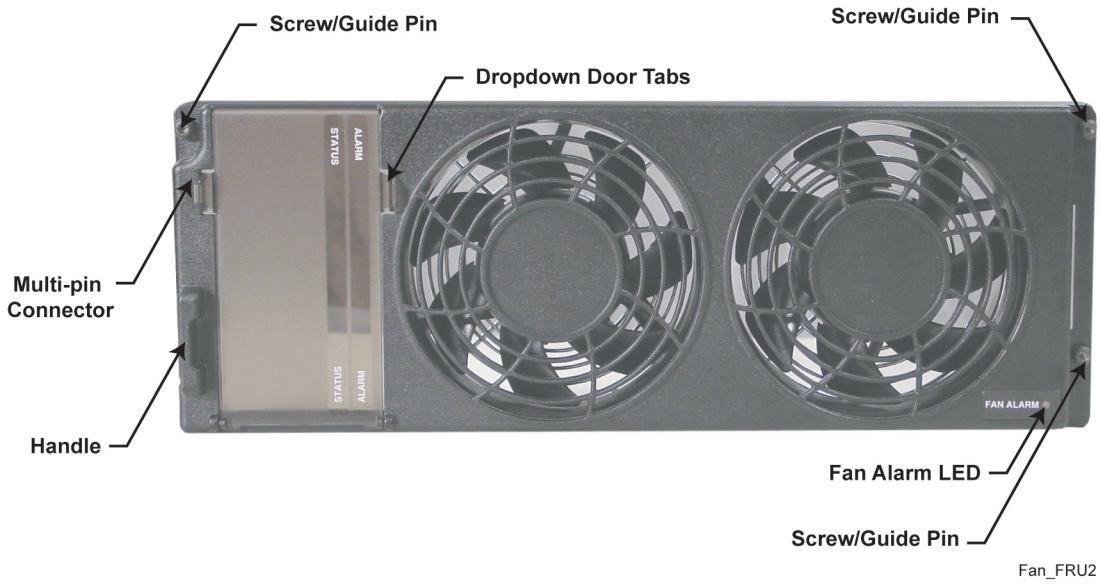
9.7 Replacing the Fan Assembly

WARNING: When removing a fan module, care should be taken to avoid contacting moving fan blades before and after removal with tools, hands, or other objects. If you are removing the fan module to access or replace the modules behind it, turn off the equipment power and allow the modules to cool before performing any work, as the surfaces of the modules can be extremely hot.

CAUTION: To prevent overheating, this fan must be in place at all times, except during servicing.

IMPORTANT: The fan assembly can be swapped out without shutting the power off. The replacement fan assembly must be in place within a reasonable amount of time so that the device module does not overheat and shut down.

Figure 60: Fan Assembly



When and where to use: Use this procedure to remove the fan module to replace the modules it covers.

Procedure:

1. Wear an Electrostatic Discharge (ESD) wrist strap and connect its cable to a verified good ground.

   CAUTION: Wear the ESD strap throughout this procedure to prevent ESD damage to any components.

2. Using a T20 bit, loosen the three captive screws on the front of the fan assembly, so they disengage from the chassis.
3. Using the handle on one end and the edge on the other side, gently pull the fan assembly straight out to disengage the connector.
4. Using the guide pins and the connector on the back of the new fan assembly, push the new fan assembly into place until it feels secured.
5. Using a T20 Bit, tighten the three captive screws on the front of the fan assembly. Torque to 17 ± 2 in-lb.
6. Verify that the fan assembly is operating properly, and the Fan Alarm LED is off. Use software tools such as Unified Event Manager (UEM) or Configuration/Service Software (CSS) to verify the status of the equipment.

9.8 Replacing a Power Supply

WARNING: The Power Supply module contains dangerous voltages which can cause electrical shock to people or damage to the equipment.

NOTICE: The power supply output is directly mapped to a PA/transceiver combination. Removal of a power supply results in a loss of the associated transmit channel until the replacement power supply is inserted and turned ON.
Place the base radio in Service Mode before replacing the module so the system does not attribute the loss of channel to a failure. For a GTR 8000 Site Subsystem, a power supply can be removed without disabling the site controllers if they are cabled to auxiliary power. Auxiliary power is available from the base radio connected to a power supply.

Figure 61: Power Supply

Procedure:

1. Wear an electrostatic discharge (ESD) wrist strap and connect its cable to a verified good ground.

   CAUTION: This strap must be worn throughout this procedure to prevent ESD damage to any components.

2. Place the base radio in Service Mode, as follows:

   a. Connect to the transceiver module Ethernet service port using Configuration/Service Software (CSS). See Connecting Through an Ethernet Port Link on page 100.

   b. From the menu, select **Service → Test and Measurement Screen**.

   c. Click **Change to Service Mode**.

   d. At the confirmation screen, click **OK**.

   The base radio halts activity in the current mode and switches operation to the requested mode.

3. Push the power rocker switch to Off (O) on the power supply unit.

4. Using a T20 bit, loosen the two captive screws on the front of the power supply to disengage them from the chassis.

   WARNING: Let the power supply module cool before performing the following step, which exposes surfaces of the module that can be extremely hot.

5. Pull on the metal handle to disengage the power supply from the backplane, and remove it completely from the chassis.

6. Slide the replacement power supply into place, pushing gently until it seats.

7 Using a T20 bit, tighten the two captive screws on the front of the power supply.

8 Turn the power button to On (I), and verify that the power supply is operating properly.

- The power supply Status LED is green.
- The power supply Alarm LED is off.
- The power supply Fan LED is off.
- Proper operation is confirmed using software tools, such as Unified Event Manager, and the **Power Supply Metering Screen** in Configuration/Service Software (CSS).

9 Place the base radio in Normal Mode, as follows:

a From the menu, select **Service** → **Test and Measurement Screen**.

b Click **Change to Normal Mode**.

c At the confirmation screen, click **OK**.

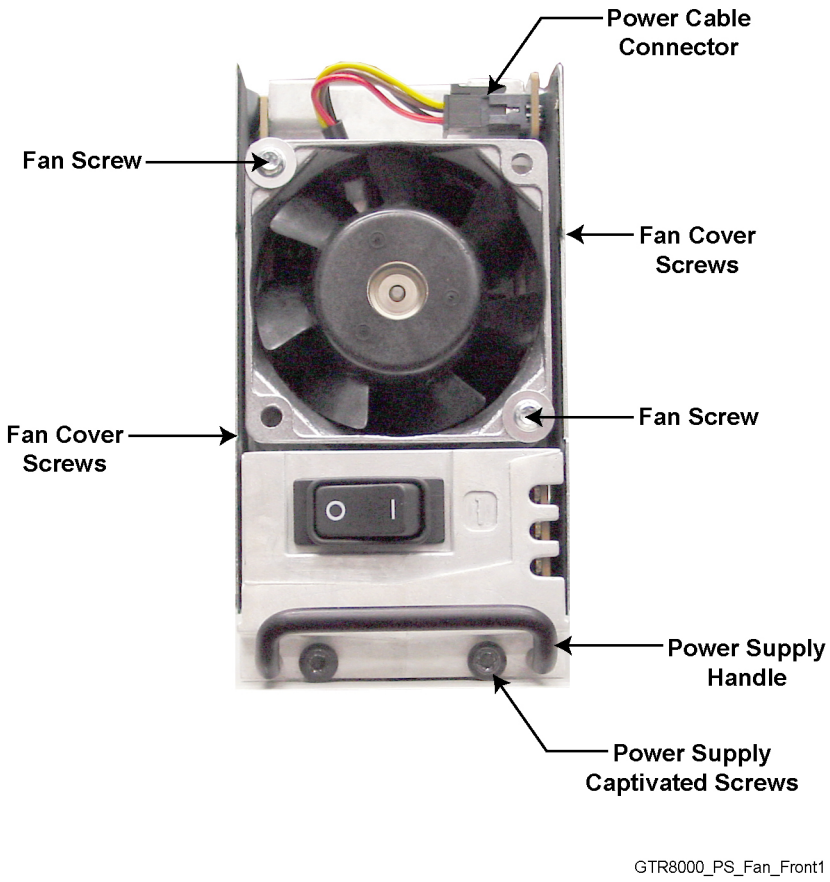
The base radio halts activity in the current mode and switches operation to the requested mode.

9.9 Replacing a Power Supply Fan

WARNING: The power supply module contains dangerous voltages which can cause electrical shock to people or damage to the equipment.

NOTICE: Replacing the power supply fan requires that the entire power supply module is removed. The power supply output is directly mapped to a PA/transceiver combination. Removal of a power supply results in a loss of the associated transmit channel until the replacement power supply is inserted and turned ON.
Place the base radio in Service Mode before replacing the module, so that the system does not attribute the loss of channel to a failure. For a GTR 8000 Site Subsystem, a power supply can be removed without disabling site controllers, if they are cabled to auxiliary power. Auxiliary power is available from any base radio still connected to a power supply.

Figure 62: Power Supply Fan



Procedure:

1. Wear an electrostatic discharge (ESD) wrist strap and connect its cable to a verified good ground.

   CAUTION: Wear the ESD strap throughout this procedure to prevent ESD damage to any components.

2. Place the base radio into Service Mode, as follows:

   a. Connect to the transceiver module Ethernet service port using Configuration/Service Software (CSS). See Connecting Through an Ethernet Port Link on page 100.

   b. From the menu, select **Service** → **Test and Measurement Screen**.

   c. Click **Change to Service Mode**.

   d. At the confirmation screen, click **OK**.

   The base radio halts activity in the current mode and switches operation to the requested mode.

3. Set the rocker switch on the front of the power supply to Off (O).

4. Using a T20 bit, loosen the two captive screws on the front of the power supply module to disengage them from the chassis.

   WARNING: Let the power supply module cool before performing the following step, which exposes surfaces of the module that can be extremely hot.

5. Pull on the metal handle to disengage the power supply from the backplane, and remove it completely from the chassis.

6 Remove the black fan cover from the power supply module:
   a Using a T15 bit, remove the four screws that connect the cover to the sides of the power supply module.
   b Slide the cover off (tilting the top edge out and lifting the bottom edge above the power supply handle).
7 Disconnect the power cable located above the fan.
8 Remove the two screws that secure the fan to the power supply.
9 Remove the fan and insert the new fan.
10 Secure the fan to the power supply with the two screws removed in step 8.
11 Attach the power cable for the fan to the connection on the power supply.
12 Replace the black fan cover:
   a Slide the cover on, tilting the bottom edge in, past the power supply handle.
   b Using a T15 bit, insert and tighten the four screws that connect the cover to the sides of the power supply module.
13 Slide the power supply into place, pushing gently until it seats.
14 Using a T20 bit, tighten the two captive screws on the front of the power supply module.
15 Turn the power button to On (I), and verify that the power supply is operating properly.
   - The power supply Status LED is green.
   - The power supply Alarm LED is off.
   - The power supply Fan LED is off and the fan is operating.
   - Proper operation is confirmed using software tools, such as Unified Event Manager, and the **Power Supply Metering Screen** in Configuration/Service Software (CSS).
16 Place the base radio in Normal Mode, as follows:
   a From the menu, select **Service** → **Test and Measurement Screen**.
   b Click **Change to Normal Mode**.
   c At the confirmation screen, click **OK**.

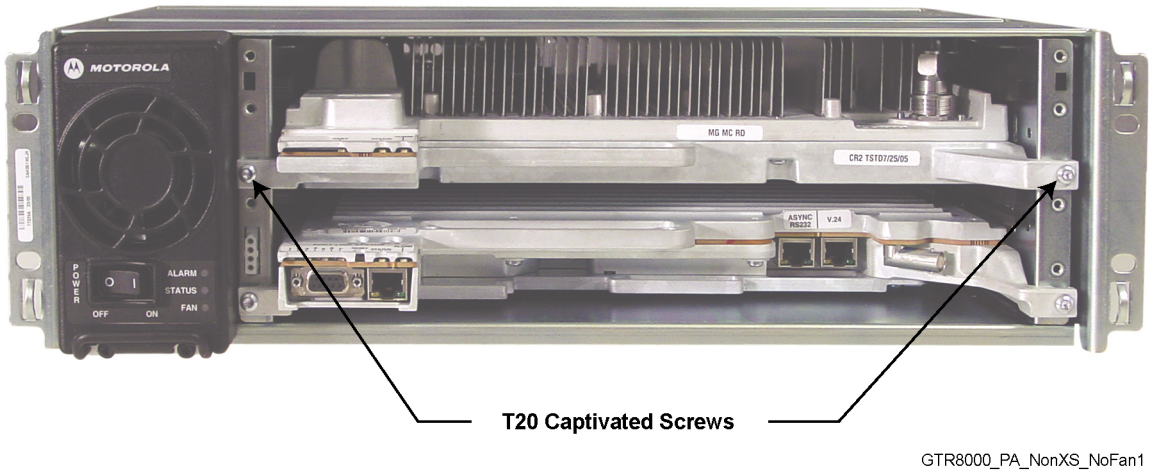
   The base radio halts activity in the current mode and switches operation to the requested mode.

9.10 Replacing a Power Amplifier

NOTICE: Place the base radio in Service Mode before replacing the module, so that the system does not attribute the loss of channel to a failure. Placing a base radio in Service Mode is performed using the Unified Event Manager or the Configuration/Service Software (CSS). It is not necessary to turn off the power supply for the power amplifier module you are replacing, as the power amplifier modules can be swapped out with the power on. If you choose to turn off the power, set the rocker switch on the front of the associated power supply to the Off (O) position.

The following figure shows the captive screws that secure the power amplifier module to the chassis in the GTR 8000 Base Radio.

Figure 63: Power Amplifier (Within Chassis)



Procedure:

1. Wear an electrostatic discharge (ESD) wrist strap and connect its cable to a verified good ground. This strap must be worn throughout this procedure to prevent ESD damage to any components.
2. If the base radio is not operational, go to step 4.
3. Place the base radio in Service Mode, as follows:
   a. Connect to the base radio transceiver module Ethernet service port using Configuration/ Service Software (CSS). See Connecting Through an Ethernet Port Link on page 100.
   b. From the menu, select **Service** → **Test and Measurement Screen**.
   c. Click **Change to Service Mode**.
   d. At the confirmation screen, click **OK**.

   The base radio halts activity in the current mode and switches operation to the requested mode.
4. If you choose to turn off the power, set the rocker switch on the front of the associated power supply to the Off (O) position.

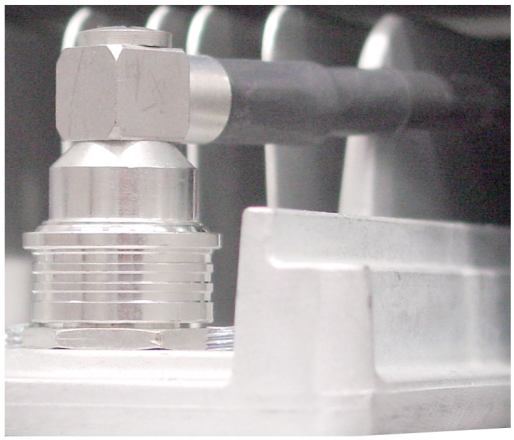
   NOTICE: It is not necessary to turn off the power supply for the power amplifier module you are replacing, as the power amplifier modules can be swapped out with the power on.
5. Remove the fan module to gain access to the power amplifier module. See Replacing the Fan Assembly on page 152.

   IMPORTANT: The power amplifier module is designed to be swapped out without shutting the power off. However, minimize the amount of time that the fan is removed, so the circuitry that remains powered on does not overheat and shut down.

   CAUTION: Let the power amplifier module cool before performing the following step, which exposes surfaces of the module that can be extremely hot.
6. Using a T20 bit, loosen the two captive screws on the front of the power amplifier module so that they disengage from the chassis.
7. Remove the RF output QN connector from the front of the power amplifier module, as follows.
   a. Pull the power amplifier out of the chassis far enough so that the QN (quick-N) RF output connector is accessible.

b Disconnect the cable from the power amplifier.

Figure 64: Power Amplifier RF Cable (Front)



GTR8000_XCVR_RFCable_On

8 Using the handle, gently pull the power amplifier module straight out, along the guides on which it sits.

9 Reconnect the RF cable to the RF output QN connector on the front of the power amplifier module, as follows:

a While holding the RF cable, slide in the replacement power amplifier module along the guiding rails until the RF cable connector can reach the RF connection on the front of the module.

b Push the RF cable connector onto the module's connector until it snaps securely into place.

10 Slide in the replacement power amplifier module until it engages with the backplane. A slight push may be needed to engage the module.

IMPORTANT: If the power amplifier module stops well before it is engaged, it is in an incorrect position. Either it is in the wrong slot or it is rotated 180 °.

11 Secure the power amplifier module to the chassis with the two captive screws on the front of the module.

12 Reinstall the fan module. See Replacing the Fan Assembly on page 152.

13 If you chose to turn off the power, set the rocker switch on the front of the associated power supply to the On (I) position.

14 Verify that the power amplifier is operating properly.

- The power amplifier Status and Transmit LEDs are green.
- The Alarm LED is off.
- Proper operation is confirmed using software tools, such as Unified Event Manager, and the Transmitter Metering Screen in Configuration/Service Software (CSS).

15 Place the base radio in Normal Mode, as follows:

a From the menu, select **Service** → **Test and Measurement Screen**.

b Click **Change to Normal Mode**.

c At the confirmation screen, click **OK**.

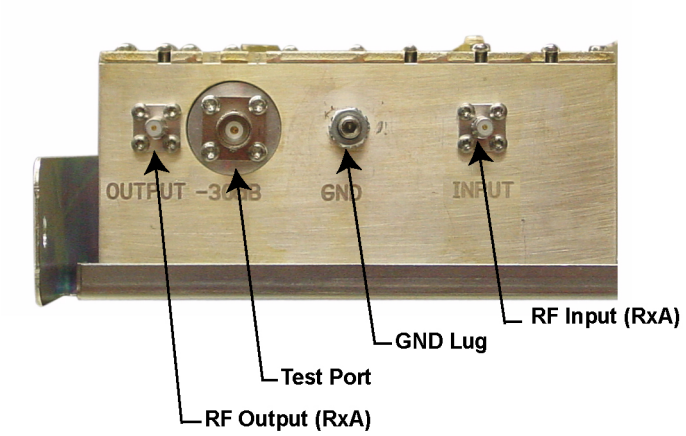
The base radio halts activity in the current mode and switches operation to the requested mode.

9.11

Replacing Filters/Preselectors in a GTR 8000 Site Subsystem

For GTR 8000 Site Subsystems, receive filters (preselectors) and transmit filters can be replaced individually, or you may receive the modules already secured to a filter tray. The following procedure includes instructions for replacing a filter tray or replacing individual filters on the tray.

Figure 65: Preselector Filter



WARNING: Shock hazard. GTR 8000 Site Subsystems contain dangerous voltages which can cause severe electrical shock or damage to the equipment. Set the rocker switches on the front of the associated power supplies to the off position before servicing this component in the subsystem.

When and where to use: If you are using the following procedure to replace one preselector filter, you can replace it without shutting the power down.

Procedure:

1. Wear an electrostatic discharge (ESD) strap and connect its cable to a verified good ground. This strap must be worn throughout this procedure to prevent ESD damage to any components.
2. Place the base radio in Service Model, as follows:
   a. Connect to the base radio transceiver module Ethernet service port using Configuration/ Service Software (CSS). See Connecting Through an Ethernet Port Link on page 100.
   b. From the menu, select **Service** → **Test and Measurement Screen**.
   c. Click **Change to Service Mode**.
   d. At the confirmation screen, click **OK**.

   The base radio halts activity in the current mode and switches operation to the requested mode.
3. Set the rocker switches on the front of the power supplies to the OFF (O) position.
4. Remove the filter tray from the rack, as follows:
   a. Label and disconnect the RF input, RF output, and ground cables from the front of the preselector.
   b. Using a T30 bit, remove the two screws which secure the filter tray to the rack.
   c. Slide the tray out the front of the rack.
5. Perform one of the following actions:

If…	Then…
If you are replacing an individual filter,	perform the following actions: **a** Remove the T20 screws that secure the filter to the tray. **b** Remove the filter. **c** Place the new filter in the tray in the same location and orientation as the filter you are replacing. **d** Secure the new filter to the existing tray using the T20 screws previously removed. **e** Go to step 6, using the existing tray
If you are replacing the entire tray including the filter or filters,	perform the following action: • Go to step 6, using the replacement tray.

6 Install the filter tray in the rack:

a Slide the filter tray into the appropriate location through the front of the rack.

b Secure the slide rail to the rack using the two screws which were previously removed.

c Reconnect the RF input, RF output, and ground cables to the preselector.

7 Set the rocker switches on the front of the power supplies to the On (I) position, to power up the GTR 8000 Site Subsystem.

8 Place the base radio in Normal Mode, as follows:

a From the menu, select **Service** → **Test and Measurement Screen**

b Click **Change to Normal Mode**.

c At the confirmation screen, click **OK**.

The base radio halts activity in the current mode and switches operation to the requested mode.

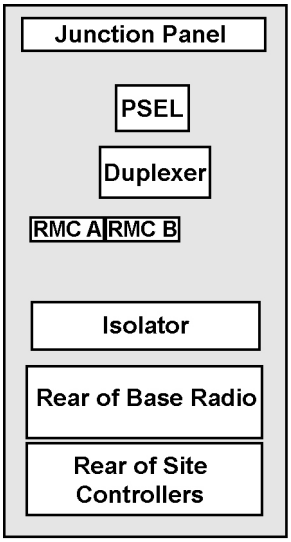
9 Verify that the GTR 8000 Site Subsystem is operating properly using fault management software, including:

- Unified Event Manager
- Transmitter Metering Screen in Configuration/Service Software (CSS)

9.12 Replacing a Cabinet RMC/LNA Module

The RMC/LNA modules and backplane connections are designed so that the modules can be swapped out without shutting the power down. In addition, the GTR 8000 Site Subsystem is designed with dual receive paths, so it may be possible to replace one RMC/LNA module without losing the channels provided by the subsystem. However, system performance may be degraded. If you choose to power down the subsystem, it causes any affiliated subscribers to relocate to another channel at the site or another channel at an adjacent site. Place the base radio in Service Mode before powering down, so that the system does not attribute the loss of channel to a failure. Placing a base radio in Service Mode is performed using Unified Event Manager (UEM) or the Configuration/Service Software (CSS).
The following figure shows the GTR 8000 Site Subsystem with two Cabinet RMC/LNA modules.

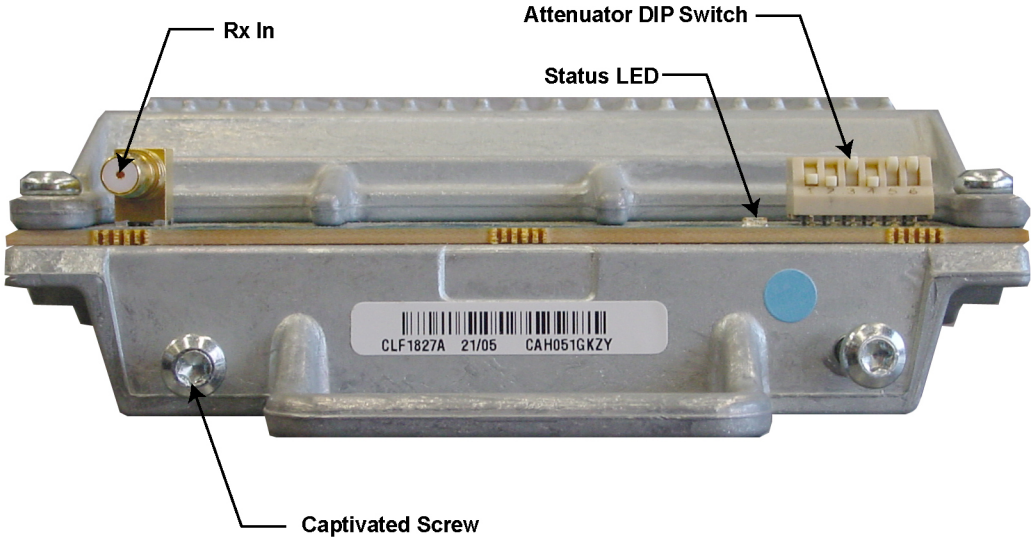
Figure 66: Cabinet RMC/LNA Modules in a GTR 8000 Site Subsystem (Rear View)



HPD_site_subsystem_config_rear_view

The following figure shows an individual Cabinet RMC/LNA module.

Figure 67: Cabinet RMC/LNA Module (Front View)



GTR8000_RFDS_XS_RMC_Cabinet_Front1

Procedure:

1. Wear an electrostatic discharge (ESD) strap and connect its cable to a verified good ground. This strap must be worn throughout this procedure to prevent ESD damage to any components.
2. Place the base radio in Service Mode, as follows:
   - **a** Connect to the base radio transceiver module Ethernet service port using Configuration/ Service Software (CSS). See Connecting Through an Ethernet Port Link on page 100.
   - **b** From the menu, select **Service** → **Test and Measurement Screen** .
   - **c** Click **Change to Service Mode**.

d At the confirmation screen, click **OK**.

The base radio halts activity in the current mode and switches operation to the requested mode.

3 If you choose to shut down the power, set the rocker switches on the front of the power supplies to the Off (O) position.

4 Remove the individual Cabinet RMC/LNA module as follows:

a Label and disconnect the QMA input connectors from the front of the RMC/LNA module. The QMA connectors can be disconnected by hand.

b Using a T20 bit, remove the two captive screws which secure the RMC module to the tray.

c If you are removing the center RMC/LNA module, the rack ground bar must be temporarily moved out of the way. Using a T30 bit, remove the screws which attach the ground bar to the rack and move the bar to one side. Note the screw locations in the bar so you can re-attach it in the same position. Retain the screws for use in re-attaching the ground bar. Do not remove any ground cables from the ground bar.

d Using the handle, gently pull the module straight out, along the guides on which it sits.

5 Set the DIP switches on the new Cabinet RMC/LNA module, using the instructions in RMC Attenuation on page 111.

6 Install the replacement Cabinet RMC/LNA module as follows:

a Slide in the module along the guiding rails.

b Secure the module to the chassis using the two T20 captive screws.

c If it is the center RMC/LNA that you are replacing, the ground bar must be re-secured. Move the ground bar to its original position and re-attach with the T30 screws.

d Reconnect the RF input cables to the QMA connector on the front of the RMC/LNA module.

7 If you chose to shut down the power, set the rocker switches on the front of the power supplies to the On (I) position.

8 Place the base radio in Normal Mode, as follows:

a From the menu, select **Service → Test and Measurement Screen**.

b Click **Change to Normal Mode**.

c At the confirmation screen, click **OK**.

The base radio halts activity in the current mode and switches operation to the requested mode.

9 Verify that the GTR 8000 Site Subsystem is operating properly using fault management software, including:

- Unified Event Manager
- Configuration/Service Software (CSS)

10 Verify that the RMC/LNA modules are operating properly.

- The Status LED on the front of each RMC/LNA module should be green.
- The red Alarm LED on the front of each RMC/LNA module should be off.

9.13 Replacing the Dual Circulator/Isolator Modules

When and where to use: These modules can be replaced individually, or if you order them together, you may receive the modules already secured to a tray. For GTR 8000 Site Subsystems, the following RFDS modules are assembled in a tray:

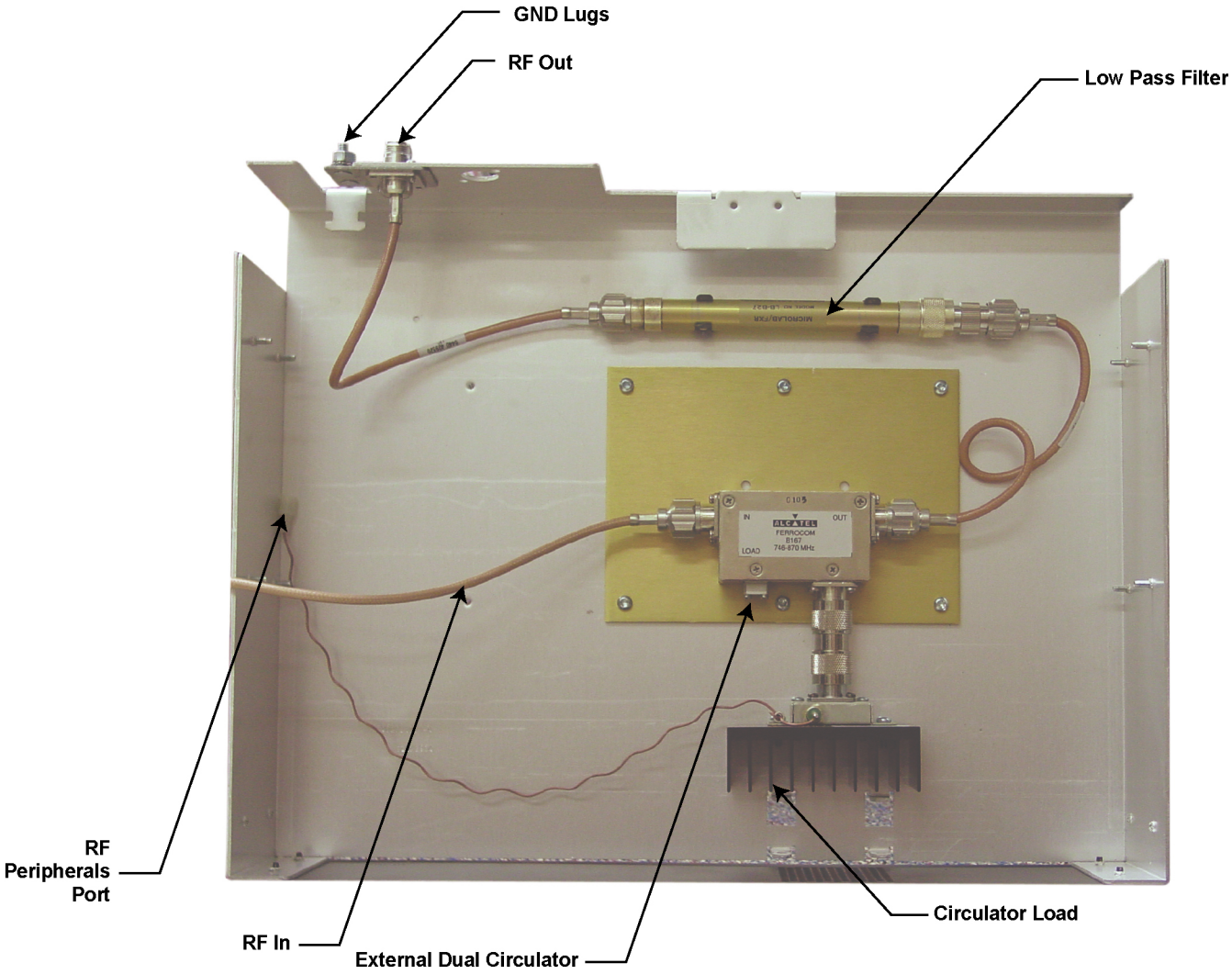
- External Dual Circulator/Isolator
- Circulator Load (a module connected directly to the External Dual Circulator module)
- Low Pass/Harmonic Filter

WARNING: Shock hazard. The GTR 8000 Site Subsystem contains dangerous voltages which can cause electrical shock or damage to the equipment. Set the power supply switches for the affected equipment to the Off (O) position when servicing this component in the GTR 8000 Site Subsystem.

Powering down the base radio causes any affiliated subscribers to relocate to another channel at the site or another channel at an adjacent site. Place the base radio in Service Mode before powering down, so that the system does not attribute the loss of channel to a failure. Placing a base radio in Service Mode is performed using Unified Event Manager (UEM) or the Configuration/Service Software (CSS).

The following figure shows these modules installed on a tray.

Figure 68: Dual Circulator/Isolator Tray (Top View)



Procedure:

1. Wear an electrostatic discharge (ESD) strap and connect its cable to a verified good ground. This strap must be worn throughout this procedure to prevent ESD damage to any components.
2. Place the base radio in Service Mode, as follows:
   a. Connect to the base radio transceiver module Ethernet service port using Configuration/ Service Software (CSS). See Connecting Through an Ethernet Port Link on page 100.
   b. From the menu, select **Service → Test and Measurement Screen**.
   c. Click **Change to Service Mode**.
   d. At the confirmation screen, click **OK**.

   The base radio halts activity in the current mode and switches operation to the requested mode.
3. Set the rocker switch on the front of the power supply to the OFF (O) position.
4. Remove the filter tray from the rack, as follows:
   a. Label and disconnect the RF input, RF output, and ground cables from the tray.

b Disconnect the Circulator Load temperature cable at the inline connector (which disconnects it from the cable leading to the RF Peripherals port on the base radio backplane).

c Using a T30 bit, remove the two screws which secure the tray to the rack.

d Slide the tray out the front of the rack.

5 Perform one of the following actions:

If…	Then…
If you are replacing an individual External Dual Circulator/Isolator module,	perform the following actions: **a** Label and disconnect the RF input and RF output cables from the External Dual Circulator module. **b** Unscrew the connector that secures the Circulator Load to the External Dual Circulator module. **c** Remove the screws that secure the circulator baseplate to the tray. **d** Remove the circulator module including the circulator load module that extends beyond the baseplate. **e** Place the new External Dual Circulator module in the tray in the same location and orientation as the module you are replacing. **f** Secure the new External Dual Circulator module baseplate to the tray using the screws previously removed. **g** Connect the RF input and RF output cables to the new External Dual Circulator module. **h** Connect the Circulator Load to the External Dual Circulator module. **i** Go to step 6, using the existing tray.
If you are replacing an individual Circulator Load,	perform the following actions: **a** Unscrew the connector that secures the Circulator Load to the External Dual Circulator module. **b** Remove the Circulator Load module. **c** Place the new Circulator Load module on the tray in the same position and orientation as the module you removed. **d** Secure the new Circulator Load to the External Dual Circulator module by tightening the connector. **e** Connect the Circulator load cable to the RF Peripherals port on the base radio backplane. **f** Go to step 6, using the existing tray.
If you are replacing an individual Low Pass/ Harmonic Filter module,	perform the following actions: **a** Label and disconnect the RF input and RF output cables from the Low Pass/Harmonic Filter module. **b** Pull up firmly to release the Low Pass Filter module from the two semi-circular clips holding it in place. **c** Insert the new Low Pass Filter module into the semi-circular clips using the same orientation as the module you are replacing. **d** Connect the RF input and RF output cables to the new Low Pass/ Harmonic Filter module.

If…	Then…
	e Go to step 6, using the existing tray.
If you are replacing the entire tray including all of its modules,	perform the following actions: • Go to step 6, using the replacement tray.

6 Install the tray in the rack:

a Slide the tray into the appropriate location through the front of the rack.

b Secure the slide rail to the rack using the two screws which were previously removed.

c Reconnect the RF input, RF output, and ground cables.

d Reconnect the Circulator Load temperature cable at the inline connector (which connects it to the cable leading to the RF Peripherals port on the base radio backplane).

7 Set the rocker switches on the front of the power supplies to the On (I) position.

8 Place the base radio in Normal Mode, as follows:

a From the menu, select **Service** → **Test and Measurement Screen**.

b Click **Change to Normal Mode**.

c At the confirmation screen, click **OK**.

The base radio halts activity in the current mode and switches operation to the requested mode.

9 Verify that the GTR 8000 Site Subsystem is operating properly using fault management software, including:

- Unified Event Manager
- Transmitter Metering Screen in Configuration/Service Software (CSS)

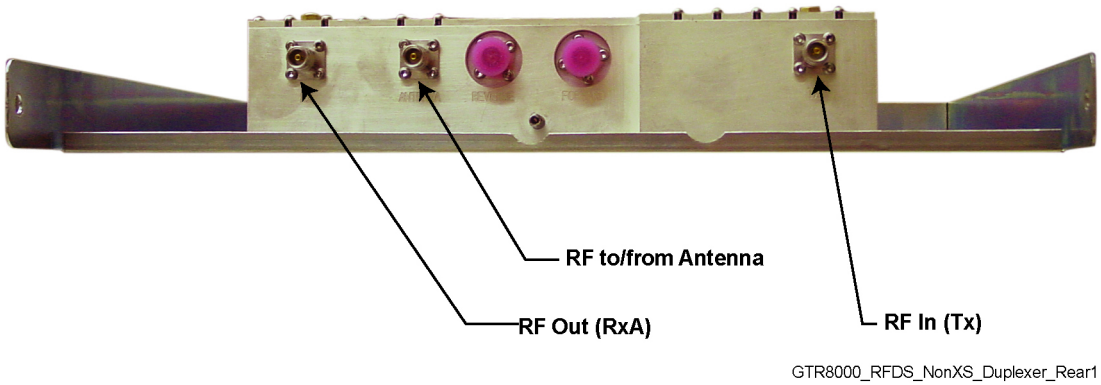
9.14 Replacing a Duplexer

Powering down the GTR 8000 Site Subsystem causes any affiliated subscribers to relocate to another channel at the site or another channel at an adjacent site. Place the base radio in Service Mode before powering down, so that the system does not attribute the loss of channel to a failure. Placing a base radio in Service Mode is performed using Unified Event Manager (UEM) or the Configuration/Service Software (CSS).

WARNING: Shock hazard. The GTR 8000 Site Subsystem contains dangerous voltages which can cause electrical shock or damage to the equipment. Set the power supply switches for the affected equipment to the Off (O) position when servicing this component in the GTR 8000 Site Subsystem.

The following figure shows the duplexer installed on a tray in the GTR 8000 Site Subsystem.

Figure 69: Duplexer Module



Procedure:

1. Wear an electrostatic discharge (ESD) wrist strap and connect its cable to a verified good ground. This strap must be worn throughout this procedure to prevent ESD damage to any components.
2. Place the base radio in Service Mode, as follows:
   - **a** Connect to the base radio transceiver module Ethernet service port using Configuration/ Service Software (CSS). See Connecting Through an Ethernet Port Link on page 100.
   - **b** From the menu, select **Service** → **Test and Measurement Screen**.
   - **c** Click **Change to Service Mode**.
   - **d** At the confirmation screen, click **OK**.

   The base radio halts activity in the current mode and switches operation to the requested mode.
3. Set the rocker switch on the front of the power supply to the OFF (O) position.
4. Remove the duplexer tray from the rack, as follows:
   - **a** Label and disconnect the Rx output, Tx input, antenna output, and ground cables from the duplexer.
   - **b** Using a T30 bit, remove the two screws which secure the tray to the rack.
   - **c** Slide the tray out the front of the rack.
5. Remove the duplexer from the tray, by removing the T20 screws that attach it to the tray.
6. Install the new duplexer in the tray, as follows:
   - **a** Place the new duplexer in the tray, in the same location and orientation as the module that you removed.
   - **b** Secure the replacement duplexer to the tray, using the T20 screws you previously removed.
7. Re-install the duplexer tray in the rack, as follows:
   - **a** Slide the tray into the front of the rack.
   - **b** Using a T30 bit, secure the tray to the rack with the two screws you previously removed.
   - **c** Reconnect the Rx output, Tx input, Antenna output, and ground cables to the duplexer.
8. Set the rocker switch on the front of the power supply to the ON (I) position.
9. Place the base radio in Normal Mode, as follows:
   - **a** From the menu, select **Service** → **Test and Measurement Screen**.
   - **b** Click **Change to Normal Mode**.

c At the confirmation screen, click **OK**.

The base radio halts activity in the current mode and switches operation to the requested mode.

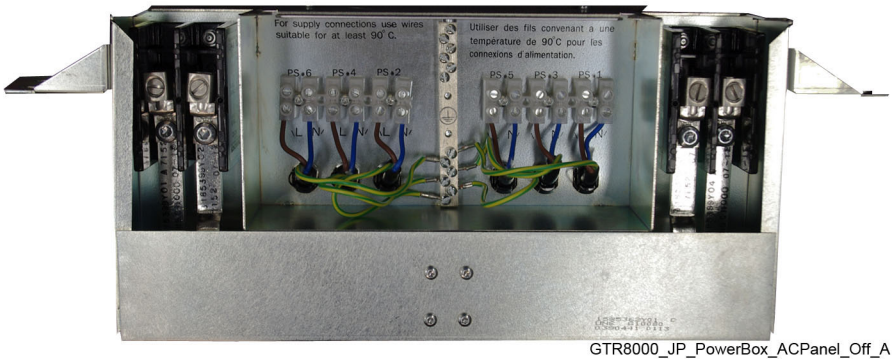
9.15

Replacing the Power Distribution Module

The power distribution module includes all AC and DC output cables that power the subsystem. This cabling is in place when you receive the system.
Powering down the GTR 8000 Site Subsystem causes any affiliated subscribers to relocate to another channel at the site or another channel at an adjacent site. Disable the site before powering down, so that the system does not attribute the loss of channel to a failure. You can disable a site using Unified Event Manager (UEM) or the Configuration/Service Software (CSS).

The following figure shows the power distribution module with the terminal block access panel removed. The power distribution module is wired for six AC outputs, not three as shown in the figure.

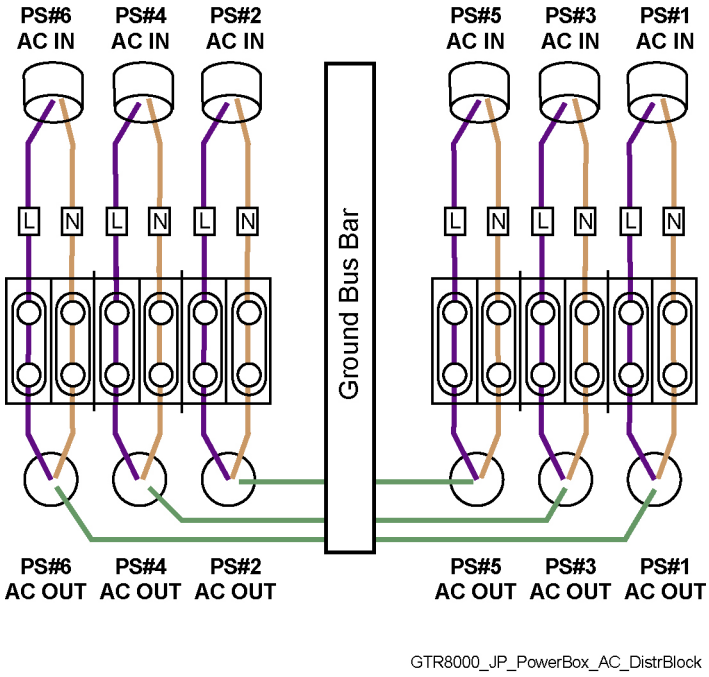
Figure 70: Power Distribution Module (Access Panel Removed)



The following figure shows AC distribution block of the power distribution module. In the figure:

- “L” indicates “Line” or “Hot” AC power feed.
- “N” indicates “Neutral” AC power feed.
- Input cable ground wires should be terminated to the ground bus bar.

Figure 71: Power Distribution Module – AC Distribution Block Diagram



Prerequisites: The procedure assumes the following service access clearances:

- At least 2 ft access at the rear of the rack
- At least 2 ft access on both sides of the rack

WARNING: Shock hazard. GTR 8000 Site Subsystems contain dangerous voltages which can cause electrical shock or damage to the equipment. Remove the AC and DC sources when servicing the power distribution module. Electrical installation work shall be carried out in accordance with the current edition of the NFPA 70 and local building codes. Where required, only a qualified and licensed electrician shall be used for all electrical installations.

CAUTION: The power distribution module and its cables are heavy. To avoid injury and damage to the equipment, have another person help lift and support the equipment when installing or removing the distribution module.

When and where to use: Follow this procedure to replace the power distribution module, including its AC and DC output cables.

Procedure:

1. Wear an electrostatic discharge (ESD) wrist strap and connect its cable to a verified good ground. This strap must be worn throughout this procedure to prevent ESD damage to any components.
2. Disable the site, as follows:
   a. Connect to the appropriate site controller using Configuration/Service Software (CSS). See Connecting Through an Ethernet Port Link on page 100.
   b. From the menu, select **Service** → **Status Panel Screen**.
   c. Select the **Site Info** tab.
   d. In the **User Requested Site State** drop down list, select **Site OFF**.

   The site is disabled.
3. Set the power supply rocker switches to OFF (O).

4 Set all the AC supply breakers to the OFF position and open up the DC battery disconnects to power down the entire GTR 8000 Site Subsystem. Also shut down any other base radio racks which are connected to the GTR 8000 Site Subsystem.

5 Label and disconnect all input AC and DC power cables from the power distribution module.

6 Ensure that all power cables in the subsystem are free to be removed.

- Disconnect all power connectors from the AC and DC ports on the base radio and site controller backplanes.
- If the cables are tied to the rack, remove the ties.

7 Disengage the power distribution module from the junction panel by removing the two screws on each side of the power distribution module, using a T30 bit.

8 Lift the power distribution module to remove it, and feed the power cables to remove them from the rack.

9 Place the new power distribution module next to the junction panel in the same position and orientation as the module you removed.

10 Secure the power distribution module to the junction panel by securing the two screws on each side of the power distribution module to the junction panel, using a T30 bit

11 Connect the new module power cables to the appropriate backplane input ports. For backplane connection information, see Backplanes and Card Cages on page 51.

12 Reconnect all input AC and DC input power cables to the appropriate ports in the power distribution module. See Figure 71: Power Distribution Module – AC Distribution Block Diagram on page 170for the terminal block connections.

13 Secure the cables to the rack with cable ties.

14 Set all the AC supply breakers to the ON position and connect the DC battery to power up the GTR 8000 Site Subsystem. Also restore power to any other base radio racks which are connected to the GTR 8000 Site Subsystem.

15 Set the power supply rocker switches to On (I).

16 Enable the site, as follows:

a Connect to the appropriate site controller using Configuration/Service Software (CSS).

b From the menu, select **Service** → **Status Panel Screen**.

c Select the **Site Info** tab.

d In the **User Requested Site State** drop down list, select **Wide Trunking**.

The site is enabled.

17 Verify that the subsystem is operating properly using software tools, including:

- Unified Event Manager
- Power Supply Metering Screen in Configuration/Service Software (CSS)

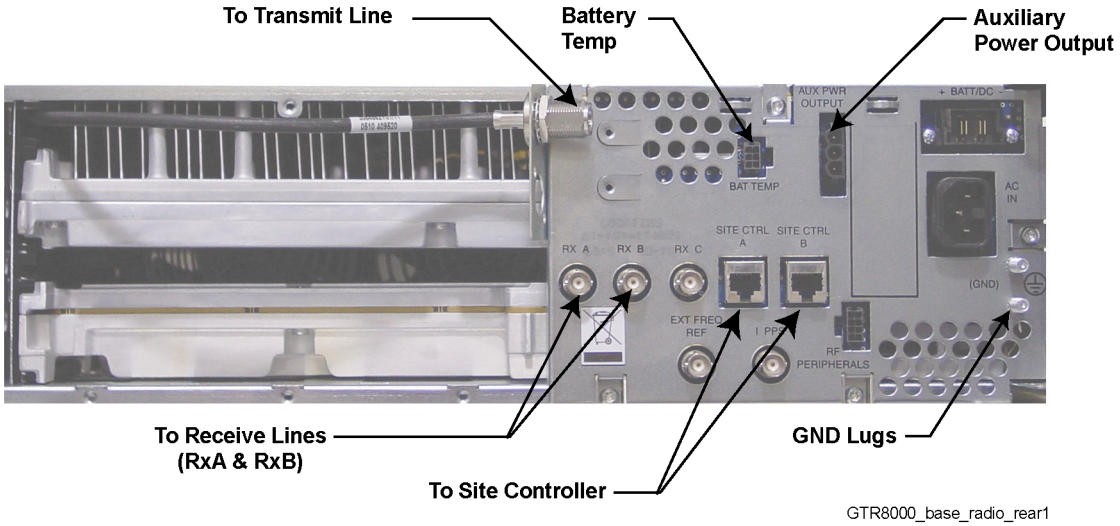
9.16 Replacing the GTR 8000 Base Radio Backplane

In a GTR 8000 Site Subsystem configuration, the “backplane” is the circuit board at the rear of the card cage which connects the power supply, transceiver, and power amplifier.
Powering down the base radio causes any affiliated subscribers to relocate to another channel at the site or another channel at an adjacent site. Place the base radio in Service Mode before powering down, so that the system does not attribute the loss of channel to a failure. Placing a base radio in

Service Mode is performed using Unified Event Manager (UEM) or the Configuration/Service Software (CSS).

The following figure shows the metal cover that must be removed to access the backplane and the ports for cables that must be disconnected to remove the cover.

Figure 72: GTR 8000 Base Radio (Backplane Cover)



Prerequisites: The procedure assumes the following service access clearances:

- At least 2 ft access at the rear of the rack
- At least 2 ft access on one side of the rack, and at least 6 inches at the rear of the rack

When and where to use: Follow these procedures to replace the base radio backplane.

Procedure:

1. Wear an electrostatic discharge (ESD) strap and connect its cable to a verified good ground. Be sure to wear this strap throughout this procedure to prevent ESD damage to any components.
2. If the base radio is not operational, go to step 4.
3. Place the base radio in Service Mode, as follows:
   a. Connect to the transceiver Ethernet service port using Configuration/Service Software (CSS). See Connecting Through an Ethernet Port Link on page 100.
   b. From the menu, select **Service → Test and Measurement Screen**.
   c. Click **Change to Service Mode**.
   d. At the confirmation screen, click **OK**.

   The base radio halts activity in the current mode and switches operation to the requested mode.
4. Push the power rocker switch to Off (O) on the power supply unit.
5. Label, then disconnect all cables from the base radio backplane.
6. To access the backplane screw behind the metal bulkhead, using a T20 bit remove the two screws securing the bulkhead to the inner chassis at the left of the backplane.

   NOTICE: There is an RF output cable from the power amplifier which connects through a metal bulkhead to the left of the backplane. This cable does not need to be disconnected.
7. Remove the power supply module from the chassis as follows:

a Using a T20 bit, loosen the two captive screws on the front of the power supply, so that they disengage from the chassis.

WARNING: Let the power supply module cool before performing the following step, which exposed surfaces of the module that can be extremely hot.

b Pull on the metal handle to disengage the power supply module from the backplane, and remove it completely from the chassis.

8 Remove the fan assembly module to gain access to the transceiver and power amplifier modules. See Replacing the Fan Assembly on page 152.

9 Disengage the transceiver module and the power amplifier from the backplane as follows:

a Using a T20 bit, loosen the two captive screws on the front of each module, so that they disengage from the chassis.

WARNING: Let the power amplifier module cool before performing the following step which exposes surfaces of the module that can be extremely hot.

b Using their handles, gently pull the modules until they disengage from the backplane.

10 Using a T20 bit, remove the screw that secures the tab on the right EMI spring panel. See Figure 74: EMI Spring Panel Guide Rail Alignment on page 175.

NOTICE: Removing the left EMI spring panel is optional.

11 Carefully slide the EMI spring panel forward, noting how the panel is affixed onto the power supply guide rail. The panel does not need to be completely removed.

12 Remove the fan cable from the backplane, from the front of the chassis, with the backplane still secured to the chassis, as follows:

a Follow the fan cable with your hand from its connector at the front of the chassis to its connection to the backplane, through the card cage section from which you removed the power supply module.

b Remove the fan cable multi-pin connector from the backplane by squeezing the top and bottom of the connector and pulling the connector straight out from the backplane.

13 Remove the five screws, using a T20 bit, that secure the metal backplane cover and the backplane circuit board to the rear of the base radio chassis.

14 Remove the metal backplane cover and the backplane circuit board.

15 Place the new backplane circuit board in the same location and orientation as the one that you removed.

16 Replace the backplane cover and insert and start the five screws previously removed.

17 Secure the new backplane circuit board and the backplane cover to the rear of the base radio chassis by torquing the screws to 18 +/- 2 in.-lbs.

18 Reinstall the metal bulkhead that holds the RF output cable from the power amplifier, using the two screws previously removed to secure it to the inner chassis at the left of the backplane.

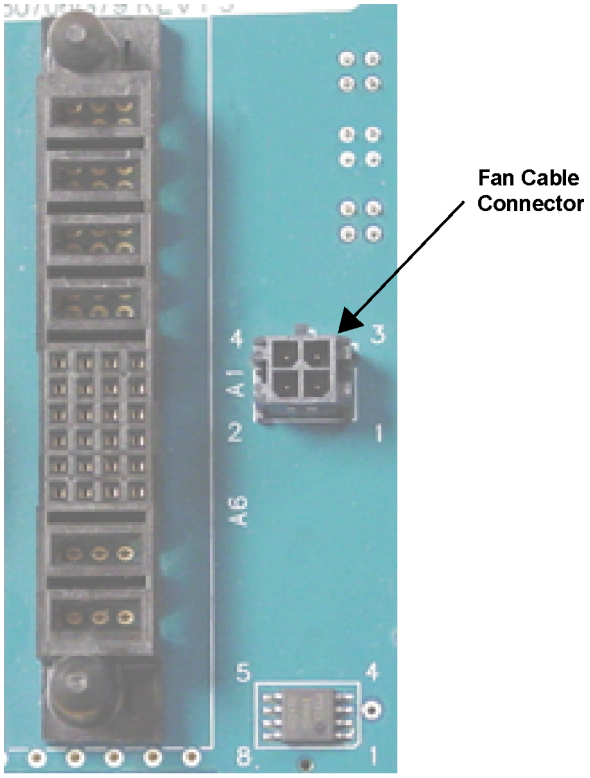
19 Connect the fan cable to the new backplane, from the front of the chassis, with the backplane secured to the chassis, as follows:

a Locate the port in the new backplane for the fan cable's multi-pin connector.

b Follow the fan cable with your hand from its connector at the front of the chassis to the connector at the other end of the cable.

c Push the fan cable multi-pin connector, with the tab up, into the correct location in the backplane.

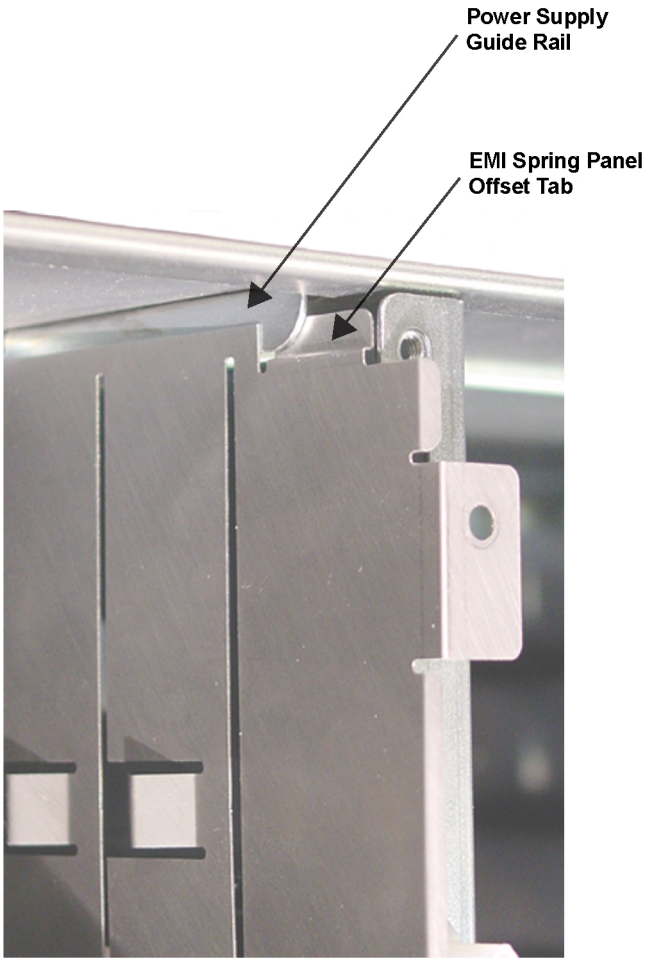
Figure 73: Fan Cable Connector



GTR_GCP_Fan_Cable_Connector

20 Slide the EMI spring panel back into the cabinet, making sure that the offset tabs on the panel are to the right (inside) of the power supply guide rail, making sure that the panel does not catch on the fan cable.

Figure 74: EMI Spring Panel Guide Rail Alignment



21 Reinstall the screw into the EMI spring panel tab.

22 Slide the transceiver and power amplifier modules into the new backplane. A slight push may be needed to engage the modules.

23 Secure the transceiver and power amplifier modules to the chassis with the two captive screws on the front of each module.

24 Reinstall the fan assembly unit. See Replacing the Fan Assembly on page 152.

25 Slide the power supply into the chassis, pushing gently until it seats in the new backplane.

NOTICE: If the power supply does not seat properly, remove it and adjust the EMI spring panel properly against the mounting flange.

26 Tighten the two captive screws on the front of the power supply.

27 Reconnect all cables at the rear of the base radio.

28 Set the power supply rocker switch to On (1).

29 Verify that the LEDs indicate the modules you removed and reinstalled are operational.

- The Status LEDs are green.

- The Alarm LEDs are off.
- The power supply Fan LED is off.

30 Place the base radio in Normal Mode, as follows:

a From the menu, select **Service** → **Test and Measurement Screen**.

b Click **Change to Normal Mode**.

c At the confirmation screen, click **OK**.

The base radio halts activity in the current mode and switches operation to the requested mode.

31 Verify proper operation using software tools, such as:

- Unified Event Manager
- Configuration/Service Software (CSS)

32 Re-configure the Security Settings into the Backplane. See Setting the Serial Security Services in CSS on page 98.

Chapter 10

GTR 8000 Site Subsystem Reference

This chapter contains supplemental reference information relating to GTR 8000 Site Subsystem.

Reference information for GTR 8000 Site Subsystem includes LED states and specifications for individual RFDS modules.

10.1 GTR 8000 Base Radio LEDs

Many of the LEDs on the GTR 8000 Base Radio provide an indication for one or more the following conditions:

Lamp Test
The Lamp Test state verifies that the indicators are operational. For Lamp Test, the LEDs stay in this state for a second or less.

Failure
A failure has occurred that can be fixed only through replacement. If a reason other than a hardware fault is causing the state, Impaired is noted.

Impaired
The device is not fully operational due to internal or external causes. Some corrective action must be taken to get back to 100% operation.

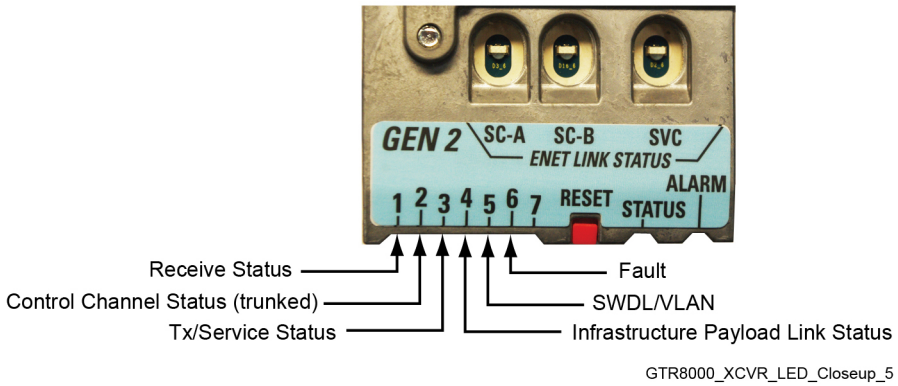
Booting Up
The device is not in service due to running of diagnostics or initializing.

Online
The device is fully operational.

The LEDs for the transceiver and power amplifier modules can be viewed through the door next to the fans with the door opened or closed.

10.1.1 GTR 8000 Base Radio Transceiver LEDs

Figure 75: Transceiver LEDs (viewable through a drop-down door)



10.1.1.1

Transceiver Status and Alarm LEDs

The Status LED is green, and the Alarm LED is red. These LEDs are either off, on, or blinking depending on the condition of the transceiver.

Table 35: Transceiver Status and Alarm LEDs

Condition	Green (Status LED)	Red (Alarm LED)
No Power	Off	Off
Lamp Test (During Test)	On	On
Impaired Operation	On	Blinking
Critical Failure	Off	On
Booting Up	Blinking	Off
Operational	On	Off

For detailed information on current operation and fault status, use the Configuration/Service Software (CSS) **Status Panel** screen.

10.1.1.2

Transceiver Ethernet Link Status LEDs

The following LEDs indicate Ethernet link and status connections between the transceiver, LAN, and the front panel service port.

Table 36: Transceiver Ethernet Link Status LEDs

LED Name	Indication	LED Status
ENET SC-A (external connection to SITE CTRL A on the rear of the chassis)	Ethernet link inactive (Remote PHY/MAC not detected.)	Off
	Ethernet link established (Remote PHY/MAC detected and auto-negotiation completed.)	Green
	GTR 8000 Base Radio Ethernet link active (Actively transmitting or receiving data.)	Amber (blinking)
ENET SCB (external connection to SITE CTRL B on the rear of the chassis)	Ethernet link inactive (Remote PHY/MAC not detected.)	Off
	Ethernet link established (Remote PHY/MAC detected and auto-negotiation completed.)	Green
	GTR 8000 Base Radio Ethernet link active (Actively transmitting or receiving data.)	Amber (blinking)
ENET SVC (front panel service port)	Ethernet link inactive (Remote PHY/MAC not detected.)	Off
	Ethernet link established (Remote PHY/MAC detected and auto-negotiation completed.)	Green
	GTR 8000 Base Radio Ethernet link active (Actively transmitting or receiving data.)	Amber (blinking)

10.1.1.3

Transceiver Application-Controlled LEDs

The application-controlled LEDs can be green, red, or amber depending on the conditions.

Table 37: Transceiver Application-Controlled LEDs

Condition	LED 1 Receive Status	LED 2 Control Channel Status	LED 3 Tx/ Service Status	LED 4 Infrastructure Payload Link Status
Booting Up*	Green	Green	Green	Green
Lamp Test	Amber	Amber	Amber	Amber
Receiver Inhibited	Amber (blinking)			
Receiver Active	Green			
RF Channel Interference	Red (blinking)			
Monitor Before Data Transmit	Green			
Illegal Carrier	Red (blinking)			
Control Channel (Operating)		Green		
Control Channel (Failsoft)		Green (blinking)		
Service Mode			Amber	
Transmitter Inhibited			Amber (blinking)	
Infrastructure Link Connected (V.24, IP, and 4–wire/V.24)				Green
Partial Infrastructure Link Established (V.24 link established, 4–wire link not established)				Amber
Infrastructure Link Disconnected (V.24, IP, and 4–wire/V-24)				Green (blinking)

* During a normal boot up sequence, LEDs 1 through 4 blink from left to right and from right to left continuously for several seconds.

10.1.1.4

Transceiver Services-Controlled LEDs

For the service-controlled LEDs, the color of all LEDs must be observed to interpret the condition of the transceiver.

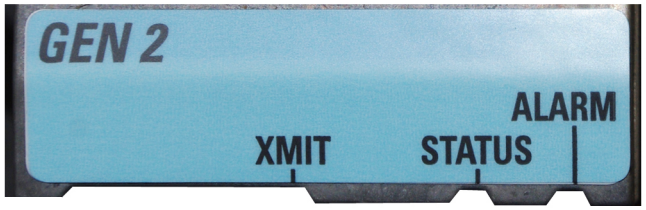
Table 38: Transceiver Services-Controlled LEDs

Condition	LED 5 SWDL/ VLAN	LED 6 Fault	LED 7
Lamp Test	Amber	Amber	Amber
Receiver Inhibited		Red	
Receiver Reference Failure		Red	
Transmitter Inhibited		Red	
SWDL (Software Download transfer in progress)	Green		
Warning		Amber	
Minor Hardware Failure		Amber (blinking)	
Major Hardware Failure		Red (blinking)	
Critical Hardware Failure		Red	
VSWR Fault		Red	

10.1.2

Power Amplifier LEDs

Figure 76: Power Amplifier LEDs, viewable through a drop-down door



GTR8000_PA_LED_Closeup1

The power amplifier LED color must be observed to interpret the power amplifiers condition. For example:

- If the Alarm LED is red and the Transmit and Status LEDs are not lit, the condition is “PA Failure” and the power amplifier module should be replaced.

Table 39: Power Amplifier LEDs

Condition	Transmit (XMIT)	Status	Alarm
Power Off	Off	Off	Off
Lamp Test	Amber	Green	Red
Not Transmitting	Off	Green	Off

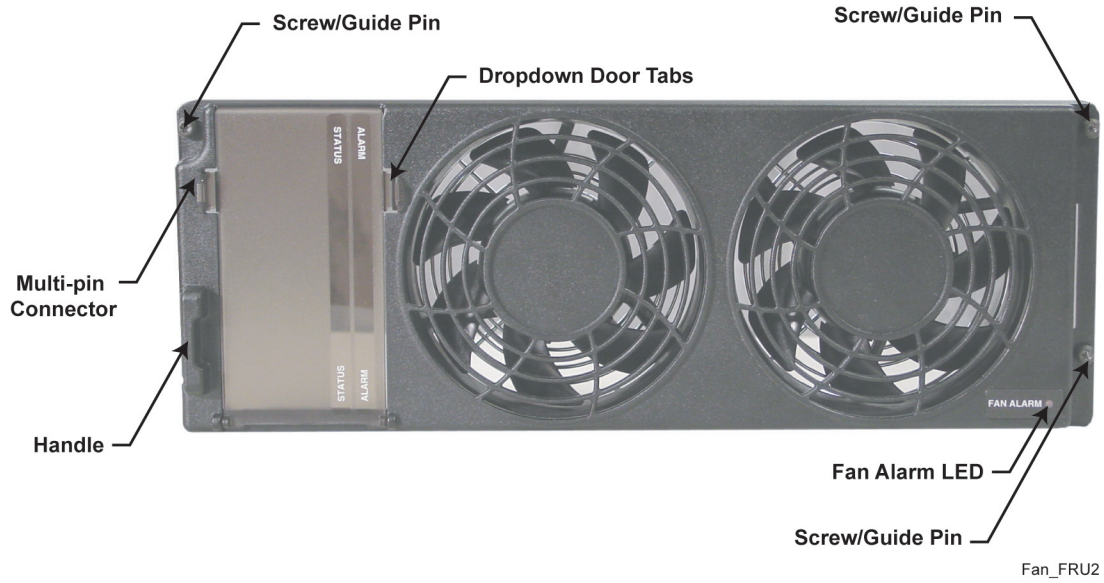
Table continued…

Condition	Transmit (XMIT)	Status	Alarm
Transmitting at Full Requested Output Power	Green	Green	Off
Transmitting at Less Than Requested Power	Amber	Green	Red
PA Failure	Red	Off	Red
Receive Only	Off	Off	Off
Transmitter Inhibited	Off	Green	Red (blinking)

10.1.3
Fan Module LED

The fan module has one Fan Alarm LED visible on the lower right corner of its front panel. The Alarm is red during Lamp Test (for 1 second or less), and remains red if the fan failures. A fan failure alarm occurs if the built-in speed sensor detects if either fan drops 30% below rated speed. A red Fan Alarm indicates that the fan module must be replaced.

Figure 77: Fan Module-Alarm LED (lower right corner)



NOTICE: The fan operates at full capability for at least seven days after the fan alarm first occurs, allowing normal operation without requiring an immediate service call.

10.1.4
Power Supply LEDs

The power supply has three LEDs visible from the front panel. To interpret its condition, observe the color of all the power supply LEDs. For example:

- If the Alarm and Fan LEDs are red and the Status LED is green, the condition is "Lamp Test"
- If the Alarm LED is red and the Fan and Status LEDs are not lit, the condition is "Power Supply Failure"

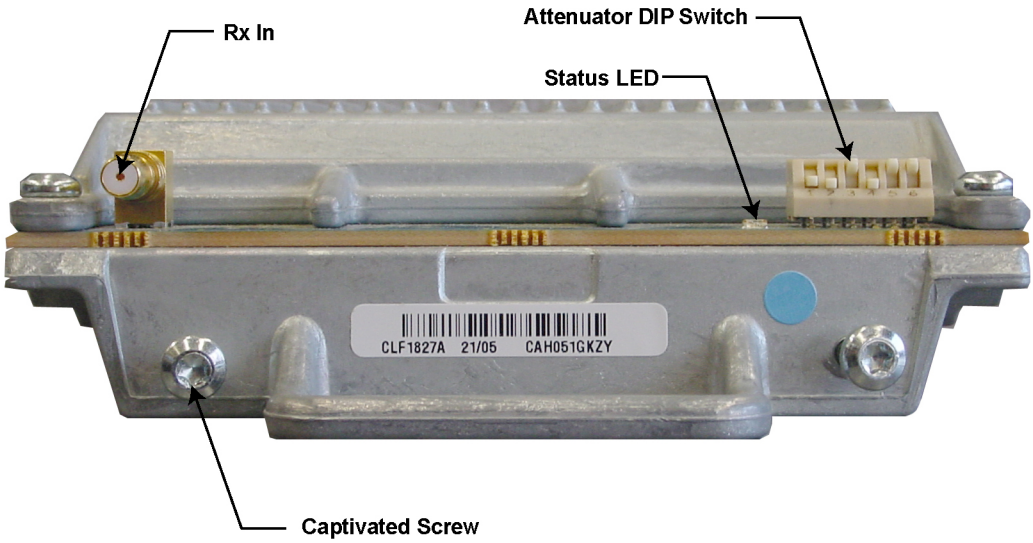
Figure 78: Power Supply Module

Table 40: Power Supply LEDs

Condition	Fan	Status	Alarm
Power Off	Off	Off	Off
Lamp Test	Red	Green	Red
Online	Off	Green	Off
Impaired	Off	Green	Red (blinking)
Power Supply Failure	Off	Off	Red
Power Supply Fan Failure	Red	Off	Red

10.1.5
RMC/LNA Alarm and Status LEDs

Figure 79: Cabinet RMC/LNA Module



GTR8000_RFDS_XS_RMC_Cabinet_Front1

Receive multicouplers/low noise amplifiers (RMCs/LNAs) have a green Status LED and red Alarm LED next to the DIP switches. These LEDs are either off or on, depending on the condition of the module, as indicated in the table.

Table 41: RMC/LNA Module LED States

Information State	Alarm LED (red)	Status LED (green)
No Power	Off	Off
Failure	On	Off
Online	Off	On

10.2
RFDS Equipment Specifications

This section provides specifications for all the RFDS equipment:site preselector filter, duplexer, and receiver multicoupler / low noise amplifier.

10.2.1
Site Preselector Filter Specifications

Table 42: Site Preselector Filter Specifications

	Site Preselector Spec Limit (700/800 MHz)	Typical
Frequency range	792-825 MHz	

Table continued…

	Site Preselector Spec Limit (700/800 MHz)	Typical
Insertion loss	1 dB	0.6 dB
VSWR max.	1.5:1	1.3:1
Tx selectivity	75 dB	78 dB
Test Port Coupling		-30 dB
Input Connector	QMA	
Output Connector	QMA	
Test Port Connector	BNC	
Test Port Coupling	-30 dB	
Test Port Coupling	-30 dB	

10.2.2
Duplexer Specifications

Table 43: Duplexer Specifications

	Duplexer Spec Limit (700/800 MHz)	Typical	Notes
Tx Frequency range	764-776 MHz or 851-870 MHz		
Rx Frequency range	792-806 MHz or 806–825 MHz		
Insertion loss Tx	1 dB	0.5 dB	
Insertion loss Rx	1 dB	0.6 dB	
VSWR max.	1.5:1	1.23:1	
Rx isolation	80 dB	85 dB	
Tx isolation	80 dB	85 dB	
Passive Intermodulation	-120 dBc		2 x 43 dBm
Antenna Connector	QN		
Rx/Tx Output Connector	QN		
Rx/Tx Output Connector	QN	QN	

10.2.3

Site Receiver Multicoupler/Low Noise Amplifier (RMC/LNA) Specifications

Table 44: Site Receiver Multicoupler/Low Noise Amplifier (RMC/LNA) Specifications

	Site RMC/LNA Spec Limit	Site RMC/LNA Typical	Notes
Frequency range	776–824 MHz		
Attenuator range	0-31 dB		
Default attenuator setting	1 dB		Factory preset
Default Gain Primary Output Expansion Outputs	 9 dB 11.8 dB	 10.5 dB 12.3 dB	Factory preset
Noise Figure Primary Output Expansion Outputs	 2.6 dB 2.4 dB	 2.0 dB 1.8 dB	Factory preset
Third Order output intercept Primary Output Expansion Outputs		 23 dBm 25 dBm	Factory preset
Input connector type	QMA		
Output connector type Primary Output Expansion Outputs	 QMA BNC (3)		
VSWR max	1.5:1		All ports

10.2.4

Cabinet Receiver Multicoupler/Low Noise Amplifier (RMC/LNA) Specifications

Table 45: Cabinet Receiver Multicoupler/Low Noise Amplifier (RMC/LNA) Specifications

	Cabinet RMC/LNA Spec Limit	Cabinet RMC/LNA Typical	Notes
Frequency range	776–824 MHz		
Attenuator range	0-31 dB		
Default attenuator setting No Site RMC With Site RMC	 0 dB 10 dB		Factory pre-set
Default Overall Gain No Site RMC With Site RMC	 15 dB 5 dB	 16.3 dB 6.4 dB	Factory pre-set

Table continued…

	Cabinet RMC/LNA Spec Limit	Cabinet RMC/LNA Typical	Notes
Noise Figure No Site RMC With Site RMC	 2.4 dB 4.5 dB	 1.7 dB 3.7 dB	Factory pre-set
Third Order output intercept No Site RMC With Site RMC		 29 dBm 24 dBm	Factory pre-set
Input connector type	QMA		
Output connector type	Harting 6–way		
VSWR max	1.5:1		All ports

Chapter 11

GTR 8000 Site Subsystem Disaster Recovery

This chapter provides references and information that assist in the recovery the GTR 8000 Base Radio and GCP 8000 Site Controller in the event of a failure.

11.1 Recovering the GTR 8000 Base Radio

Follow the steps in this process to recover the GTR 8000 Base Radio.

Process:

1. To replace, install, connect power, and cable the base radio, see GTR 8000 Site Subsystem Hardware Installation on page 67.
2. To replace the transceiver module within the chassis only, see Replacing a Transceiver Module on page 144 and follow steps 1 through 14.
3. To replace other hardware devices within the chassis or cabinet, see GTR 8000 Site Subsystem FRU Procedures on page 139.
4. To perform basic device configuration and SWDL download, see Replacing a Transceiver Module on page 144 and follow steps 15 through 26.

11.2 Recovering the GCP 8000 Site Controller

Follow these process steps to recover the GCP 8000 Site Controller.

Process:

1. To replace, install, connect power, and cable the site controller, see GTR 8000 Site Subsystem Hardware Installation on page 67.
2. To replace the site controller module within the chassis only, see Replacing the GCP 8000 Site Controller Module on page 148 and follow steps 1 through 15.
3. To replace other hardware devices within or on the chassis, see GTR 8000 Site Subsystem FRU Procedures on page 139.
4. To perform basic device configuration and SWDL download, see Replacing the GCP 8000 Site Controller Module on page 148 and follow steps 16 through 25.

11.3 Performing a Site Download

Procedure:

1. Connect an Ethernet straight through cable between the Ethernet port on the service computer/laptop and the Ethernet service port on the site controller. The service computer/laptop IP address must be set to an address on the subnet of the local site, which varies depending on the site and zone numbers. See Connecting Through an Ethernet Port Link on page 100.

2 Open the Software Download Manager.

CAUTION: Load the correct version of the software. There is a possibility of a mismatch in software versions when replacing the transceiver module with an on-hand spare. If a mismatch in software versions occurs, this mismatch may cause the base radio at the site to go into a configuration mode of operation with a reason of 'Invalid Software Version'. To exit out of configuration mode, see “CSS Procedures > Changing from Configuration to Normal Mode” in the *CSS Online Help*.
If a mismatch in software versions occurs with a site controller, this mismatch may cause a 'critical malfunction', or if it becomes active, to bring the entire site into a configuration mode of operation.

3 From the **Advanced Options** menu, select the transfer type.

4 Download and install the necessary software onto the site controllers and base radios as follows:

a From the menu, select **Action** → **Use DNS Server**.

NOTICE: Typically, the site is part of an ASTRO® 25 system equipped with a DNS server, and therefore the **Use DNS Server** setting (default setting) should be selected. For ASTRO® 25 site upgrade scenarios when the system DNS server cannot be reached, select **Use Standard ASTRO IPs**.
The **Load DNS File** selection should only be used in situations where a custom DNS configuration file has been provided. Typically, this option is selected when the site IP addresses are not configured to be part of an ASTRO® 25 system.

b From the menu, select **File** → **File Manager**.

The **Software Depot File Manager** opens.

c From the menu, select **Component Operations** → **Import Fileset**.

The **Import a Fileset Into the Software Depot** dialog box appears.

d Click **Browse** and search for the `swdlv3.cfg` file, or follow the path `E:\swdl\swdlv1.cfg` or `swdlv3.cfg`. Click **Open**.

The file appears in the **Configuration File Path** field of the dialog box.

e Click **Generate**. Click **OK**.

the **Import a Fileset Into the Software Depot** dialog box closes and the software component appears in the **Components In the Software Depot** list of the **Software Depot File Manager** window.

f Exit the **Software Depot File Manager**.

g From Software Download Manager, click **Open Site Mode**.

h From the **ASTRO 25 Site Type** field, select the type of site.

i Select the **Zone**, **Site**, and if applicable, the **Subsite**. The Subsite ID is only available when the Site ID is between 1-64.

j Click **Connect**.

k If the device supports SNMPv3 protocol, a pop-up window appears with the security level option. Choose the required security level. Click **OK**.

NOTICE: Depending on the size of the system, the window takes a few minutes to update.
If the Ethernet connection to the site uses the Site Controller Service Port, you might need to enter an 802.1x login account to connect to the SC Service Port. An 802.1x account is a centrally managed account.

The system connects to the specified zone and site.

l In **Operations Type**, select **Transfer and Install**.

m In the **Application Type**, select both **HPD Site Controller** and **HPD Base Radio**.

n In the **Software Component** the drop-down list select the version for each site device.

o In the **Simultaneous Channels Install** drop down list, select the number of the channels to install simultaneously.

Software Download Manager always installed all channels. For example, setting the **Simultaneous Channels Install** field to a specific number value means that those amounts of channels are installed simultaneously.

NOTICE: The **Simultaneous Channels Install** field decreases the installation time. A warning is displayed if the site goes into failsoft, due to this setting.

p Click **Start Operation**.

NOTICE: If the **Start Operation** button is grayed out, SWDL has determined that there is a problem performing this operation to the selected devices. The button becomes active, when the appropriate operation set details are selected.
If a fileset is damaged, the Transfer operation stops. Import a correct fileset and repeat the operation.

q In the window that appears, click **Proceed**.

The Transfer operation begins first. After the transfer is successfully completed, SWDL begins the Install operation.

If the install was successful, the **Operation Status** bar displays green. If the install failed, the **Operation Status** bar displays red.

r Verify that the selected devices have installed the desired version of software.

NOTICE: After installation, the new software version is present in the **Running Version** column. If the new version is not present, it indicates a problem.
For more information, consult the “Fixing a Transfer Failure” section of the *Software Download Manager* manual.

In many cases, a second attempt at transferring the software corrects the failure. If further attempts continue to fail, contact System Support.

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