System Release 7.17
ASTRO® 25
INTEGRATED VOICE AND DATA

Simulcast Subsystem with HPD Overlay

NOVEMBER 2016

MN003355A01-A

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Document History

Version	Description	Date
MN003355A01-A	Original release of the *Simulcast Subsystem with HPD Overlay* manual	November 2016

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About Simulcast Subsystem with HPD Overlay

This manual covers the installation, configuration, and management of an ASTRO® 25 Simulcast Subsystem with HPD Overlay from the site perspective.

What Is Covered in This Manual

This manual contains the following chapters:

- Simulcast Subsystem with HPD Overlay Description on page 21 provides a high-level overview of the simulcast subsystem with HPD Overlay feature.
- Simulcast Subsystem with HPD Overlay Technical Overview on page 23 provides a detailed description of the necessary components of a simulcast subsystem with HPD Overlay Site.
- Simulcast Subsystem with HPD Overlay Installation on page 31 includes the topics for HPD Overlay equipment that may be installed at a simulcast prime site or remote site.
- Simulcast Subsystem with HPD Overlay Configuration on page 45 contains the procedures for configuring the HPD equipment.
- Simulcast Subsystem with HPD Overlay Feature Expansion/Upgrades on page 51 provides information necessary to add HPD Overlay to an existing simulcast site.

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 that should be followed when setting up a Motorola Solutions communications site. Also known as R56 manual. The R56 manual may be purchased on CD **9880384V83** by calling the North America Parts Organization at 800-422-4210 (or the international number: 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(r) 25 radio communication system.
GGM 8000 System Gateway	Provides a single source for customer reference to install, configure, and optimize the transport gateway wherever the transport gateway is used.
Motorola GGM 8000 Hardware User Guide	Provides hardware installation, basic software configuration, and cabling instructions for the GGM 8000 gateway.

Related Information	Purpose
Motorola Network Router (MNR) S2500 Hardware User Guide	Provides hardware installation, basic software configuration, and cabling instructions for the MNR S2500 router.
Motorola Network Router (MNR) S6000 Hardware User Guide	Provides hardware installation, basic software configuration, and cabling instructions for the MNR S6000 router.
	These guides are available on the Motorola Solutions Online website. To access the guides, select **Resource Center → Product Information → Manuals → Network Infrastructure → Routers and Gateway**.

Chapter 1

Simulcast Subsystem with HPD Overlay Description

This chapter contains a high-level description of the simulcast subsystem with High Performance Data (HPD) Overlay and the function it serves on your system.

1.1
Overview

HPD remote site equipment can be added to a prime site or remote sites within a simulcast subsystem to provide HPD services. The HPD Overlay equipment at a site share location and the same network transport path (switch, router, and site link) as the IV&D equipment at the site. However, the HPD Overlay equipment operates separately from the IV&D equipment. It has its own HPD GCP 8000 Site Controller platform, HPD GTR 8000 Base Radios, and MOSCAD Network Fault Management (NFM) monitoring platform. The HPD Overlay equipment does not interact with the IV&D equipment at a site.

NOTICE: When simulcast subsystem is referenced, it pertains to both circuit-based and IP-based simulcast subsystems.

The Dynamic System Resilience (DSR) feature supports Simulcast Subsystems with HPD Overlay. For more information on DSR, see the *Dynamic System Resilience* manual.

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Chapter 2

Simulcast Subsystem with HPD Overlay Technical Overview

This chapter explains how the simulcast subsystem with an HPD Overlay site works in the context of your system.

2.1
Simulcast Subsystem with HPD Overlay

A simulcast prime site or remote site can be equipped with overlay equipment to provide HPD services within the site coverage area. The overlay equipment consists of an HPD GCP 8000 Site Controller (with redundant modules) and up to five HPD GTR 8000 Base Radios.

Multiple HPD sites may be colocated at different sites within a simulcast subsystem, but each HPD site operates independently. HPD signaling is not simulcasted.

2.1.1
Simulcast Prime Site with HPD Overlay

At a prime site with HPD Overlay, both HPD GCP 8000 Site Controllers are connected to their respective site switches. Depending on the equipment supported at the prime site and each of the remote sites, the prime site can be handling a large volume of traffic to the zone core. In this case, multiple T1/E1 site links can be required.

This document only describes HPD overlay on the simulcast subsystem. For more information about the simulcast subsystem configurations, equipment, and options, see the simulcast subsystem documentation.

> **NOTICE:** Both HPD GCP 8000 Site Controllers connect to the LAN at the prime site. To prevent a switched network loop, disable the Ethernet connection between the HPD GCP 8000 Site Controllers.

The following figure shows the typical layout for HPD equipment collocated at a circuit-based simulcast prime site.

Figure 1: Circuit-Based Simulcast Prime Site with HPD Overlay
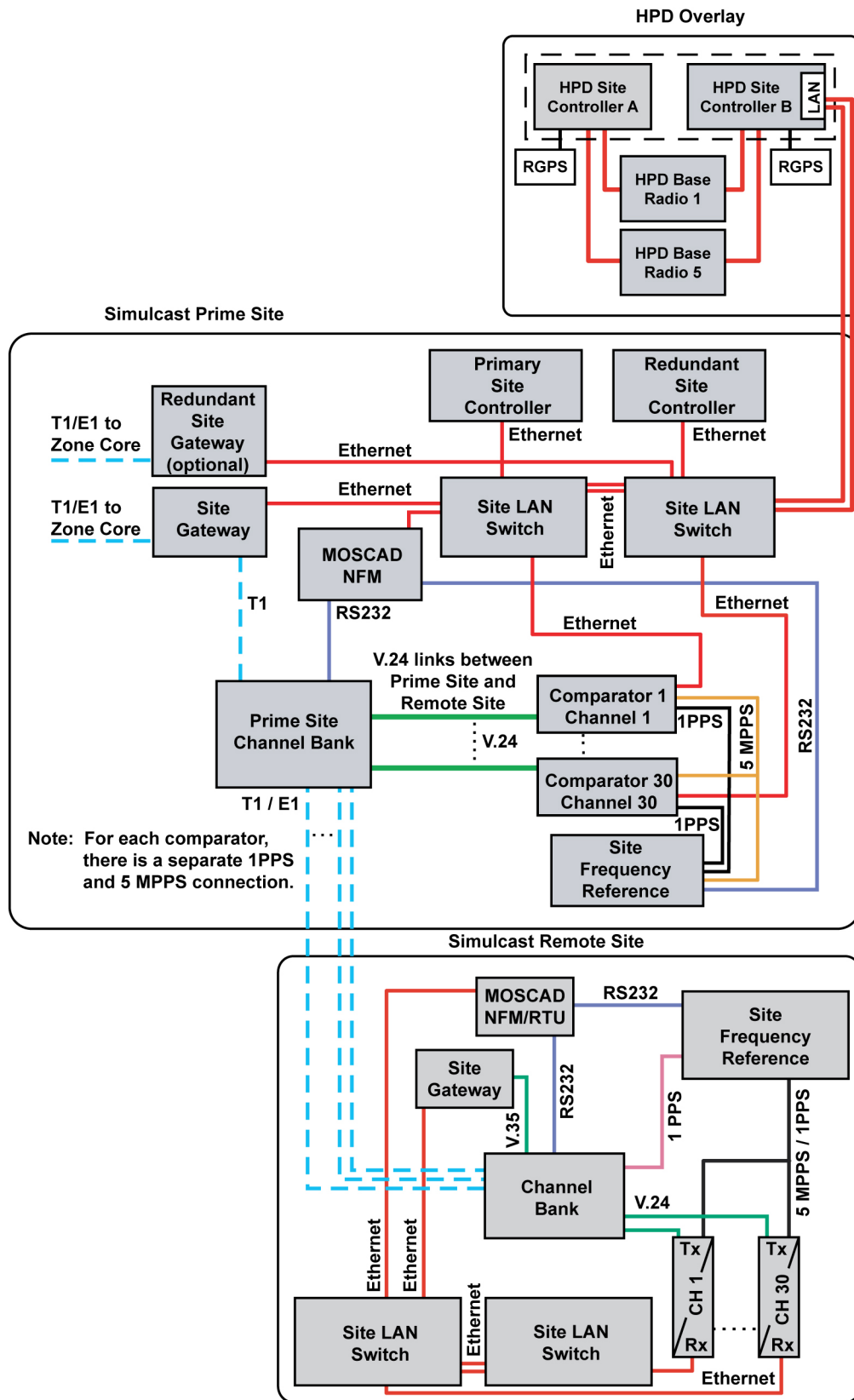
S_Simul_Prime_Site_W_HPD_Overlay2

The following figure shows the typical layout for HPD equipment collocated at an IP-based simulcast prime site.

> **NOTICE:**
> The following figure features T1/E1 links. Simulcast Subsystems with HPD Overlay also support Ethernet links. For more information, see the *Flexible Site and InterZone Links* manual.
>
> Both HPD GCP 8000 Site Controllers connect to the LAN at the prime site. To prevent a switched network loop, disable the Ethernet connection between the HPD GCP 8000 Site Controllers.

Figure 2: Trunked IP-Based Simulcast Prime Site with HPD Overlay

S_IP_Simul_Prime_Site_W_HPD_Overlay_D
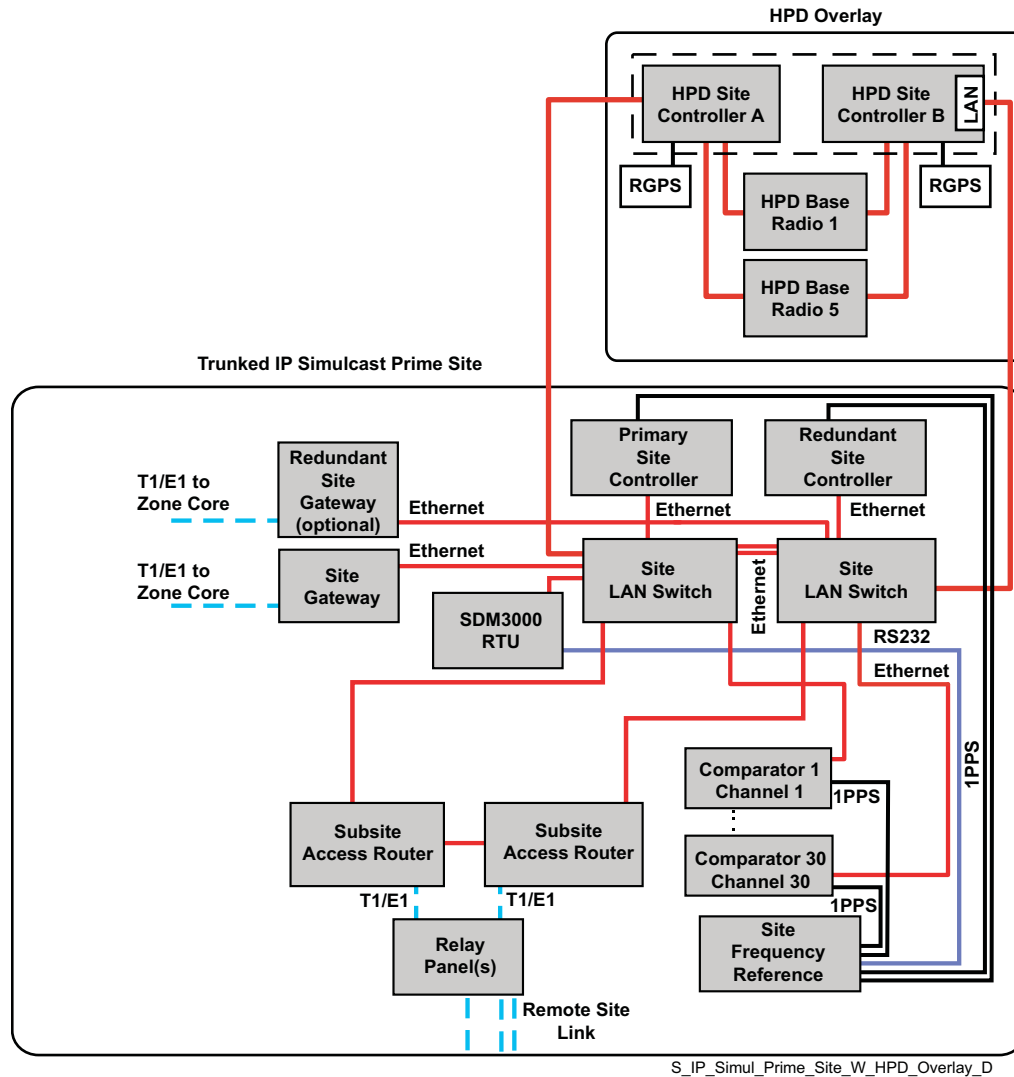
Simulcast Prime Site with Geographical Redundancy and HPD Overlay

To provide a highly available trunked IP simulcast subsystem, a simulcast prime site can be split to two separate locations. Each half of a geographically redundant simulcast prime site is called a split prime site. Switchover to back up facilities and equipment occurs without operator intervention.

An HPD overlay site collocated at the prime site must reside only on the primary prime site. Both HPD site controllers are connected to the same split prime site LAN switch. This configuration results in lower availability for the collocated HPD overlay site since A LAN switch failure completely isolates the HPD site from the master site.

2.1.2
Simulcast Remote Site with HPD Overlay

For simulcast remote sites with up to 14 IV&D channels, typically, only one switch exists at the remote site. When only one switch exists at the site, only the primary HPD GCP 8000 Site Controller module has a physical connection to the switch. The two HPD GCP 8000 Site Controllers must have an internal Ethernet connection enabled. IP simulcast remote subsites can also be configured with GPB 8000 Reference Distribution Modules (RDM). The RDM acts as the IP simulcast remote subsite switch. Typically there are two RDMs in the remote subsite to provide redundancy. Therefore the two HPD GCP 8000 Site Controllers must not have the internal Ethernet connection enabled in the configuration with two RDMs.

The following figure shows the layout for HPD equipment at a circuit-based simulcast remote site.

Figure 3: Circuit-Based Simulcast Remote Site with HPD Overlay
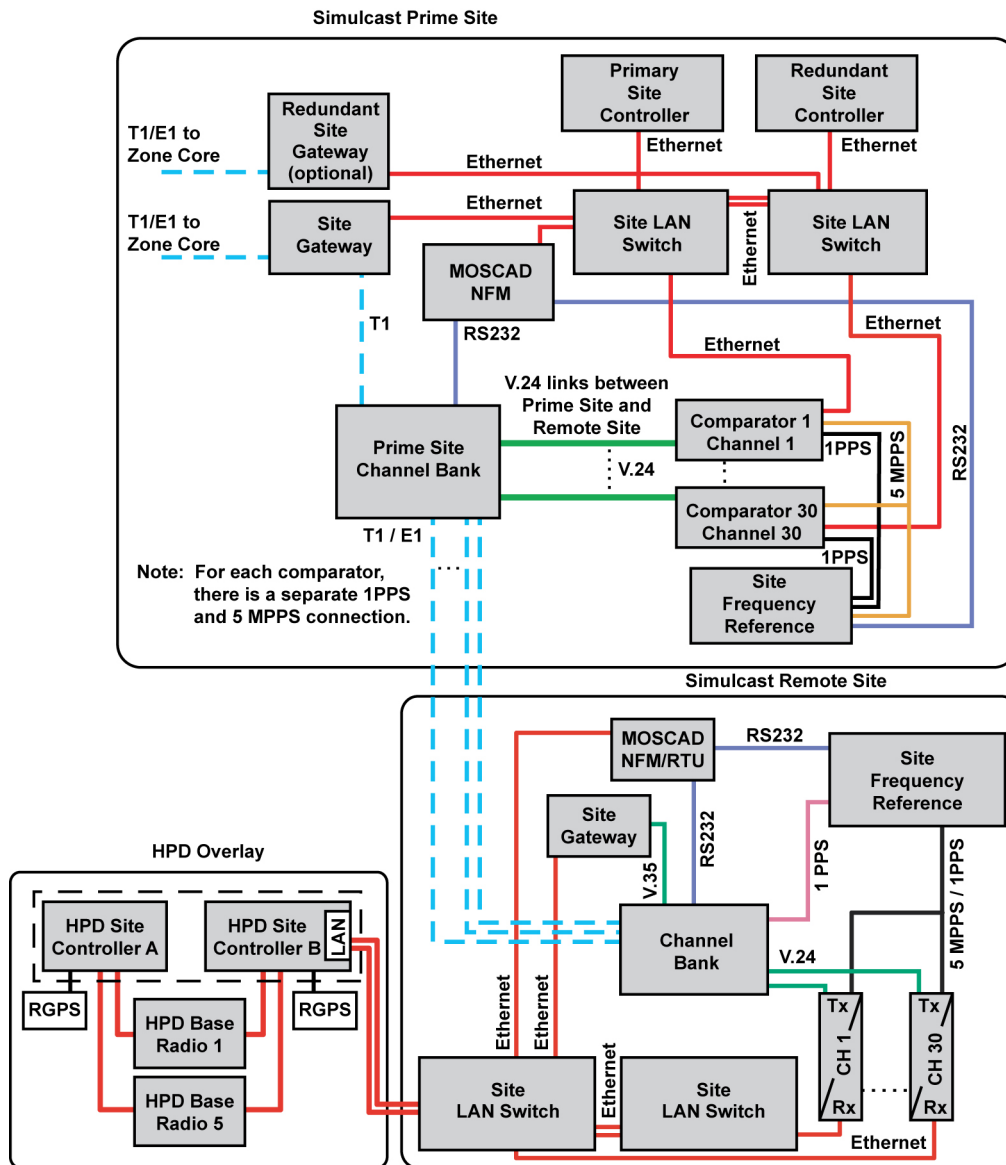
S_Simul_Remote_Site_W_HPD_Overlay_2

The following figure shows the layout for HPD equipment at an IP-based simulcast remote site.

✎ **NOTICE:**
The following figure features T1/E1 links. Simulcast Subsystems with HPD Overlay also support Ethernet links. For more information, see the *Flexible Site and InterZone Links* manual.

The diagram assumes a standard prime site and remote subsite configuration. The prime site architecture also assumes 15 subsites or less.

Figure 4: Trunked IP-Based Simulcast Remote Site with HPD Overlay
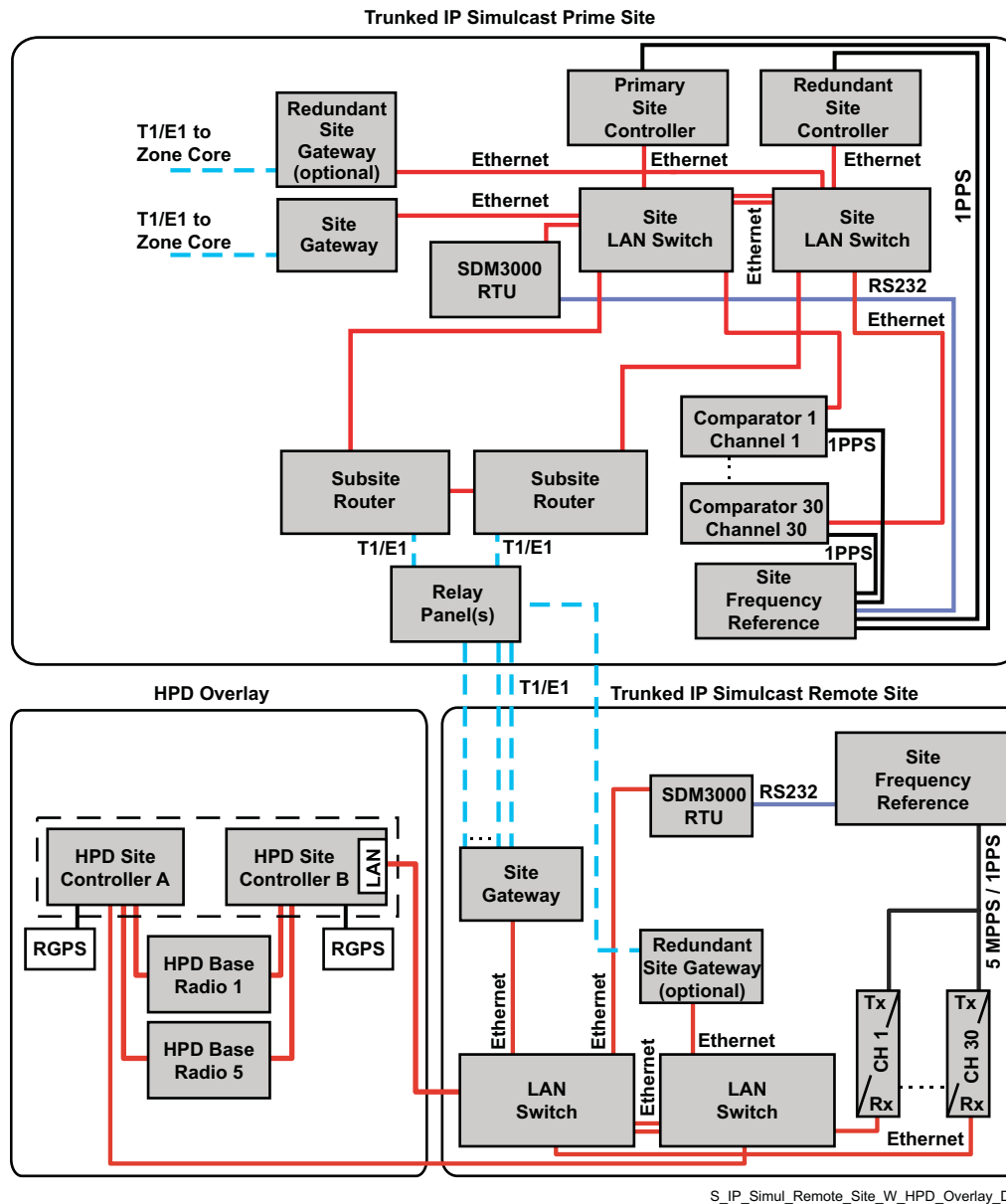
S_IP_Simul_Remote_Site_W_HPD_Overlay_D

Sites with more IV&D channels have two switches or two GPB 8000 Reference Distribution Modules installed. Both HPD GCP 8000 Site Controller modules connect to their respective switch or GPB 8000 Reference Distribution Module at the site.

✎ **NOTICE:** When two switches or two GPB 8000 Reference Distribution Modules are at the remote site, both HPD GCP 8000 Site Controllers connect to the site LAN. To prevent a switched network loop, disable the Ethernet connection between the HPD GCP 8000 Site Controllers.

The following figure shows the IP Simulcast remote subsite with GPB 8000 Reference Distribution Modules.

Figure 5: IP Simulcast Subsystem with GPB 8000 Reference Distribution Modules

S_IP_Simul_Remote_Site_ESS_HA_Config_F
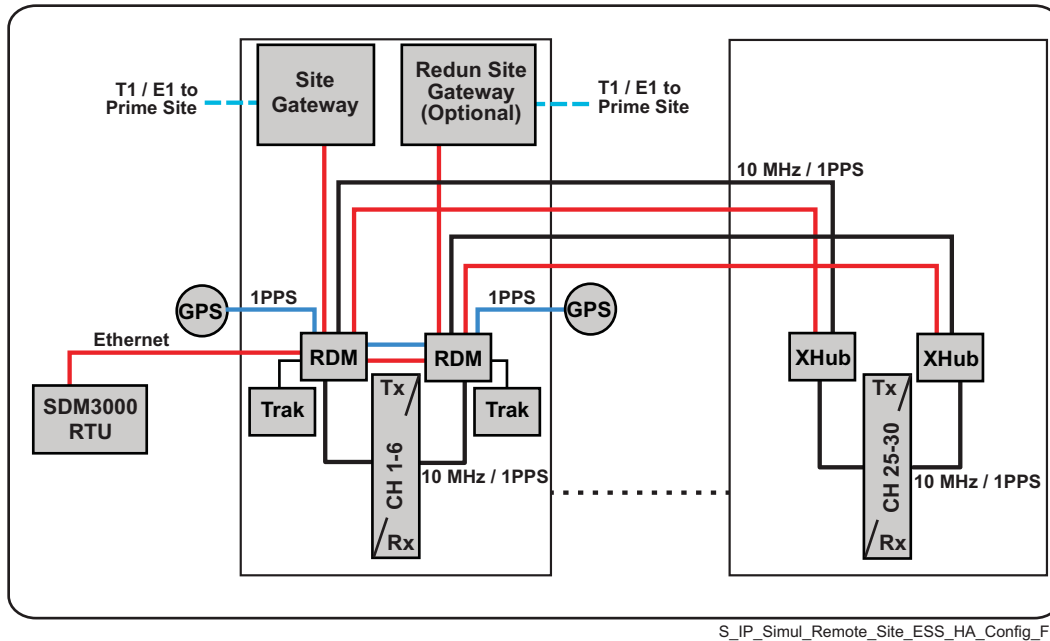
2.1.3
Simulcast Subsystem Capacity and HPD Overlay

A simulcast subsystem supports up to 32 subsites (increased from 15 subsites in the previous releases of the ASTRO® 25 system). An HPD overlay site could be deployed at any of these subsites. However, the total number of HPD overlay sites and channel capacity are heavily dependent on the simulcast subsystem configuration and other features. System designers must consider the existing simulcast subsystem configuration and other capacity must ensure that existing capacity limits are not exceeded on the prime site links.

2.2
HPD Overlay Equipment

HPD Overlay at a site operates in the same fashion as a standalone HPD site to provide an RF interface to MSUs in the region. The HPD Overlay equipment includes a site controller with redundant modules to service registration requests, administer site operations, and handle inbound/outbound HPD traffic. One site controller module operates as the active site controller at the site, while the redundant module remains in standby mode.

The site may include up to five HPD channels. A full-duplex base radio with HPD capability is implemented on each channel at the site. These base radios maintain periodic communication with the site controller for site control messaging and status updates. Registration requests/responses are routed between the HPD GTR 8000 Base Radios and the zone controller through the active HPD GCP 8000 Site Controller. HPD user data is routed between the HPD GTR 8000 Base Radios and the HPD RNG in the zone through the HPD GCP 8000 Site Controller.

Alarms and RFDS fault management for the HPD equipment can be handled through the MOSCAD Network Fault Management (NFM) equipment that supports the remainder of the IV&D equipment at the site.

The HPD Overlay equipment at the site may consist of one of the following platforms:

- HPD GCP 8000 Site Controller, standalone (with redundant modules) HPD GTR 8000 Base Radios, standalone (for 700 MHz and 800 MHz HPD channels)
- GTR 8000 Site Subsystem
- GTR 8000 Expandable Site Subsystem

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Chapter 3

Simulcast Subsystem with HPD Overlay Installation

This chapter details installation procedures relating to the simulcast subsystem with HPD Overlay.

3.1
HPD GCP 8000 Site Controller

Connect the HPD GCP 8000 Site Controller with the site switches or two GPB 8000 Reference Distribution Modules, HPD GTR 8000 Base Radios, and GNSS antennas. The site controller includes more connections for auxiliary power and alarm monitoring. The following figures and table show the connections for the HPD GCP 8000 Site Controller.

⚠️ **WARNING:** The HPD GCP 8000 Site Controller switch configuration must be set up properly before plugging the HPD site into the voice site network. If the HPD GCP 8000 Site Controller is being installed in a simulcast site with two Ethernet switches or two GPB 8000 Reference Distribution Modules, disable the redundant switch connection (port 20) for each HPD GCP 8000 Site Controller through the Configuration/Service Software (CSS) application to prevent a network loop at the site. For more information, see Configuration Overview on page 45.

📝 **NOTICE:** The Comparator A/B, EXT FREQ REF, and PPS connections are not used for HPD operation.

Figure 6: HPD GCP 8000 Site Controller Module – Front Connections
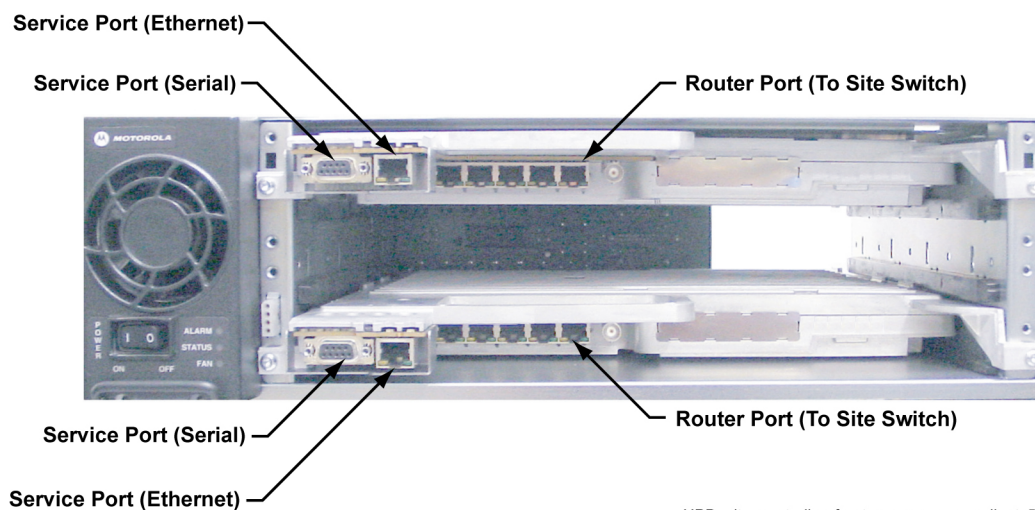
HPD_site_controller_front_wo_cover_w_callouts5

Figure 7: HPD GCP 8000 Site Controller – Rear Connections
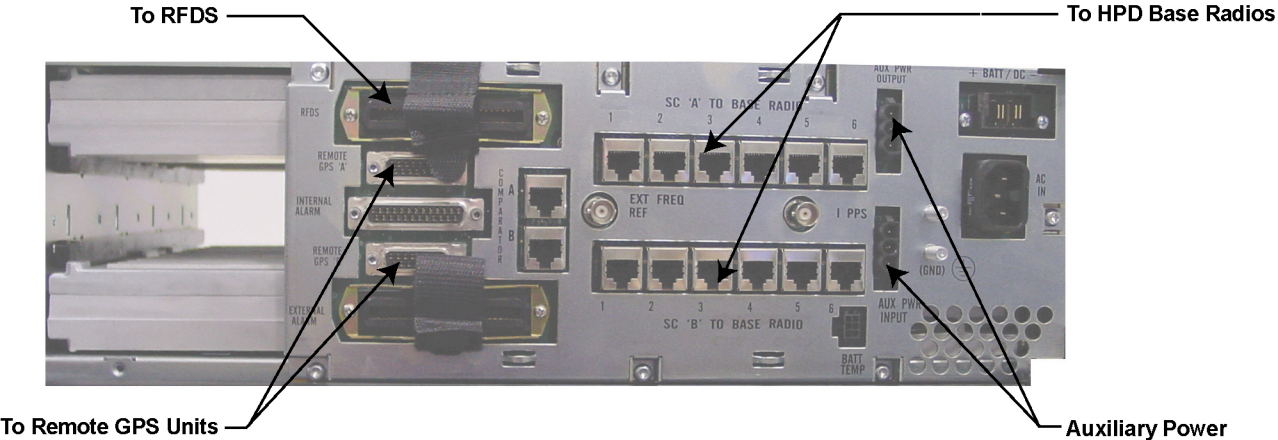
HPD_GCP8000_site_controller_rear1

Table 1: HPD GCP 8000 Site Controller Connections

Device	Port / Type	Device	Port / Type	Description
HPD GCP 8000 Site Controller (Module A)	Router port, RJ-45	Ethernet Switch #1	Port 18 or 24, RJ-45	**IMPORTANT:** A crossover cable must be used for this connection. The connection depends on the number of switches at the site. • If only one switch is installed at the site, then the router port on an HPD site controller A connects with a port 18 on the site switch. • If two switches are installed at the site, then the router port on an HPD site controller A connects with a port 24 on a site switch #1.
HPD GCP 8000 Site Controller (Module A)	Router port, RJ-45	GPB 8000 Reference Distribution Module A	NetAux A, RJ-45	**IMPORTANT:** A crossover cable must be used for this connection. NetAux port on GPB 8000 Reference Distribution Module A must be configured to 100/Full. The Router port on HPD GCP 8000 Site Controller A is connected to the LAN. Otherwise the HPD GCP 8000 Site Controller A is not connected to the LAN.

Table continued…

Device	Port / Type	Device	Port / Type	Description
HPD GCP 8000 Site Controller (Module B)	Router port, RJ-45	Ethernet Switch #2 – (optional)	Port 20, RJ-45	**IMPORTANT:** A crossover cable must be used for this connection. If the site has two switches, the router port on and HPD site controller B must be connected. Otherwise, HPD site controller B is not connected to the LAN.
HPD GCP 8000 Site Controller (Module B)	Router port, RJ-45	GPB 8000 Reference Distribution Module B	Net Aux B, RJ-45	**IMPORTANT:** A crossover cable must be used for this connection. NetAux port on GPB 8000 Reference Distribution Module B must be configured to 100/Full. The Router port on HPD GCP 8000 Site Controller B is connected to the LAN. Otherwise the HPD GCP 8000 Site Controller B is not connected to the LAN.
HPD GCP 8000 Site Controller	SC 'A' to Base Radio 1-5, RJ-45	HPD GTR 8000 Base Radio (1-5)	SITE CTRL A	Connection between a site controller A and each of the base radios at the site.
HPD GCP 8000 Site Controller	SC 'B' to Base Radio 1-5, RJ-45	HPD GTR 8000 Base Radio (1-5)	SITE CTRL B	Connection between a site controller B and each of the base radios at the site.
HPD GCP 8000 Site Controller	Remote GPS 'A'	Lightning Arrestor for RGPS Unit A	Line terminals	For terminal connection details on the lightning arrestor, see Figure 11: RGPS and Lightning Arrestor - System Connections on page 42.
HPD GCP 8000 Site Controller	Remote GPS 'B'	Lightning Arrestor for RGPS Unit B	Line terminals	For terminal connection details on the lightning arrestor, see Figure 11: RGPS and Lightning Arrestor - System Connections on page 42.
HPD GCP 8000 Site Controller	Service port, RJ-45	Service computer/laptop	LAN port, RJ-45	Service port is available for local access using CSS and performing localized software downloads. Service port also mirrors all the other Ethernet ports on the HPD site controller A. Data Collection Device (DCD) can be connected to capture and an-

Table continued…

Device	Port / Type	Device	Port / Type	Description
				alyze traffic that passes over the HPD GCP 8000 Site Controller switch ports.
HPD GCP 8000 Site Controller	Service port, DB9	Service computer/laptop	RS232 port, DB9	Service port for initial configuration of the site controller IP address.
HPD GCP 8000 Site Controller	Frequency calibration, BNC	Frequency monitor/calibration	BNC	Port available on the site controller module for measuring and calibrating the frequency reference.
HPD GCP 8000 Site Controller	Aux Pwr Input	HPD GTR 8000 Base Radio	Aux Pwr Output	The auxiliary output input can be connected with an HPD GTR 8000 Base Radio as a secondary power source.
HPD GCP 8000 Site Controller	Aux Pwr Output	Not used		Not used
HPD GCP 8000 Site Controller	RFDS, 50-pin	RFDS equipment (power monitor, receive multicoupler)		Monitors RFDS alarms from the power monitor and receive multicoupler. Provides an auxiliary power source to the RMC.
HPD GCP 8000 Site Controller	External Alarm, 50-pin	Not used		Not used
HPD GCP 8000 Site Controller	Internal Alarm, DB25	External-integrated alarm card connections.		Allows more alarm sources to be supplied to the integrated alarm card of the site controller.
HPD GCP 8000 Site Controller	Bat Temp, 4-pin	Battery temperature sensor		Connection for monitoring the backup battery temperature.
HPD GCP 8000 Site Controller	Batt/DC	DC power supply or battery		Input from a 48 VDC power supply or backup battery.
HPD GCP 8000 Site Controller	AC	120/240 VAC power source.		Input from 120/240 VAC nominal power source.

3.2
HPD GTR 8000 Base Radio

The standalone HPD GTR 8000 Base Radio connects with each of the HPD GCP 8000 Site Controllers and connects to the transmit and receive paths. The following figure and table show the connections for the HPD GTR 8000 Base Radio.

Send Feedback

📝 **NOTICE:** Connections for RX C, EXT FREQ REF, and 1PPS port are not used for HPD operation.

Figure 8: HPD GTR 8000 Base Radio – Rear Connections

HPD_GTR8000_base_radio_rear1

Table 2: HPD GTR 8000 Base Radio Connections

Device	Port / Type	Device	Port / Type	Description
HPD GTR 8000 Base Radio	SC A port, RJ-45	HPD GCP 8000 Site Controller A	Base radio port, RJ-45	Connects to site controller A base radio port for this channel (1-5).
HPD GTR 8000 Base Radio	SC B port, RJ-45	HPD GCP 8000 Site Controller B	Base radio port, RJ-45	Connects to a site controller B base radio port for this channel (1-5).
HPD GTR 8000 Base Radio	RX A, BNC	Receive line A	BNC	RF coax to receive a path for an antenna A.
HPD GTR 8000 Base Radio	RX B, BNC	Receive line B	BNC	RF coax to receive a path for an antenna B.
HPD GTR 8000 Base Radio	Transmit port, N-type	Transmit line	N-type	RF coax to transmit an antenna.
HPD GTR 8000 Base Radio	Service	Service computer/ laptop	LAN port, RJ-45	Service port for local access using Configuration/Service Software (CSS). Also may be used for localized software

Table continued…

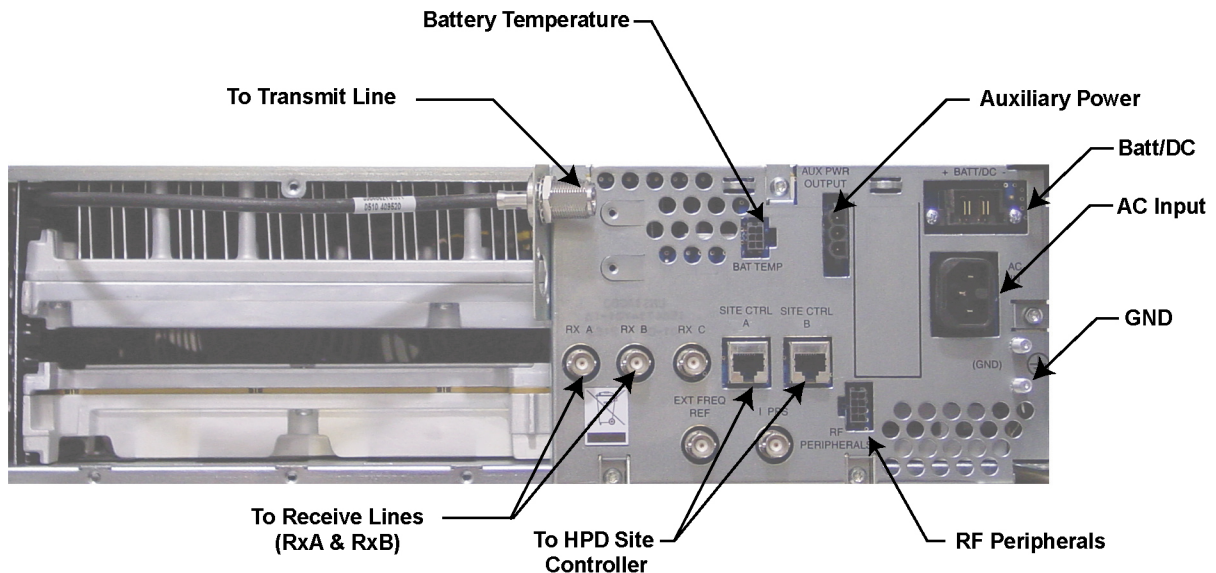| Device	Port / Type	Device	Port / Type	Description
	port, RJ-45			downloads. Located on the front of the transceiver module.
HPD GTR 8000 Base Radio	Service port, DB9	Service computer/ laptop	RS232 port, DB9	Service port for initial configuration of the base radio IP address. Located on the front of the transceiver module.
HPD GTR 8000 Base Radio	Aux Pwr Output	HPD GCP 8000 Site Controller or RMC	Aux Pwr Input	The auxiliary output power can be connected with the HPD GCP 8000 Site Controller or RMC to provide secondary power to the device.
HPD GTR 8000 Base Radio	Bat Temp, 4-pin	Battery temperature sensor		Connection allowing the BR to monitor the battery temperature.
HPD GTR 8000 Base Radio	RF Peripherals	RF peripheral sensor ports		Antenna relay and presence detect, external circulator load temperature (external wattmeter not supported).
HPD GTR 8000 Base Radio	Batt/DC	DC power supply or battery		Input from a 48 VDC power supply or backup battery.
HPD GTR 8000 Base Radio	AC	120/240 VAC power source.		Input from 120/240 VAC nominal power source.

HPD GTR 8000 Site Subsystem

The HPD GTR 8000 Site Subsystem contains a standalone site controller, standalone base radio, and an RF distribution system, mounted in a single rack. The RF distribution system consists of an isolator, duplexer, two branch RMCs, and a preselector. A junction panel is at the top of the rack for connections to other devices at the HPD remote site as shown in the following figure and table.

⚠ **WARNING:** The HPD GCP 8000 Site Controller switch configuration must be set up properly before plugging the HPD site into the voice site network. If the HPD GCP 8000 Site Controller is being installed in a simulcast site with two Ethernet switches or GPB 8000 two Reference Distribution Modules, disable the redundant switch connection (port 20) for each HPD GCP 8000 Site Controller through the Configuration/Service Software (CSS) application to prevent a network loop at the site. For more information, see Configuration Overview on page 45.

Figure 9: HPD GTR 8000 Site Subsystem – Junction Panel

HPD_GTR8000_site-subsystem_panel3
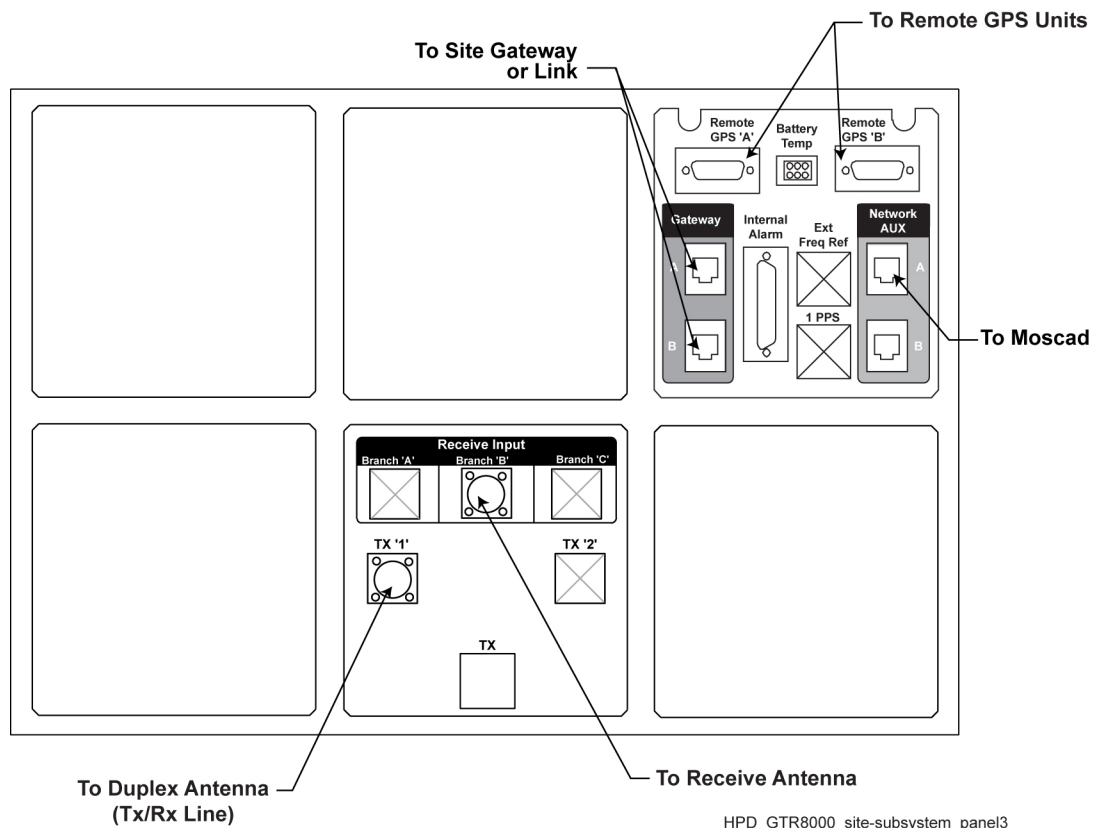
Table 3: HPD GTR 8000 Site Subsystem Connections

Device	Port / Type	Device	Port / Type	Description
HPD Site Subsystem, Junction Panel	Router A port, RJ-45	Ethernet Switch #1	Port 18 or Port 24, RJ-45	**IMPORTANT:** A crossover cable must be used for this connection. The connection depends on the number of switches at the site. • If only one switch is installed at the site, then the router port on an HPD site controller A connects with a port 18 on the site switch. • If two switches are installed at the site, then the router port on an HPD site controller A connects with a port 24 on a site switch #1.
HPD Site Subsystem, Junction Panel	Router A port, RJ-45	GPB 8000 Reference Distribution Module A	NetAux, RJ-45	**IMPORTANT:** A crossover cable must be used for this connection. NetAux port on GPB 8000 Reference Distribution Module A must be configured to 100/Full.

Table continued…

Device	Port / Type	Device	Port / Type	Description
HPD Site Subsystem, Junction Panel	Router B port, RJ-45	Ethernet Switch #2 (optional)	Port 20, RJ-45	**IMPORTANT:** A crossover cable must be used for this connection. If the site has two switches, the router port on an HPD site controller B must be connected. Otherwise, HPD site controller B is not connected to the LAN.
HPD Site Subsystem, Junction Panel	Router B port, RJ-45	GPB 8000 Reference Distribution Module B	NetAux, RJ-45	**IMPORTANT:** A crossover cable must be used for this connection. NetAux port on GPB 8000 Reference Distribution Module B must be configured to 100/Full. The Router port on HPD GCP 8000 Site Controller B is connected to the LAN. Otherwise the HPD GCP 8000 Site Controller B is not connected to the LAN.
HPD Site Subsystem, Junction Panel	Battery Temp	Backup Battery Temperature Sensor		See battery temperature sensor instructions for connection requirements.
HPD Site Subsystem, Junction Panel	Remote GPS A, DB15	Lightning Arrestor for RGPS Unit A	Line terminals	For terminal connection details on the lightning arrestor, see Figure 11: RGPS and Lightning Arrestor - System Connections on page 42.
HPD Site Subsystem, Junction Panel	Remote GPS B, DB15	Lightning Arrestor for RGPS Unit B	Line terminals	For terminal connection details on the lightning arrestor, see Figure 11: RGPS and Lightning Arrestor - System Connections on page 42.
HPD Site Subsystem, Junction Panel	Internal Alarm, DB25	External-integrated alarm card (IAC) connections.		Allows more alarm sources to be supplied to the integrated alarm card in the site controller.
HPD Site Subsystem, Junction Panel	RX 'B', N-type	Receive an antenna		RF coax to receive an antenna.
HPD Site Subsystem, Junction Panel	TX 'A', N-type	Transmit/receive (full-duplex) antenna		RF coax to transmit/receive an antenna for full-duplex operation.

3.4
HPD GTR 8000 Expandable Site Subsystem

The expandable site subsystem includes two site controller modules, up to five transceivers and power amplifier modules, and RF distribution equipment. Internal connections between modules are made through the backplane.

A junction panel is at the top of the rack for connections to other devices at the HPD remote site as shown in the following figure and table.

⚠️ **WARNING:** The HPD GCP 8000 Site Controller switch configuration must be set up properly before plugging the HPD site into the voice site network. If the HPD GCP 8000 Site Controller is being installed in a simulcast site with two Ethernet switches or two GPB 8000 Reference Distribution Modules, disable the redundant switch connection (port 20) for each HPD GCP 8000 Site Controller through the Configuration/Service Software (CSS) application to prevent a network loop at the site. For more information, see .

Figure 10: HPD GTR 8000 Expandable Site Subsystem – Junction Panel
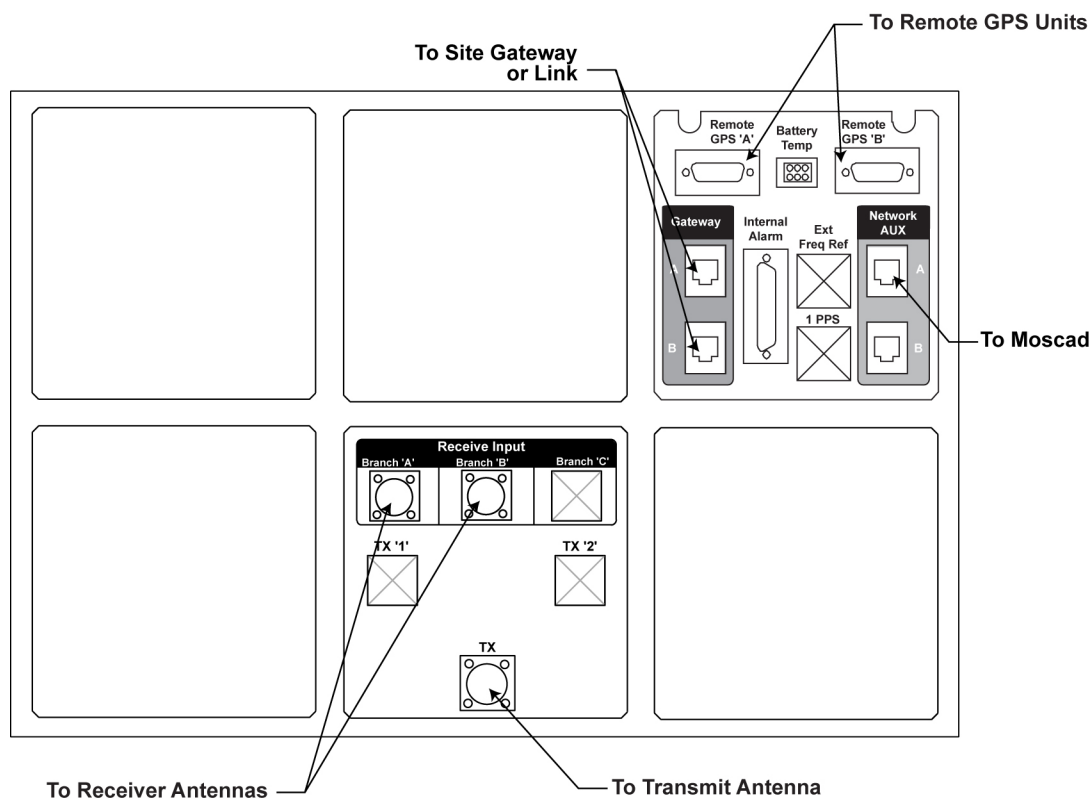
HPD_GTR8000_JP_ESS

The subsystem rack accepts up to six 120/240 VAC inputs and two separate 48 VDC inputs (for a battery or DC power source input). The DC terminals on the top left of the rack internally connect the

left three power supplies. The DC terminals on the top right corner of the rack internally connect with the three power supplies in the lower right portion of the subsystem rack.

Table 4: HPD GTR 8000 Expandable Site Subsystem Connections

Device	Port / Type	Device	Port / Type	Description
HPD Expandable Site Subsystem, Junction Panel	Router A port, RJ-45	Ethernet Switch #1	Port 18 or Port 24, RJ-45	**IMPORTANT:** A crossover cable must be used for this connection. The connection depends on the number of switches at the site. • If only one switch is installed at the site, then the router port on an HPD site controller A connects with a port 18 on the site switch. • If two switches are installed at the site, then the router port on an HPD site controller A connects with a port 24 on a site switch #1.
HPD Expandable Site Subsystem, Junction Panel	Router A port, RJ-45	GPB 8000 Reference Distribution Module A	NetAux, RJ-45	**IMPORTANT:** A crossover cable must be used for this connection. NetAux port on GPB 8000 Reference Distribution Module A must be configured to 100/Full.
HPD Expandable Site Subsystem, Junction Panel	Router B port, RJ-45	Ethernet Switch #2 – (optional)	Port 20, RJ-45	**IMPORTANT:** A crossover cable must be used for this connection. If the site has two switches, the router port on an HPD site controller B must be connected. Otherwise, HPD site controller B is not connected to the LAN.
HPD Expandable Site Subsystem, Junction Panel	Router B port, RJ-45	GPB 8000 Reference Distribution Module B	NetAux, RJ-45	**IMPORTANT:** A crossover cable must be used for this connection. NetAux port on GPB 8000 Reference Distribution Module B must be configured to 100/Full.

Table continued…

Device	Port / Type	Device	Port / Type	Description
				The Router port on HPD GCP 8000 Site Controller B is connected to the LAN. Otherwise the HPD GCP 8000 Site Controller B is not connected to the LAN.
HPD Expandable Site Subsystem, Junction Panel	Battery Temp	Backup Battery Temperature Sensor		See battery temperature sensor instructions for connection requirements.
HPD Expandable Site Subsystem, Junction Panel	Remote GPS A, DB15	Lightning Arrestor for RGPS Unit A	Line terminals	For terminal connection details on the lightning arrestor, see Figure 11: RGPS and Lightning Arrestor - System Connections on page 42.
HPD Expandable Site Subsystem, Junction Panel	Remote GPS B, DB15	Lightning Arrestor for RGPS Unit B	Line terminals	For terminal connection details on the lightning arrestor, see Figure 11: RGPS and Lightning Arrestor - System Connections on page 42.
HPD Expandable Site Subsystem, Junction Panel	Internal Alarm, DB25	External-integrated alarm card (IAC) connections.		Allows more alarm sources to be supplied to the integrated alarm card in the site controller.
HPD Expandable Site Subsystem, Junction Panel	RX A, N-type	Receive an antenna A / tower top amplifier	TTA output port	RF coax to receive branch A.
HPD Expandable Site Subsystem, Junction Panel	RX B, N-type	Receive an antenna B / tower top amplifier	TTA output port	RF coax to receive a branch B.
HPD Expandable Site Subsystem, Junction Panel	TX, 7/16	Transmit an antenna	Tx input port	RF coax to transmit an antenna.

> **NOTICE:** For calculating the Inline attenuator value for a GTR 8000 Expandable Site Subsystem with a TTA for TDMA operation, see the *Dynamic Dual Mode for TDMA Operations* manual.

3.5
Remote GNSS Unit

A Remote GNSS unit and lightning arrestor is connected for each HPD GCP 8000 Site Controller module. There are two types of lightning arrestors available. Figure 11: RGPS and Lightning Arrestor - System Connections on page 42, Figure 12: Lightning Arrestor DSIX-2L1M1DC48-IG – Wiring on page 42, and Figure 13: Lightning Arrestor DS109-10129H-A – Wiring on page 43 show the required connections and terminal assignments for installing the RGPS unit and two types of lightning arrestor.

Figure 11: RGPS and Lightning Arrestor - System Connections

site_arrestor_systemwiring

Figure 12: Lightning Arrestor DSIX-2L1M1DC48-IG – Wiring

Pin 1 Brown/Black	= Power
Pin 2 White	= Transmit Data -
Pin 3 White/Black	= Transmit Data +
Pin 4 Blue	= Receive Data -
Pin 5 Blue/Black	= Receive Data +
Pin 6 Green	= Not Used
Pin 7 Green/Black	= Not Used
Pin 8 Red	= Power Return
Pin 9 Brown	= Power Return
Pin 10 Red/Black	= Power
Pin 11 Yellow/Black	= 1PPS +
Pin 12 Yellow	= 1PPS -

Pin 8 Brown/Black	= Power
Pin 12 White	= Transmit Data -
Pin 4 White/Black	= Transmit Data +
Pin 9 Blue	= Receive Data -
Pin 1 Blue/Black	= Receive Data +
Pin 11 Green	= Not Used
Pin 3 Green/Black	= Not Used
Pin 14 Red	= Power Return
Pin 15 Brown	= Power Return
Pin 7 Red/Black	= Power
Pin 2 Yellow/Black	= 1PPS +
Pin 10 Yellow	= 1PPS -

lightning_arrestor_2L1M1DC48

Figure 13: Lightning Arrestor DS109-10129H-A – Wiring

Pin 1 Brown/Black	= Power
Pin 2 White	= Transmit Data -
Pin 3 White/Black	= Transmit Data +
Pin 4 Blue	= Receive Data -
Pin 5 Blue/Black	= Receive Data +
Pin 6 Green	= Not Used
Pin 7 Green/Black	= Not Used
Pin 8 Red	= Power Return
Pin 9 Brown	= Power Return
Pin 10 Red/Black	= Power
Pin 11 Yellow/Black	= 1PPS +
Pin 12 Yellow	= 1PPS -

Pin 8 Brown/Black	= Power
Pin 12 White	= Transmit Data -
Pin 4 White/Black	= Transmit Data +
Pin 9 Blue	= Receive Data -
Pin 1 Blue/Black	= Receive Data +
Pin 11 Green	= Not Used
Pin 3 Green/Black	= Not Used
Pin 14 Red	= Power Return
Pin 15 Brown	= Power Return
Pin 7 Red/Black	= Power
Pin 2 Yellow/Black	= 1PPS +
Pin 10 Yellow	= 1PPS -

lightning_arrestor_0129H

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Chapter 4

Simulcast Subsystem with HPD Overlay Configuration

This chapter details configuration procedures relating to the simulcast subsystem with HPD Overlay.

4.1
Using Multiple Managers to Configure an HPD Site

Configure, manage, and service the system infrastructure of the HPD site using the Unified Network Configurator (UNC), Configuration/Service Software (CSS), and Provisioning Manager applications.

CSS is used to program all parameters in the site controllers and base radios.

UNC is used to program parameters to the site devices, routers, LAN switches, Zone Controller, and PDG.

Provisioning Manager is used to program system-level parameters for the Zone Controllers, Packet Data Gateways, Consoles, and Conventional Site Controllers.

For more information on configuration details, see the *Provisioning Manager* and *Unified Network Configurator* manuals, and CSS online help. For more information on HPD data services, see the *HPD Packet Data Resource Management* manual.

4.2
Configuration Overview

Programming for the HPD Overlay equipment is outlined by your customized system documentation provided for your system by Motorola. The customized system documentation provides the settings for all parameters of the equipment at the site. Using it as your programming aid ensures that you program the devices to a known baseline. The CSS application default settings provide typical values that are suitable for many sites. The overall configuration process for the equipment at the site is described in . This configuration process is nearly identical to the procedure used for HPD Overlay in an ASTRO$^®$ 25 Repeater Site. However, properly configure the HPD site as colocated with a simulcast prime site or remote site in UNC server application.

> **WARNING:** The HPD GCP 8000 Site Controller switch configuration must be set up properly before plugging the HPD site into the voice site network. If the HPD GCP 8000 Site Controller is being installed in a simulcast site with two Ethernet switches or two GPB 8000 Reference Distribution Modules, disable the redundant switch connection (port 20) for each HPD GCP 8000 Site Controller through the Configuration/Service Software (CSS) application to prevent a network loop at the site.

> **IMPORTANT:** Do not deviate from specified settings without following the proper change procedures for your organization. If a problem due to programming arises, not following proper change procedures makes troubleshooting more difficult.

> **NOTICE:** Obtain the following information your system administrator before performing the configuration process:
>   * IP addresses (devices that require IP addresses)
>   * Account logins and passwords (types of accounts)

Configuring an HPD Site

Process:

1 Set the IP address and physical address for each of the HPD GTR 8000 Base Radios and HPD GCP 8000 Site Controller modules using a direct serial connection with the Configuration/ Service Software (CSS) application.

2 Transfer and install software to the equipment at the HPD remote site by using Software Download Manager.

> **NOTICE:** Motorola installs the software before shipping the equipment to the intended installation site. Software Download Manager is used to transfer and install software updates to devices in the HPD remote site as needed.

3 The following records must be created and configured at each site for the zone controller:

- Sites

- Channels

4 Use the Unified Network Configurator (UNC) Wizard to:

- Discover devices.

- Upload configurations for the devices.

- Generate changes for non-compliant devices.

- Approve jobs – if any.

5 Configure the HPD GCP 8000 Site Controller settings through CSS. See: Configuring the HPD GCP 8000 Site Controller Settings with CSS on page 46.

6 Configure the HPD GTR 8000 Base Radio settings through CSS. See: Configuring the HPD GTR 8000 Base Radio Settings with CSS on page 47.
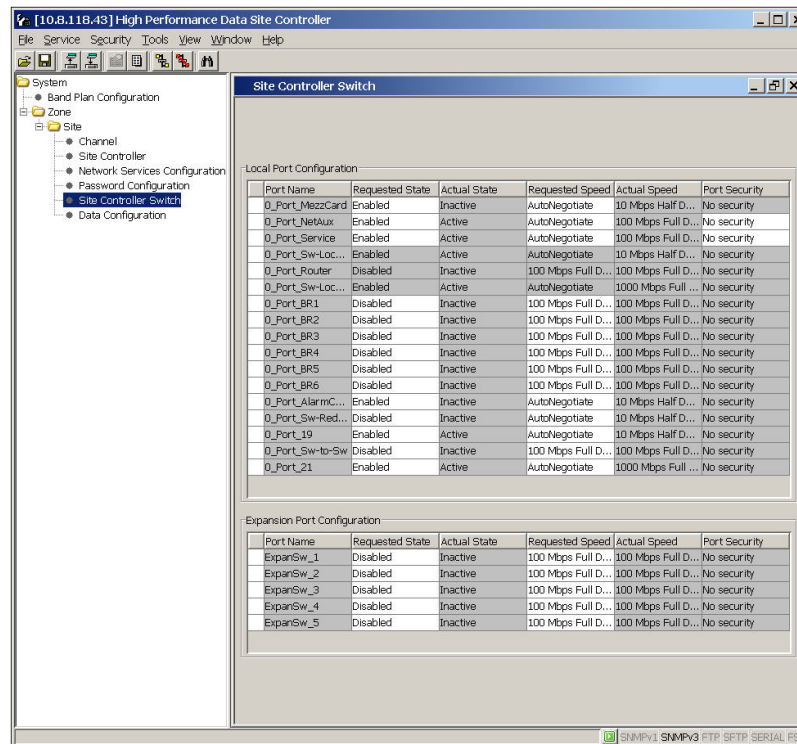
Configuring the HPD GCP 8000 Site Controller Settings with CSS

Prerequisites: Completed steps of the Configuring an HPD Site on page 46.

Procedure:

1 Connect Configuration/Service Software (CSS) with the active HPD GCP 8000 Site Controller through an Ethernet connection.

Figure 14: HPD Site Controller Switch

2   Configure the channels, band plan, and switch settings.

> ⚠ **IMPORTANT:** If the site has two Ethernet site switches or two GPB 8000 Reference
> Distribution Modules, then both HPD GCP 8000 Site Controllers are connected to the
> LAN. In this case, the redundant switch connection (port 20) in each HPD GCP 8000 Site
> Controller must be disabled through CSS to prevent a network loop. If the site has only
> one Ethernet switch (and only one HPD GCP 8000 Site Controller connects with the
> LAN), then the switch connection (port 20) must be enabled through CSS.

3   Write the data to the HPD GCP 8000 Site Controller.

4   Check the status report and status panel to verify that the HPD GCP 8000 Site Controller and its
components are operating properly.

5   Check the GNSS information screen and verify the values. Press the Refresh button to get
current GNSS values.

6   Through a serial connection, initiate the battery equalization for the HPD GCP 8000 Site
Controller using CSS.

7   Reset the HPD GCP 8000 Site Controller so the other site controller becomes active.

8   Configure the new active site controller in the same manner.

4.3.2
Configuring the HPD GTR 8000 Base Radio Settings with CSS

Prerequisites: Completed steps of the Configuring an HPD Site on page 46.

Procedure:

1   Connect Configuration/Service Software (CSS) with the HPD GTR 8000 Base Radio through an
Ethernet connection.

2 Configure the base radio settings, including the transmit/receive frequencies, band plan settings, battery type, and GTR 8000 configuration (standalone, site subsystem, or expandable site subsystem).

3 If the HPD GTR 8000 Base Radio is in a site subsystem or expandable site subsystem rack, set the attenuation on the receive multicouplers (RMCs) according to the values in the Receive Multicoupler (RMC) Configuration tab.

4 Press the Validate HW Configuration button to verify that the hardware configuration is valid. A success or error message is displayed.

5 Change the mode from Configuration mode into Normal mode.

6 Write the data to the HPD GTR 8000 Base Radio.

7 Check the status report and status panel to verify that the HPD GTR 8000 Base Radio and its components are operating properly.

8 Initiate a battery alignment in CSS.

9 Set the HPD GTR 8000 Base Radio to Service mode.

10 Initiate tests and measurements for BER and RSSI using HPD patterns (connect with a service monitor).

11 Set the HPD GTR 8000 Base Radio with the appropriate channel number through CSS.

12 Set the date and time through CSS.

4.4
Software Download

The HPD GCP 8000 Site Controllers and base radios are preloaded with software before being shipped from the factory. If more devices are added to the site or if the software needs upgrading, use Software Download Manager to transfer and install the software.

The HPD GCP 8000 Site Controllers and base radios each have an active and inactive memory bank. A software transfer is a background process that does not affect system operation. During the transfer, software is loaded into the inactive memory bank of the device. The HPD GCP 8000 Site Controllers act as the proxy devices for the HPD GTR 8000 Base Radios, so any transfers for the base radios are first loaded into the HPD GCP 8000 Site Controllers, which then transfer the software into the base radios at the site.

When the install operation is selected, the device/devices reset and initialize using the new software. The old software remains in the inactive memory bank. A successful transfer and install operation may take between 20 minutes and 1 hour, depending on the number of channels at the site.

Version information, installed files, and other information for both the active (running) software and inactive software can be viewed through Software Download Manager. For more information, see the *Software Download Manager* manual.

4.5
GCP 8000 Site Controller Configuration for HPD Operation with CSS

For detailed configuration procedures about the GCP 8000 Site Controller using the Configuration/ Service Software (CSS), see the *GCP 8000 Site Controller* manual and CSS online help.

4.6
GTR 8000 Base Radio Configuration for HPD Operation with CSS

For detailed configuration procedures about the GTR 8000 Base Radio using the Configuration/Service Software (CSS), see the *GTR 8000 Base Radio* manual and CSS online help.

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Chapter 5

Simulcast Subsystem with HPD Overlay Feature Expansion/Upgrades

This chapter provides information necessary to add HPD Overlay to an existing simulcast site.

5.1
Bandwidth Requirements

Since the HPD Overlay equipment shares bandwidth on the site link, consider the total amount of bandwidth on the link.

A simulcast remote site bandwidth does not require more than a full T1/E1 link to the prime site. If an existing remote site is using a fractional T1/E1 site link, supply the proper amount of bandwidth (up to a full T1/E1 link) to support the simulcast equipment, HPD Overlay equipment, and any conventional channels supported at the remote site.

The HPD Overlay equipment adds one DS0 of site link bandwidth per HPD channel (with a minimum of two DS0s per site). So, add a total of 2-5 DS0s to the site link bandwidth calculation for the HPD Overlay equipment.

The simulcast prime site may require one, two, or three full T1/E1 links to the zone core. The number of links depends on the bandwidth of IV&D, HPD, and conventional channel traffic within the entire subsystem that is passing through the prime site link. If the total bandwidth required to the zone core exceeds 24 DS0s (T1) or 30 DS0s (E1), then add a second full T1/E1 link using Multilink frame relay (MFR). If the total bandwidth exceeds 48 DS0s (T1) or 60 DS0s (E1) then three full T1/E1 links are required to the zone core.

For more information on calculating bandwidth requirements, see the *Console Site Bandwidth Management* manual.

5.2
Router Upgrade Requirements

A simulcast prime site may use the Multilink frame relay (MFR) to provide up to three full T1/E1 links to the zone core.

When adding HPD Overlay to an existing simulcast remote site, replace any S6000 routers with S2500 site gateways.

For more information on upgrade and migration requirements within the subsystem, see the simulcast subsystem documentation.

For detailed information on routers, see the *S6000 and S2500 Routers* manual.

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