Macro Base Station Installation Procedures (NPM-2500)

Release 2.1

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FCC Warning

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his or her own expense.

Regulatory Information

This equipment complies with the following regulatory certifications:
FCC Part 15

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Chapter 1

OVERVIEW

This chapter provides an introduction to the NPM-2500 single-sector macro base station.

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Introduction

The NPM-2500 is a single-sector SOMA base station. Figure 1.1 shows the base station components.

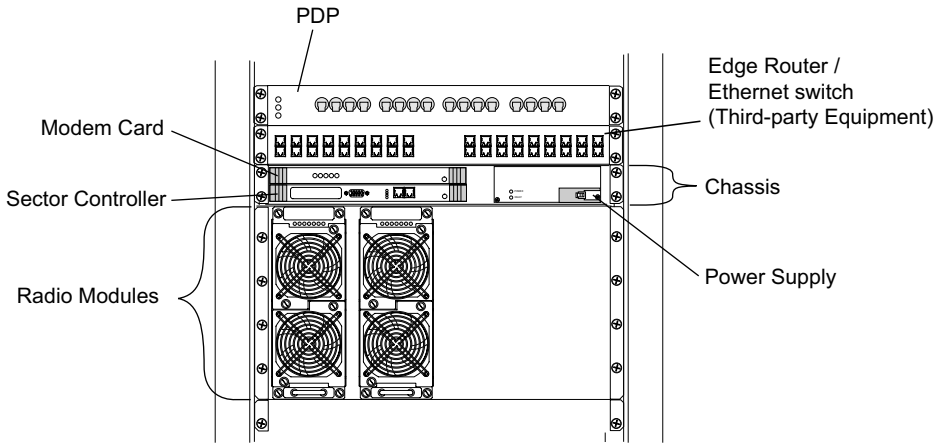


Figure 1.1 Single-Sector NPM-2500

Multiple base stations can be stored on a single 19-inch rack, as shown in Figure 1.2.

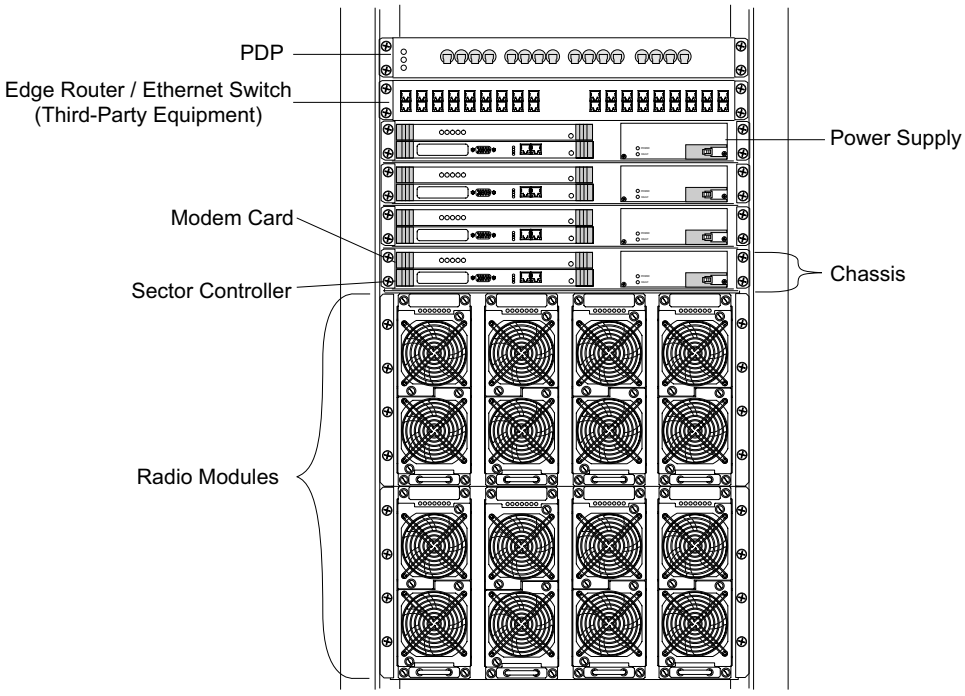


Figure 1.2 Multi-Sector NPM-2500 Configuration

Major Components

This section describes the major components in the NPM-2500.

Chassis

The chassis consists of a Kaparel 1U CompactPCI chassis with two frontplane slots, two backplane slots, and a slot for a 200W, –48V power module.

Sector Controller

The sector controller consists of a PP310 card from Concurrent Technologies and provides base station management functions and IP connectivity to the router. The sector controller is installed in the lower chassis slot.

Sector Controller RTM

The sector controller Rear Transition Module (RTM) has two Ethernet ports. *eth0* is used for the backhaul connection/connection to the edge router. *eth1* is used for a management connection (eg: a laptop). The RTM contains a CompactFlash card that stores all the software images for the base station.

Modem Card

The modem card converts digital data between the air interface and the IP-based network. There are two serial interface ports (MAIN SERDES, DIV SERDES) for connection to the main and diversity radio modules. The modem card is installed in the upper chassis slot.

Modem Card RTM

The modem card RTM provides rear-panel connects and includes a clock source for use with the air interface.

Radio Modules

The radio modules contain the power amplifiers and other equipment required for RF transmission and reception. The base station uses two radio modules per sector: one for the main antenna and one for the diversity antenna.

Edge Router / Ethernet Switch

The edge router (or Ethernet switch, depending on the network configuration) is a third-party device that provides connectivity between the base station and the network core via a backhaul. Contact your SOMA Networks technical representative for a list of approved equipment.

PDP

The Power Distribution Panel (PDP) provides –48V power to the chassis, edge router, and individual radio modules. Each power feed is protected by a circuit breaker.

Chapter 2

SITE PREPARATION

This chapter identifies the requirements that your site needs to meet before you can proceed with the installation of the base station. Please review these requirements before proceeding to the next chapter.

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Physical Requirements

Before you begin installing the base station, read the following physical requirements. Ensure that each requirement is met before proceeding with the installation, and consult your methods of procedures (MOPs) for information concerning transportation method, route, and precise installation location.

Dimensions

Table 2.1 lists the dimensions of the individual base station components. The components are designed to be rack-mounted on a 19-inch telecommunications chassis.

Component	Height and Depth	Weight
Chassis	1U, 300 mm (11.8 inches) depth	4.8 kg (10.6 pounds)
PDP	1U	**2 kg (4.4 pounds)**
Radio module / shelf	6U (each shelf holds 4 radio modules)	11 kg (24.3 pounds) per module
Switch	1U	3.8

Table 2.1 Dimensions of Base Station Components

Torque Values

Table 2.2 shows the recommended torque values for the different sizes of fasteners used in the racks. Unless otherwise specified, torque tolerances are ±0.2 N•m (±1.8 inch-pounds).

Fastener Size	Recommended Torque
Radio module thumb screws (M4)	1.5 N•m (13 inch-pounds)
SMA RF connectors	1 N•m (9 inch-pounds)
Type-N RF connectors	1 N•m (9 inch-pounds) (hand-tightening) 2 N•m (22 inch-pounds) (hex-connector)
7/16 DIN RF connectors	28 N•m (248 inch-pounds)
PDP power/ground connectors	TBD
M5 screws (for mounting shelves to rack)	3 N•m (27 inch-pounds)
2.5 mm screws (for fastening cards to chassis)	0.4 N•m (3 inch-pounds).

Table 2.2 Torque Values of Threaded Fasteners

Environmental Requirements

Before you begin installing the base station, read the following environmental requirements. Ensure that each requirement is met before proceeding with the installation and consult your MOPs for procedures concerning building requirements, hazardous materials and waste, and environmental systems.



WARNING: Failure to meet the following requirements may result in personal injury and cause damage to or destruction of the base station and surrounding equipment.

Temperature

The base station is designed to be installed in a temperature-controlled environment. Table 2.3 shows the ambient temperature requirements.

Operational State	Temperature Requirement
Operating	+5°C to +40°C (+41°F to +104°F)
Short-term operation (less than 96 hours/year)	–5°C to +50°C (+23°F to +122°F)
Storage	–40°C to +60°C (–40°F to +140°F)

Table 2.3 Temperature Requirements

Humidity

The base station is designed to be installed in a humidity-controlled environment. Table 2.4 shows the humidity requirements.

Operational State	Humidity Requirement
Operating	5% to 85% relative humidity, noncondensing
Short-term operation (less than 96 hours/year)	5% to 90% relative humidity, noncondensing
Storage	5% to 95% relative humidity, noncondensing

Table 2.4 Humidity Requirements

Airflow

Each base station rack requires 0.3 m (1 foot) of open space in front of and behind it to allow suitable airflow for cooling.

Heat Output

Table 2.5 shows the amount of heat produced by the base station.

Configuration	Heat Output (W)	Heat Output (BTU/hour)
MMDS	1024 (estimate)	3 494 (estimate)

Table 2.5 Heat Output

Electrical Requirements

Before you begin installing the base station, read the following requirements. Ensure that each requirement is met before proceeding with the installation and consult your MOPs for procedures concerning power, grounding, and high-risk cut-over activities.



WARNING: Failure to meet the following requirements may result in personal injury and cause damage to or destruction of the base station and surrounding equipment.

Base Station Power Supply

Table 2.6 lists the required power specifications (MMDS) for the base station.

Specification	Value
Nominal power supply	–48V DC
Voltage range	–38V to –70V DC
Maximum ripple/noise	100 mVp-p from DC to 20 MHz
Recommended DC power setting	–54.4V (measured at the PDP inputs)
Current at –48V (1 sector)	22.2A
Power consumption at –48V (1 sector)	1064W

Table 2.6 Base Station Electrical Requirements

NOTE: Each radio module draws up to 9A at –48V, depending on the supported RF spectrum.

NOTE: A readily accessible disconnect device shall be incorporated in the building installation wiring.

Base Station Power Supply Circuit Breakers

The customer's –48V DC power supply must be equipped with a TBDA circuit breaker to protect the base station power cables.

Base Station Power Supply Grounding

The return lead on the power supply shall be connected to earth ground. For fault protection, the earthing conductor shall be sized in accordance with applicable regulations to carry the current of the largest power source circuit breaker. Since this is a negative-supply positive-ground system, the return lead is the one with the most positive potential of the active conductors, –48V and DC return.

Backup Power

The base station does not contain any internal battery backup systems. Ensure that your main power source has a backup power system in case of a power failure.

Fuses

Each radio module contains one 2A, 250V, fast-blowing fuse (1.25 × 0.25 inch) to protect the RF components from damage in the event of an electrical overload.

Rack Grounds

Table 2.7 shows the grounding requirements for each rack.

Ground Type	Requirement
Chassis ground	TBD
Radio module ground	TBD
Isolation pad (recommended)	The rack must be installed on an isolation pad to ensure proper grounding.

Table 2.7 Grounding Requirements

Network and Backhaul Requirements

Before you begin installing the base station, read the following network requirements. See the following documents for detailed information about network and backhaul requirements:

- *Network Deployment Planning Guide* – Describes site, network, and backhaul requirements
- *System Overview* – Describes the role and function of equipment in the core network

Backhaul Circuits

Multiple T1/E1, DS3/E3, or other interfaces connect the edge router at the base station site to the network core. See your field engineering package information about your site's backhaul circuits and the configuration of any necessary customer service units (CSUs).

NOTE: Backhaul circuits must be tested by qualified personnel before the base station is placed into operation in order to ensure connectivity with the core network.

PSTN Gateway

The base station does not connect directly to the PSTN. A PSTN gateway located in the core network connects the IP-based equipment to the circuit-switched PSTN.

NOTE: Ensure that any equipment connecting the base station to the PSTN is UL-listed.

General Site Requirements

Each site has unique requirements and characteristics. Consult your SOMA Networks technical representative for information about specific site requirements. See the *Network Deployment Planning Guide* for a comprehensive description of generic site requirements.

Restricted Access

The base station is intended for installation in restricted access locations only. Access to the site must be controlled by the authority for that location and granted through the use of special tools, locks and keys, or other means of security. Access should be limited to service personnel who have been instructed about the reasons for the access restrictions and about any precautions that must be taken while at the location.

Mounting Surface

The base station equipment is intended for installation only in areas with concrete or other noncombustible surfaces.

Equipment Entrance and Unloading Area

A route must be provided between the unloading area and the equipment room where no restrictions will be encountered.

AC Outlets

The site must have at least two duplex AC receptacles located within a convenient distance to facilitate installation and maintenance of the base station.

Fire Protection System

SOMA Networks recommends a fire protection system for the site.

Lighting

The site must have sufficient lighting to conduct work in a safe manner. Emergency lighting is recommended. Lighting must meet local and other applicable regulations.

Beacon System

Depending on its height and applicable regulations, the tower may require aviation safety lights. Consult the aviation, environmental, and communication regulations applicable to your site for information.

Antenna Mounting Locations

The base station uses two antennas (main and diversity) per sector. Consult your SOMA Networks technical representative for information about the size, weight, and installation requirements of the antennas.

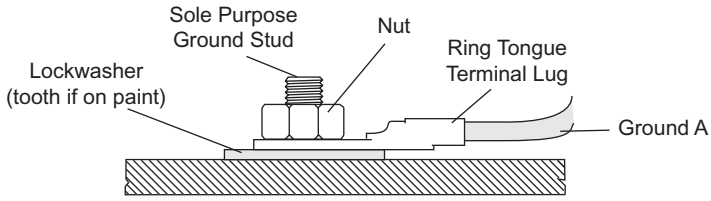
Cabling Requirements

Ensure that your site has the necessary cable racking to accommodate the base station and that your site has external cable access ports for RF antenna cabling.

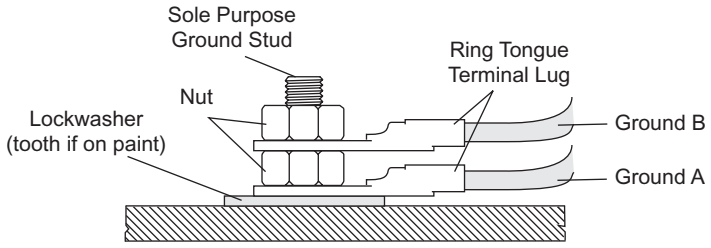
Ground Cable Fastening Techniques

Figure 2.1 shows the correct methods for fastening cable grounds to a master ground bar (MGB) (or other suitable grounding point. SOMA Networks recommends that only one ground cable be fastened to a ground stud. However, if circumstances require multiple connects to a single ground stud, the grounds should be attached using the correct method shown in Figure 2.1. By using this method, the ground from one rack can be removed without disturbing the ground for the other rack.

Correct Fastening for Single Ground



Correct Fastening for Two Grounds



Incorrect Fastening for Two Grounds

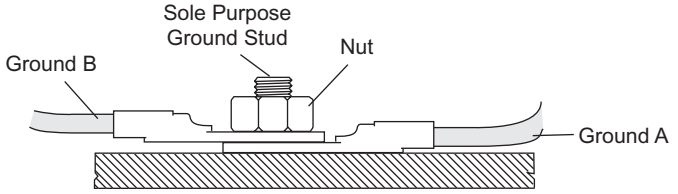


Figure 2.1 Correct Ground Fastening Technique

Chapter 3

PRE-INSTALLATION REQUIREMENTS AND PROCEDURES

This chapter lists the tools and equipment required for installing and testing the base station. It also provides procedures for unpacking the racks and configuring individual cards and shelves.

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Antistatic Precautions



WARNING: Components in the base station are highly sensitive to electrostatic discharges (ESD). Follow the procedures described below to prevent unseen damage from occurring.

To prevent damage to components from static electricity:

- Do not handle circuit boards unless you are using the appropriate antistatic protection, such as wrist straps, boot straps, boots, or a conductive mat. Wrist straps must have snug but comfortable contact with your skin, and they must be connected to a grounding point on the racks.
- Handle circuit boards by the faceplate, handles, or edges. Do not touch any integrated circuits, connections, pins, or soldered surfaces.

Wrist-Strap Grounding Point

The chassis contains a wrist-strap grounding point. The grounding point is connected to the frame ground and provides antistatic protection when technicians work with circuit cards.

NOTE: The rack must be grounded for the wrist-strap grounding point to be effective.

Equipment, Tools, and Supplies Checklists

Tools

The following tools are recommended for a typical base station installation:

- Allen key set
- Cable ties
- Electrical tape
- Extension cord (optional)
- Heat gun (with heat shrink roll) (optional)
- Label maker
- Marking pencil
- Oxide-inhibiting compound
- Platform stepladder (6-foot) (optional)
- Scissors
- Socket sets (Imperial and metric)
- Tape measures (linen and metal)
- Thomas and Betts (T&B) crimper
- Torque wrenches
- Utility knife
- Wrench sets (Imperial and metric)

NOTE: Ensure that your torque wrenches are correctly calibrated according to the methods and schedule specified by the manufacturer. The calibration date should be indicated on each wrench.

Safety Equipment

The following safety equipment is recommended for a typical base station installation.

- Electrical gloves
- ESD straps
- First aid kit
- Flashlight
- Safety glasses
- Safety shoes

Test Equipment

Table 3.1 shows the equipment recommended for testing base station functionality.

Equipment	Purpose
Digital multimeter	Checking continuity and electrical characteristics
Workstation, terminal, or laptop	Installing, configuring, and verifying software
Cable sweep generator	Testing the electrical integrity of antenna and RF cables
Spectrum analyzer	Monitoring RF signal output
Ethernet cable tester	Testing the type and integrity of Ethernet cables

Table 3.1 Recommended Test Equipment

NOTE: Ensure that your test equipment is correctly calibrated according to the methods and schedule specified by the manufacturer. The calibration date should be indicated on each piece of test equipment.

Software

Table 3.2 shows the software recommended to be installed on your laptop or workstation.

Software	Purpose
TCP/IP drivers	Accessing the individual systems over TCP/IP
SSH, SCP	Creating secure shell (SSH) sessions with the cards in the base station. For UNIX-like operating systems, you can type `ssh` at the command line. For Windows operating systems, use putty.exe or another SSH client. Secure copy (SCP) is required for transferring files securely across the network.
Telnet, FTP	Establishing sessions and transferring files with devices in the network
Serial terminal	Communicating with the sector controller
Text editor	Viewing and editing text and configuration files. Must support UNIX-style text files.
Web browser	Accessing Web pages.

Table 3.2 Recommended Software

Unpack and Inspect the Equipment

Once you received your base station equipment, use the following procedure to ensure you have all the necessary parts.

To unpack and inspect the base station equipment

1. Transport the shipping boxes to the installation area using a dolly or pallet jack.
2. Inspect the exterior packaging for any noticeable damage that may have occurred during shipment.
3. Unpack the equipment. If a component is packed in anti-static packaging, leave the component inside the packaging until you are ready to install it.
4. Check the equipment for extra mounting hardware or invoices. If there are additional items, remove them and keep them for future use.
5. Save the packaging material and the BOMs in case any of the equipment needs to be returned or moved in the future.
6. Ensure that all equipment and accessories have been shipped.
7. Document any shortages and report them to your SOMA Networks representative so that any missing equipment may be procured and delivered to the site as soon as possible.
8.

Chapter 4

INSTALLATION PROCEDURES

This chapter provides procedures on installing the NPM-2500.

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Attach the Base Station Components

The following base station components are designed to be rack-mounted on a standard 19-inch telecommunications rack:

- NPM-2500 chassis
- Radio module shelf
- PDP

The components typically use four M5 screws (two on each side) to attach to the rack. The recommended torque for each screw is 3 N•m (27 inch-pounds).

The edge router for the site is typically installed on the same rack as the base station equipment.

To attach the rack components

1. Attach the radio module shelf to the bottom of the rack. If the rack is shared with other equipment, install the radio module to the bottom-most location.
2. Attach the chassis directly above the radio module shelf.
3. If possible, attach the edge router directly above the chassis. Refer to the manufacturer's documentation for specific information about installation.
4. Attach the PDP to the top-most location in the rack to be used for base station components.

Install the Radio Modules

Two radio modules are used per sector, main and diversity.

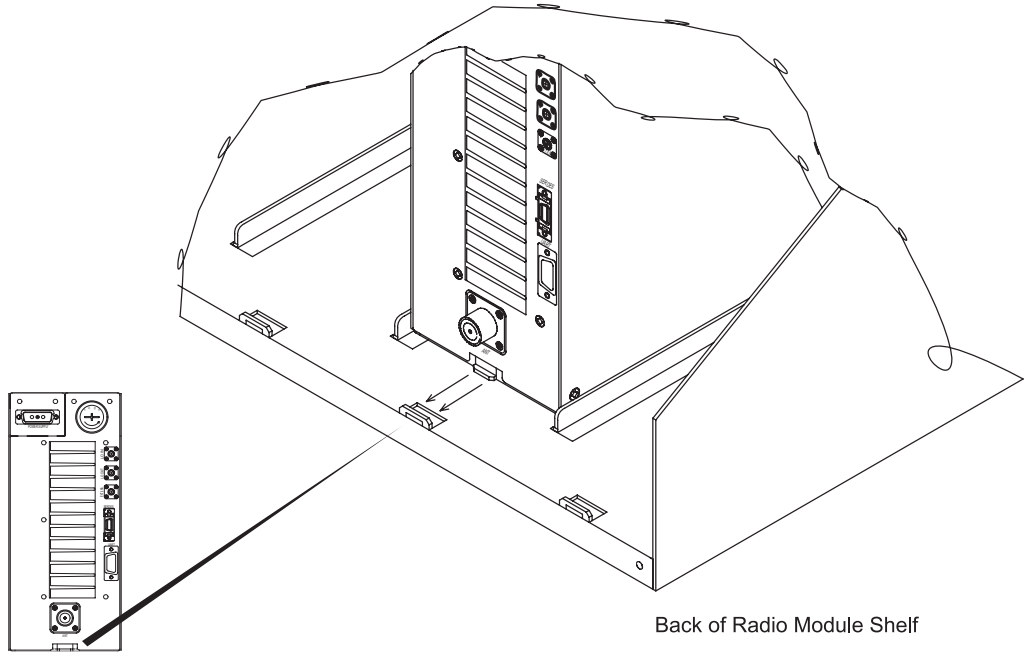


Figure 4.1 Radio Module Insertion

To install the radio modules

1. Remove the radio module from its protective bag.
2. Orient the radio module properly.
3. Slide the radio module into the first available radio module slot. The slots should be filled from left to right, then top to bottom.
4. Ensure that the radio module is anchored into the guide shoe in the back of the radio module shelf. Figure 4.1 shows how to anchor the radio module into the guide in the back of the radio module shelf.
5. Secure the module in the slot using four thumb screws, one in each corner. Torque the thumb screws to 1.5 N•m (13 inch-pounds).
6. Ensure that the radio module is secure by grasping the handle on the front panel and pulling lightly. The radio module should not move. If the radio module does move, ensure that the thumb screws are attached to the shelf assembly and that the module is seated correctly. If necessary, remove the module and repeat this procedure.
7. Repeat steps 1 to 6 for the second radio module.
8. Cover any empty slots in the radio module shelf with filler panels.\

Connect the Power Supply

Refer to the MOPs before scheduling or beginning any work involving the site's main power. Before proceeding with this procedure, ensure that all the necessary site cable layout, runaway, and grid work has been completed.



WARNING: Ensure that the necessary requirements and procedures have been reviewed prior to the start of any power-related activity. Refer to your power cut-over MOP for procedures specific to your site.

Ensure that the main DC power supply and the base station are powered off before you begin this procedure. Failure to turn off the power supply may result in personal injury or death and cause damage to or destruction of the base station and surrounding equipment.

To connect the power cables

1. Ensure that the –48V DC power supply for the base station is powered off.
2. Ensure that each cable (GND, return, and –48V) is terminated with a correctly sized compression lug and that an anti-oxidant solution has been applied.
3. Connect the Ground (GND) cable to the ground terminal of your power supply. Ensure that the cable is an appropriate size.
4. Connect the –48V power cable to the –48V terminal of your power supply. Ensure that the cable is an appropriate size.
5. Connect the Return (RTN) cable to the return terminal of your power supply. Ensure that the cable is an appropriate size.
6. Connect each cable (GND, return, and –48V) to the base station's PDP. Use 1/4-inch hex nuts with 1/4-inch split-lock washers when securing the cables. Torque each hex nut to 78 inch-pounds.
7. Ensure the–48V and return power cables are connected to the power supply correctly by performing a continuity test on each cable.
8. Dress and label the main and return power cables according to the standards and requirements of your site.

Configure Jumpers on Sector Controller

A Concurrent 310 card is used for the sector controller. It may be necessary to modify the jumper settings, as the base station uses a configuration of these cards that differs from the manufacturer's original settings.

NOTE: If the card is pre-installed in the chassis, then it has already been configured and this procedure is not required.

Jumper Settings

Table 4.1 shows the required settings of the configuration switches that differ from the factory defaults.

Switch	Appearance	Description
Console Mode → Serial console mode		Directs the console to the serial port
User/Test → Restore user defaults/soak		Restores BIOS settings from NVRAM in case of corruption rather than factory defaults

Table 4.1 Concurrent 310 Switch Settings

To configure the Concurrent PP310 Jumper Settings

1. Remove the card from its antistatic packaging at a grounded work area. Ensure that you are properly grounded with a wrist or boot strap before handling the cards. Depending on the configuration of your base station, you may have up to eight cards that need to be configured.
2. Ensure that the jumper switches are configured as shown in Table 4.1. Figure 4.2 shows the location of the jumpers.

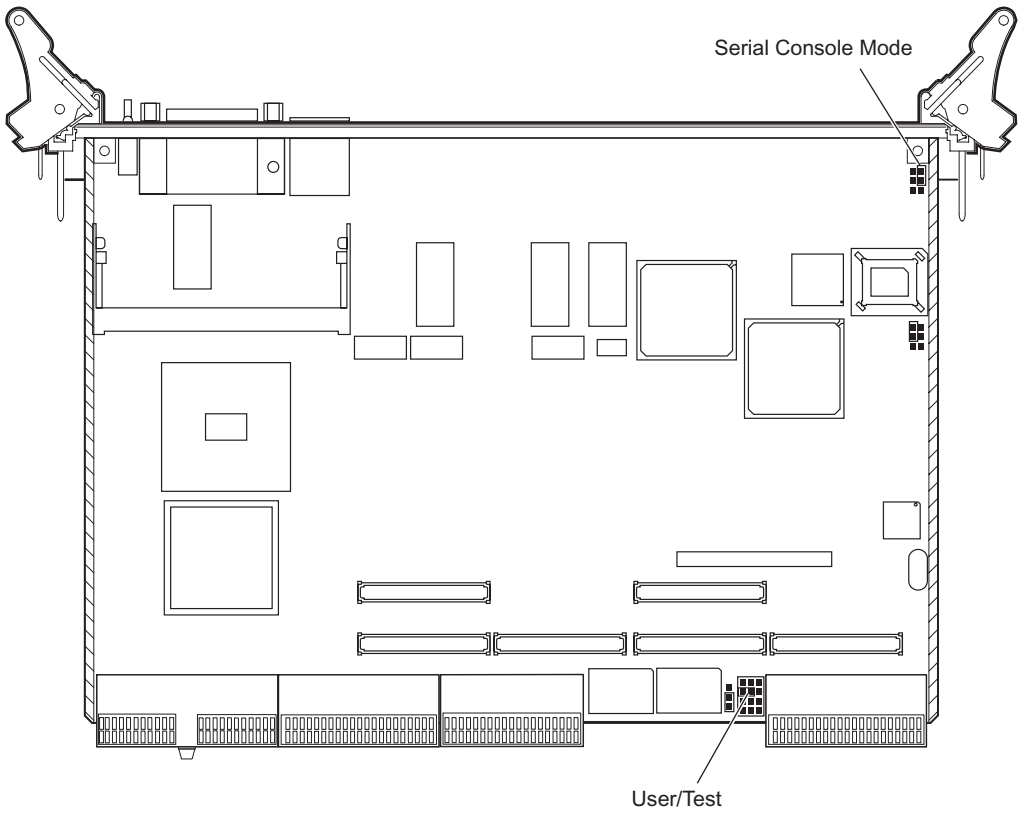


Figure 4.2 Concurrent 310 Jumper Configuration

3 Place the card back in its antistatic packaging until you are ready to install it in the shelf.

Install the Cards in the Chassis

The chassis contains slots for the following cards:

- Sector controller – Front bottom slot, indicated by a red strip
- Sector controller RTM – Rear bottom slot, indicated by a red strip
- Modem card – Front top slot
- Modem RTN – Rear top slot
- Power supply – Front right slot

Figure 4.3 shows the locations of each card in the front of the chassis.

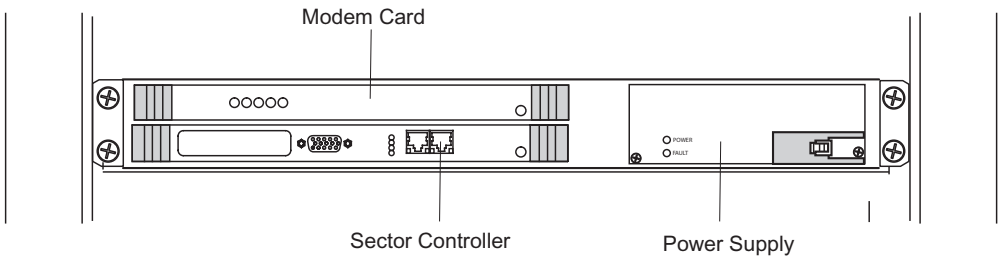


Figure 4.3 Card Layout

To insert the cards and power supply into the chassis

1 Ensure that there are no obstructions in the guide rails for each of the three slots and check the backplane for bent pins.

If there are bent pins, the backplane is damaged and requires repair. Report any damaged equipment to your SOMA Networks representative as soon as possible.

2 Use the following procedure to insert each of the following cards in order: chassis power supply, sector controller RTM, modem RTM, sector controller, and modem card:

i Remove the card from its antistatic bag.

ii Set the ejector handles on the in the open position by turning the handles away from the center of the front panel.

iii In the open position, the ejector handles are at an approximately 45° angle from the front panel.

iv Ensure that the mounting screws are withdrawn enough to allow for the insertion of the card.

v Orient the card so that the text on the front panel is right-side up. The guide pins should be located to the right of the ejector handles.

vi Slide the card into the correct slot. Figure 4.3 shows the correct card layout. Use the guide rails to ensure the connectors are aligned.

vii Apply sufficient pressure to fully mate the card by pressing on both ejector handles with equal force. If present on the card, the guide pins should slide into the round holes located at the top and the bottom of each slot on the right-hand side.

viii Lock the card in the slot by turning the ejector handles towards the center of the front panel.

ix In the lock position, the ejector handles are at a 90° angle from the front panel.

x Secure the card in the slot by installing the 2.5-mm mounting screws. Torque each screw to 0.4 N•m (3 inch-pounds).

Connect the PDP, Ethernet, and SERDES Cables

Table 4.2 shows the cabling for all the components in the base station.

Cable	From	To
Power	PDP (–48V, RTN GND)	Chassis
	PDP (–48V, RTN GND)	Radio module (main)
	PDP (–48V, RTN GND)	Radio module (diversity)
	PDP (–48V, RTN GND)	Edge router
Ethernet	Sector controller, EthA	Edge router port 1
	Sector controller, EthB	Edge router port 2
SERDES	Modem card RTM MAIN	SERDES port on radio module (main)
	Modem card RTM DIV	SERDES port on radio module (diversity)

Table 4.2 Base Station Cabling

To connect the cables

1. Connect the cables. See Table 4.2 for information about the origin and termination point of each cable.
2. Contact your SOMA Networks technical representative for information about your edge router cable connections.

Configure Sector Controller BIOS Settings

It may be necessary to modify the settings in the sector controller's BIOS, as the base station uses a configuration of these cards that differs from the manufacturer's original settings.

NOTE: If the card is pre-installed in the chassis, then it has already been configured and this procedure is not required.

BIOS Settings

Table 4.3 shows the required BIOS settings for the card. The BIOS settings can be viewed or changed via a serial terminal.

Option	Setting
Main → Boot Options → Option ROM Loading	Load SCSI Once
Main → Boot Option's → Serial Console Baud Rate	115.2K
Main → ROM Disk (A:)	ROM Disk
Advanced → Ethernet 0 Connector	Backplane
Boot order	Hard Drive, Diskette Drive, Removable Devices, CD-ROM Drive
CPCI Bridge → CPCI Bridge Memory	64 Mbytes
CPCI Bridge → CPCI Bridge Pref Memory	64 Mbytes
CPCI Bridge → CPCI Bridge I/O	4 kbytes

Table 4.3 Concurrent 310 BIOS Settings

To configure the Concurrent PP310 BIOS Settings

1. Connect a laptop to the serial port on the front of the sector controller. A custom serial cable is required.
2. Start a serial terminal session with the following settings: 115200, 8, none, 1.
3. Power on the chassis.
4. Follow the on-screen instructions and ensure that the card's BIOS settings are correct.
5. After the BIOS has been configured, power off the chassis.

Chapter 5

ANTENNA INSTALLATION PROCEDURES

This chapter describes the antenna equipment installation.

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Install the Main and Diversity Antennas

This procedure describes the general process for installing the main and diversity antennas. Consult your SOMA Networks technical representative for any site-specific antenna installation requirements.



WARNING: Before proceeding with the installation of the antennas, consult the applicable local code of wiring for requirements, including: clearance from power and lightning conductors, proper mounting methods, and antenna grounding.

RF cabling must be correctly tested prior to the installation of SOMA RF equipment. Consult your SOMA Networks technical representative for RF cable sweep procedures specific to your deployment.

Before You Begin

Before you install the antennas:

- Select an installation location away from any objects that might obstruct the RF signals. Although the base station has non-line-of-site RF capability, obstructions may reduce the strength of the transmission or reception signals.
- Ensure that the type and length of cabling used to connect the main and diversity antennas to the radio modules meet your attenuation and shielding requirements.

Cabling and Connectors

Figure 5.1 shows the main and diversity antenna cabling and connectors.

NOTE: Connector and cable types may change depending on the configuration of your deployment.

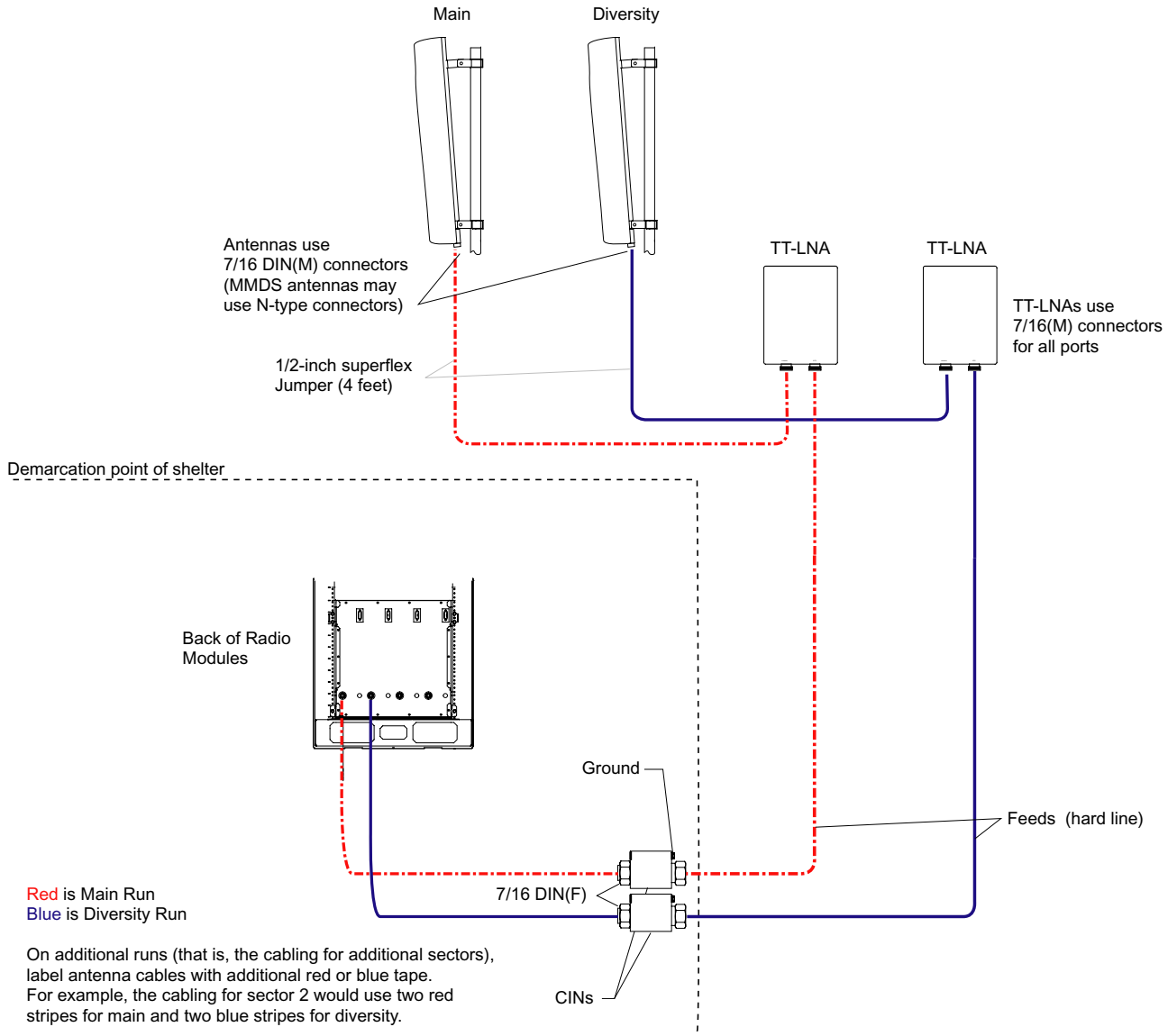


Figure 5.1 RF Antenna Configuration

To install the main and diversity antennas

1. Verify that you have the right type of antennas, both in terms of frequency and beamwidth.
2. Run the antenna cable from the racks to the intended location of each antenna. Consult your SOMA Networks technical representative for antenna cable specifics.

   NOTE: Ensure that the cable remains clear of any sources of potential interference, such as transmitting equipment or power lines.

3. Attach each antenna to the tower or building using the required mounting hardware.
4. Orient each antenna to the correct azimuth (direction) and tilt. Consult your SOMA Networks technical representative for information.



CAUTION: Failure to orient the antennas correctly may seriously affect the performance of your wireless network.

5. Tighten and secure each antenna.
6. Connect the antenna to the radio module:
   - **i** Install each TT-LNA within 1.5 m (3 feet) of its antenna. The TMAs should be installed as close to the antennas as possible in order to ensure optimal performance. Consult the documentation that ships with the TT-LNA for the correct mounting procedures.
   - **ii** Connect the ANT port on each TT-LNA to its antenna using a suitable coaxial cable. Properly torque and weatherproof each connector.



CAUTION: Do not over-tighten connectors. Overtightening the connectors may damage the cable and degrade the RF signal.

   - **iii** Install each CIN (also called a bias-T) inside the base station equipment room in accordance with its documentation. Ensure that the DC port on the CIN (SMA connector) is facing towards the base station. Torque and weatherproof each connector.



CAUTION: Do not over-tighten connectors. Overtightening the connectors may damage the cable and degrade the RF signal.

   - **iv** Connect the base station port on each bias tee to the ANT port on each radio module. The ANT port is located on the rear side of the radio module.
   - **v** Connect the CIN port (also called Vout) on the rear side of the radio module to the DC port on the bias tee.