RadioRouter® Base Station Indoor Installation Guide for the RR1000

Date: 03-28-2005
Version 1.7

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- **Safety**
  - UL 60950 — Underwriters Laboratories, Inc.
  - CAN/CSA-C22.2 No. 60950 — Canadian Standards Association
  - EN 60950 — European Norm
  - IEC 60950 — International Electrotechnical Commission
- **EMC — Electromagnetic Compatibility**
  - FCC Part 15 (CFR 47) Class A — Federal Communications Commission, Code of Federal Regulations
  - ICES-003 Class A — Interference-Causing Equipment Standard
  - EN55022 Class A
  - CISPR22 Class A
- **Telecom**
  - FCC Part 27 — Miscellaneous Wireless Communications Services
- **Industry/Environmental**
  - GR-63-CORE NEBS Level 3 — Network Equipment Building System
  - GR-1089-CORE NEBS Level 3 — Electromagnetic Compatibility and Electrical Safety
  - ETSI EN 300 019-2-3 V2.1.2 — European Telecommunications Standards Institute

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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 own expense. (CFR reference 15.105)

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This Class ‘A’ digital apparatus complies with Canadian ICES-003.

Cet appareil numerique de la classe ‘A’ est conforme á la norme NMB-003 de Canada.

HOW TO USE THIS MANUAL

About this Document

This guide is intended for use by qualified engineering personnel only. The *RadioRouter® Base Station Indoor Installation Guide* covers all of the necessary information required to install the hardware of an indoor RadioRouter base station.

Intended Audience

This guide is intended primarily for qualified engineering personnel who will use it to complete the base station installation process. It can also be used by maintenance personnel after the initial installation is complete.

Related Documents

This guide focuses on the initial hardware installation. For information on commissioning the base station after hardware installation, see the *RadioRouter® Base Station Commissioning Guide*. For other documentation or for additional copies of existing documentation, please contact your Flarion representative.

Change History

- Version 1.0 — Initial Release
- Version 1.1 — Added polarity check before powering up. Added power down sequence changes.
- Version 1.2 — Minor formatting changes. Additions to Site Prep material.
- Version 1.3 — Added Alarm section with pinouts. Included new photos of the base station. Added instructions for simulcast configurations.
- Version 1.4 — Added instructions for simulcast configurations — sections 4.1 and 7. Added Legal notices. Added grounding caution.
- Version 1.5 — Added instructions for reseating the RF cards when installing the cabinet (Chapter 3.)
- Version 1.6 — Updated schematic of clearance holes in the cabinet bottom.
- Version 1.7 — Corrected part number for alarm connector, added instructions for attaching power to a DC-to-DC converter, added instructions for E1 connection, ground cable changed from #6 to #2 AWG.

Document Conventions

The following typographical conventions are used in this document:

- `Screen font` is used to show output from the system in terminal session descriptions.
- *`Italics screen font`* is used for the variables supplied by the system.
- **`Bold screen font`** is used to show user input in terminal session descriptions.

- ***Bold italics screen font*** is used for the variables that the user must supply.
- **Bold** is used for command names such as **Show**, non-printing characters, and function keys such as **Enter**.
- The plus sign (+) is used for keys that the user must press and hold together such as **Shift+Tab** and **Ctrl+Alt+Delete**.

A list of abbreviations used in this manual can be found at the end of the document in *Appendix A - List of Abbreviations*.

WARNINGS, CAUTION STATEMENTS AND NOTES

This document uses certain conventions to indicate supplementary information, of varying degrees of severity and importance. Material marked with a “warning” label is considered critical; failure to observe this information can result in death or serious injury. Information that refers to potential damage to equipment is marked with a “caution” label. Information that is considered additional but useful is marked with a “note” label.

Samples of warnings, caution statements and notes appear as follows:

WARNING:

WARNINGS ARE ALWAYS IN UPPER CASE. WARNINGS RELATE TO POTENTIAL LOSS OF LIFE OR SERIOUS INJURY. YOU MUST OBEY ALL WARNINGS.

CAUTION:

Normal Cautions are in bold type. Cautions relate to potential damage to equipment. You must obey all cautions.

ESD CAUTION:

Electrostatic Discharge (ESD) warnings are in bold type, and are accompanied by the ESD warning symbol. ESD can damage sensitive electronic equipment; ESD warnings should likewise be heeded.

Note:

Notes are displayed in italic. Notes contain information that may be valuable to the reader, but is considered supplementary to the normal text flow.

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Chapter 1. Overview

The *RadioRouter® Base Station Installation Guide* covers all of the necessary information required to physically install the RadioRouter base station hardware. This guide assumes that a suitable site has already been prepared. A checklist is provided in *Chapter 2. Verifying the Site Preparation* to assess the site prior to installation.

Once the physical installation is complete, the base station can be configured and commissioned. Instructions for the configuration process can be found in the *RadioRouter® Base Station Commissioning Guide*.

1.1. Base Station Characteristics

The RadioRouter indoor base station has the physical characteristics shown in *Figure 1-1: RadioRouter Base Station Characteristics*.

- Standard EIA 19 inch rack mount
- 38 U of electronics mounting height
- 71" H x 24" W x 26.5" D with door and back panel installed
- 71" H x 24" W x 24.5" D without door and back panel installed
- 631 lbs with door and back panel installed
- 559 lbs without door and back panel installed
- Inherent forced air cooling
- Front access required only for maintenance
- Welded steel construction
- Antenna cable connectors on top 7/16" DIN female
- Power cable and backhaul entry from top

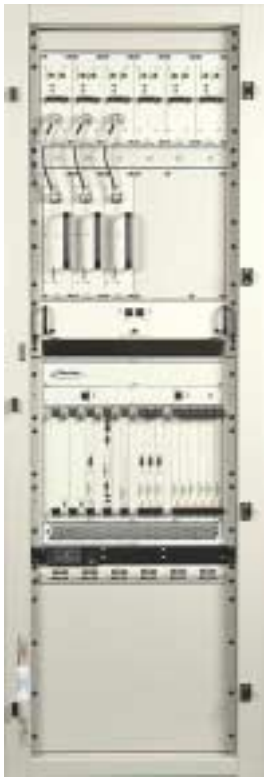

Figure 1-1: RadioRouter Base Station Characteristics

WARNING:

THE RADIOROUTER BASE STATION INDOOR CABINET WEIGHS APPROXIMATELY 650 LB AND IS TOP HEAVY. CARE MUST BE TAKEN TO HANDLE THE CABINET PROPERLY WITHOUT DANGER TO THE INSTALLATION PERSONNEL OR OTHER NEARBY EQUIPMENT.

IT IS THE RESPONSIBILITY OF THE INSTALLER TO ENSURE THAT ALL LOCAL, STATE, AND FEDERAL SAFETY REQUIREMENTS ARE FOLLOWED.

ESD CAUTION:

It is the responsibility of the installer to ensure that all necessary precautions are taken to avoid electrostatic discharge damage to the equipment.

Note:

All installation work must be coordinated with the carrier to insure compliance with carrier requirements regarding scheduling work during maintenance windows.

1.2. Special Equipment

In addition to standard installation tools, it is recommended that special equipment be used to move the RadioRouter base station cabinet. Examples of equipment which can be used are:

- Pallet jack with 27” width across the jacks. Pallet jack 4YX97 from Dayton or equivalent.
- A 36” L x 24” W x 5.5” H flat equipment dolly. McMaster-Carr® part number 2730T6 or equivalent.
- Hoist or crane with heavy duty structural straps — 1000 lb load capability.

Chapter 2. Verifying the Site Preparation

Before you begin the physical installation of the base station, confirm that the site preparation is complete. The checklist below identifies all items that must be in place before the installation can begin.

WARNING:

IF PROPER SURGE ARRESTORS ARE NOT IN PLACE, DAMAGE TO THE EQUIPMENT MAY RESULT.

2.1. Site Preparation Checklist — Indoor Base Station

- **Floor Plan**
  - Architectural drawing or sketch of site indicating location of all equipment to be installed, including base station cabinet and cables
- **Environment**
  - Enclosed space with functional HVAC
  - Floor plan with adequate space for cabinet — at least 24” front and 6” rear
- **Electrical system**
  - Appropriate power feeds and surge suppression
  - Approriate site grounding, for example internal ground halo and master ground bar
- **Antenna plant**
  - Surge arrestor mounting available, arrestor installed
  - Six Tx/Rx antenna line surge protectors installed on surge arrestor mounting
- **Backhaul connection**
  - Backhaul surge arrestor mounting available, arrestor installed
  - Surge arrestor grounded and ready to be connected to backhaul network termination
- **Alarm connection**
  - One AC power failure alarm termination point — AMP 554954–2 connector
  - One high temperature alarm termination point — AMP 554954–2 connector
- **Cable support**
  - Trays or other support mechanisms for cables available
- **Cables**
  - DC power cabling: #6 AWG THHN or THWN
  - Ground cabling to master ground bar: #6 AWG THHN or THWN
  - RF cabling to surge arrestors: Andrews 1/2” SuperFlex jumpers or equivalent

- For T1 installations: 2–pair shielded
- for E1 installations: 2–pair shielded or coaxial
- For Ethernet installations: CAT 5 cable
- Alarm sensor cables

2.2. Preparing the Floor

Before the cabinet can be placed into position, mounting holes must be drilled into the floor. There are a total of 8 clearance holes in the base of the cabinet — 2 in each corner. *Figure 2-1: Clearance Holes in Cabinet Base — Schematic View* shows the positioning of the holes.

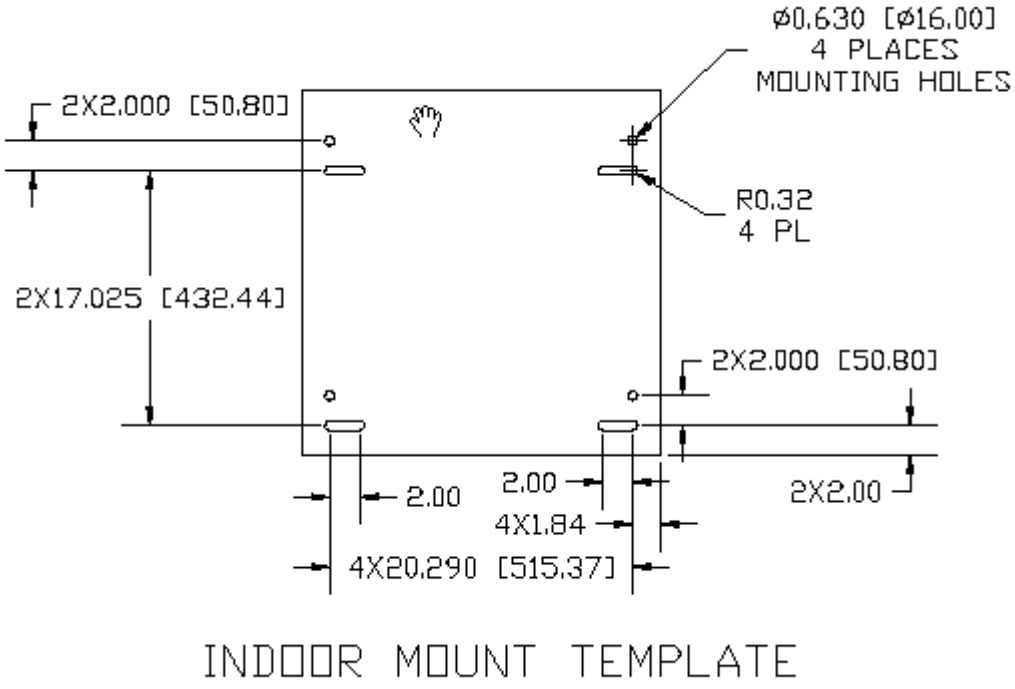

Figure 2-1: Clearance Holes in Cabinet Base — Schematic View

Figure 2-2: Clearance Holes in Cabinet Base shows the holes as viewed from inside the front corner of the cabinet.

Figure 2-2: Clearance Holes in Cabinet Base

Only one hole per corner is required to mount the cabinet. All holes must have threads to accommodate 1/2” diameter bolts with flat washers, 1” minimum length.

Chapter 3. Installing the Cabinet

The base station cabinet is shipped assembled, shrouded in cardboard, and mounted on a shipping pallet. The pallet is 35” L x 30” W x 6.75” H.

WARNING:

THE RADIOROUTER BASE STATION INDOOR CABINET WEIGHS APPROXIMATELY 650 LB AND IS TOP HEAVY. CARE MUST BE TAKEN TO HANDLE THE CABINET PROPERLY WITHOUT DANGER TO THE INSTALLATION PERSONNEL OR OTHER NEARBY EQUIPMENT.

Equipment that can be used to move the base station is described in *Chapter 1. Overview*.

3.1. Removing the Cabinet from the Pallet

When this procedure is completed, the cabinet will be free to be moved directly into place. Alternatively, the cabinet can be placed onto a flat dolly and moved through narrow equipment aisles.

1. Remove the cardboard shroud and discard.

2. Inspect the cabinet for damage. If there is any damage, fill out the Punchlist in . If the damage is minor and does not prevent continuation of the installation procedures, continue with the installation. If the damage prevents continuation of the installation, contact the Project Manager for instructions.

3. Locate the pallet's side support braces. See *Figure 3-1: Side Brace and Screws*. Unscrew the braces and remove them.

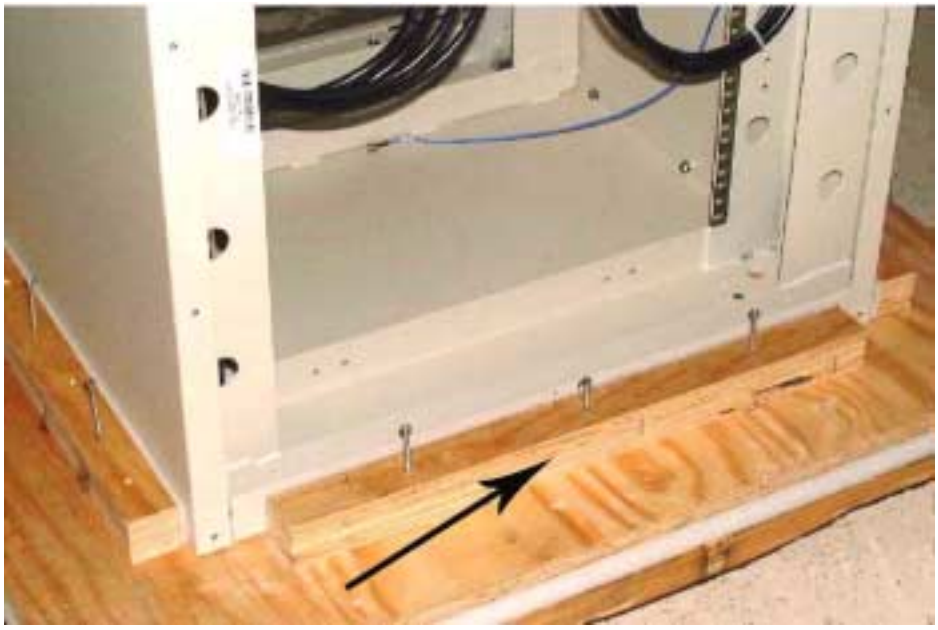

Figure 3-1: Side Brace and Screws

4. Open the front door of the cabinet. Lift the door upwards and remove the door from its hinges.

5. Unfasten all the screws on the rear panel and remove the panel.

Note:

Reinstallation of the rear panel is optional. If the rear panel is to be reinstalled, make sure that there is sufficient rear clearance to reinstall in place or reinstall prior to final positioning of the cabinet.

6. Unscrew the 8 screws on the bottom front access panel. Remove the panel.

7. Unscrew the cabinet-to-pallet mounting screws. These are located on the inside corners of the cabinet. See *Figure 3-2: Cabinet-to-Pallet Mounting Screws*.

Figure 3-2: Cabinet-to-Pallet Mounting Screws

3.2. Lifting the Cabinet

Once the cabinet is near its final position, it can be moved into place. It is recommended that the cabinet be lifted by a hoist or crane using heavy duty structural straps with 1000 lb load capability.

Note:

Before lifting the cabinet into place, make sure all necessary holes have been drilled. See Section 2.2. Preparing the Floor. Make sure the back panel and front door have been removed.

1. Remove the 1U blank panel at the top of the cabinet.

Figure 3-3: Top of Cabinet with Panels Removed

2. Route the structural straps through the top of the cabinet from front to back.
3. Lift the cabinet into place.
4. Replace the 1U blank panel at the top of the cabinet.

3.3. Mounting the Cabinet to the Floor

Once the cabinet has been moved to its final location, it must be bolted to the floor.

Note:

Reinstallation of the rear panel is optional. If the rear panel is to be reinstalled, make sure that there is sufficient rear clearance to reinstall in place or reinstall prior to final positioning of the cabinet.

1. Align the clearance holes in the base of the cabinet to the threaded holes in the floor. Although there are two clearance holes in each corner, only one is necessary for mounting.

2. Screw the cabinet to the floor using 1/2” diameter screws and flat washers.

3. Tighten the screws to 400 in-lb +/- 25 in-lb.

Note:

Replace the front access panel after all cables have been routed and connected.

3.4. Reseating the RF Cards

It is possible that during shipping some settling of the modules in the base station may have occurred. Since this can lead to less than optimal connectivity of the modules, they must be reseated.

1. Locate the coaxial cables connecting the LNAs and PAs on the front of the base station. *Figure 3-4* shows the location of the cables.

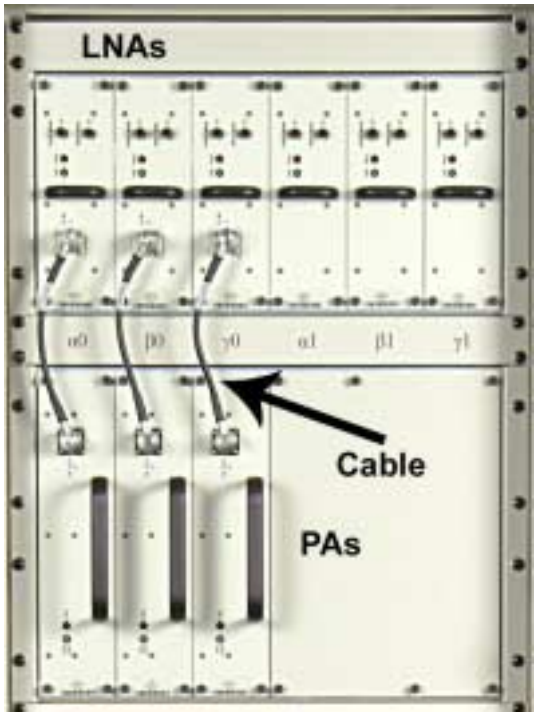

Figure 3-4: Front View of LNAs and PAs

2. Disconnect the lower end of each cable which is the end connected to the PA.

3. On each LNA and PA, loosen the four captive mounting screws until they pop out.

4. Reseat all of the LNAs and PAs:

   4.a. Slowly pull out each module until it disengages from the rear connector — about 1 to 2 inches.

   4.b. Slowly push in the module until it is firmly reengaged with the rear connector.

5. Hand tighten the captive mounting screws on all the LNAs and PAs.

6. Reconnect the coaxial cables. Use a calibrated torque wrench and tighten to 18–22 ft lbs.

Chapter 4. Connecting the Power System

The RadioRouter base station indoor cabinet requires a connection to DC power. This chapter contains procedures for routing the power cables and connecting to power and ground.

WARNING:

WHEN PERFORMING ANY TASKS INVOLVING THE POWER SYSTEMS, MAKE SURE THAT THE POWER IS NOT LIVE. ALL POWER OPERATIONS SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY.

Two different power configurations are available. Each is described separately. The two options are:

- Systems with a Power Distribution Unit (PDU)
- Systems with a DC-to-DC Power Converter

4.1. Routing the Cables

Cables are routed from the top of the cabinet either through one of the cable entry ports or, if available, through the cable access opening.

4.1.1. Routing Cables Through the Cable Entry Port

There are two cable entry ports, one located in each of the top front corners as shown in *Figure 4-1: Cable Entry Port.*

Figure 4-1: Cable Entry Port

1. To route a cable through a cable entry port, the cable channel covers must be removed. *Figure 4-2: Channel Cover with Mounting Screw* shows the cable channel cover in place. Remove all three mounting screws and remove the channel cover.

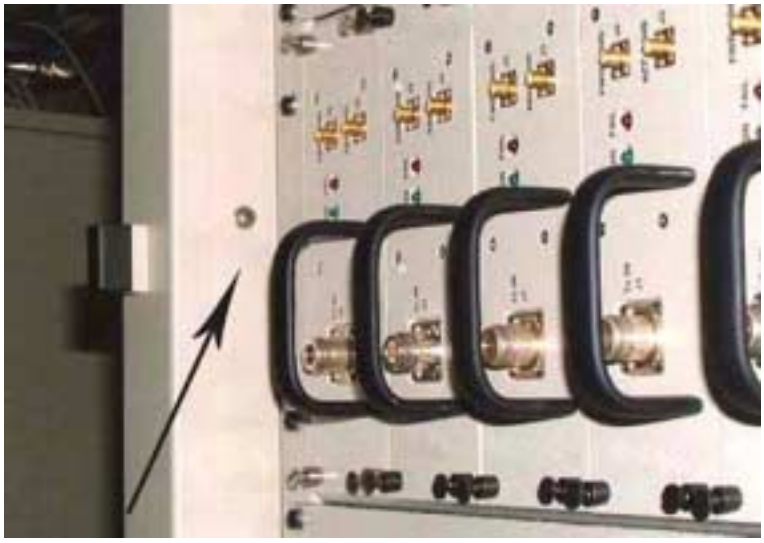

Figure 4-2: Channel Cover with Mounting Screw

2. Route the cable through the channel to the lower portion of the cabinet. See *Figure 4-3: Cable Routed in Channel*.

Figure 4-3: Cable Routed in Channel

3. Route the cable through the holes in the cabinet structure to access the connection point. See *Figure 4-4: Cable Routed Through Structure*.

Figure 4-4: Cable Routed Through Structure

4. When all cables have been routed, reinstall the channel covers.

4.1.2. Routing Cables Through the Cable Access Plate

In some base station configurations, the cable access opening is located across the top of the cabinet as shown in *Figure 4-5: Antenna Cable Access Plate on Top of Cabinet.*

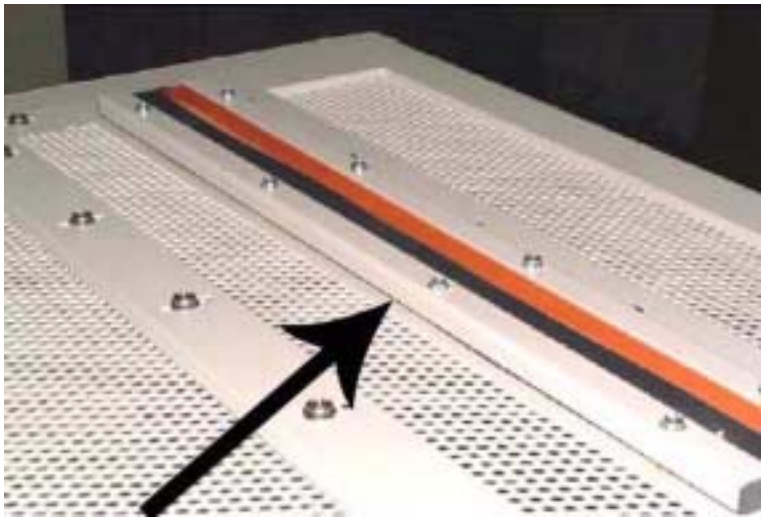

Figure 4-5: Antenna Cable Access Plate on Top of Cabinet

In some base station configurations, the cable access opening is replaced with a series of antenna connectors as shown in *Figure 4-6: Top-Mount Antenna Connectors — Rear View*. In these systems, cables may be routed using the cable access ports only.

Figure 4-6: Top-Mount Antenna Connectors — Rear View

4.2. Connecting the Power — PDU Option

The power distribution panel with the power connections is located at the bottom of the cabinet. The power distribution panel contains circuit breakers and is visible from the front. The power connections are on the bottom of the distribution panel as shown in *Figure 4-7: Access to Power Connections — Front View*.

Figure 4-7: Access to Power Connections — Front View

To reach the connections, the front access panel must be off. If the front access panel has not yet been removed, unscrew the 8 screws and remove it. Once the front panel has been removed, the connections are visible from the underside of the power distribution panel.

WARNING:

WHEN PERFORMING ANY TASKS INVOLVING THE POWER SYSTEMS, MAKE SURE THAT THE POWER IS NOT LIVE. ALL POWER OPERATIONS SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY.

1. Locate the DC power connection point and the DC return connection point. See *Figure 4-8: Power Connections Viewed from inside the Cabinet* and *Figure 4-9: Schematic View of Power Connections*.

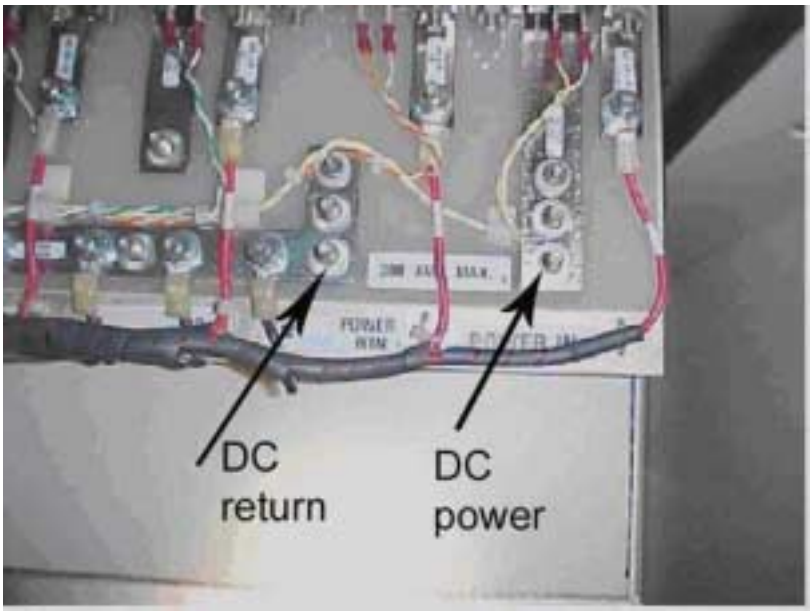

Figure 4-8: Power Connections Viewed from inside the Cabinet

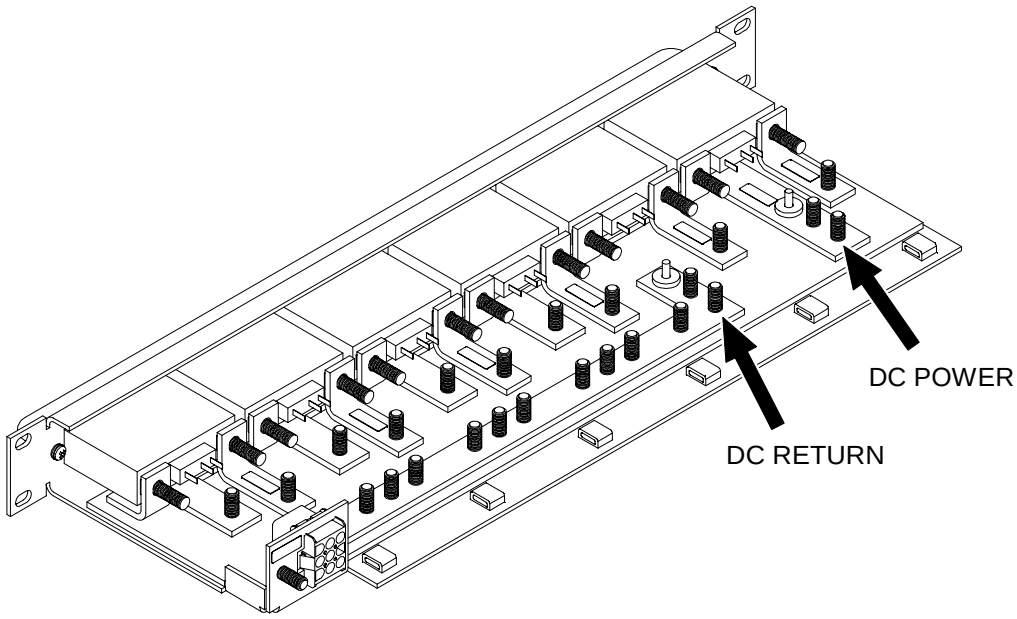

Figure 4-9: Schematic View of Power Connections

2. Connect the power cable to the connectors with 6 AWG wire with a 2–hole lug for a 1/4" diameter stud.

3. Fasten the lug on to the stud with the nuts provided. Tighten nuts to 40–50 in-lb torque.

4. Connect the other end of the cable to the DC power source.

4.3. Connecting the Power — DC–to–DC Converter Option

In a base station with a DC-to-DC power converter, the power is connected in the lower rear of the cabinet as shown in *Figure 4-10*.

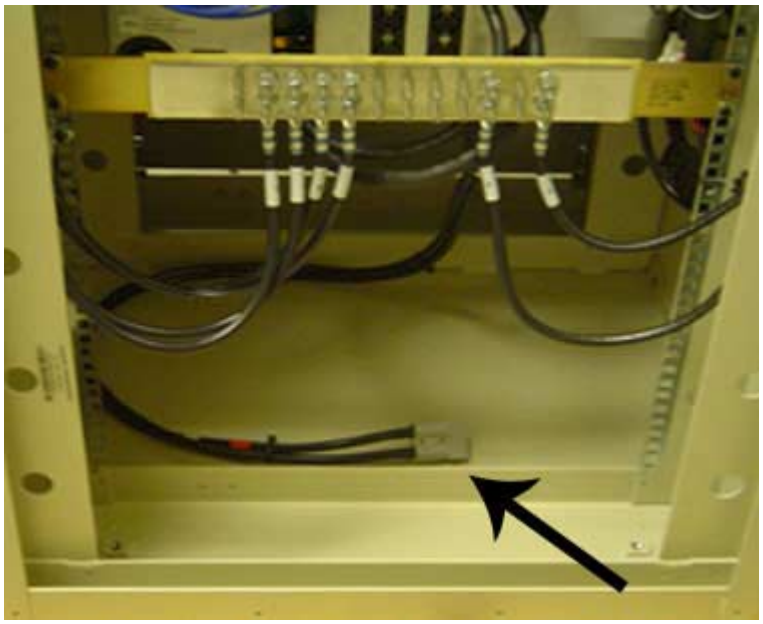

Figure 4-10: Power Connection in Lower Rear of Cabinet

The base station power connector is labeled with a minus sign (–) for the –48 V side and a plus sign (+) for the return. In addition, the –48 V cable is labeled with a minus sign (–) on the cable itself.

A matching connector must be installed on the customer power cable prior to completing the power connection. A parts kit is provided with the base station and is attached to the lower front panel of the cabinet. See *Figure 4-11*.

Figure 4-11: Parts Kit on Front of Cabinet

The contents of the parts kit are shown in *Figure 4-12*.

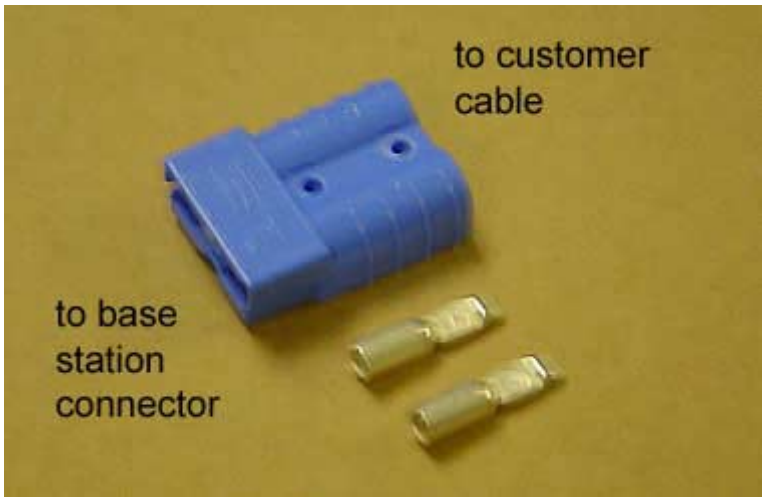

Figure 4-12: Power Connector Parts Kit

1. With the appropriate tool, crimp the contact pins from the power connector parts kit to the end of the customer cable.

2. With the rounded side of the blue connector housing facing up, insert the crimped contacts into the connector through the D-shaped openings in the housing. The contacts should be inserted with the "A" at the top of the pin facing up toward the rounded side of the opening. *Make sure to insert the –48 V wire in the side labeled "-" and the return wire in the side labeled "+".*

3. Push the wires into the connector until there is an audible click. Pull the wires firmly to make sure that they are securely attached to the connector.

4. Attach the customer installed connector housing to the power connector located in the lower rear of the cabinet. See *Figure 4-10* for the location of the base station cable.

4.4. Connecting to Ground

The cabinet must be connected to earth ground at the installation site.

CAUTION:

Failure to properly connect the cabinet to ground could result in permanent damage to the equipment.

If this connection is made, all of the following conditions must be met:

• This equipment shall be connected directly to the d.c. supply system earthing electrode conductor or to a bonding jumper from an earthing terminal bar or bus to which the d.c. supply system earthing electrode conductor is connected.

• This equipment shall be located in the same immediate area (such as, adjacent cabinets) as any other equipment that has a connection between the earthed conductor of the same d.c. supply circuit and the earthing conductor, and also the point of earthing of the d.c. system. The d.c. system shall not be earthed elsewhere.

• The d.c. supply source is to be located within the same premises as the equipment.

• Switching or disconnecting devices shall not be in the earthed circuit conductor between the d.c. source and the point of connection of the earthing electrode conductor.

1. Locate the ground bus bar. See *Figure 4-13: Cabinet with Ground Bus Bar — Rear View*.

Figure 4-13: Cabinet with Ground Bus Bar — Rear View

2. Connect the ground cable to the connectors with 2 AWG wire with a 2–hole lug for a 1/4" diameter stud. See *Figure 4-14: Ground Bus Bar*.

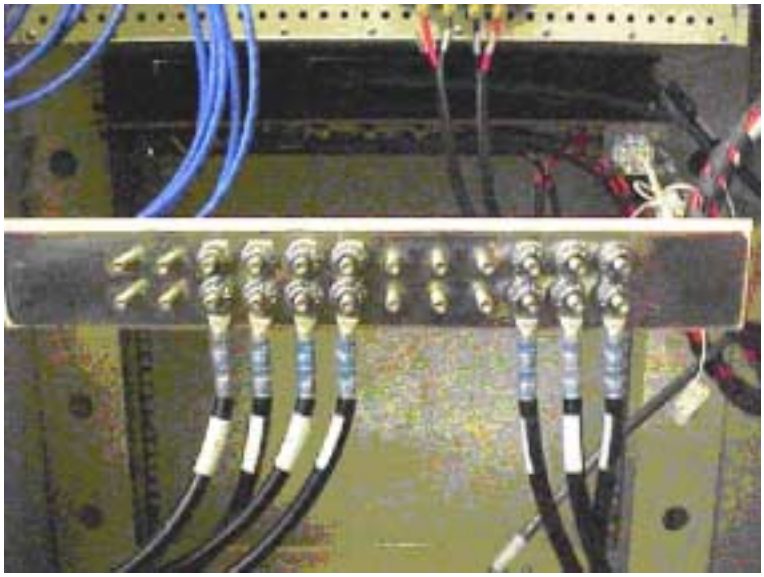

Figure 4-14: Ground Bus Bar

3. Fasten the lug onto the stud with the nuts provided. Tighten the nuts to 40–50 in-lb torque.

4. Connect the other end of the cable to the master ground bar or other suitable ground source available at the installation site.

Chapter 5. Connecting the Core Network Cables

The RadioRouter base station can access the core network through either T1, E1, or Ethernet connections. This section describes connectivity for each backhaul option.

5.1. Connecting to the Network via T1

T1 connections are made using cables terminated in RJ-48 connectors.

1. Locate the T1 connectors on the rear of the cabinet. See *Figure 5-1: Cabinet with T1 Connectors — Rear View*.

Figure 5-1: Cabinet with T1 Connectors — Rear View

2. Remove the DSX cables from the connectors.

   Figure 5-2: DSX Cables in T1 Connectors shows the cables in the connectors. *Figure 5-3: DSX Cables Removed from T1 Connectors* shows the connectors with the cables removed.

Note:

Removing the DSX cables will disable the DSX-1 panel. The DSX cables must be reconnected to use the DSX-1 panel.

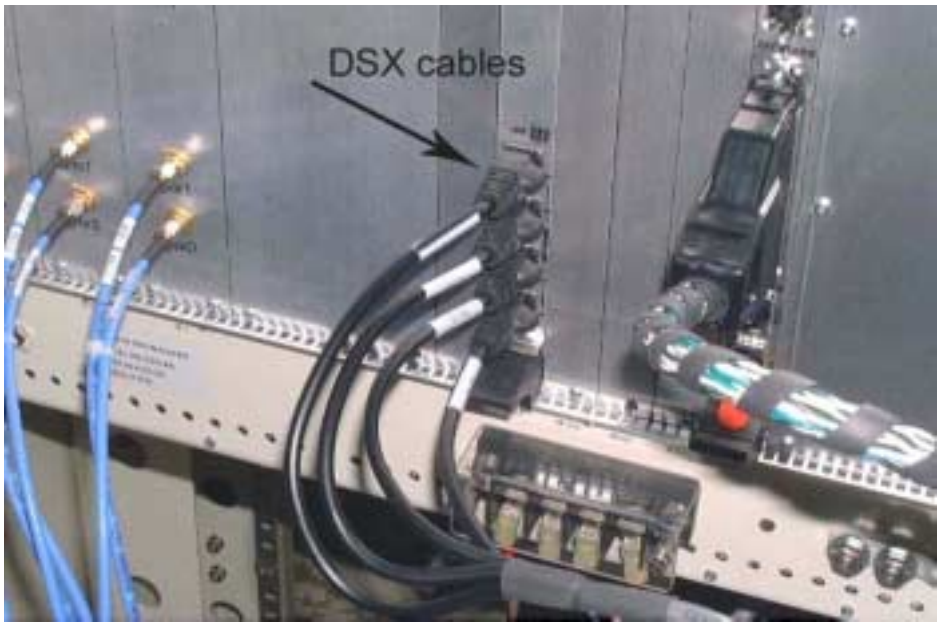

Figure 5-2: DSX Cables in T1 Connectors

Figure 5-3: DSX Cables Removed from T1 Connectors

3. Insert the first RJ-48 plug into the top jack which is labeled 1.

4. Insert any additional plugs from the top down.

5.2. Connecting to the Network via E1

E1 connections are made using cables connected to the Backhaul Access Panel (BAP). Depending on the specific configuration, the connectors may be BNC or SMZ.

1. Locate the E1 connections on the front of the cabinet. See *Figure 5-4*.

Figure 5-4: Backhaul Access Panel — Front View

2. Insert the first BNC or SMZ connectors into the leftmost connectors on the access panel which are labeled “1”. Attach the cable *out to* the network to the top connector labeled “OUT”. Attach the cable *in from* the network to the bottom connector labeled “IN”.

3. Insert any additional connectors from left to right as you face the cabinet.

5.3. Connecting to the Network via Ethernet

Ethernet connections are made using RJ-45 connectors. *Figure 5-5: Cabinet with Ethernet Connection — Front View* shows the location of the Ethernet connector on the front of the cabinet.

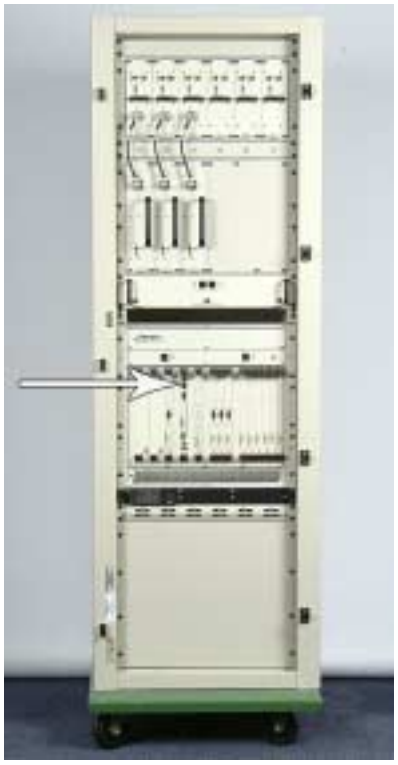

Figure 5-5: Cabinet with Ethernet Connection — Front View

1. Insert the RJ-45 connector into the top Ethernet port. See *Figure 5-6: Ethernet Port*.

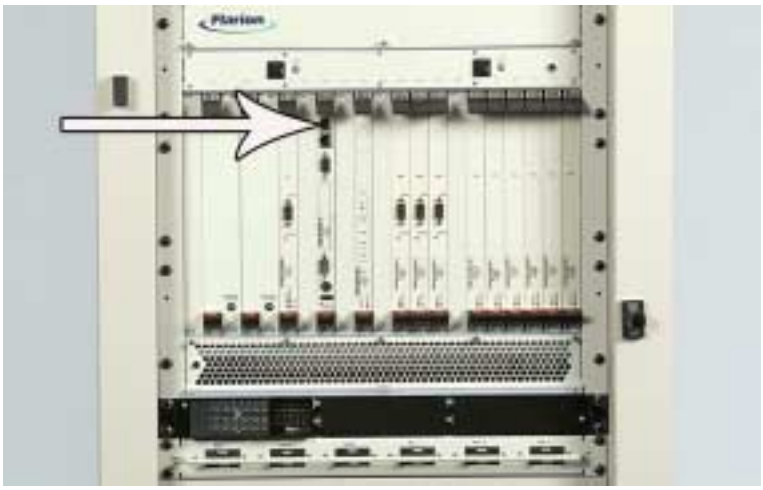

Figure 5-6: Ethernet Port

2. Route the Ethernet cable to the side cable channel and up the channel through the cable entry port in the top of the cabinet as shown in *Figure 5-7: Route of Ethernet Cable — Front View*.

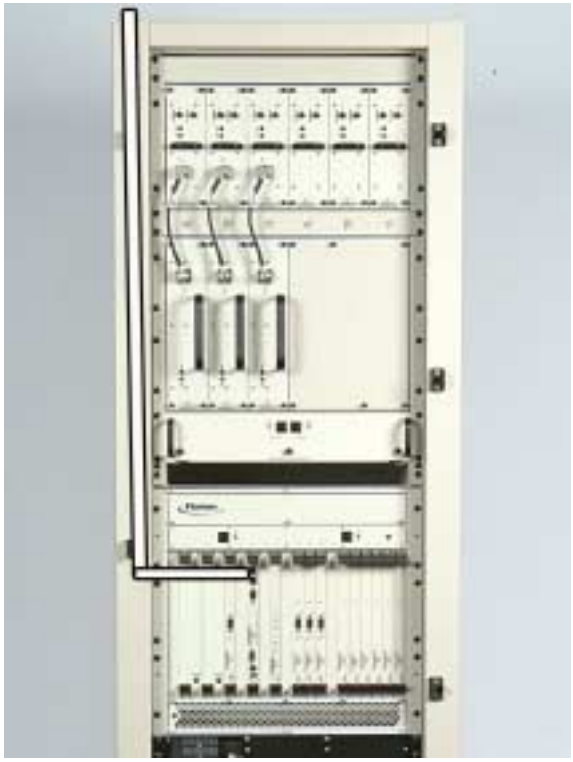

Figure 5-7: Route of Ethernet Cable — Front View

Chapter 6. Installing the Alarm Connections

6.1. Alarm Connector

The base station provides the following types of external alarm connections:

- Outputs — predefined: Summary, Critical, Major, Minor
- Outputs — customer definable outputs: 4
- Inputs — customer definable inputs: 14

Connection to the system alarm contacts is through a 50–pin AMP connector (part no. 554954-2). The connector is typically site specific depending on which alarms are used in a given installation. Details of the pinouts and connections are provided in this chapter.

The alarm connector is located in the rear of the cabinet. See *Figure 6-1: Cabinet with Alarm Connector — Rear View* and *Figure 6-2: Alarm Connector*. Cables can be routed to the connector using the procedures described in *Section 4.1. Routing the Cables*.

Figure 6-1: Cabinet with Alarm Connector — Rear View

Figure 6-2: Alarm Connector

6.2. Predefined Alarm Connections

The predefined alarms, summary, critical, major and minor, use dry contacts. They are presented as normally closed contacts which open under alarm conditions. Connections are made to these alarms by attaching the external device between the desired alarm pin and its associated common

alarm pin. The alarm connections for the predefined alarms are shown in *Figure 6-3: Summary, Critical, Major, and Minor Alarm Connections*. Note that the Summary and Critical alarms share a common pin, as do the Major and Minor alarms.

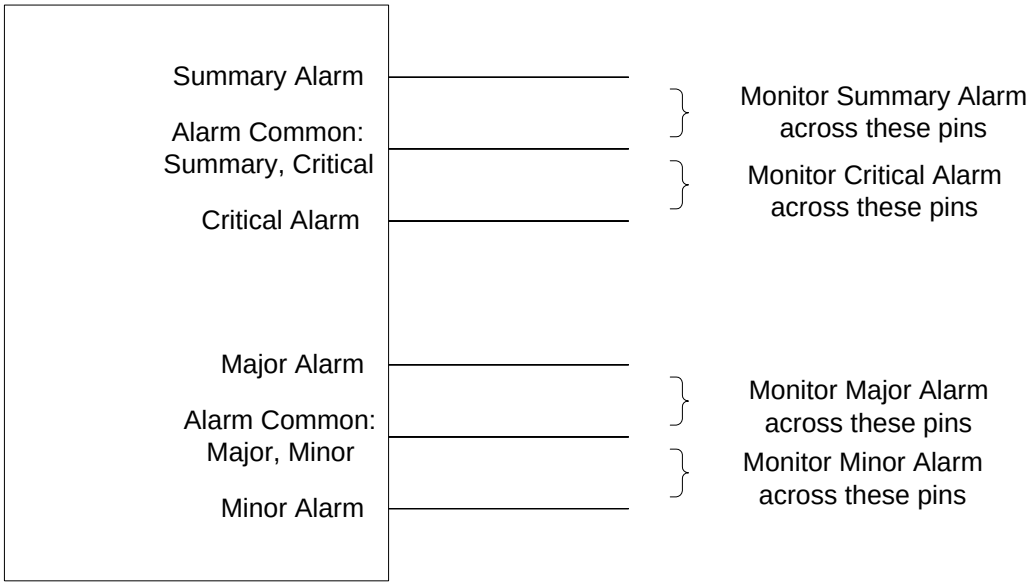

Figure 6-3: Summary, Critical, Major, and Minor Alarm Connections

Table 6-1: Pin Assignments for Predefined Alarms shows the pin assignments.

Table 6-1: Pin Assignments for Predefined Alarms

Connection	**Pin Assignment**
Summary, Critical: Alarm Common	1
Summary Alarm	2
Critical Alarm	3
Major, Minor: Alarm Common	26
Major	27
Minor	28

6.3. Customer Definable Alarm Outputs

The customer definable alarm outputs use dry contacts. Connections are made to these alarms by attaching the external device between the desired alarm pin and its associated common alarm pin. Connections can be made to Normally Open (N/O) or to Normally Closed (N/C) pins. The Customer definable alarm connections are shown in *Figure 6-4: Customer Definable Alarm Output Connections*.

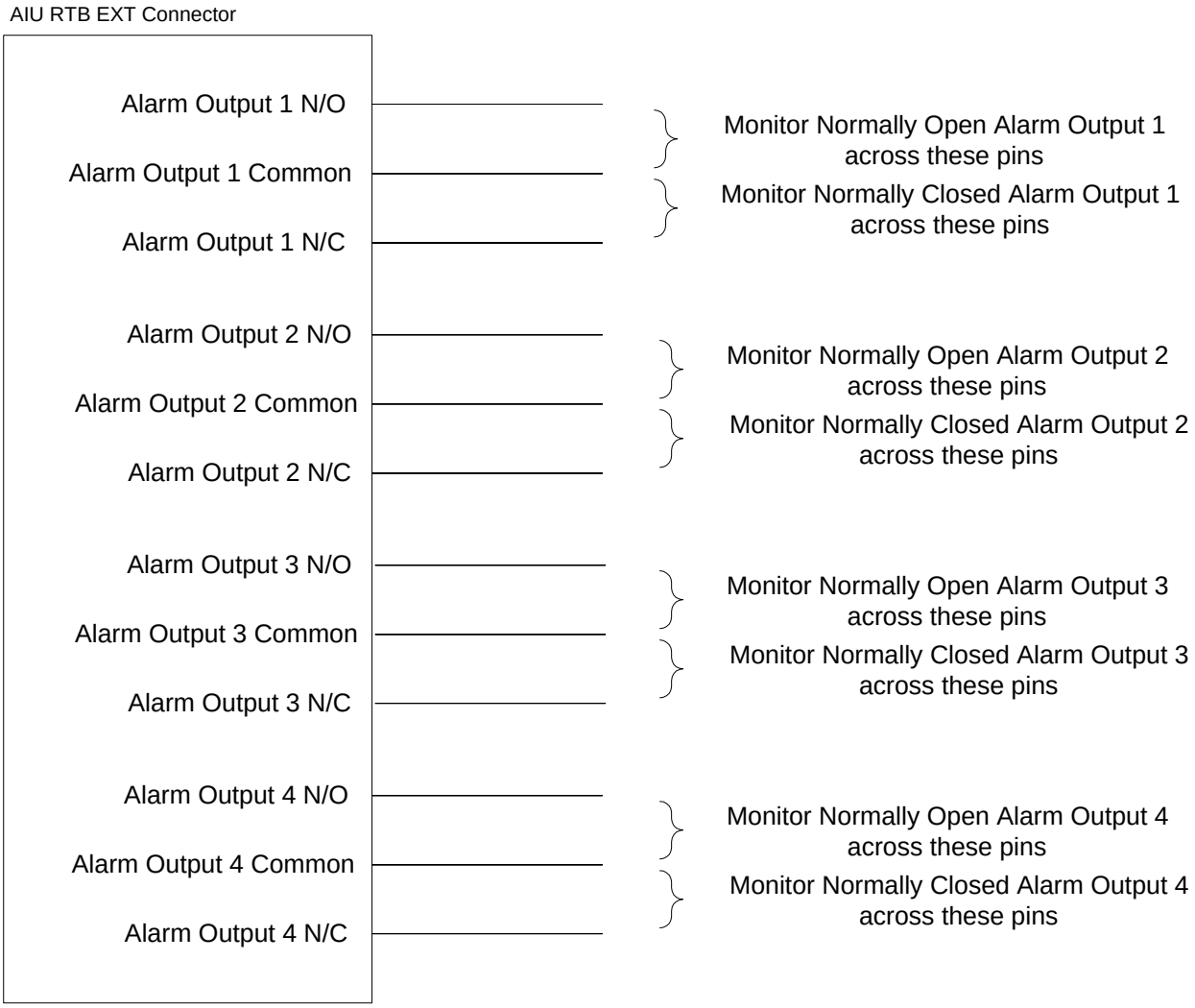

Figure 6-4: Customer Definable Alarm Output Connections

Table 6-2: Pin Assignments for Customer Definable Outputs shows the pin assignments for the customer definable alarm outputs.

Table 6-2: Pin Assignments for Customer Definable Outputs

Connection	Pin Assignment
Alarm Output 1: Common	4
Alarm Output 1: N/O	5
Alarm Output 1: N/C	6
Alarm Output 2: Common	7
Alarm Output 2: N/O	8
Alarm Output 2: N/C	9
Alarm Output 3: Common	29
Alarm Output 3: N/O	30
Alarm Output 3: N/C	31
Alarm Output 4: Common	32
Alarm Output 4: N/O	33
Alarm Output 4: N/C	34

6.4. Customer Definable Alarm Inputs

The base station monitors the alarm inputs for external dry contact closures. Each external dry contact must be connected across the Alarm Input pin and the Alarm Voltage Supply pin. A connection is also required between the Alarm Return pin and the Alarm Voltage Return pin. These two connections are shown in *Figure 6-5: Customer Definable Alarm Input Connections*.

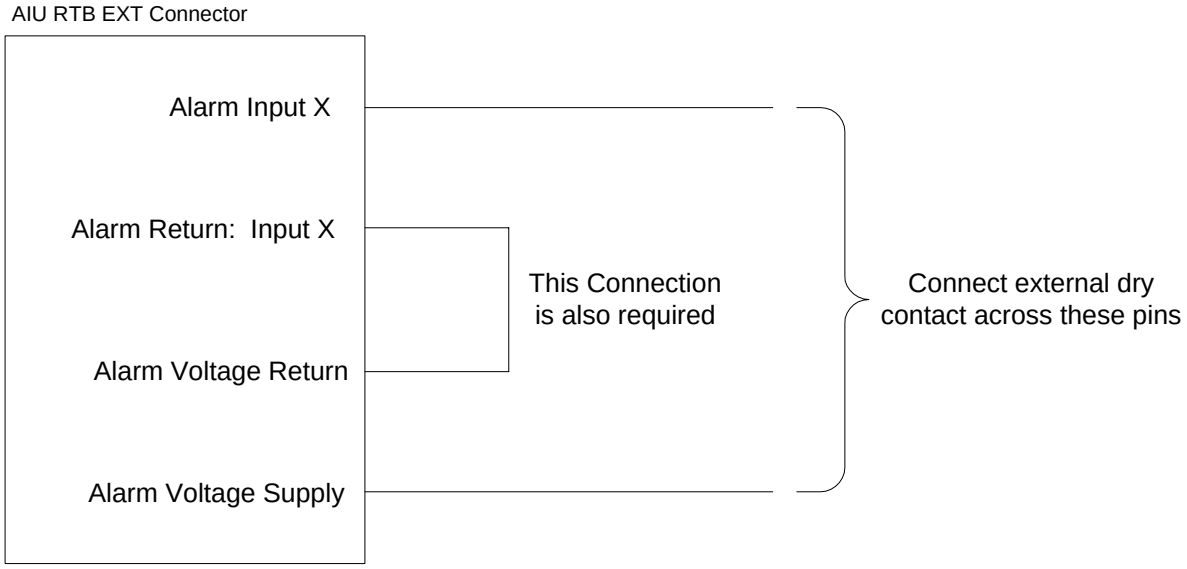

Figure 6-5: Customer Definable Alarm Input Connections

Table 6-3: Pin Assignments for Customer Definable Inputs shows the alarm pinouts. Note that Alarm Inputs 1–4 share a single Alarm Return pin, as do Alarm Inputs 5–8, Alarm Inputs 9–12 , and Alarm Inputs 13–14.

Table 6-3: Pin Assignments for Customer Definable Inputs

Connection	**Pin Assignment**
Alarm Voltage Supply	10
Alarm Voltage Return	35
Alarm Input 1	13
Alarm Input 2	14
Alarm Input 3	15
Alarm Input 4	16
Alarm Input 5	17
Alarm Input 6	18
Alarm Input 7	19
Alarm Input 8	20
Alarm Input 9	21
Alarm Input 10	22
Alarm Input 11	23
Alarm Input 12	24
Alarm Input 13	38
Alarm Input 14	39
Alarm Return: Inputs 1–4	11
Alarm Return: Inputs 5–8	12
Alarm Return: Inputs 9–12	25
Alarm Return: Inputs 13–14	37

Chapter 7. Connecting the Antenna Cables

The base station supports two different antenna connection configurations:

- Connectors mounted beneath the cable access plate
- Connectors mounted to the top of the cabinet

Systems with a cable access plate are described in *Section 7.1. Systems with a Cable Access Plate*. Systems without a cable access plate are described in *Section 7.2. Systems with Top Mounted Connectors*.

CAUTION:

Antenna cables may be prepared for installation, but do not connect the cables to the cabinet until the completion of RF Commissioning. Instructions for Commissioning can be found in the *RadioRouter Base Station Commissioning Guide*.

All antenna operations should be performed by qualified personnel only. Installers must meet the requirements of FCC Bulletin OET 65 and coax terminations and have expertise working with RF coaxial cable. Care must be taken not to crimp or damage the cables.

7.1. Systems with a Cable Access Plate

7.1.1. Cable Access Plate

The antenna cables are connected through the cable access plate on the top of the cabinet. *Figure 4-5: Antenna Cable Access Plate on Top of Cabinet* shows the cable access plate in place.

Before connecting the cables, the cable access plate must be removed. This gives access to the cable mating connectors. See *Figure 7-1: Top of Cabinet with Cable Access Plate Removed*.

Figure 7-1: Top of Cabinet with Cable Access Plate Removed

7.1.2. Antenna Connectors

There are six DIN Female connectors. When viewed from the rear from *right* to *left*, they are:

1. Alpha sector Tx/Rx
2. Beta sector Tx/Rx
3. Gamma sector Tx/Rx
4. Alpha sector RX only
5. Beta sector Rx only
6. Gamma sector Rx only

It is recommended that the antenna cables that attach to the connectors be clearly labeled with color-coded bands. For example:

1. Alpha sector Tx/Rx — 1 white band
2. Beta sector Tx/Rx — 1 blue band
3. Gamma sector Tx/Rx — 1 green band
4. Alpha sector RX only — 2 white bands
5. Beta sector Rx only — 2 blue bands
6. Gamma sector Rx only — 2 green bands

See *Figure 7-2: Antenna Connectors — Rear View* and *Figure 7-3: Antenna Connectors Schematic — Rear View*.

Figure 7-2: Antenna Connectors — Rear View

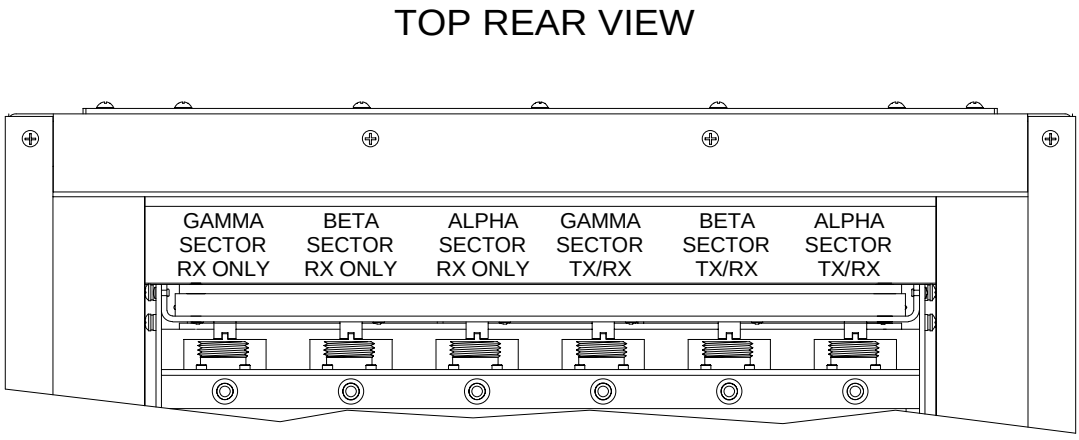

Figure 7-3: Antenna Connectors Schematic — Rear View

7.1.3. Connecting the Antenna Cables

1. Route the antenna cable from the top and screw mount it to the mating connector. The connector nut is 1 1/4" hex (across flats).

2. Fully seat the connector and hand tighten with an appropriate tool. The connector may be tightened from either the rear or the top.

3. Repeat Steps 1 and 2 for all antenna cables.

4. Reinstall the cable access panel. Make sure the rubber edging is tight against the cables. *Figure 7-4: Top of Cabinet with Two Antenna Cables Installed* shows two antenna cables installed.

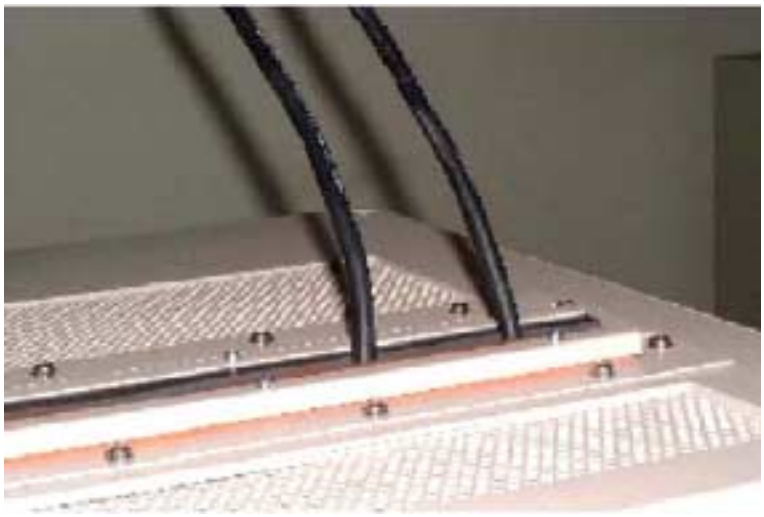

Figure 7-4: Top of Cabinet with Two Antenna Cables Installed

7.2. Systems with Top Mounted Connectors

In some systems, the antenna cables are attached to connectors located at the top of the base station. Typically, there are either four or six connectors. *Figure 4-6: Top-Mount Antenna Connectors — Rear View* shows the location of the connectors.

7.2.1. Antenna Connectors — 6–Connector Configuration

There are six DIN Female connectors. When viewed from the rear from *right* to *left*, they are:

1. Alpha sector Tx/Rx
2. Beta sector Tx/Rx
3. Gamma sector Tx/Rx
4. Alpha sector RX only
5. Beta sector Rx only
6. Gamma sector Rx only

It is recommended that the antenna cables that attach to the connectors be clearly labeled with color-coded bands. For example:

1. Alpha sector Tx/Rx — 1 white band
2. Beta sector Tx/Rx — 1 blue band
3. Gamma sector Tx/Rx — 1 green band
4. Alpha sector RX only — 2 white bands
5. Beta sector Rx only — 2 blue bands
6. Gamma sector Rx only — 2 green bands

See *Figure 7-5: Top-Mount Antennas, 6–Connector Schematic — Rear View*.

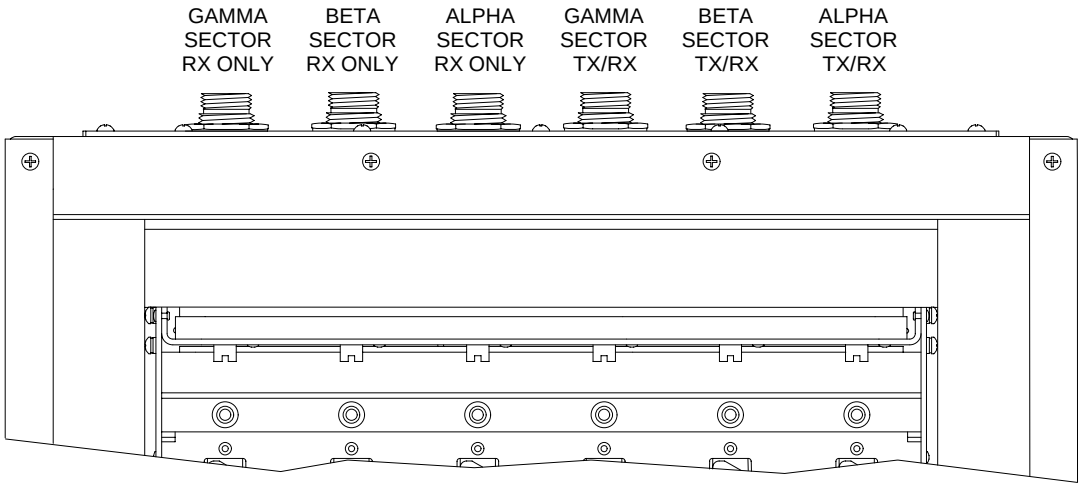

Figure 7-5: Top-Mount Antennas, 6–Connector Schematic — Rear View

7.2.2. Antenna Connectors — 4–Connector Configuration

There are four DIN Female connectors. When viewed from the rear from *right* to *left*, they are:

1. Alpha sector Tx/Rx
2. Beta sector Tx/Rx
3. Alpha sector RX only
4. Beta sector Rx only

It is recommended that the antenna cables that attach to the connectors be clearly labeled with color-coded bands. For example:

1. Alpha sector Tx/Rx — 1 white band
2. Beta sector Tx/Rx — 1 blue band
3. Alpha sector RX only — 2 white bands
4. Beta sector Rx only — 2 blue bands

See *Figure 7-6: Top-Mount Antennas, 4–Connector Schematic — Rear View*.

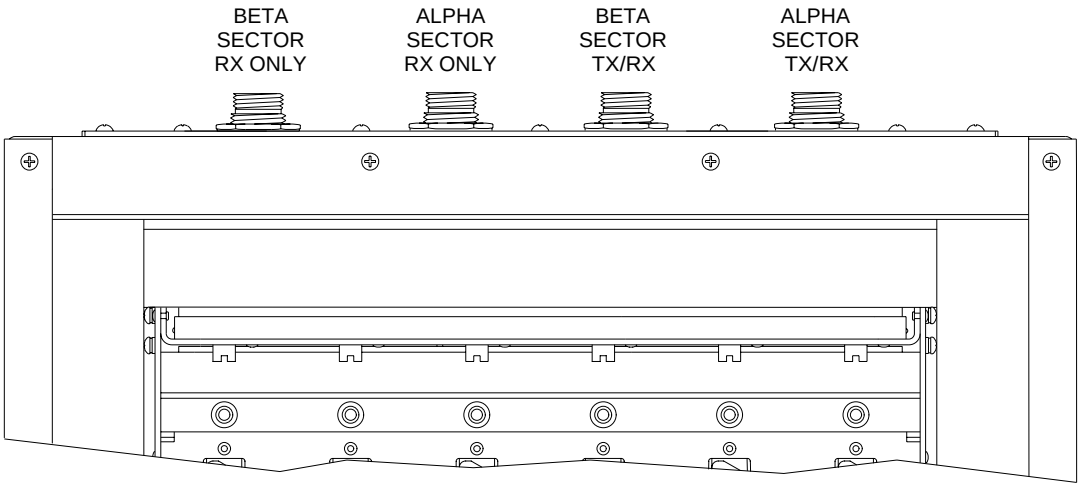

Figure 7-6: Top-Mount Antennas, 4–Connector Schematic — Rear View

7.2.3. Connecting the Antenna Cables

1. Route the antenna cable from the top and screw mount it to the mating connector. The connector nut is 1 1/4” hex (across flats).

2. Fully seat the connector and hand tighten with an appropriate tool. The connector may be tightened from either the rear or the top.

3. Repeat Steps 1 and 2 for all antenna cables.

Chapter 8. Powering Up the Cabinet

The cabinet requires DC power to operate. Before attempting to power up the cabinet, verify that DC power is available. It may be necessary to wait for a maintenance window to connect the cabinet to DC power and perform this procedure.

WARNING:

ALL POWER OPERATIONS SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY. BEFORE ATTEMPTING TO POWER UP THE SYSTEM, CONFIRM THAT ALL POWER CONNECTIONS HAVE BEEN MADE PROPERLY.

8.1. Powering Up the Cabinet

The cabinet is powered up using the circuit breakers on the distribution panel on the front of the cabinet. See *Figure 8-1: Distribution Panel with Circuit Breakers — Front View*.

For this procedure you will need a volt meter.

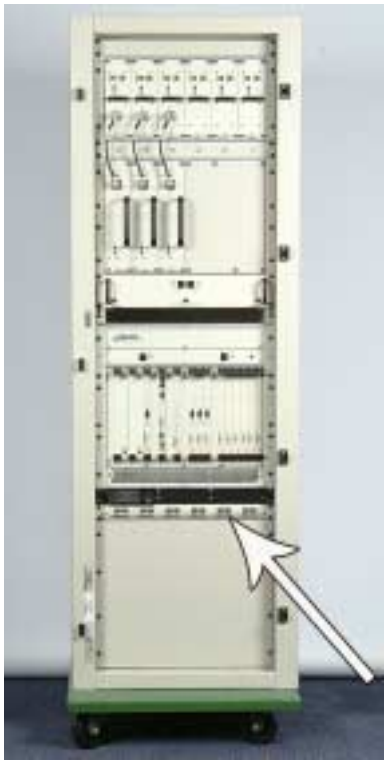

Figure 8-1: Distribution Panel with Circuit Breakers — Front View

1. Before turning on the power, confirm the voltage and polarity:

   1.a. Connect the common lead of the volt meter to the DC return connector on the power distribution panel. See *Figure 8-2: Power Distribution Panel with Volt Meter Connections*.

   1.b. Connect the positive lead of the volt meter to the DC power connector which is labeled POWER IN.

   1.c. Confirm that the voltage is the expected voltage for this base station.

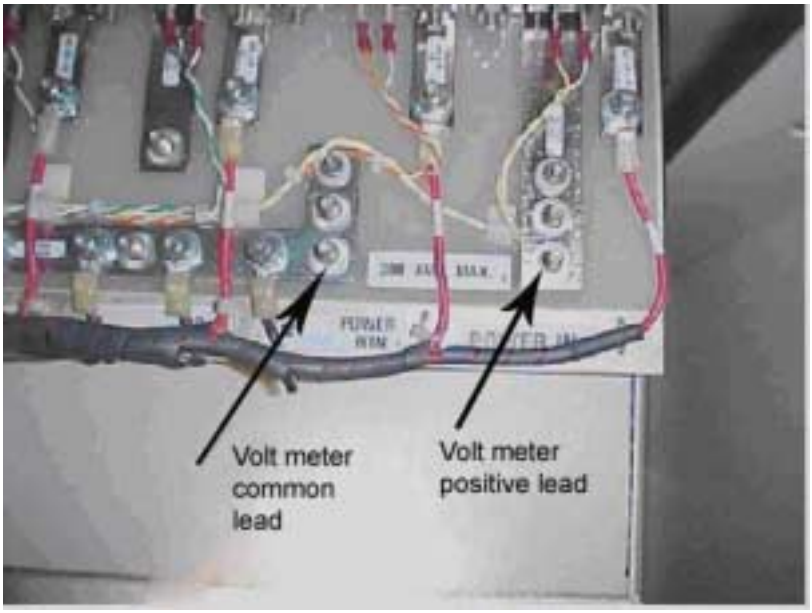

Figure 8-2: Power Distribution Panel with Volt Meter Connections

2. Turn on the RRC breaker. The RRC breaker is on the left as you face the cabinet. See *Figure 8-3: Circuit Breakers — Front View* and *Figure 8-4: Circuit Breakers Schematic — Front View*.

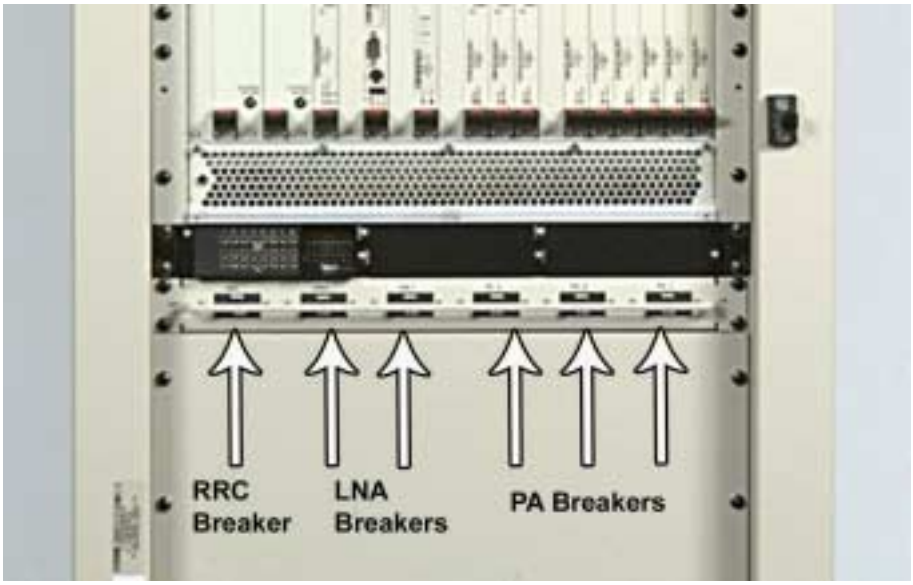

Figure 8-3: Circuit Breakers — Front View

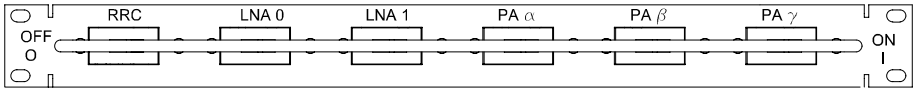

Figure 8-4: Circuit Breakers Schematic — Front View

3. Turn on the LNA breakers which are located next to the RRC breaker.

4. Turn on the PA breakers. The PA breakers are on the right of the LNA breakers.

5. Verify that the LEDs on the front of the cabinet match *Table 8.1 Power On Expected LEDs*. If the LEDs do not match the table, power the system down and check the wiring.

Table 8-1: Power On Expected LEDs

Unit	**Name**	**Condition**
PDU Fan Tray	FAN	Green
RRC	FAN STATUS	Green
RRC	FAN STATUS	Green
PCU1	ON (GREEN) FAIL (RED)	Green
PCU2	ON (GREEN) FAIL (RED)	Green

Chapter 9. Powering Down the Cabinet

The base station is powered down using a PC or terminal connected to the COM1 port on the Master Control Unit (MCU) board. This helps ensure that all system files are closed before the power is shut off. Attach the PC or terminal using a serial cable with a null-modem adapter. The PC should be running a terminal emulation such as Microsoft® Windows® HyperTerminal.

Connect the 9–pin female RS-232 connector (DB9F) to the COM1 port located on the MCU. Connect the 9–pin female cable connector (DB9F) on the other end of the cable to the connector of the VT-100 terminal or to the PC serial port. Either COM1 or COM2 of the PC may be used.

The following settings should be used for HyperTerminal sessions:

- Bits per second: 9600
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: None

WARNING:

ALL POWER OPERATIONS SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY.

9.1. Powering Down

1. Connect a PC to the serial port of the MCU. See *Figure 9-1: COM Port on MCU*.

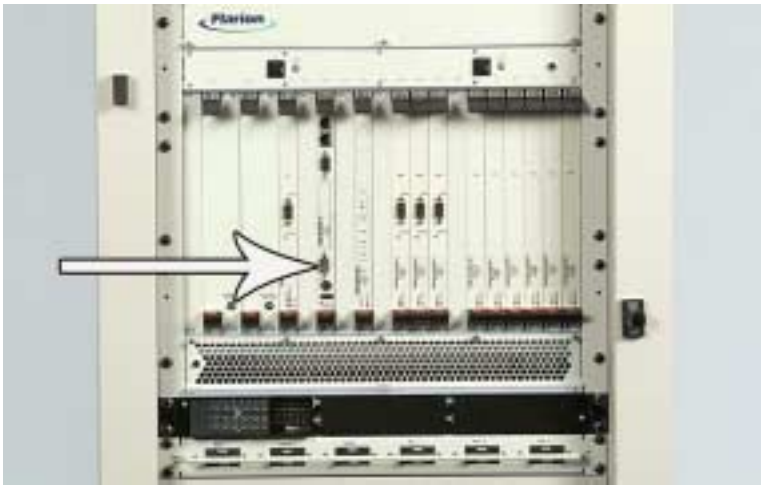

Figure 9-1: COM Port on MCU

2. Run a terminal emulator such as Microsoft Windows HyperTerminal.
3. At the `Login:` prompt, type **`root`** and press **Enter**.
4. At the `Password:` prompt, type the root login password and press **Enter**.
5. At the `BS_Name#>` prompt, type **`halt`** and press **Enter**.

   The system displays the message `System Halted` followed by the message `Press any key to reboot.`

   Be careful not to touch any other keys or the system will restart.
6. Turn off the PA breakers. The PA breakers are on the right as you face the cabinet. See *Figure 8-3: Circuit Breakers — Front View*.
7. Turn off the LNA breakers which are located to the left of the PA breakers.
8. Turn off the RRC breaker which is located to the left of the LNA breakers.

Chapter 10. Verifying the Installation

Verifying the proper installation of the cabinet must be done before the installation can be considered complete.

Verify that all of the following requirements are met:

- Clearance requirements are met — at least 24” front and 6” rear. There must be room to open the cabinet doors for service.
- The base station is powered up. All the LEDs in *Table 8.1 Power On Expected LEDs* must reflect the states listed in the table. The system should remain in the powered up state. If it is necessary to power down the base station, do so in accordance with the instructions in *Chapter 9. Powering Down the Cabinet*.
- Correct terminations on all T1 and alarm cables
- No crimps in RF cables
- RF cable markings match those specified in *Chapter 7. Connecting the Antenna Cables*.

APPENDIX A. List of Abbreviations

AA ..... Authentication and Authorization
ADC ..... Analog-to-Digital Converter
BBU ..... Baseband Unit
BHU ..... Backhaul Unit
DAC ..... Digital-to-Analog Converter
DNS ..... Domain Name Server
DSX ..... Digital Signal Cross-Connect
FA ..... Foreign Agent
LNA ..... Low Noise Amplifier
MCU ..... Master Control Unit
MLPPP ..... Multi-Link Point-to-Point Protocol
NTP ..... Network Time Protocol
OCXO ..... Oven Controlled Crystal Oscillator
PA ..... Power Amplifier
PCU ..... Power Conditioning Unit
RADIUS ..... Remote Authentication Dial-In User Service
RRC ..... Radio Router Chassis
SNMP ..... Simple Network Management Protocol
TXU ..... Transmit Unit