

1.6 Site Grounding and Lightning Protection



Proper site grounding and lightning protection are vitally important consideration. Failure to provide proper lightning protection may result in permanent damage to the radio equipment.

One of the most important considerations when designing a communications site is the ground and lightning protection system. While proper grounding techniques and lightning protection are closely related, the general category of site grounding may be divided into the following section.

1.6.1 Electrical Ground

Ground wires carrying electrical current from circuitry or equipment at the site is included in the category of electrical ground. Examples include the AC or DC electrical power used to source equipment located at the site, and wires or cables connected to alarms or sensors located at the site.

1.6.2 RF Ground

This type of ground is related to the transmission of the radio frequency energy to earth ground. An example of RF grounding is the use of shielding to prevent or at least minimize the leakage of unwanted RF transmissions from communications equipment and cables.

1.6.3 Lightning Ground

Providing adequate lightning protection is critical to a safe reliable communications site. RF transmission cables, and AC and DC power lines must all be protected to prevent lightning energy from entering the site building.

Although a comprehensive coverage of the site grounding technique and lightning protection is not within the scope of this instruction manual, there are several excellent industry sources for rules and guidelines on ground and lightning protection at communications site.

NOTE: Motorola recommends the following reference source:

Motorola Quality Standards Fixed Network Equipment

Installation Manual R56.....6881089E50

1.6.4 Equipment Grounding Guidelines

The repeater is equipped with a ground screw located on the rear of the repeater power supply module. This screw is used to connect the repeater to the site ground point. It is assumed that all antenna cables, and AC or DC power cabling, has been properly grounded and lightning protected by following the rules and guidelines provided in the above reference.

1.7 Power Supply Connections

Refer to [4.1.1 AC Input Power Connection](#) on page 4-1 for the recommended AC input power connection and to [4.1.2 Ground Connection](#) on page 4-2 for the recommended ground connection.

Notes

Chapter 2 Mechanical Installation

This section describes the procedures to unpack and mechanically install the MOTOTRBO Repeater. A variety of mounting methods are possible, depending on which type of cabinet or rack (if any) has been selected to house the repeater(s). Installation procedures are provided for each of the cabinet and rack types.



Caution

Be sure to observe proper electrostatic discharge precautions if modules must be removed from the repeater.

2.1 Unpacking Equipment



WARNING

Inspect the equipment for damage immediately after unpacking, and make a report of the extent of any damage to the transportation company and to Motorola.

2.2 Transferring Equipment from Shipping Container to Rack or Cabinet

The repeater is shipped in a box. Upon delivery, the equipment must be removed from the container and transferred to a rack or cabinet.

NOTE: Customer-supplied cabinets and racks must have mounting rail and hole spacing compatible with EIA Universal 48.3 cm (19 inches) specifications. Cabinets must provide adequate ventilation (as detailed on page 3) and must meet the following criteria:

- 41.3 cm (16.25 inches) deep
- 48.3 cm (19 inches) wide
- 13.4 cm (5.25 inches) high

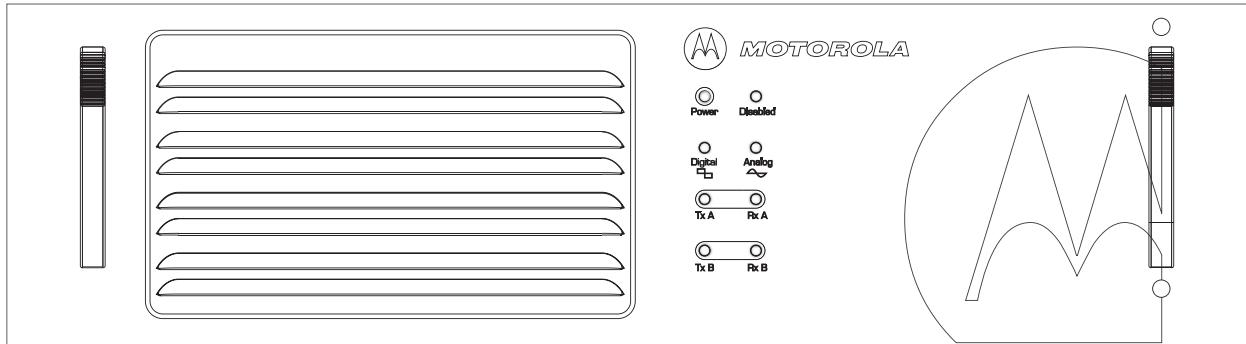
Two mounting rails 5 cm (2 inches) from front cabinet with front mounting holes 5.7 cm (2.25 inches) apart (center to center).

Contact Motorola Technical Support for specific question(s) regarding mounting equipment in customer-supplied cabinets.

Notes

Chapter 3 Indicators and Connectors

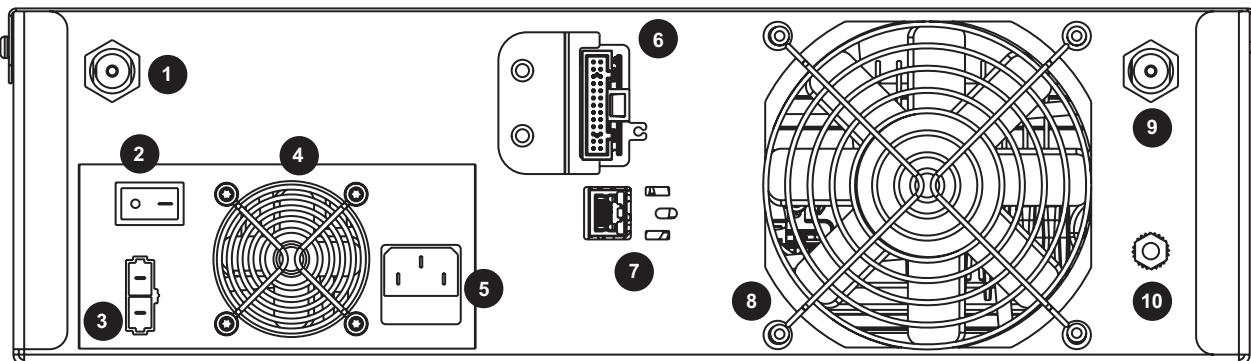
3.1 Front Panel



3.1.1 LED Indicator Descriptions

LED	Status	Description
Power	Solid GREEN	Repeater powered by AC
	Solid RED	Repeater powered by backup battery
	Off	Repeater powered off
Repeater Disable	Solid RED	Repeater function disabled
	Blinking RED	Repeater in self-test mode
	Off	Repeater in normal operational mode
Digital	Solid BLUE	Repeater in Digital Mode
Analog	Solid YELLOW	Repeater in Analog Mode
Tx-A	Solid GREEN	Repeater transmitting (Analog)
	Solid GREEN	Repeater transmitting on Slot A (Digital)
Rx-A	Solid YELLOW	Repeater receiving a signal for Slot A (Analog)
	Solid YELLOW	Repeater receiving on Slot B (Digital)
Tx-B	Solid GREEN	Repeater transmitting on Slot B (Digital)
Rx-B	Solid YELLOW	Repeater receiving a signal for Slot B (Digital)

3.2 Rear Panel



3.2.1 Rear Panel Parts

No	Item	Description
1	Rx Connector	Type BNC-F
2	Power Supply On/Off Switch	Turns on or off the power to the repeater from AC input.
3	Battery Backup Connector (DC Input)	Backup battery supplies backup power to the repeater. The battery is an optional accessory. The repeater will trickle charge battery, but an external charger is recommended to equalize battery after a prolonged use. Auto switching from AC to battery with loss of AC power is a function of the standard repeater power supply. Supply will automatically switch back to AC operation upon the return of AC power. The front panel power LED switches from green to red when on battery power.
4	Power Supply Fan	Runs continuously.
5	Main Power Supply Connector (AC Input)	100 – 240 Volts
6	26-Pin Accessory Connector	Programming cable plugs in here.
7	Ethernet Connector	(For Future Use)
8	Main Fan	Variable speed. Idles at room temperature. Speeds up with extended use of the repeater.
9	Tx Connector	Type N – F
10	Ground Screw	Must be connected to System Ground.

Chapter 4 Electrical Connections

After the MOTOTRBO Repeater has been mechanically installed, electrical connections must be made. This involves making the following connections:

- to power supply via AC power cord, and to
- antenna coax cables

Figure 4-1 shows the position of the repeater external connectors and line cord located on the back panel. The AC power cord is also located at the rear of the repeater.

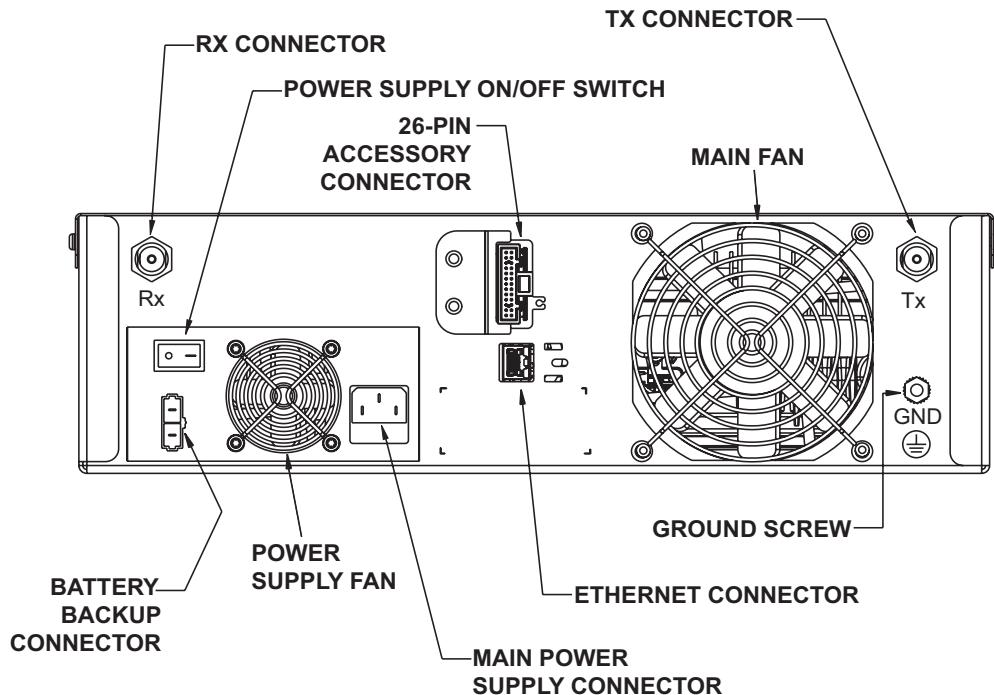


Figure 4-1 Locations of External Connectors at Rear of Repeater

4.1 Power Supply Connections

4.1.1 AC Input Power Connection



Caution
Do not apply AC power to the repeater at this time. Make sure that the circuit breaker associated with the AC outlet is turned to **OFF**.

NOTE: The AC socket-outlet must be installed near the equipment and must be easily accessible.

Each repeater ships with a 2.438 m (8 feet) 3-conductor line cord that connects the repeater to a 110/120/220/240Vac source. Figure 4-1 shows the location of the main power supply connector (AC input), where the line cord connects to the repeater. Insert the 3-prong plug into a 110/120/220/240Vac grounded outlet.

If an alternate line cord is required, obtain a suitable line cord, with fittings approved by the safety testing agency in the end-use country, from a certified electrical parts supplier.

4.1.2 Ground Connection

The repeater is equipped with a ground screw located on the rear of the repeater. Connect the ground screw to the site ground point.



Caution Refer to Motorola Quality Standards Fixed Network Equipment Installation Manual R56 (6881089E50), for complete information regarding lightning protection.



Caution The repeater is to be connected to a battery supply that is in accordance with the applicable electrical codes for the end use country; for example, the National Electrical Code ANSI/NFPA No. 70 in the U.S.

4.1.3 Battery Backup Connection

The MOTOTRBO Repeater offers the capability of connecting to battery backup power in the event of an AC power failure.

The battery backup system is connected to the repeater through the DC connector mounted at the rear of the repeater.

The repeater power supply will trickle charge the backup battery. If the battery is significantly discharged, it is recommended that an external charger be used to charge the battery.



Caution The repeater is to be connected to a battery charger that is in accordance with the applicable electrical codes for the end use country; for example, the National Electrical Code ANSI/NFPA No.70 in the U.S.



Figure 4-2 Making Connections to a Backup Battery

4.2 RF Antenna Connections

The transmit and receive antenna RF connection are made using two separate connectors. Coax cable from the receive and transmit antenna must be connected to the N-type (Tx) and BNC-type (Rx) connectors. The position of these connectors is shown in [Figure 4-1](#). For repeater use, either two antennas with adequate isolation (75 dB-UHF, 85 dB-VHF) between them, or one antenna and a duplexer with at least 75 dB-UHF, 85 dB-VHF isolation between the Tx and Rx antenna ports is required.



Caution The repeater can key up at any time due to input from a subscriber unit or a CW ID. Please insure that all power is switched off before disconnecting the transmit antenna.

4.2.1 Duplexer Selection

The selection of the duplexer is critical to system performance. The use of a notch (band reject) duplexer is possible in some systems that are not located at high RF density sites. A duplexer like the HFE8400 (406 – 450 MHz) or RFE4000 (450 – 470 MHz) or HFD8465 (150 – 160 MHz) is adequate. Note that these duplexers are good for 4 to 7 MHz Tx/Rx spacings. Select a different duplexer for other Tx/Rx spacings.

The duplexer must be able to handle at least 50 Watts continuously. For the best system range, the insertion loss should be less than 2 dB. If the repeater is used in higher RF density sites, the use of a bandpass duplexer is recommended.

4.2.2 Antenna Selection

The selection of the antenna is critical to system performance. The selected antenna must be 50 Ohm impedance and capable of at least 50 Watts. Gain antennas may be used to increase system coverage. Please take note of licensing restrictions when selecting gain antennas. Some services or regions may have antenna gain or system ERP limitations.

The antenna must be connected to the duplexer with a high grade 50 Ohm transmission line (Heliax). The line must have connectors to match the connectors on the duplexer and antenna. For proper antenna installation, please also consult the Motorola Quality Standards Fixed Network Equipment Installation Manual R56 (6881089E50).



Caution It is important that all antenna cables are grounded at the point they enter the building.



Caution The antenna design is the customer's responsibility. All aspects of the antenna design must comply with the relevant local regulations.

Notes

Chapter 5 Post-Installation Checklist

After the MOTOTRBO Repeater has been mechanically installed and all electrical connections have been made, power may now be applied and the repeater checked for proper operation.

5.1 Applying Power

Before applying power to the repeater, make sure all boards are securely seated in the appropriate connectors on the backplane and that all RF cables are securely connected.

Turn ON the circuit breaker controlling the AC outlet that is supplying power to the repeater Power Supply Module.

5.2 Verifying Proper Operation

Operation of the repeater can be verified by:

- observing the state of the 8 LEDs located on the front panel, and
- exercising radio operation.



Some repeater components can become extremely hot during operation. Turn off all power to the repeater, and wait until sufficiently cool before touching the repeater.

5.2.1 Front Panel LEDs

After turning ON the repeater power (or after a repeater reset), the 8 LEDs on the repeater front panel:

- are all lit for about one second to indicate that they are functional.
- go off for one second.
- now indicate operational status of the repeater.

5.3 Archiving

5.3.1 Copying the Repeater Codeplug Data to a Computer

Backup the repeater's codeplug data by using the Customer Programming Software (CPS) on a computer.

Notes

Chapter 6 Accessories

Antennas

- Untuned Duplexer, 406 – 450 MHz (HFE8400_)
- UHF Preselector, 440 – 474 MHz (HFE8459_)
- 3.8 dB Gain Omni Antenna 450 – 470 MHz (RDE4556_)
- Untuned Duplexer, 450 – 470 MHz (RFE4000_)
- VHF Duplexer, 144 – 155 MHz (HFD8188_)
- VHF Duplexer, 155 – 162 MHz (HFD8189_)
- VHF Duplexer, 162 – 174 MHz (HFD8190_)
- VHF Preselector, 144 – 160 MHz (HFD8461_)
- VHF Preselector, 160 – 174 MHz (HFD8462_)
- VHF 3.0 dB Gain Antenna, 150 – 158 MHz (RDD4527_)

Cables

- Mobile and Repeater Rear Programming Cable (PMKN4010_)
- Mobile and Repeater Rear Programming, Testing, and Alignment Cable (PMKN4016_)
- Battery Backup Cable (RKN4152_)

Miscellaneous Accessories

- Wall Mount Kit for XPR 8300 (PMLE4476_)
- Tower Mounting Hardware for RRX4038_ (RRX4032_)
- RF Surge Suppressor (RRX4038_)

Notes

Appendix A Replacement Parts Ordering

A.1 Basic Ordering Information

When ordering replacement parts or equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it. The XPR 8300 Repeater Basic Service Manual (Motorola publication part number 6816810H01) includes complete parts lists and parts numbers.

A.2 Motorola Online

Motorola Online users can access our online catalog at

<http://motorola.com/businessonline>

To register for online access, please call 1-800-422-4210 (for U.S. and Canada Service Centers only). International customers can obtain assistance at <http://motorola.com/businessonline>

A.3 Mail Orders

Mail orders are only accepted by the U.S. Federal Government Markets Division (USFGMD):

Motorola Inc.
7031 Columbia Gateway Drive
3rd Floor - Order Processing
Columbia, MD 21046
U.S.A.

A.4 Telephone Orders

Radio Products and Solutions Organization*
(United States and Canada)
7:00 AM to 7:00 PM (Central Standard Time)
Monday through Friday (Chicago, U.S.A.)
1-800-422-4210
1-847-538-8023 (United States and Canada)

U.S. Federal Government Markets Division (USFGMD)
1-877-873-4668
8:30 AM to 5:00 PM (Eastern Standard Time)

A.5 Fax Orders

Radio Products and Solutions Organization*
(United States and Canada)
1-800-622-6210
1-847-576-3023 (International)

USFGMD
(Federal Government Orders)
1-800-526-8641 (For Parts and Equipment Purchase Orders)

A.6 Parts Identification

Radio Products and Solutions Organization*
(United States and Canada)
1-800-422-4210

A.7 Product Customer Service

Radio Products and Solutions Organization (United States and Canada)
1-800-927-2744

* The Radio Products and Solutions Organization (RPSO) was formerly known as the Radio Products Services Division (RPSD) and/or the Accessories and Aftermarket Division (AAD).

Appendix B Motorola Service Centers

B.1 Servicing Information

If a unit requires further complete testing, knowledge and/or details of component level troubleshooting or service than is customarily performed at the basic level, please send the radio to a Motorola Service Center as listed below.

B.2 Motorola Service Center

45D Butterfield Trail
El Paso, TX 79906
Tel: 1-800-227-6772

B.3 Motorola Federal Technical Center

4395 Nicole Drive
Lanham, MD 20706
Tel: 1-800-969-6680
Fax: 1-800-784-4133

B.4 Motorola Canadian Technical Logistics Center

Motorola Canada Ltd.
8133 Warden Avenue
Markham, Ontario, L6G 1B3
Tel: 1-800-543-3222
Fax: 1-888-331-9872 or 1-905-948-5970

Notes



MOTOROLA

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