1 PRE-INSTALLATION CONSIDERATIONS

Proper installation ensures the best possible performance and reliability of the station equipment. Pre-installation planning is required. This includes considering the mounting location of the equipment in relation to input power, antennas, and telephone interfaces. Also to be considered are site environment conditions, the particular mounting method (several available), and required tools and equipment.

If this is the first time installing this type of equipment, it is highly recommended that the user read:

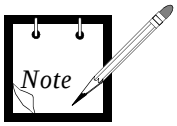
- this entire installation section before beginning the actual installation, and
- the Motorola Quality Standards Fixed Network Equipment Installation manual, R56 (68P81089E50); specifically refer to the information on ground connection for lightning protection.

Installation Overview

The following information is an overview for installing the station and ancillary equipment. Step-by-step procedures for each of the major installation tasks are then provided beginning in Section 2, Mechanical Installation.

- Plan the installation, paying particular attention to environmental conditions at the site, ventilation requirements, and grounding and lightning protection.
- Unpack and inspect the equipment
- Mechanically install the equipment at the site
- If a Wireline Interface Board or an Auxiliary I/O Board is included with the station, configure the board jumpers for required operation
- Make necessary electrical and cabling connections, including the following:
  - AC input cabling
  - Coaxial cables to transmit and receive antennas
  - Phone line connections
  - System cables

- Perform a post-installation functional checkout test of the equipment to verify proper installation
- Proceed to the Optimization procedures to customize the station parameters per customer specifications (e.g., operating frequency, PL, codes, etc.)



Regulatory requirements may require the use of an optional high stability reference for some modes of operation. It is recommended that the user check current local regulations prior to operation.

Environmental Conditions at Intended Installation Site

IMPORTANT

If the station is to be installed in an environment which is unusually dusty or dirty (and so does not meet the air quality requirements), the air used to cool the station modules must be treated using appropriate filtering devices. Dust or dirt accumulating on the internal circuit boards and modules is not easily removed, and can cause such malfunctions as overheating and intermittent electrical connections.

The station may be installed in any location suitable for electronic communications equipment, provided that the environmental conditions do not exceed the equipment specifications for temperature, humidity, and air quality. These are:

Operating Temperature Range	–30°C (–22°F) to +60°C (+140°F) This is the temperature measured in close proximity to the station. For example, if the station is mounted in a cabinet, the temperature within the cabinet would be measured.
Humidity	Not to exceed 95% relative humidity @ 50°C (122°F).
Air Quality	For equipment operating in an environmentally controlled environment with the station(s) rack mounted, the airborne particulates level must not exceed 25 $\mu g / m^3$. For equipment operating in an area which is not environmentally controlled (station(s) cabinet mounted), the airborne particulates level must not exceed 90 $\mu g / m^3$.

Equipment Ventilation

The high-power (100/75W) stations are equipped with cooling fans that are used to provided forced convection cooling.

When planning the installation, observe the following ventilation guidelines:

Mounting the MTR2000 in a Cabinet

- Customer-supplied cabinets must be equipped with ventilation slots or openings in the front (for air entry) and back or side panels (for air to exit). If several stations are installed in a single cabinet, be sure ventilation openings surround each station to allow for adequate cooling.
- All cabinets must have a least 15cm (6in) of open space between the air vents and any wall or other cabinets. This allows adequate air flow.
- When multiple cabinets (each equipped with several stations) are installed in an enclosed area, make sure the temperature within each cabinet does not exceed the recommended / maximum operating temperature of +60°C (+140°F). It may be necessary to have air conditioning or other climate control equipment installed to satisfy the environmental requirements.

IMPORTANT

High Power Stations: The mounting of only ONE STATION PER CABINET is recommended. More than one station per cabinet will result in degradation of thermal specifications at high ambient temperatures.

Low Power Stations: In order to maintain thermal specification of –30°C (–22°F) to +60°C (+140°F), the low power stations must be mounted in a cabinet with additional cooling. A single low power station mounted in a cabinet without additional cooling, will operate at thermal specification performance of –30°C (–22°F) to +54°C (+129°F).

Appropriate precautions should be taken to ensure that station ambient temperature does not exceed +60°C (+140°F).

If multiple stations are required, AND THERMAL SPECIFICATION DEGRADATION IS ACCEPTABLE, the following is recommended when no cabinet fans are used. Up to three stations can be mounted in a 76.2cm (30in) or larger cabinet with two rack units of spacing between each station. This will result in thermal specification performance of –30°C (–22°F) to +40°C (+104°F).

Mounting the MTR2000 in a Rack

CAUTION

When mounting multiple stations in a rack, ensure that the minimum spacing between stations is:

- **3 rack units (13.3cm or 5.25in) for VHF and UHF low power stations, and 350MHz stations.**
- **1 rack unit (4.4cm or 1.75in) for VHF and UHF high power stations, 800MHz stations, and 900MHz stations.**

This spacing needs to be complied with to ensure that the thermal rating of the station is not exceeded.

AC Input Power Requirements

If the station is equipped with a switching power supply, this assembly operates from 85 Vac to 264 Vac at 47 to 63 Hz ac input power. A standard 3-prong line cord is supplied to connect the power supply to the ac source.

It is recommended that a standard 3-wire grounded electrical outlet be used as the ac source.

CAUTION

The ac socket-outlet must be installed near the equipment and must be easily accessible.

The outlet must be connected to an ac source capable of supplying a maximum of 1020 VA. For a nominal 110/120 Vac input, the ac source must supply 8.5 A and should be protected by a circuit breaker rated at 15 A. For a nominal 220/240 Vac input, the ac source must supply 4.25 A and should be protected by a circuit breaker rated at 10 A.

New Requirement for European Union (EU) Countries

Beginning January 1, 2001, new input harmonic current specifications are being imposed for most electronic telecommunication equipment installed in EU countries. Accordingly, an external power factor correction choke is necessary for high power MTR2000 stations. For compatibility with this choke, a new power supply module is used. The new power supply/choke combination operates from an input of 180 to 264 Vac.

Equipment Mounting Methods

The station equipment may be mounted in a rack or cabinet (available as options).

The station can be shipped:

- …in an floor-mount indoor cabinet. Each floor-mount cabinet has front and rear vented doors and has the capacity to hold a minimum of a single station (see thermal limitations described under Equipment Ventilation), and required ancillary equipment. The larger cabinets provide additional room for supplementary peripheral equipment.
- …in a rack. Open frame racks accept multiple stations and ancillary equipment; EIA 48.3cm (19in) rack configuration.

Floor-mount Cabinet

The physical dimensions for all available floor-mount cabinets are shown in Figure 2. All dimensions are common to all cabinets, except for cabinet height. The cabinet options and associated height are:

Cabinet Option	Height
X52AF	76.2cm (30in)
X308AD	1.168m (46in)
X180AC	1.524m (60in)

Minimum recommended clearances are 76.2cm (30in) front and 91.44cm (36in) rear for minimum installation access. Refer to Equipment Ventilation for recommended ventilation clearances.

For improved access to the unit, a tray slide is available; option X968AA.

WARNING

Ensure that the cabinet is securely anchored to the floor, thereby avoiding possible equipment tipping and personal injury. Refer to Mounting Procedures – Mounting Floor-mount Cabinets for details on proper cabinet installation.

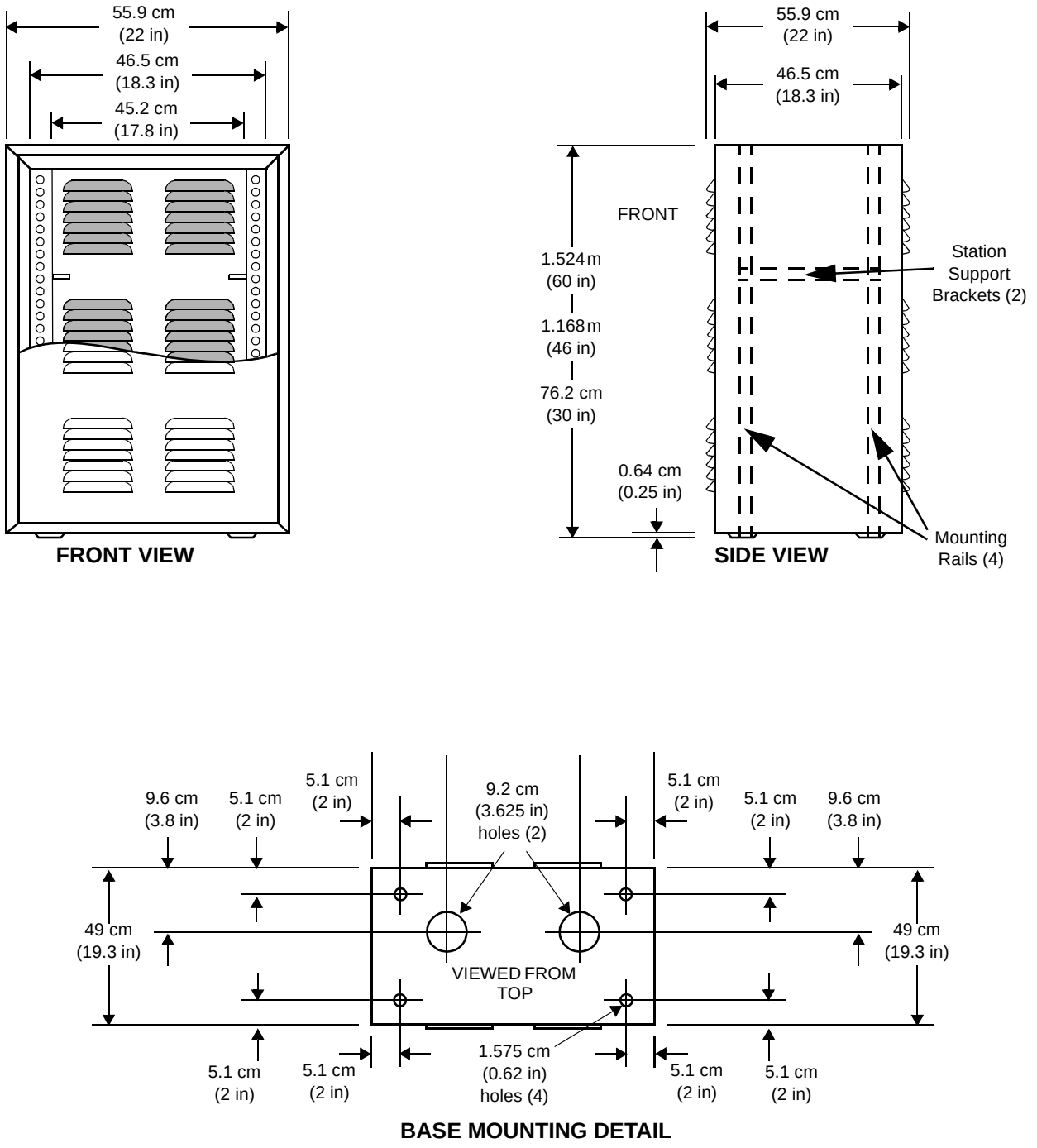


Figure 1. Floor-mount Cabinet – Dimensions and Clearances

Modular Racks

The rack options, associated height and available number of racking units are:

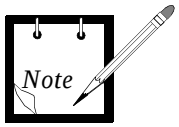
Rack Option	Rack Height	Number of Racking Units
X741AF	76.2cm (30in)	16
X742AF	1.143m (45in)	24
X743AF	1.32 m (52 in)	27

The physical dimensions and clearances for all available modular racks are shown in Figure 2. The top and bottom plates are identical. All dimensions and clearances are common to all racks, except for the 2 dimensions identified below. The rack options and associated dimensions are:

Rack Option	Dimension A	Dimension B
X741AF	79.2cm (31.2in)	26.1cm (10.27in)
X742AF	1.147m (45in)	27.25cm (10.73in)
X743AF	1.28 m (52in)	31.15cm (12.26in)

Recommended clearance front and rear is 91.44cm (36in) minimum for servicing access. Refer to Equipment Ventilation for recommended ventilation clearances.

FRU kit CLN6679A (MTR2000 Rack Mounting Hardware) is included with each Rack Option. This allows proper installation of the MTR2000 station within the rack's centre of gravity.



This kit includes two rack mount standoffs and eight mounting screws.

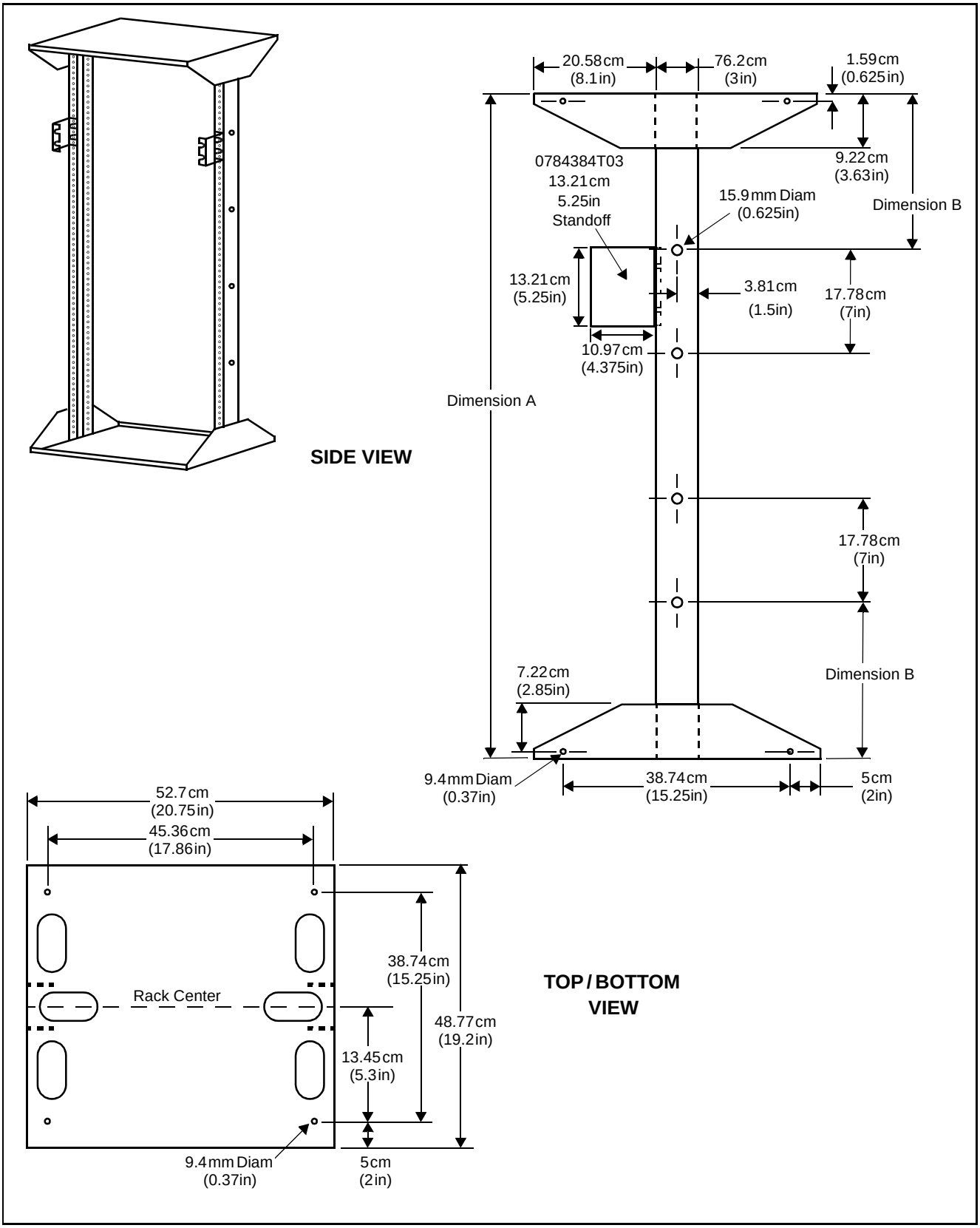


Figure 2. Modular Rack – Dimensions and Clearances

Site Grounding and Lightning Protection

Site Grounding Lightning Protection Recommendations

IMPORTANT

Proper site grounding and lightning protection are vitally important considerations. 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 as follows:

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, telephone lines, and wires or cables connected to alarms or sensors located at the site.

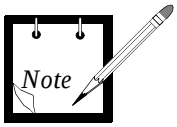
RF Ground

This type of ground is related to the transmission of 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.

Lightning Ground

Providing adequate lightning protection is critical to a safe and reliable communications site. Telephone lines, 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 site grounding techniques and lighting protection is not within the scope of this manual, there are several excellent industry sources for rules and guidelines on ground and lightning protection at communications sites.



Motorola recommends the following reference source:

Motorola Quality Standards Fixed Network Equipment Installation manual, R56 . . . . . .68P81089E50

Equipment Grounding Guidelines

The station is equipped with a ground screw located on the rear of the station Power Supply module. This screw is used to connect the station to the site ground point. It is assumed that all telephone lines, 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.

Recommended Tools and Equipment

In addition to the typical compliment of hand tools, the following tools and equipment are recommended for proper installation of the station equipment.

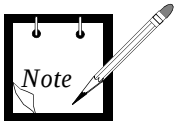
- Tarpaulin or plastic drop cloth or cover surrounding equipment while drilling concrete anchor holes (for installations where cabinet or rack is being anchored to concrete).
- Vacuum cleaner for removing concrete dust caused by drilling.

Equipment Unpacking and Inspection

The station equipment may be shipped by either air freight or electronic van (as specified by customer), except where noted.

- If no cabinet or rack is desired, the station is shipped in a box; the station is positioned between pieces of cushioned corrugated cardboard.
- All available cabinets are shipped with the station(s) installed in the cabinet, with the cabinet bolted to a wooden skid and covered with a cardboard box with corrugated interior corner braces.
- Stations to be used in open frame racks are shipped with the station and ancillary equipment mounted in the rack and covered by an antistatic plastic bag. All rack shipments are electronic van only.

Thoroughly inspect the equipment as soon as possible after delivery. If any part of the equipment has been damaged in transit, immediately report the extent of the damage to the transportation company and to Motorola.



Antistatic plastic bags should be kept for future shipping / transporting of station.

Cabinet Unpacking

When a station (mounted in a cabinet) is delivered from Motorola, it arrives in suitable packing materials. **If the unpacked equipment is damaged, return it to Motorola in its original packaging.**

WARNING

Equipment should be handled in its original packaging until it is delivered to its final destination. If the equipment is damaged while being moved without the original packaging, the warranty claim is not valid.

2 MECHANICAL INSTALLATION

This section describes the procedures to unpack and mechanically install the station equipment. A variety of mounting methods are possible, depending on whether a cabinet or rack (if any) has been selected to house the station(s). Installation procedures are provided for each of the cabinet and rack types, as well as the slide rail.

STOP

IMPORTANT

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

Unpacking Equipment

Introduction

Station equipment packing methods vary depending upon the type of optional rack or cabinet selected by the customer. Unpacking procedures for these various methods are provided in the following paragraphs.

STOP

IMPORTANT

The equipment must be immediately inspected for damage after unpacking, and a report of the extent of any damage made to the transportation company and to Motorola.

Unpacking Stations

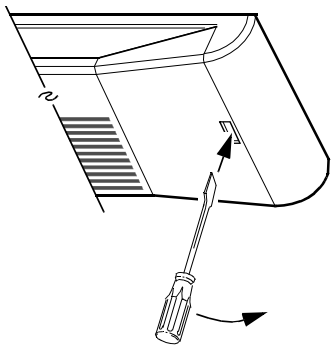
The station is shipped in a carton, cushioned between corrugated cardboard.

To remove the station from the carton, follow the procedure provided in Figure 3.

STOP

WARNING

Improper handling of the station may cause personal injury or damage to the station. DO NOT pick up the station by holding the Preselector (if so equipped). Use the handles on the front of the station, or the Power Supply and Power Amplifier casings when picking up the station.

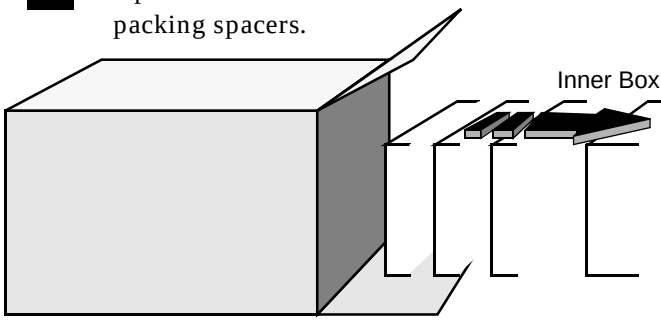


Front Panel – Removal and Replacement

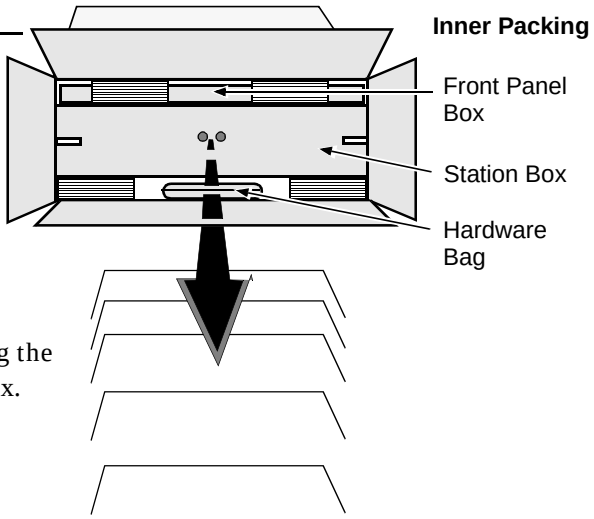
Remove station front panel by inserting a small flat-blade screwdriver into one of two access holes at either end of the panel and, by carefully moving the handle of the screwdriver away from the center, release the front panel locking clip from the chassis and pull away the panel.

Replace station front panel by inserting one of the front panel locking clips into corresponding latch on the station housing, and carefully pressing the panel on the opposite side until the second locking clip snaps into place.

1. Open box and remove the 2 foam corner packing spacers.

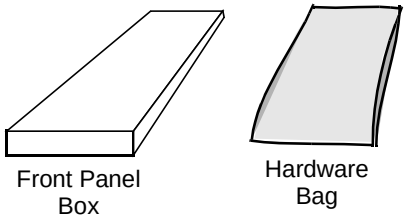


2. Slide out inner box and open.

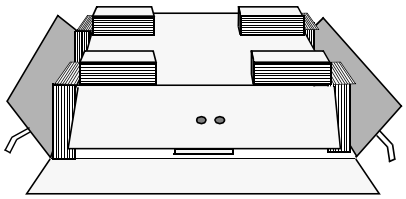


3. Slide out inner packaging using the 2 holes located in the center box.

4. Remove front panel box and hardware bag, located outside of station box.



5. Remove tape from sides of station box, fold down the front of this box.



6. Lift up the top of the station box to access the station.

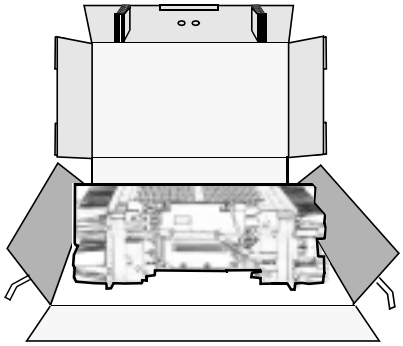
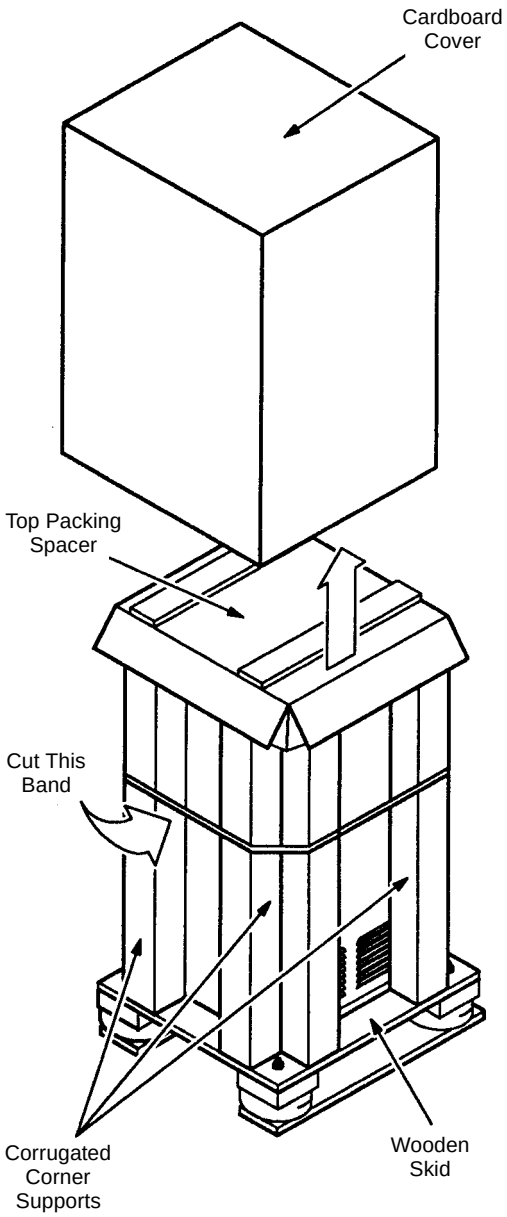


Figure 3. Unpacking Procedure - Station

Unpacking Floor-mount Cabinets

The floor-mount cabinets are shipped mounted to a wooden skid, secured with corrugated corner braces held by a plastic strap, and covered with a cardboard cover. Unpack the equipment as described in Figure 4.

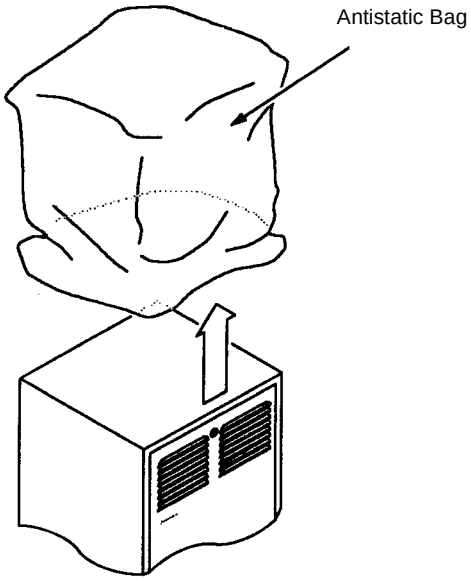
1. Remove cardboard cover from station.



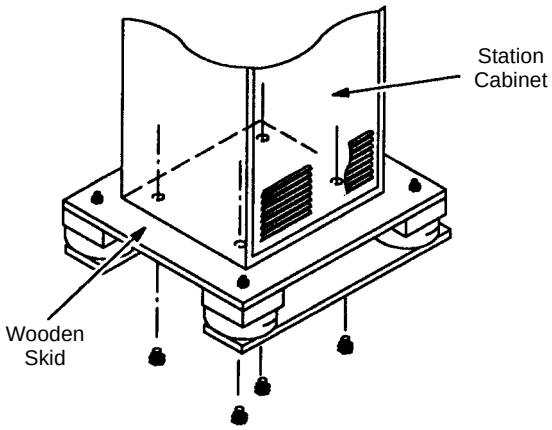
2. Cut band as shown.

3. Remove top packing spacer and corrugated corner supports.

4. Remove antistatic bag. **Do not** discard bag, it will be reinstalled to protect equipment during installation.



5. Depending on cabinet type, either open or remove front and rear doors to gain access to the four (4) bolts securing the station to the wooden skid. Remove the bolts and nuts as shown.



6. Use hoist to lift the station from the skid. Remove skid and return station to floor.

7. Replace antistatic bag over station to provide protection during installation.

Figure 4. Unpacking Procedures - Floor-mount Cabinets

Mounting Procedures

Introduction

In most cases, stations are shipped in the selected cabinet or rack (i.e., the station is mounted and cabled), and may be installed by following the procedures below. However, the following three scenarios require special mounting procedures:

- Customer plans to mount equipment in customer-supplied rack or cabinet, and orders equipment to ship from the factory without a rack or cabinet.
- Customer orders two stations in a single rack.
- Customer requires slide rail assembly.

Installing Racks

In a typical installation, the rack is bolted to a concrete floor to provide stability.

The following procedure describes the steps necessary to bolt the rack to a concrete floor. Be sure to check with local authorities to verify that the following procedure conforms to local building codes and regulations *before permanently installing the rack.*

1. Carefully align the rack at the desired anchoring location.
2. Use the rack mounting foot as a template and mark the location of the six 19mm (3/4in) diameter mounting holes. All six anchoring positions must be used.
3. Move the rack aside, drill holes in the concrete floor, and install the mounting anchors (RAM RD-56 anchors recommended) per instructions provided with the anchors. Make sure that none of the anchors comes in contact with the reinforcing wire mesh buried in the concrete; the rack must be electrically isolated from any other equipment or materials at the site.
4. Align the rack with the installed anchors and lightly secure the rack to the floor using the proper mounting hardware. **Do not tighten the mounting hardware at this time.**
5. Check the vertical plumb of the rack. Also check that the top is level. Use shims (flat washers or flat aluminum plates) as necessary under the rack mounting foot to achieve vertical plumb and horizontal level.
6. Tightly secure the rack to the floor anchors making sure that it remains vertically plumb and horizontally level.
7. After all debris is removed and cement dust is cleared away, remove whatever protective covering has been placed on the equipment, including the antistatic bag.

CAUTION

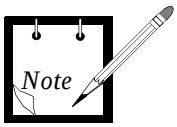
Cement dust from concrete flooring is harmful to electronic equipment and wiring. Make sure that the rack and any collocated equipment are protected prior to drilling holes in the concrete floor. Use a tarpaulin, cloth, or plastic sheeting to cover exposed equipment. (The rack should be already covered with an antistatic bag; do not remove the bag at this time.) Use a vacuum while drilling the holes to minimize the spread of concrete dust. Carefully clean up any accumulated dust and debris from the anchor installation before uncovering the equipment.

Mounting Floor-mount Cabinets

Each cabinet bottom is pre-drilled with four (4) mounting holes to allow attachment to the site floor. If installing on a concrete floor, use the cabinet as a template, mark the hole locations, and follow the procedures above for anchoring equipment racks. If installing on a wooden floor, use lag bolts and washers (customer supplied) to secure the cabinet to the floor.

Transferring Equipment from Shipping Container to Rack or Cabinet

As mentioned under Equipment Unpacking and Inspection, a station can be shipped in a box. Upon delivery, the equipment must be removed from the container and transferred to a Motorola-supplied rack or cabinet, or to a customer-supplied rack or cabinet.



Customer-supplied cabinets and racks must have mounting rails and hole spacing compatible with EIA Universal 48.3cm (19in) specifications. Cabinets must provide adequate ventilation (as detailed under Equipment Ventilation) and must meet the following criteria:

- 41.3cm (16.25in) deep
- 48.3cm (19in) wide
- 13.4cm (5.25in) high
- Two mounting rails 5cm (2in) from front of cabinet with front mounting holes 5.7 cm (2.25in) apart (center to center).

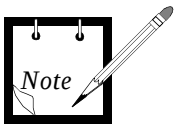
Contact Motorola Engineering for specific questions regarding mounting equipment in customer-supplied cabinets.

Installing Slide Rail Assembly in a Motorola Cabinet

Referring to Figure 5, perform the following procedure to install slide rail option X968AA.

On a bench-top, working on one side of the slide rail assembly at a time…

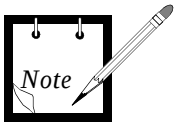
1. Remove the Inner-Slide Rail from the slide assembly (left and right) by depressing the Slide Locking Latch and sliding the Inner-Slide Rail out from the slide assembly.
2. Install the Inner-Slide Rail (left) on the Power Supply side by:
   - removing the 2 bottom screws from the station power supply EMI cover, and
   - installing the Inner-Slide Rail (left) with the supplied screws.
3. Install the Inner-Slide Rail (right) on the PA side using the holes in the PA casing.
4. Attach each Outer-Slide Rail to a Cabinet Bracket with supplied screws.



The left and right Cabinet Brackets are identical.
The Locking Tab of each Outer-Slide Rail must face towards the rear of the cabinet.

Working in the cabinet…

5. The cabinet must have a set of vertical cabinet rails in the back as well as the front. If there is no set in the back, these must be installed. The back rail is installed the same as the front rail, with the supplied screws.
6. Install each assembled Cabinet Bracket (with attached Outer-Slide Rail) to the appropriate side of the cabinet.



The U-shaped cutout of the Cabinet Bracket must face up.

7. Slide the station (with an Inner-Slide Rails mounted on each side) into the Outer-Slide Rails in the cabinet; an audible snap is heard. Continue sliding the station in until the station is fully seated.
8. Secure the station to the cabinet front rails with the supplied screws.

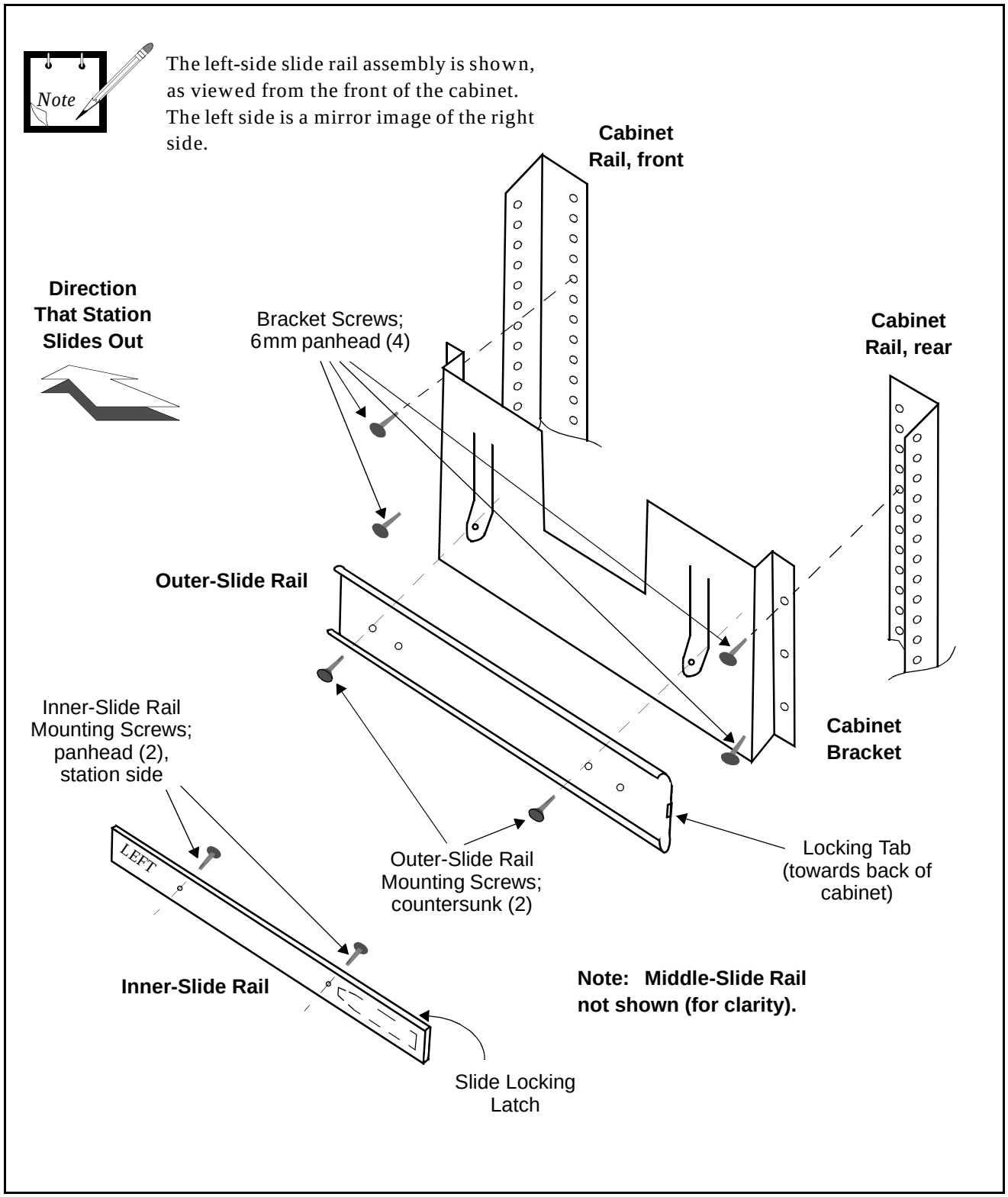


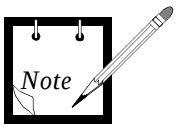
Figure 5. Slide Rail Installation; Option X968AA (Left Side Shown)

Installing Slide Rail Assembly in a Non-Motorola Cabinet

Referring to Figure 6, perform the following procedure to install slide rail option X346AB.

On a bench-top, working on one side of the slide rail assembly at a time…

1. Remove the Inner-Slide Rail from the slide assembly (left and right) by depressing the Slide Locking Latch and sliding the Inner-Slide Rail out from the slide assembly.
2. Install the Inner-Slide Rail (left) on the Power Supply side by:
   - removing the 2 bottom screws from the station power supply EMI cover, and
   - installing the Inner-Slide Rail (left) with the supplied screws.
3. Install the Inner-Slide Rail (right) on the PA side using the holes in the PA casing.
4. Attach each Outer-Slide Rail to the cabinet Brackets with supplied screws. Only use the lower slot of each bracket. Leave the screws loose; they will tightened when the brackets are mounted in the cabinet (step 7).



The left and right Cabinet Bracket sets are identical.
The Locking Tab of each Outer-Slide Rail must face towards the rear of the cabinet.

Working in the cabinet…

5. Install a cage nut in line with clearance hole in Threaded Strip prior to fitting the Front Bracket to the front cabinet rail.
   This nut is required for mounting the station (in step 9).
   The cage nuts are provided with the cabinet.
6. Fit the Short Bracket and Long Bracket (with attached Outer-Slide Rail) to the Front and Rear Cabinet Rails using the Bracket Mounting Screws and Threaded Strips.
7. Tighten the Outer-Slide Rail hardware after positioning the Outer-Slide Rail front side in line with the inner surface of the Front Cabinet Rails.
8. Slide the station (with an Inner-Slide Rails mounted on each side) into the Outer-Slide Rails in the cabinet; an audible snap is heard. Continue sliding the station in until the station is fully seated.
9. Secure the station to the Front Cabinet Rails with the supplied Station Mounting Screws.

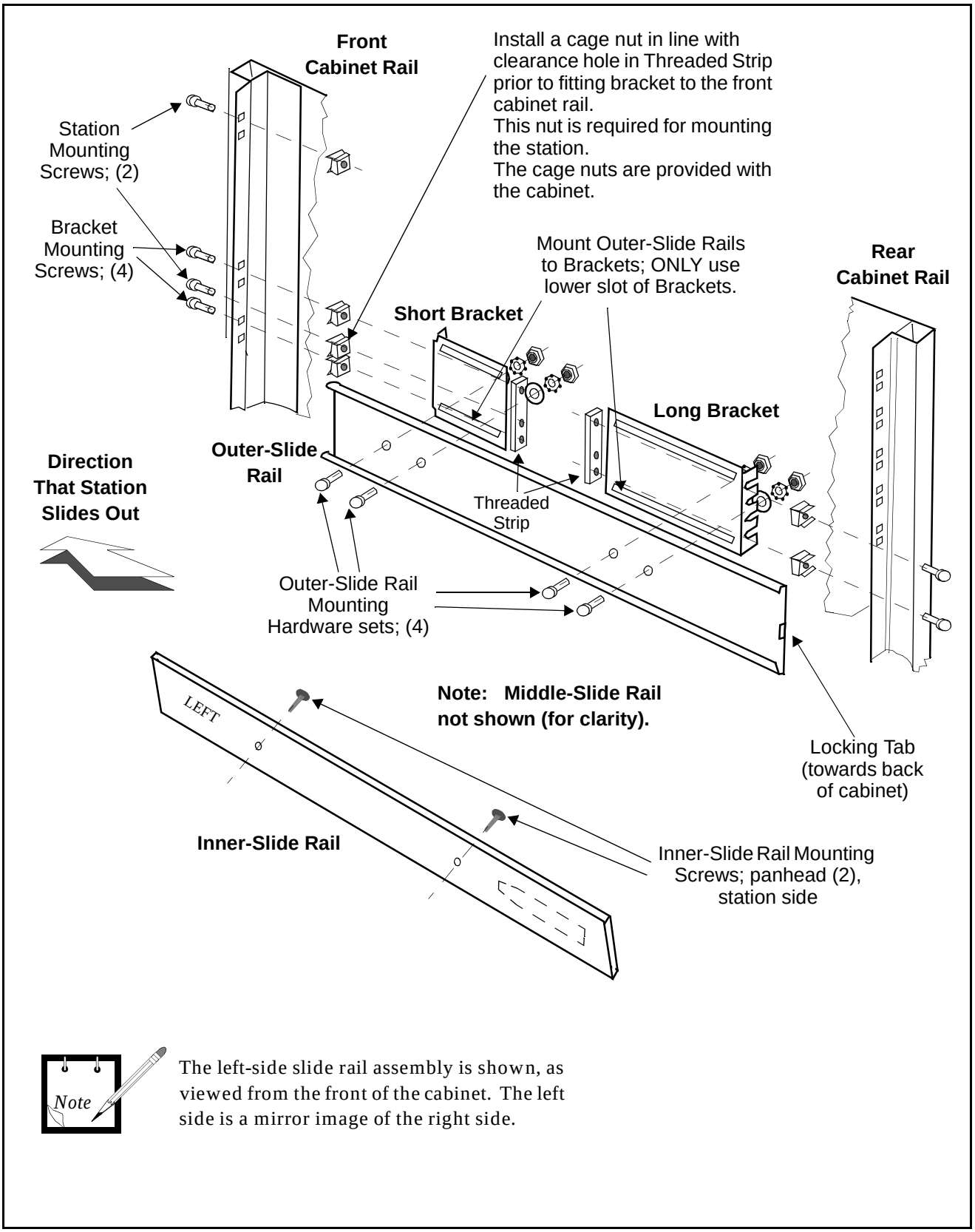


Figure 6. Slide Rail Installation; Option X346AB (Left Side Shown)

3 BOARD CONFIGURATION

Most station configuration parameters are altered through the Radio Service Software (RSS) with the exception of some parameters for the following boards, which are configured through jumpers:

- 4-Wire Wireline Interface Board (CLN1203),
- 4-Wire Euro Wireline Interface Board (CLN1204),
- Auxiliary I/O Board(CLN1206).

4-Wire Wireline Interface Board

Model CLN1203 WIB supports tone control of the station. CLN1203 provides a fixed impedance of 600Ω to the wireline. Figure 7 shows the jumper locations for tone control.

	P10, P11	P12, P13	P14, P15	P16, P17
Tone Remote Control 2-wire/4-wire configurations	out			

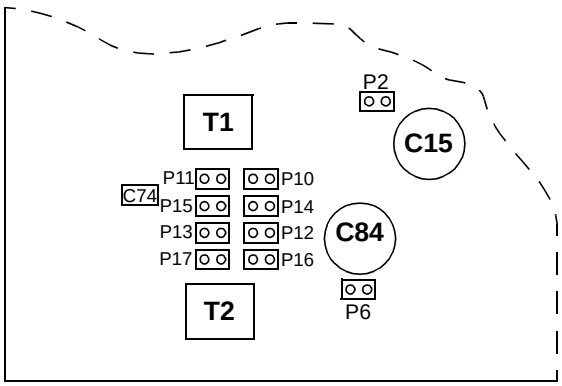


Figure 7. CLN1203 Wireline Interface Board Jumper Settings

4-Wire Euro Wireline Interface Board

Figure 8 shows the correct settings of impedance matching jumpers for the model CLN1204 WIB, as determined by the country in which the station is being operated. Incorrect jumper settings may violate local telecommunications authority regulations and place the equipment in an unapproved status. Some countries also specify a maximum allowed line input level. Refer to the RSS Online Help, under Line Level.

√ = Jumper In

A = Pin 1 connects to Pin 2

* This setting represents a standard 600 ohm matching and is the factory default.

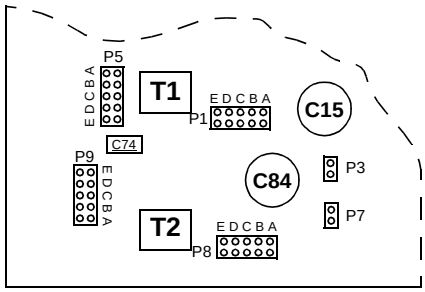
B = Pin 3 connects to Pin 4

C = Pin 5 connects to Pin 6

D = Pin 7 connects to Pin 8

E = Pin 9 connects to Pin 10

Note Canada and the U.S wireline requirements are supported by Wireline board model CLN1203.



Country	Reference Impedance	P1, P5, P8, P9 A *	B	C	D	E	P3, P7
Australia	120ηF, 220Ω 820Ω			√			√
Spain	120ηF, 220Ω 820Ω			√			√
Austria	115ηF, 220Ω 820Ω			√			√
Germany (2-wire)	115ηF, 220Ω 820Ω			√			√
Luxemburg	115ηF, 220Ω 820Ω			√			√
South Africa	115ηF, 220Ω 820Ω			√			√
Switzerland	115ηF, 220Ω 820Ω			√			
Belgium	72ηF, 150Ω 830Ω			√			√
Cyprus	600Ω	√					√
Former USSR	600Ω	√					√
Former Yugoslavia	600Ω	√					√
Germany (4-wire)	600Ω	√					√
Greece	600Ω	√					√
Italy	600Ω	√					√
Netherlands	600Ω	√					√
Portugal	600Ω	√					√
Denmark	330ηF, 400Ω 500Ω				√		√
Ireland	310ηF, 370Ω 620Ω				√		√
UK	310ηF, 370Ω 620Ω				√		√
Finland	115ηF, 220Ω 820Ω		√				√
France	115ηF, 220Ω 820Ω		√				√
Norway	115ηF, 220Ω 820Ω		√				
Sweden	30ηF, 900Ω					√	

Figure 8. CLN1204 Wireline Interface Board Jumper Settings

Auxiliary I/O Board

Jumpers are provided to route inputs and outputs in a specific direction to and from the SCM; the SCM determines the functionality of the inputs and outputs.

The board jumpers are shown in Figure 9.

GPI_14 is a special input which can be jumpered to be a transistor input or opto isolated. In addition it can be dedicated to the Ext_PTT* Line routed to the SCM. This function is a fast external PTT* (an active low function).

The board jumper settings for P2, P9, P6 are provided in Table 1. Settings for P5 are provided in Table 2. Settings for P3, P4 are provided in Table 3.

P7 and P8 are not used.

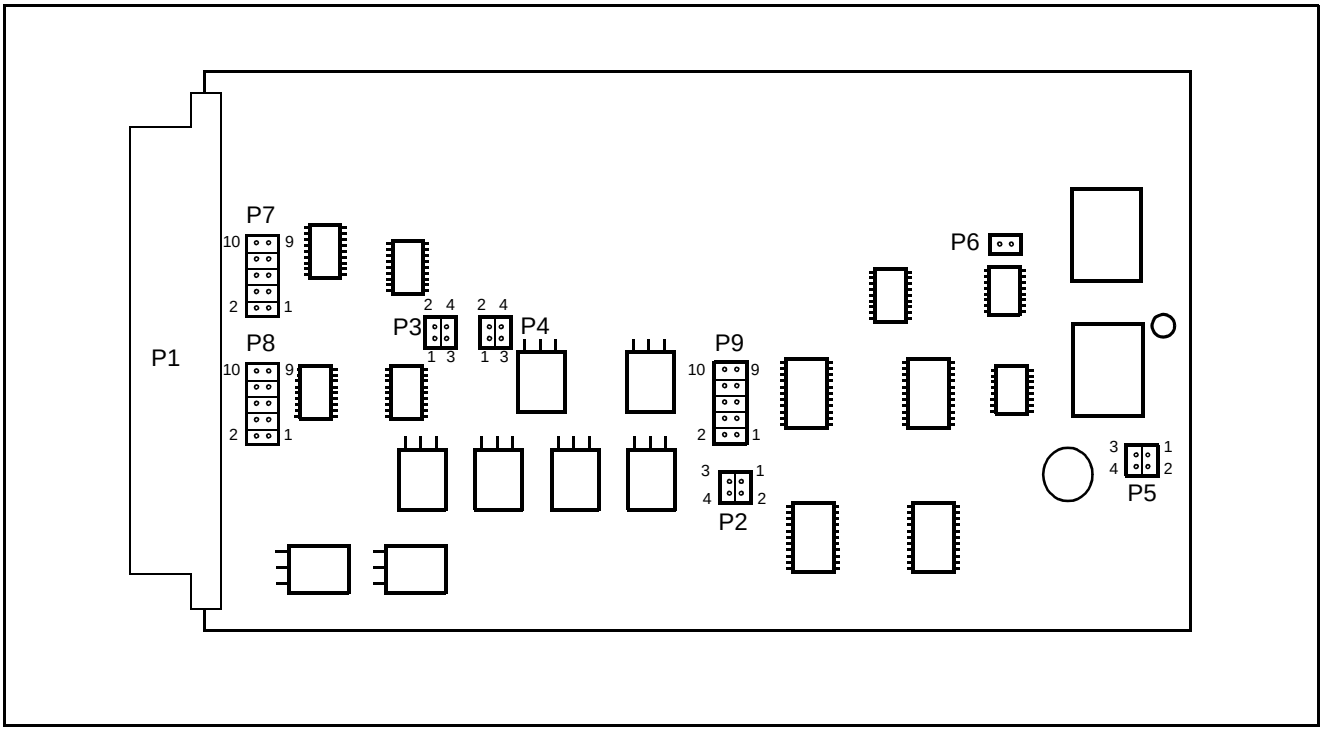


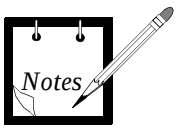
Figure 9. CLN1206 Auxiliary I/O Board Jumpers

Table 1. Configuring Input GPI_14 Function

Function on GPI_14	Input Type	System Connector Input Pins	Auxiliary I/O Board Jumpers		
			P2	P9	P6 (See Note 1)
$\overline{\text{Fast External PTT}}$*	via Optocoupler (E/M sub). (See Note 2)	A29 Opto + A26 Opto –	3 - 4, 1 - 2		In
	via Transistor	B26		9 - 10, 7 - 8	In
Fast External PTT	via Optocoupler (E/M sub)	A29 Opto + A26 Opto –	3 - 4, 1 - 2		Out
	via Transistor	B26		9 - 10, 7 - 8	Out

Table 2. Configuring Output GPO_14 Function

Function on GPO_14	Output Type	System Connector (J5) Output Pins	Auxiliary I/O Board Jumper P5
AC Fail	via Relay Closure	B29, A30	2 - 4
SPI Latch for GPO_14 (software defined)	via Relay Closure	B29, A30	1 - 2



The shaded areas indicate default manufacturing settings.

Note 1: This is an active low; that is, no current to the Opto Input.

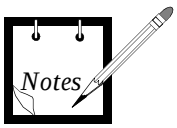
Note 2: This configuration, with P6 out (PTT when current to the Opto Input) represents the E Signal of 4 wire E&M Trunk Type I Phone Signalling. The opposite direction of the E&M is covered in Note 3.

CAUTION

In this configuration the second remaining unused input type must be jumpered to the SPI Buffer. The Buffer Input should never be left floating; otherwise the IRQ Generator will not function properly (i.e., use either P2-1&2 or P9-7&8).

Table 3. Configuring Output GPO_15 Function

Function on GPO_15	Output Type	System Connector (J5) Output Pins	Auxiliary I/O Board Jumpers	
			P3	P4
Fast Carrier Detect	via Relay Closure	C3, B3	2 - 4	2 - 4
	via Open Collector	B21 (see Note 4)	3 - 4	2 - 4
RdStat	via Relay Closure (see Note 3)	C3, B3	2 - 4	1 - 3
	via Open Collector	B21 (see Note 4)	3, 4	1, 3
SPI Latch for GPO_15 (software defined)	via Relay Closure	C3, B3	1 - 2	
	via Open Collector	B21 (see Note 4)	1 - 3	



Note 3: This configuration represents the M Signal of 4 wire E&M Trunk Type I Phone Signalling. The opposite direction of the E&M is covered in Note 2.

Note 4: Indicates that the configuration is only available when the board is plugged into Option slot 1.

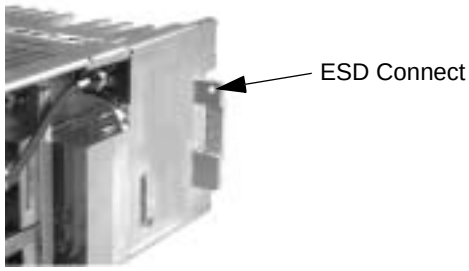
4 ELECTRICAL CONNECTIONS

After the station equipment has been mechanically installed, electrical connections must be made. This involves making the following connections to:

- power supply,
- antenna coax cables,
- system cables, and
- telephone lines.

IMPORTANT

When installing option boards, ensure that an Electro-Static Discharge (ESD) cable is connected (via banana plug) to the hole in the front-right handle of the station when installing option boards. Otherwise, the option boards may be damaged.



There are also electrical connections associated with maintenance and troubleshooting of the station. These connectors are located on the front of the Station Control Module (see Station Operation section for position of these connectors).

Figure 10 shows the position of the station external connectors located at the rear of the station.

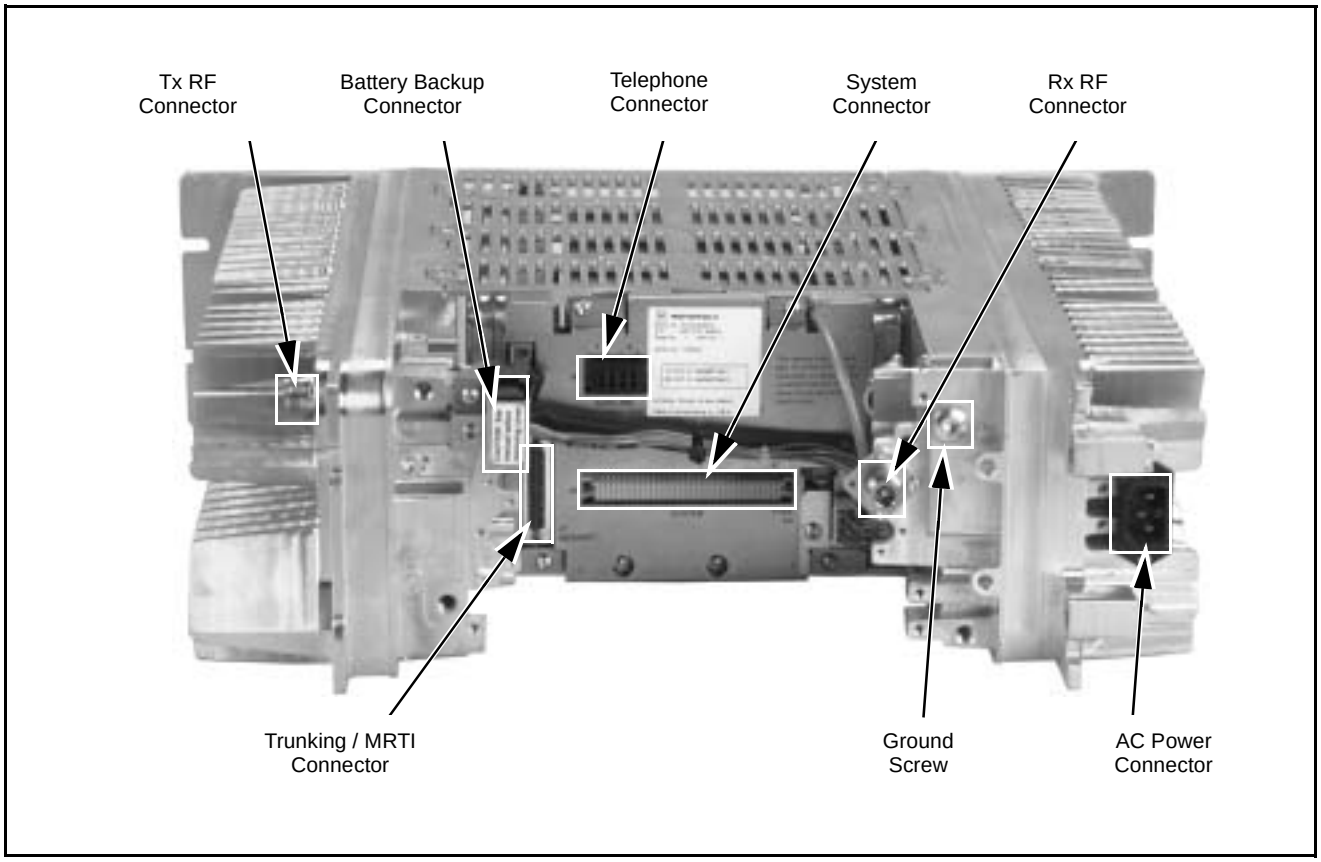


Figure 10. Location of External Connectors at Rear of Station

Power Supply Connections

AC Input Power Connection

CAUTION

Do not apply ac power to the station at this time. Make sure that the circuit breaker associated with the ac outlet is turned to OFF.

CAUTION

The ac socket-outlet must be installed near the equipment and must be easily accessible.

Each station is shipped with an 2.5 m (8 ft) 3-conductor line cord. Figure 10 shows the ac line cord connector. Insert the plug into an appropriate grounded outlet.

The North American line cord is equipped with a NEMA 5–15 plug, intended for 110/120Vac operation.

The optional European line cord (Option X189AA) is equipped with a "Schuko" style CEE VII (7) plug, intended for 220/240VAC operation.

Plugs for other countries are available as the following options:

Location	Option Number
U. K.	X162AA
Australia	X191AA

If an alternate line cord is required, obtain a line cord employing "HAR" flexible cord with fittings approved by the safety testing agency in the end-use country.

STOP

WARNING The **PFC choke must be separated from the station.** Failure to do so will result in degradation of station audio quality.
- If the PFC choke is installed in a rack or cabinet, the mounting tray of the PFC chokes must be located at least 3 rack units (RUs), or about 14 cm, (5.25 inches) from the closest MTR2000 station on the rack or in the cabinet.
- If the PFC choke is not installed in the mounting tray, the PFC choke must be separated from the station by a distance of at least 15 cm (6 inches).

Installation of High Power Stations in EU Countries

High power MTR2000 stations being installed in EU countries (after January 1, 2001), must be configured with a different power supply that operates in conjunction with a Power Factor Correction Choke. Each high power station requires a separate choke.

As an option (X590AA), the chokes are provided in a rack-mount tray, with a maximum of 5 chokes in a tray.

To connect ac power to the station (see Figure 11):

1. Connect the power cord from each MTR2000 to the mating connector of the choke.
2. Connect each choke to the ac power source using the standard MTR2000 power cord.

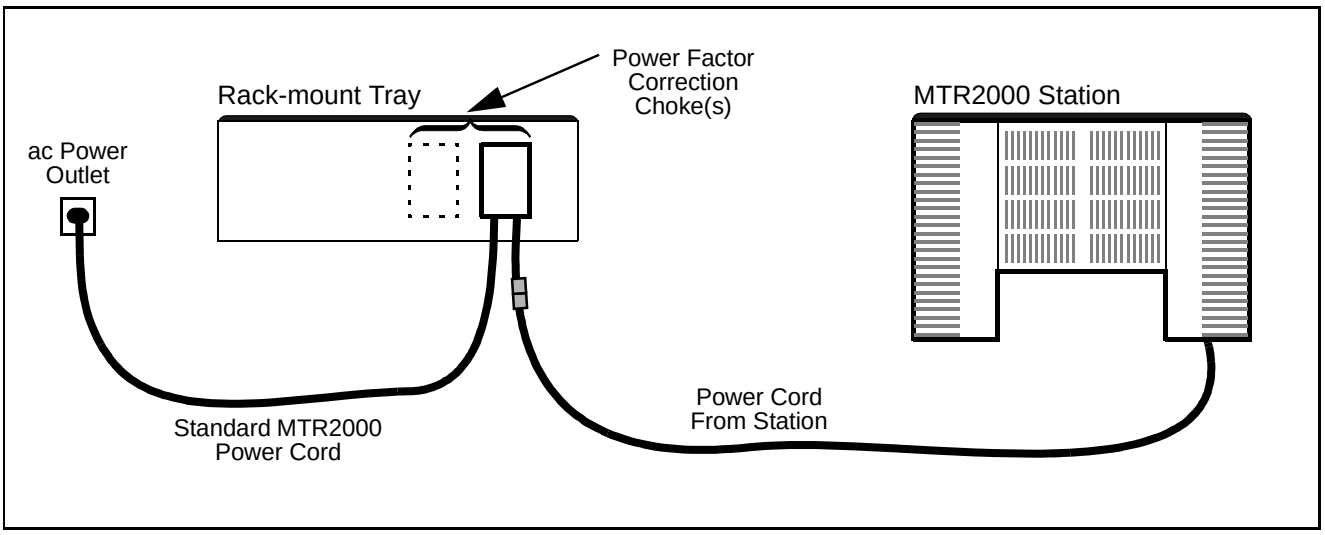


Figure 11. Connecting the Station to a Power Factor Correction Choke

Ground Connection

The station is equipped with a ground screw located on the rear of the station Power Supply module. Connect the ground screw to the site ground point.

CAUTION

Refer to Motorola Quality Standards Fixed Network Equipment Installation manual, R56 (68P81089E50) for complete information regarding lightning protection.

CAUTION

The station 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.

DC Input Power Connection

In the case where a DC-only power supply is provided with a station, the DC source power is connected to the station through the connector located at the back of the Power Supply module. This connector is in place of the AC Power connector shown in Figure 10.

STOP

WARNING

Ensure that the appropriate voltage is connected; that is,
Nominal 14.2 Vdc (10.8 to 16.0 Vdc) for a low power station, or
Nominal 28.6 Vdc(21.0 to 32.0 Vdc) for the high power station.

Battery Connection

Battery backup interface offers the capability of connecting to battery backup power in the event of an AC power line failure.

CAUTION: See manual before removing cover.

The battery backup system is connected to the station through the red and black connector mounted at the rear of the station. The connector has a cover with the following label. This label directs the technician to read the information provided below:

This battery backup system must have, at a minimum, a disconnect relay controlled by an AC fail detector.

STOP

WARNING

DO NOT connect a battery directly to the station. Damage to batteries as well as to the station may occur. Batteries must be connected to the station through an Argus Technologies Battery Reverting Charger, Model #010-519-20 (Motorola Model #L1883) for 12V charging systems, and Argus Technologies Model #010-523-20 (Motorola Model #L1884) for 24V charging systems. These systems were developed specifically for this interface and tested by Motorola for proper station operation. Damage resulting from use of any other charging systems will void the war-

ranty. Refer to qualified sales/service representative for charger ordering information.

CAUTION

The station 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 Electric Code ANSI/NFPA No.70 for the U.S.

Cables are supplied with the charging option. **Do not make connections directly from the station to the storage battery**. Connect as shown in Figure 12.

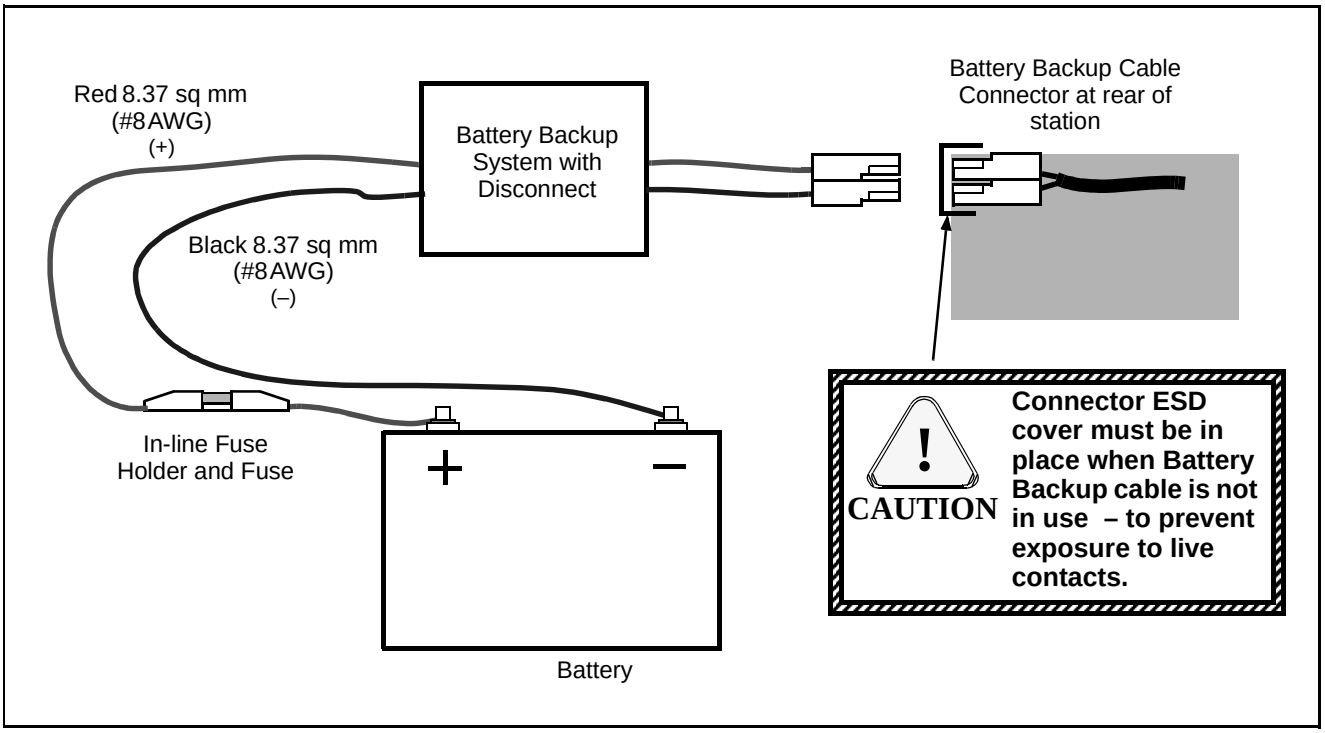


Figure 12. Making Connections to Storage Battery

RF Antenna Connections

The transmit and receive antenna rf connections are made using two separate N-type connectors. Coax cables from the receive and transmit antennas must be connected to the two N-type connectors. The position of these connectors is shown in Figure 10.

In the case where an optional Antenna Relay is used on the station, the coax cable from the single transmit / receive antenna is connected to the middle N-type connector of the Antenna Relay.

System Cable Connections

System connections are made through one or both of the following connectors:

- the Trunking / MRTI connector and
- the System connector.

Trunking / MRTI Connector

The location of the Trunking / MRTI connector and System connector on the station rear panel is shown in Figure 10.

The following cables are available for trunking system applications:

- 7.62 m (25 ft) Trunk Cable, part # 3083765X04
- 15.24 m (50 ft) Trunk Cable, part # 3083765X05
- 22.86 m (75 ft) Trunk Cable, part # 3083765X06
- 30.48 m (100 ft) Trunk Cable, part # 3083765X07

The following cables are available for MRTI applications:

- Interface cable for MRTI, kit # CDN6350
- Interface cable for MRTI 2000, kit # CDN6349

System Connector

The cable connected to the System connector can be configured for various system options.

A generic System cable is available for variety of applications such as Wild Card, Main Standby, and Auxiliary Input / Output:

- generic System cable, kit # TKN9205A

This cable provides a housing shell for connection to the 96 pin backplane connector, 30 loose pins, and a quantity of 30 of 24 gauge wires (2 meter long with a pin for header on one end and unterminated at the other end).

Table 4 provides a description of commonly used System Connector pins.

Table 4. System Connector – Commonly Used Pins

Pin Function		Pin #	Pin Signal Characteristics
Name	**Description**		
RdStat	TTL compatible logic output indicating Rx. Activation status.	B3, B21, C2	0.0 to 0.2Vdc with squelched receiver, 4.8 to 5.2Vdc with unsquelched receiver.
Disc. Rx. Audio	Unfiltered and unsquelched discriminator audio without de-emphasis.	C17	80mV minimum to 400mV maximum for 60% system deviation. Output level is RSS programmable.
RSSI	DC output volts related to received carrier level.	C11	Typically 0.5Vdc for –120dBm to 3.5 Vdc for –40 dBm carrier. Variation with carrier level @ approximately 40mV/dBm.
Cntrl 14.2V	14.2 volts dc output. For dc-only 250W power supplies, this voltage is equal to the input supply voltage.	A18, B18, C18 C32, B32, C32	Total current through all of these pins should not exceed 1Amp.
5 V	5.1 ± 0.25 volts dc output.	A20, B20, C20	Total current through all of these pins should not exceed 500 mA.
GND	Ground.	A19, B19, C19 A27, B27, C27 A31, B31, C31	Total current through all of these pins should not exceed 1.5 Amp.
Aux.Tx Audio	Tx. modulation input from external source.	A17	RSS programmable sensitivity. For R03.01 (host software) and earlier, the fixed sensitivity is @ 172 mVrms for 60% system deviation. RSS programmable for pre-emphasized or flat response. DC offset +2.4V. High impedance input.
Ext. PTT	External Tx. keying signal.	C10	Grounding Ext. PTT pin causes Tx to key. 5.0Vdc on pin when Tx is not keyed. Note: To transmit signalling code (PL / DPL) by external PTT, it should be mapped (via RSS) to Wireline, and external modulation input should be routed to wireline.
AC_Fail	Logic output to indicate failure of AC line input.	A4	Requires a Battery Revert dc supply. Line goes high (5.0Vdc) if AC fails.
Wireline Pair 3+/–	Additional wireline for other functions.	C28, C30	Line sensitivity and operation identical to line pairs 1 and 2 (see Table 10).
Wireline Pair 4+/–		B28, B30	

Table 5 provides a summary of the Auxiliary Inputs / Outputs (Wildcard I/O) currently available through the System Connector.

Table 5. Summary of Auxiliary Inputs/Outputs at the System Connector

Auxiliary I/O GPI_...	System Connector (J5) Pin
3	A5
4	C5
7	A22
9	A28
10	C12
11	B12
12	B11
13	B9

Auxiliary I/O GPO...	System Connector (J5) Pin
0	A12
2	A11
8	A1
RX Lock	B1
TX Lock	C1
13	B2
15	C3

Details of the System connector pinouts are provided in:

- Table 6, Row A pin assignments
- Table 7, Row B pin assignments
- Table 8, Row C pin assignments

The following symbols and abbreviations are used in Tables 6 to 8:

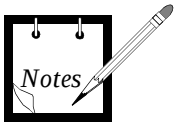
* = line is Active Low

NS = Not Supported; **this pin should not be used**.

Aux I/O = Indicates that the Aux I/O board must be present for this functionality.

WCI = Wild Card Input

WCO = Wild Card Output



The RSS Online Help provides the most current information on the System Connector pin assignments.

Table 6. J5 SYSTEM CONNECTOR, Row A Pins

Pin #	Pin Assignment	Input/ Output	To/From	Signal Characteristics
1	GPO_8 (WCO)	O	J1-C32, J2-C32	OCO, 100 mA, 40 V
2	PA Fail (Aux I/O)	O	J1-C31, J2-C31	OCO, 100 mA, 40 V, active low
3	SCI_CLCK1	O	J1-C30, J2-C30, J3-C28	Do not use.
4	AC Fail	O	P8-5, J1-C29, J2-C29, J3-C24	TTL output, active high
5	GPI_3 (WCI)	I	J1-C28, J2-C28	Pulled up transistor input, 16 V max
6	GP1_15 (–) (NS)	I	J1-C27, J2-C27	Negative side opto-isolated input, see C7
7	Ext Failsoft (Aux I/O)	I	J1-C26, J2-C26	Pulled up transistor input, 16 V max
8	GPI_1 (NS)	I	J1-C25, J2-C25	
9	GPI_2 (NS)	I	J1-C24, J2-C24	Pulled up transistor input, 16 V max
10	VSWR_Fail* (Aux I/O)	O	J1-C23, J2-C23	Pulled up transistor output (10 kohms to +5 Vdc), active low
11	GPO_2 (WCO)	O	J1-C22, J2-C22	Pulled up transistor output (10 kohms to +5 Vdc)
12	GPO_0 (WCO)	O	J1-B25, J2-B25	
13	Antenna Relay	O	P10-1, J3-C26	OCO, 200 mA, active low
14	Not Supported	O	J1-C18, J2-C18, J3-C19	
15	Spare 310	–	–	
16	Spare 308	–	–	
17	Aux TX Audio	I	J1-C16, J2-C16, J3-C16	RSS programmable input sensitivity
18	Cntrl 14.2 VDC	O	P8 pins 3, 4 (thru F2)	+14.2 Vdc, Note 1
19	GND	–	Station ground	
20	5 VDC	O	P8 pins 7, 8	+5.1 ± 0.25 Vdc
21	Not Supported	O	J3-C12	
22	GP1_7 (WCI)	I	J1-C11, J2-C11	Pulled up transistor input, 16 V max.
23	Spare 323	–	–	
24	Spare 320	–	–	
25	Spare 903	–	–	
26	Ext PTT or GP1_14 (–), Note 2	I	J1-C7, J2-C7	Negative side opto-isolated input, see A29
27	GND	–	Station ground	
28	GPI_9 (WCI) or GPO_3 (NS)	I/O	J1-C6, J2-C6	Caution: See Auxiliary I/O section for jumpering information
29	Ext PTT or GPI_14 (+), Note 2	I	J1-C5, J2-C5	Positive side opto-isolated input, see A26
30	AC Fail or GPO_14, Note 3	O	J1-C4, J2-C4	One side of normally open relay, see B29
31	GND	–	Station ground	
32	Cntrl 14.2 VDC	O	P8 pins 3, 4 (thru F2)	+14.2 Vdc, Note 1

Note 1: For dc-only 250 W power supplies, this voltage is equal to the input supply voltage.

Note 2: This pin can be jumpered for Ext PTT (supported) or GPI_14 (not supported). See Aux I/O jumpers P2 and P9.

Note 3: This pin can be jumpered for AC Fail (supported) or GPO_14 (not supported). See Aux I/O jumper P5.

Table 6. J5 SYSTEM CONNECTOR, Row A Pins

Pin #	Pin Assignment	Input/ Output	To/From	Signal Characteristics
1	GPO_8 (WCO)	O	J1-C32, J2-C32	OCO, 100 mA, 40 V
2	PA Fail (Aux I/O)	O	J1-C31, J2-C31	OCO, 100 mA, 40 V, active low
3	SCI_CLCK1	O	J1-C30, J2-C30, J3-C28	Do not use.
4	AC Fail	O	P8-5, J1-C29, J2-C29, J3-C24	TTL output, active high
5	GPI_3 (WCI)	I	J1-C28, J2-C28	Pulled up transistor input, 16 V max
6	GP1_15 (–) (NS)	I	J1-C27, J2-C27	Negative side opto-isolated input, see C7
7	Ext Failsoft (Aux I/O)	I	J1-C26, J2-C26	Pulled up transistor input, 16 V max
8	GPI_1 (NS)	I	J1-C25, J2-C25	
9	GPI_2 (NS)	I	J1-C24, J2-C24	Pulled up transistor input, 16 V max
10	VSWR_Fail* (Aux I/O)	O	J1-C23, J2-C23	Pulled up transistor output (10 kohms to +5 Vdc), active low
11	GPO_2 (WCO)	O	J1-C22, J2-C22	Pulled up transistor output (10 kohms to +5 Vdc)
12	GPO_0 (WCO)	O	J1-B25, J2-B25	
13	Antenna Relay	O	P10-1, J3-C26	OCO, 200 mA, active low
14	Not Supported	O	J1-C18, J2-C18, J3-C19	
15	Spare 310	–	–	
16	Spare 308	–	–	
17	Aux TX Audio	I	J1-C16, J2-C16, J3-C16	RSS programmable input sensitivity
18	Cntrl 14.2 VDC	O	P8 pins 3, 4 (thru F2)	+14.2 Vdc, Note 1
19	GND	–	Station ground	
20	5 VDC	O	P8 pins 7, 8	+5.1 ± 0.25 Vdc
21	Not Supported	O	J3-C12	
22	GP1_7 (WCI)	I	J1-C11, J2-C11	Pulled up transistor input, 16 V max.
23	Spare 323	–	–	
24	Spare 320	–	–	
25	Spare 903	–	–	
26	Ext PTT or GP1_14 (–), Note 2	I	J1-C7, J2-C7	Negative side opto-isolated input, see A29
27	GND	–	Station ground	
28	GPI_9 (WCI) or GPO_3 (NS)	I/O	J1-C6, J2-C6	Caution: See Auxiliary I/O section for jumpering information
29	Ext PTT or GPI_14 (+), Note 2	I	J1-C5, J2-C5	Positive side opto-isolated input, see A26
30	AC Fail or GPO_14, Note 3	O	J1-C4, J2-C4	One side of normally open relay, see B29
31	GND	–	Station ground	
32	Cntrl 14.2 VDC	O	P8 pins 3, 4 (thru F2)	+14.2 Vdc, Note 1

Note 1: For dc-only 250 W power supplies, this voltage is equal to the input supply voltage.

Note 2: This pin can be jumpered for Ext PTT (supported) or GPI_14 (not supported). See Aux I/O jumpers P2 and P9.

Note 3: This pin can be jumpered for AC Fail (supported) or GPO_14 (not supported). See Aux I/O jumper P5.

Table 7. J5 SYSTEM CONNECTOR, Row B Pins

Pin #	Pin Assignment	Input/ Output	To/From	Signal Characteristics
1	RX Lock (Aux I/O)	O	J1-B32, J2-B32	OCO, 100 mA, 40 V; active high
2	GPO_13 (WCO)	O	J1-B31, J2-B31	OCO, 100 mA, 40 V
3	RdStat or GPO_15, Note 4	O	J1-B30, J2-B30	One side of normally open relay, see C3
4	Carrier Detect Switch	O	J1-B29, J2-B29, J3-B24	TTL output, active high
5	GPI_8 (NS)	I	J1-B28, J2-B28	Pulled up transistor input, 16V max
6	GPI_5 (NS)	I	J1-B27, J2-B27	
7	Ext Repeat* (Aux I/O)	I	J1-B26, J2-B26	
8	Trunk Duplex Enable*	I	J3-B25	TTL input
9	GPI_13 (WCI) or GPO_7 (NS)	I/O	J1-B24, J2-B24	Caution: See Auxiliary I/O section for jumpering information
10	Spare 311	–	N/C	
11	GPI_12 (WCI) or GPO_6 (NS)	I/O	J1-B22, J2-B22	Caution: See Auxiliary I/O section for jumpering information
12	GPI_11 (WCI) or GPO_5 (NS)	I/O	J1-B23, J2-B23	
13	Spare 301	–	N/C	
14	Not Supported	I	J1-B19, J2-B19, J3-B19	TTL input
15	GND	–	Station ground	
16	Spare 300	–	–	
17	Spare 321	–	–	
18	Cntrl 14.2 VDC	O	P8 pins 3, 4 (thru F2)	+14.2 Vdc, Note 1
19	GND	–	Station ground	
20	5 VDC	O	P8 pins 7, 8	+5.1 ± 0.25 Vdc
21	RdStat or GPO_15, Note 4	O	J1-B12	OCO, 100 mA, 40 V
22	Spare 322	–	–	
23	Spare 325	–	–	
24	Spare 309	–	–	
25	Spare 902	–	–	
26	Ext PTT or GPI_14, Note 2	I	J1-B7, J2-B7	Pulled up transistor input, 16V max, see A29
27	GND	–	Station ground	
28	Line 4+	O	J4-C10	Wireline output balanced, (+)
29	AC Fail or GPO_14, Note 3	O	J1-B4, J2-B4	Other side of normally open relay, see A30
30	Line 4–	O	J4-A9	Wireline output balanced, (–)
31	GND	–	Station ground	
32	Cntrl 14.2 VDC	O	P8 pins 3, 4 (thru F2)	+14.2 Vdc, Note 1

Note 4: This pin can be jumpered for RdStat (supported) or GPO_15 (supported). See Aux I/O jumpers P3 and P4.

Table 8. J5 SYSTEM CONNECTOR, Row C Pins

Pin #	Pin Assignment	Input/ Output	To/From	Signal Characteristics
1	TX Lock (Aux I/O)	O	J1-A32, J2-A32	OCO, 100 mA, 40 V; active high
2	Rdstat-R2 Control	O	J1-A31, J2-A31, J3-A26	TTL output, high when unsquelched
3	RdStat or GPO_15, Note 4	O	J1-A30, J2-A30	Other side of normally open relay, see B3
4	Failsoft Output (Aux I/O)	O	J1-A29, J2-A29	OCO, 100 mA, 40 V, active low
5	GPI_4 (WCI)	I	J1-A28, J2-A28	Pulled up transistor input, 16 V max
6	Not Supported	I	J1-A27, J2-A27, J3-B26	
7	GPI_15 (+) (NS)	I	J1-A26, J2-A26	Positive side opto-isolated input, see A6
8	Trunk TX Inhibit*	I	J3-A25	TTL input
9	RF Relay Control Out (Aux I/O)	O	J1-B5, J2-B5	OCO, 200 mA, 40 V, active high
10	Ext PTT* Out (Aux I/O), Note 5	I	J1-A23, J2-A23, J3-A23	TTL input
11	RSSI	O	J1-A22, J2-A22, J3-A22	Typically 0.5 Vdc for –120 dBm to 3.5 Vdc for –40 dBm carrier. Variation with carrier level @ approximately 40 mV/dBm.
12	GPI_10 (WCI) or GPO_4 (NS)	I/O	J1-A24, J2-A24	Caution: See Auxiliary I/O section for jumpering information
13	Spare 304	–	–	
14	Not Supported	O	J1-A19, J2-A19, J3-A19	
15	GND	–	Station ground	
16	GND	–	Station ground	
17	Disc RX Audio	O	J1-A16, J2-A16, J3-A16	Discriminator audio, flat response; 80 mV to 400 mV for 60% deviation
18	Cntrl 14.2 VDC	O	P8 pins 3, 4 (thru F2)	+14.2 Vdc, Note 1
19	GND	–	Station ground	
20	5 VDC	O	P8 pins 7, 8	+5.1 ± 0.25 Vdc
21	Not Supported	O	J3-A12	
22	Spare 302	–	–	
23	Spare 324	–	–	
24	GPIO_0 (CNTR I/O)	I/O	J1-A9, J2-A9, J3-A17	TTL input/output
25	Spare 317	–	–	
26	Spare 901	–	–	
27	GND	–	Station ground	
28	Line 3+	I	J4-C12	Wireline input balanced, (+)
29	GPIO_1 (CNTR I/O)	I/O	J1-A4, J2-A4, J3-A13	TTL input/output
30	Line 3–	I	J4-A11	Wireline input balanced, (–)
31	GND	–	Station ground	
32	Cntrl 14.2 VDC	O	P8 pins 3, 4 (thru F2)	+14.2 Vdc, Note 1

Note 5: Ext PTT signal output, taken from Ext PTT input. The output signal can be inverted, depending on jumper settings. See jumpers P2, P6, P9.

Telephone Line Connections

Introduction

In conventional systems where the station is controlled by a remote console, or in wide area systems utilizing comparators, phone lines must be connected between the station and the remote equipment. The phone lines may carry analog voice, or encoded voice. Also carried on the phone lines are Tone Remote Control (type of remote control signalling). The following information defines the specifications for the phone lines, the location on the station backplane for phone line connections, and which of the four (4) wireline circuits to use for various system types.

Telephone Line Specifications

Most telephone companies recognize either “3002” or “Type 5” as designations to define phone line types and associated electrical specifications. Telephone lines meeting the specifications for either of these types are acceptable for use with the station. Table 9 shows the specifications for “3002” or “Type 5” phone line types.

Table 9. Type 5 and “3002” Phone Line Specifications

Parameter	Type 5 Specification	3002 Specification
Loss Deviation	±4.0 dB	±4.0 dB
C–Notched Noise	51 dBmCO	51 dBmCO
Attenuation Distortion: 504 to 2504 Hz 404 to 2804 Hz 304 to 3004 Hz	 –2.0 to +8.0 dB –2.0 to +10.0 dB –3.0 to +12.0 dB	 –2.0 to +8.0 dB –2.0 to +10.0 dB –3.0 to +12.0 dB
Signal To C–Notched Noise Ratio	≥24 dB	≥24 dB
Envelope Delay Distortion: 804 to 2604 Hz	 1750 µsec	 1750 µsec
Intermodulation Distortion: R2 R3	 ≥27 dB ≥32 dB	 ≥25 dB ≥30 dB
Phase Jitter: 20 to 300 Hz 4 to 300 Hz	 ≤10 Degrees ≤15 Degrees	 ≤25 Degrees ≤30 Degrees
Frequency Shift	±3 Hz	±5 Hz

Location of Telephone Line Connections

Wireline Connector

When 4-wire (2 line) telephone connections are required, Line 1 and Line 2 are provided through the 4–position wire wrap terminal connector. Table 10 provides a description of the Wireline connector line pair assignments.

Table 10. Wireline Connector Line Pair Assignments

Line Pair	Functionality
1 +/–	Tx wireline input for 4 wire configuration. Input level is programmable by RSS between 0 dBm to –50 dBm. Do not use this line pair for 2 wire wireline configuration.
2 +/–	Rx wireline output for 4 wire configuration. Output level is programmable between +7 dBm to –20 dBm for 100% deviation. Use this line pair for 2 wire wireline configuration.

Connector 4 has 8 holes:

- the round holes are for wire insertion, and
- the square holes are for insert release.

This wire-trap terminal connector accepts only 0.52 sq mm (20 AWG) to 0.2 sq mm (24 AWG); solid wire **or** stranded wire with a tin topcoat. Wires inserted into the connector should be stripped to length 9.53mm (0.375 in).

As a removal release tool, use either:

- a stripped wire of any of above sizes, or
- the Wireline connector tool, part number 6600809D00.

CAUTION

Before applying excessive pullout force on the telephone connection wires, be sure to release wires properly.

System Connector

When 8-wire (4 line) telephone connections are required:

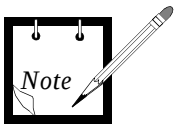
- Line 1 and Line 2 are provided through the 4-terminal Telephone connector.
- Line 3 and Line 4 are provided through the System connector.

The location of the Telephone and System connectors on the station rear panel is shown in Figure 10.

Table 4 describes the System connector pin assignments for Line Pairs 3 and 4.

System Type vs. Wireline Circuit

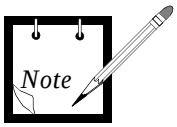
Table 11 shows which of the four (4) wireline circuits to use for various system types.



Stations equipped with a 4–wire Wireline Interface can support a single 4–wire or a single 2–wire telephone line connection.
Stations equipped with an 8–wire Wireline Interface can for example support a two 4–wire or a single 2–wire telephone line connection.

Table 11. System Types vs. Wireline Circuit Matrix

System Type	**Line 1** (Note i)	**Line 2** (Note i)	**Line 3**	**Line 4**
Conventional Local Area Analog	Console	Console	Not used	Not used
Conventional Wide Area Analog	Comparator or Console	Comparator	Not used	Not used
Trunked Local Area Clear, without CPI	CIT	CIT	Not used	Not used
Trunked Local Area Clear, with CPI	Console	Console	CIT	CIT
Trunked Wide Area Clear without CPI	Comparator	Comparator	Not used	Not used
Trunked Wide Area Clear, with CPI	Console	Console	Comparator	Comparator
Trunked AMSS Clear	Comparator	Comparator	Not used	Not used
Redundant Trunking Clear, Wide Area without CPI	Comparator	Comparator	Not used	Not used



i) For 4–wire systems, Line 1 is transmit audio (landline to station), and Line 2 is receive audio (station to landline). For 2–wire systems, Line 2 is transmit and receive audio.

ii) A CPI is a Console Priority Interface.; used in Trunking systems.
A CIT is a Central Interconnect Terminal; used in Trunking systems.

iii) Transmit audio with respect to consoles, comparators, CIT, and DVM modems are outputs.
Transmit audio with respect to stations is an input.

iv) Receive audio with respect to consoles, comparators, CIT, and DVM modems are inputs.
Receive audio with respect to stations is an output.

Station Maintenance Connections

Table 12 provides a description of the maintenance connections located on the front of the Station Control Module.

Table 12. Station Maintenance Connections on the SCM

Connector Name	Function	Details
5/10MHz External Reference Signal (J5603)	External Reference signal for internal system clock	5MHz or 10MHz external reference may be used. Select desired frequency through RSS. High impedance input. Minimum level is 1Vpp for either type of input. Maximum level should not exceed 3Vpp.
Service Speaker (P5601)	Output to Power Voice speaker	Adjustable between 0 to 500mV across 1Kohm @60% system deviation. Audio signal appears between pins 3 and 4 on the connector. Must use speaker type HSN1000 via adapter cable Part.No. 0185180U01.
RSS (P5600)	Serial Port	For connection to serial port of a computer via cable Part No. 3082056X02. The Radio Service Software (RSS) application is run on the computer.
Microphone (P5602)	Local Microphone Input	Use local microphone type GMN6147 or equivalent. Modulation sensitivity for 60% system deviation is typically 300mV. This microphone should be equipped with 3 control buttons for speaker volume control, Rx. monitor and Intercom control functions.

5 POST INSTALLATION CHECKLIST

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

Applying Power

Before applying power to the station, 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 station Power Supply Module, or switch on the DC-supply to a station with a DC-only Power Supply Module.

Changing Fuse

To replace the station fuse:

1. Turn off station power at source (e.g., ac breaker).
2. Remove fuse cover plate located on the backplane shield by unscrewing one M4 screw.
3. Pull defective fuse carefully with small needle nose pliers.
4. Replace new fuse (part # 6583049X16) carefully with small needle nose pliers.

CAUTION

For continued protection of the station against risk of fire, replace the fuse only with the same type and rating of fuse.

5. Restore power to the station.

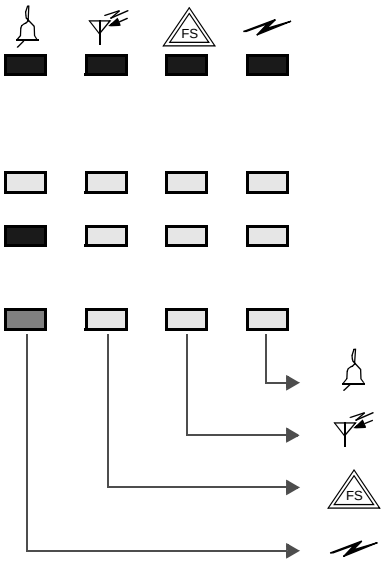
Verifying Proper Operation

Operation of the station can be verified by:

- observing the state of the 4 LEDs located on the front panel
- listening to audible alarms, and
- exercising radio operation.

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

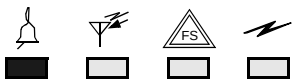
Front Panel LEDs



After turning the station power ON (or after a station reset), the 4 LEDs on the station front panel:

1. Are all lit for about 3 seconds to indicate that they are functional. The **Station Status** LED appears yellow since both the red and green LEDs of this bicolor indicator are lit at the same time.
2. All go off for about 15 seconds.
3. All stay off except for the **Station Status** LED which goes red for about 6 seconds.
4. Now indicate operational status of the station. The 4 LEDs indicate:
   - **PA Keyed** LED; green – station PA is keyed.
   - **FailSoft** LED; yellow – (if set up for trunking) station is not being controlled from the trunking central controller.
   - **Rx Active** LED; green – station is unsquelched.
   - **Station Status** LED; red / green – operational status of station.

Station Status LED



This two-color **Station Status** LED (i.e., red or green) indicates the following:

LED Color	LED State	Indicates that the…
Off	Off	5V power is not present
Red	On	Station is Not Operational – major failure
Red	Flashing	Station is Operational but Not Fully Functional – minor failure
Green	On	Station is Operating Normally
Red / Green	Alternately Flashing	Station is in Boot Mode
Green	Flashing	Station is in Service Mode

A major failure renders the station unusable. These failure could be caused by one of the following conditions:

- Rx or Tx synthesizer out of lock
- PA failure,
- Sharp (i.e., 10 dB) rf power cutback,
- self test failure

CAUTION

A random flashing of the Station Status LED indicates major failure of the Station Control Module; since a control module reset turns the LEDs on.

A minor failure limits the functionality of the station. These failures could be caused by one of the following conditions:

- ac source power failure
- exciter or receiver analog metering voltage degradation
- wireline loopback failure
- invalid local channel selection

Boot mode is the mode the station is in during the loading of software into the station's Flash memory.

Service mode is the mode the station is in during normal maintenance and service periods. These modes include the following conditions:

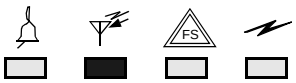
- Intercom
- Access Disable
- Power Control Disable

The Radio Service Software (RSS) can be used to determine which failure or service modes are active.

CAUTION

Service mode indicates that the station is not fully functional.

RX Active LED

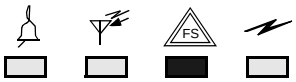


This **RX Active** LED indicates the following:

LED Color	LED State	Indicates that the…
Green	On	Receiver is active.

This LED is lit when receive activation criteria (user defined) are satisfied; i.e., the radio is unsquelched.

FailSoft LED

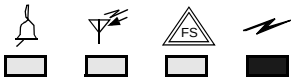


This **FailSoft** LED indicates the following:

LED Color	LED State	Indicates that the …
Yellow	Flashing	station is in the Trunking system Failsoft mode.

This LED is lit when no activity is detected on the transmit data signal from the trunking central controller; the station is in Failsoft mode. This condition usually indicates a failed link to the trunking central controller.

PA Keyed LED



This **PA Keyed** LED indicates the following:

LED Color	LED State	Indicates that the …
Green	On	PA is keyed.
Green	Flashing	PA is keyed, but operating with power cutback.

Listening For Audible Alarms

With a Service Speaker connected to the station (see Station Operation, Service Connections), any active audible alarms can be heard.

Alarm	Sound	Indicates that …
AC Fail	a single short beep	a station configured with DC-revert has detected an AC power failure.
PA Fail	two short beeps	the station has been keyed, and the Power Amplifier has failed.

The audible alarms are repeated every 10 seconds. If more than one alarm is active, they are offset by 2 seconds.

Exercising Radio Operation

Operation of the station radio can be verified by exercising the radio's two-way operation. This may be carried out when an external speaker and microphone are connected to the Station Control Module (SCM).

The kit # for the speaker is HSN1000. The external speaker requires an adaptor cable, part # 0185180U01.

CAUTION

Using a speaker other than the recommended HSN1000 may result in the station blowing a fuse.

The kit number for the microphone is GMN6147B.

6 OPTIMIZATION

After the station and ancillary equipment have been mechanically installed, properly cabled, and power applied, the equipment must then be optimized; that is, before placing the station in operation. Optimizing is performed through the Radio Service Software (RSS), kit number RVN4148.

After the station is operational, the station's codeplug data must be copied to a PC- compatible computer.

CAUTION

In order to program an MTR2000 station for Trunking operation, kit number RVN4148C (or later) of the RSS must be used. The current version is available through the U.S. and Canada Americas Aftermarket Division (AAD).

Optimizing Tasks

Optimization involves the following tasks:

1. Reading the station codeplug from the station (this ensures a match between the station serial number (resident in the codeplug) and the serial number (part of the customized station codeplug data) that is written back to the station (see task 5).
2. Customizing the station codeplug and saving the data to the station
3. Aligning the station for:
   - Rx Wireline
   - Tx Wireline
   - Receiver RSSI calibration (option)
   - Receiver Squelch Adjust
4. Performing post-optimization procedures.
5. Writing the customized codeplug to the station codeplug.

For details on these tasks, refer to the *Optimizing a New Installation* topic of the Radio Service Software (RSS) Online Help.

Copying Station Codeplug Date To a PC-compatible Computer

CAUTION

A copy of each station's codeplug data must be made on an IBM-PC compatible computer. This is done through the Radio Service Software (RSS). See the RSS Startup Manual, 68P81096E15.

7 INSTALLING STATION HARDWARE OPTIONS

When a station is ordered with an Antenna Relay or External Preselector option, the respective module is attached to the station when delivered.

When a station is ordered with an External Double Circulator option, this circulator is provided in a peripheral tray.

In the case where an option is later added to the station, it can be installed according to the information provided in the Ancillary Equipment sections of the appropriate Instruction manual. Also refer to the Troubleshooting section for information on tuning the External Preselector.