MOTOROLA

INSTALLATION

For *Quantar* Stations and Ancillary Equipment (VHF, UHF, 800 MHz, and 900 MHz)

Contents

Commercial Government and Industrial Solutions Sector
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1 PRE–INSTALLATION CONSIDERATIONS

A good installation is important to ensure the best possible performance and reliability of the station equipment. Vital to a good installation is pre–installation planning. Planning the installation includes considering the mounting location of the equipment in relation to input power, antenna(s), and telephone interfaces. Also to be considered are site environmental conditions, the particular mounting method (several available), and required tools and equipment. The following paragraphs provide additional details on these and other pre–installation considerations.

Important— If this is your first time installing this type of equipment, it is highly recommended that you completely read the entire Installation section before beginning the actual installation.

Installation Overview

The following information is intended to serve as an overview for installing the *Quantar* station and ancillary equipment. Step–by–step procedures for each of the major tasks are then provided beginning in paragraph 2.

- 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
- 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 (located behind the OPTIMIZATION tab) to customize the station parameters per customer specifications (e.g., operating frequency, PL codes, etc.)

Environmental Conditions at Intended Installation Site

The Quantar 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 to +60°C

Humidity — not to exceed 95% relative humidity @ 50°C

Air Quality — For equipment operating in an environmentally controlled environment with the station cage(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 cage(s) cabinet mounted), the airborne particulates level must not exceed 90 $\mu g/m^3$

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

Important - *The equipment should not be directly exposed to corrosive environments. Corrosive contaminates may come from local sources or the general atmosphere in the area of the radio equipment. A common source of corrosive contaminates comes from salt mist at a site located in a coastal environment. In such a case, proper air filtration for the site should be in place to protect the equipment from salt mist contamination.*

Important! Rack–mounted stations must be protected from dripping water from overhead pipes, air conditioning equipment, ertc. Serious damage to station components could occur if proper protection is not provided.

Equipment Ventilation

Two of the station modules (the power amplifier and power supply modules) are equipped with cooling fans (thermostatically controlled) that are used to provide forced convection cooling. The air flow is front to back, allowing several station cages to be stacked within a rack or cabinet. When planning the installation, observe the following ventilation guidelines:

- 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 station cages are installed in a single cabinet, besure ventilation openings surround **each** cage to allow for adequate cooling.
- All cabinets must have at least six inches of open space between the air vents and any walls or other cabinets. This allows adequate air flow.
- When multiple cabinets (each equipped with several station cages) are installed in an enclosed area, make sure the ambient temperature of the room does not exceed the recommended maximum operating temperature (+60°C). It may be necessary to have air conditioning or other climate control equipment installed to satisfy the environmental requirements.

AC Input Power Requirements

The *Quantar* station is equipped with a multiple–output dc power supply module (various models available) that operates from 90Vrms to 280Vrms, 50 or 60 Hz ac input power (automatic range and line frequency selection). A standard 3–prong line cord is supplied to connect the power supply (rear of station) to the ac source.

Note: *If you wish to connect the station to a 220 VAC outlet, you must obtain a line cord employing "HAR" flexible cord with fittings approved by a safety testing agency in the end use country.*

It is recommended that a standard 3–wire grounded electrical outlet be used as the ac source. The outlet must be connected to an ac source capable of supplying a maximum of 766 Watts. For a nominal 110V ac input, the ac source must supply 8.5 amperes and should be protected by a circuit breaker rated at 15 amperes. For a nominal 220V ac input, the ac source must supply approximately 4.25 amperes.

Equipment Mounting Methods

The *Quantar* station equipment may be mounted in a variety of racks and cabinets (available as options), as follows:

No Rack or Cabinet

- Station shipped without rack or cabinet (Option X87AA) — customer may install station in rack or cabinet of choice; station is designed to fit standard EIA 19" rack configuration

Standard Open Racks

- 7' (Model TRN7342), 7½' (Model TRN7343), or 8' (Model TRN7344) racks— open frame racks accept multiple *Quantar* stations and ancillary equipment; EIA 19" rack configuration. Note that rack mounting hardware (Option X153AA) is required for each *Quantar* cage to be rack mounted.

Modular Racks

- 30" (Option X741AA), 45" (Option X742AA), or 60" (Option X743AA) modular racks — accept multiple *Quantar* stations and ancillary equipment; EIA 19" rack configuration. These racks are designed to be stacked (see page 26).

Cabinets

Note: *Although cabinets can physically house multiple stations, thermal limitations may reduce the maximum number of stations for a given cabinet size. Consult Motorola System Engineering or the Product System Planner if you anticipate possible thermal limitations.*

- Shipped in 12" x 20" cabinet (Option X430AA) — roll–formed cabinet with front and rear vented doors holds a single *Quantar* station
- Shipped in 30" x 20" cabinet (Option X52AA) — roll–formed cabinet with front and rear vented doors holds up to three (3) *Quantar* stations
- Shipped in 46" x 20" cabinet (Option X308AA) — roll–formed cabinet with front and rear vented doors holds up to four (4) *Quantar* stations
- Shipped in 60" x 20" cabinet (Option X180AA) — roll–formed cabinet with front and rear vented doors holds up to six (6) *Quantar* stations

Site Grounding and Lightning Protection

CAUTION

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.

Site Grounding and Lightning Protection Recommendations

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 lightning protection is not within the scope of this instruction manual, there are several excellent industry sources for rules and guidelines on grounding and lightning protection at communications sites. Motorola recommends the following reference source:

Standards and Guidelines for Communication Sites (R56) *68P81089E50-A*

Quantar *Equipment Grounding Guidelines*

The *Quantar* station cage is equipped with a single ground lug located on the rear panel of the cage. Use this lug to connect the cage 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 previously mentioned reference source.

Recommended Tools and Equipment

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

- A six to eight foot wooden step ladder (used to access the top of the 7', 7½', and 8' racks, if applicable)
- A block–and–tackle or suitable hoist is recommended to lift cabinets equipped with multiple stations, and to stack cabinets or modular racks. (Each fully equipped station cage weighs approximately 55 lbs.)
- Tarpaulin or plastic drop cloth to cover surrounding equipment while drilling concrete anchor holes (for installations where cabinet or rack is being anchored to concrete flooring)
- Vacuum cleaner for removing concrete dust (for installations where cabinet or rack is being anchored to concrete flooring)

Equipment Unpacking and Inspection

The *Quantar* station equipment may be shipped either by air freight or electronic van (as specified by customer). The packing methods are as follows:

- If no cabinet or rack is selected, the station cage is shipped in a cardboard container with styrofoam interior corner braces.
- If the 12" x 20" cabinet is selected, the station cage is shipped installed in the cabinet, all contained within a cardboard container with corrugated interior corner braces.
- All other available cabinets are shipped with the *Quantar* station cage(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 ordered for use in open frame racks (7', 7½', or 8' available) are shipped with the cage(s) in a cardboard container with corrugated interior corner braces. The rack is shipped separately wrapped in insulating foam.
- Stations ordered for use in a modular rack (30", 45", or 52" available) are shipped installed in the rack. The rack is then covered in an anti–static bag.

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.

Physical Dimensions and Clearances

Quantar *Cage without Cabinet*

Figure 1 shows the dimensions and recommended clearances for a single *Quantar* station cage.

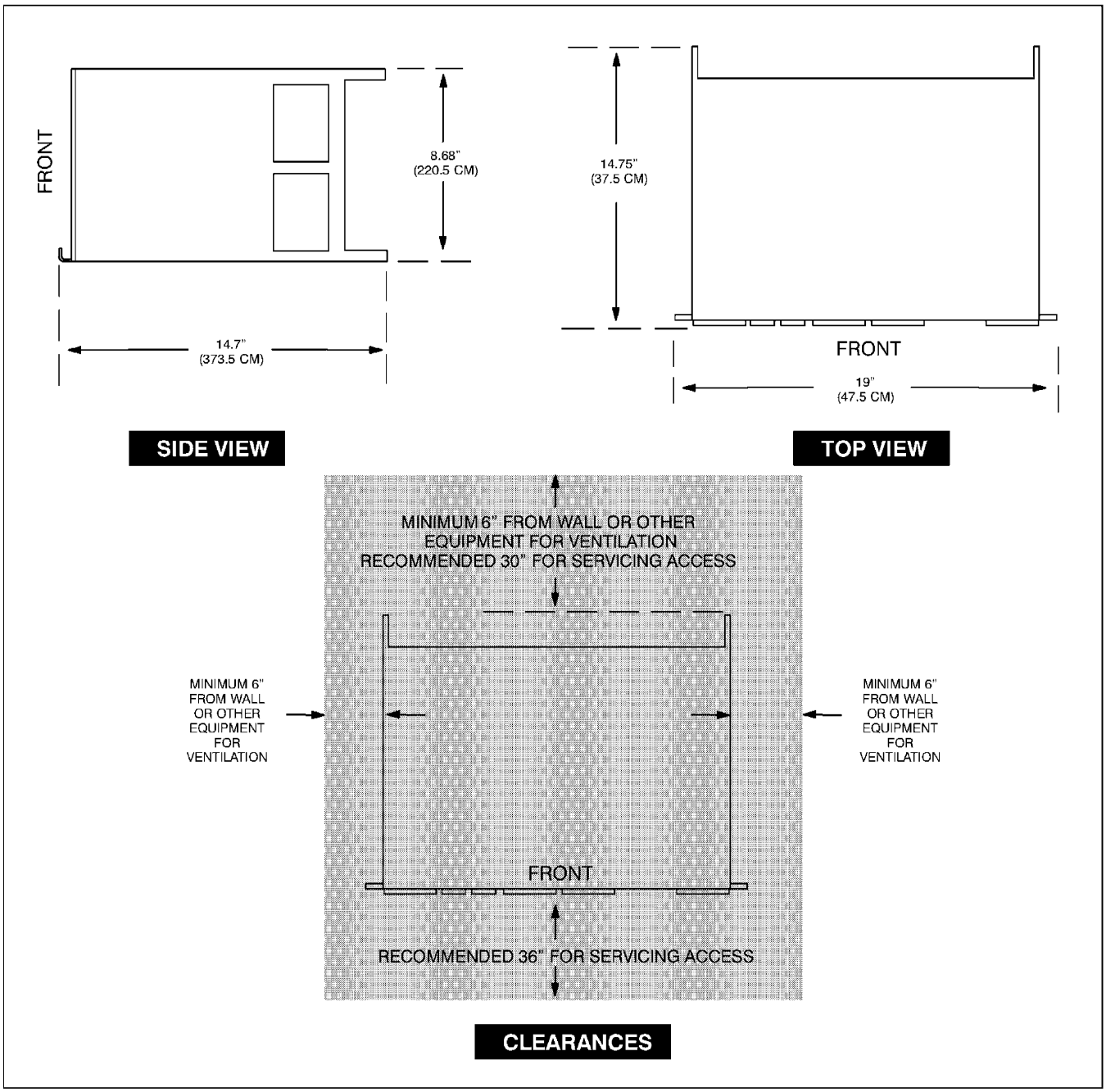


Figure 1. *Quantar* Station Cage Dimensions and Clearances

Physical Dimensions and Clearances (Continued)

Model numbers for the three rack sizes are:

7'	*TRN7342*
7½'	*TRN7343*
8'	*TRN7344*

Quantar *Cages Installed in 7', 7½', and 8' Racks*

Three sizes of racks are available for mounting *Quantar* station cages and ancillary equipment. Figure 2 shows the physical dimensions for all three rack sizes (shown is 8' rack with ten (maximum) *Quantar* cages installed; 7' and 7½' racks each hold nine maximum). Recommended clearance front and rear is 36" minimum for servicing access. Refer to Equipment Ventilation on Page 3 for recommended ventilation clearances.

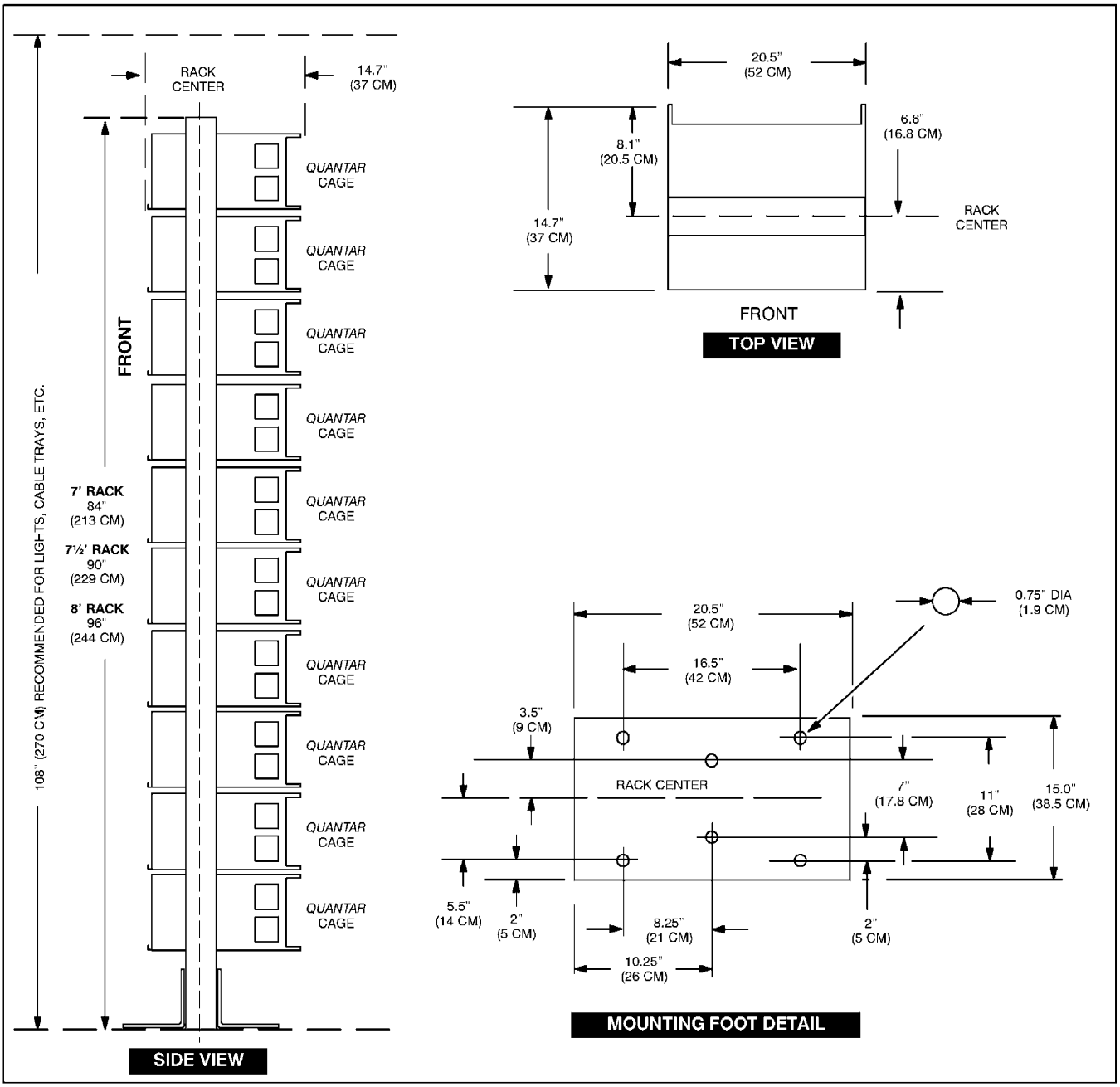


Figure 2. Dimensions and Clearances for 7', 7½', and 8' Racks

Physical Dimensions and Clearances (Continued)

Option numbers for the three modular rack sizes for ***Quantar*** *stations are:*

30"	*X741AA*
45"	*X742AA*
52"	*X743AA*

Quantar *Cages Installed in Modular Racks*

Three sizes of modular racks are available for mounting *Quantar* station cages and ancillary equipment. Figure 3 shows the physical dimensions for all three rack sizes (shown is 52" modular rack with five (maximum) *Quantar* cages installed; 30" racks hold 3 cages and 45" racks hold 4 cages maximum). Recommended clearance front and rear is 36" minimum for servicing access. Refer to Equipment Ventilation on Page 3 for recommended ventilation clearances.

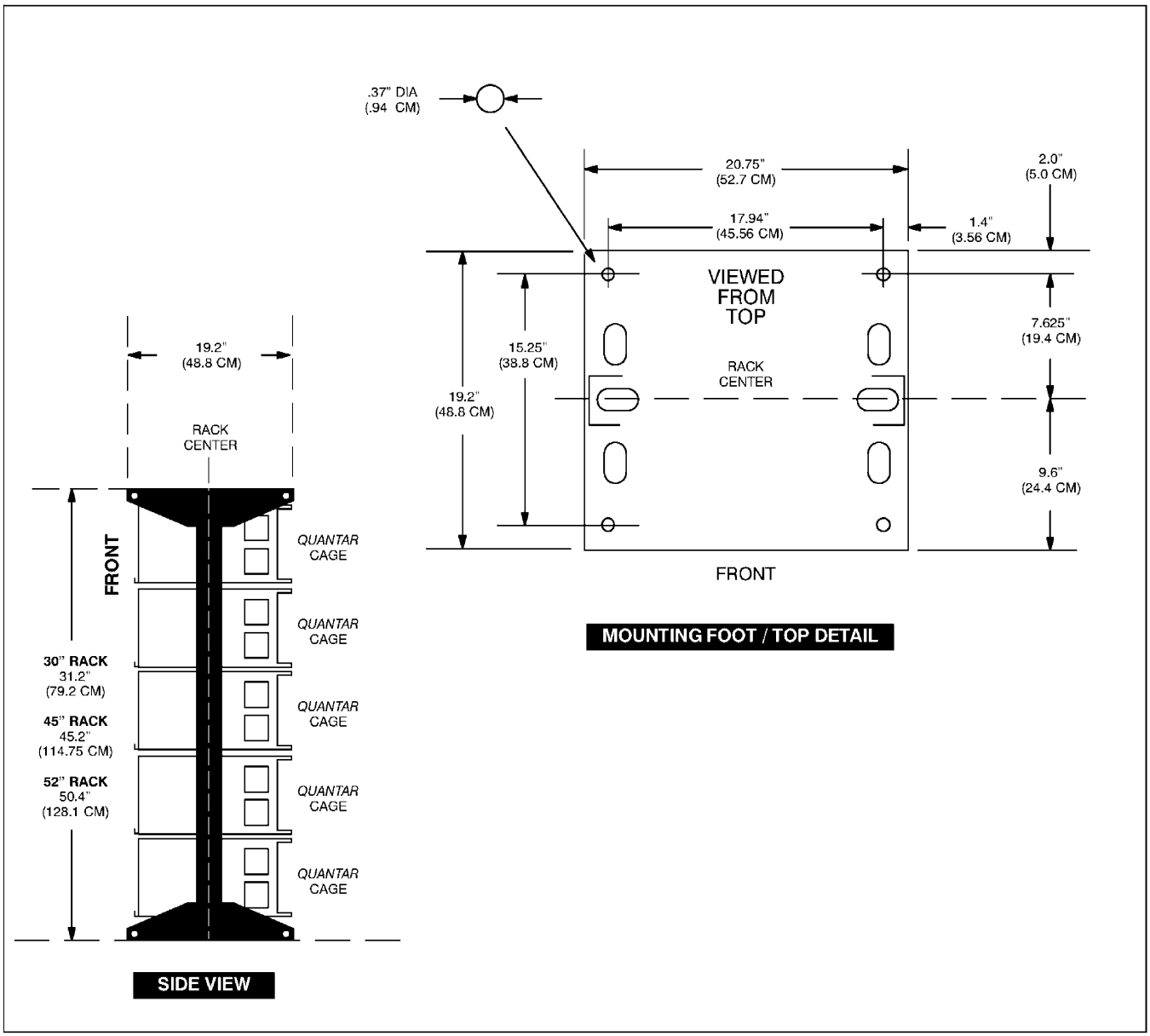


Figure 3. Dimensions and Clearances for 30", 45", and 52" Modular Racks

Physical Dimensions and Clearances (Continued)

12" x 20" Cabinet

Figure 4 shows the physical dimensions for a 12" x 20" cabinet (Option X430AA). Minimum recommended clearances are 30"(front) and 36" (rear) for installation access. Refer to Equipment Ventilation on Page 3 for recommended ventilation clearances.

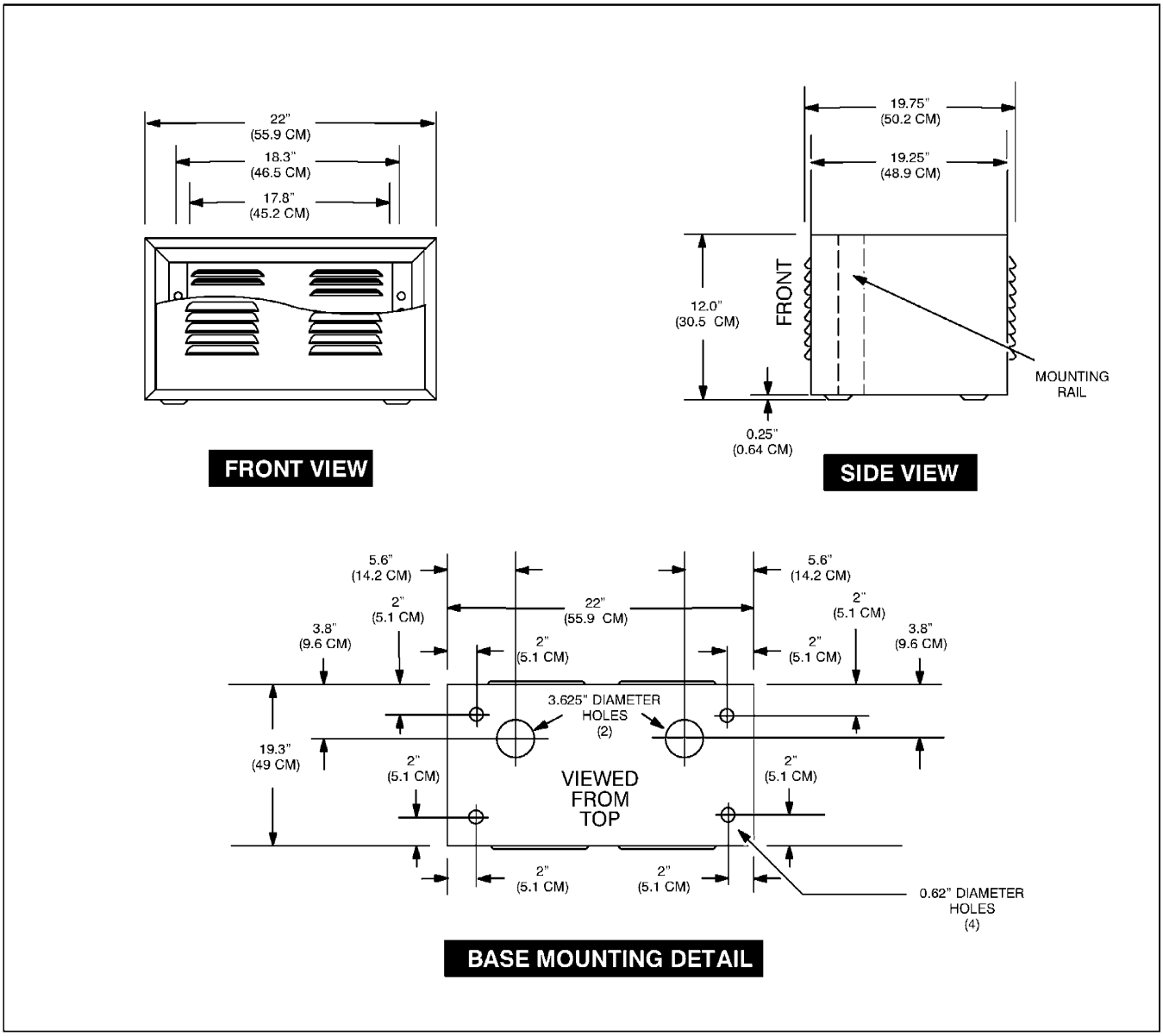


Figure 4. 12" x 20" Cabinet Dimensions

Physical Dimensions and Clearances (Continued)

30" x 20" Cabinet

Figure 5 shows the physical dimensions for a 30" x 20" cabinet (Option X52AA). Minimum recommended clearances are 30"(front) and 36" (rear) for installation access. Refer to Equipment Ventilation on Page 3 for recommended ventilation clearances.

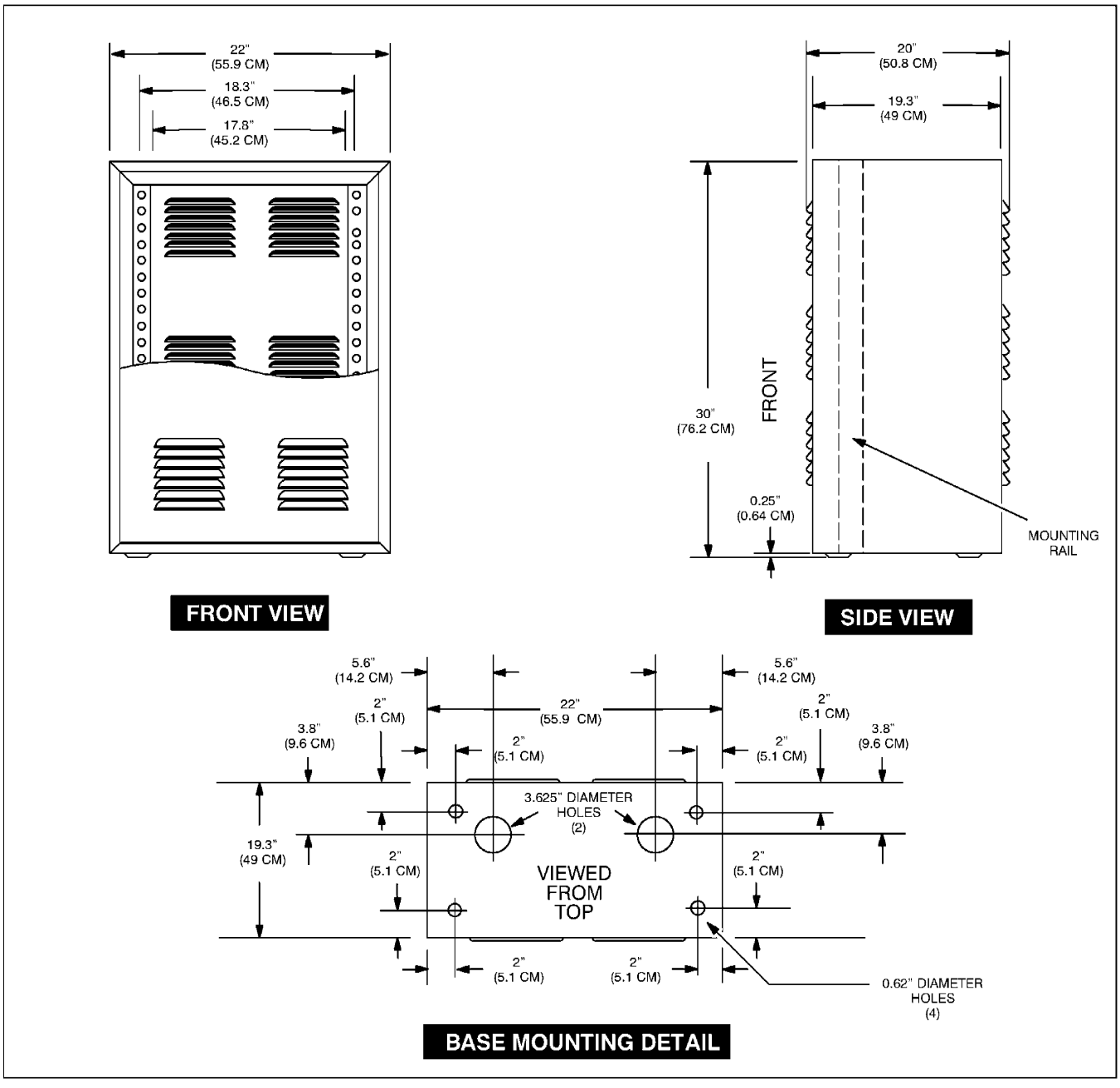


Figure 5. 30" x 20" Cabinet Dimensions

Physical Dimensions and Clearances (Continued)

46" x 20" Cabinet

Figure 6 shows the physical dimensions for a 46" x 20" cabinet (Option X308AA). Minimum recommended clearances are 30"(front) and 36" (rear) for installation access. Refer to Equipment Ventilation on Page 3 for recommended ventilation clearances.

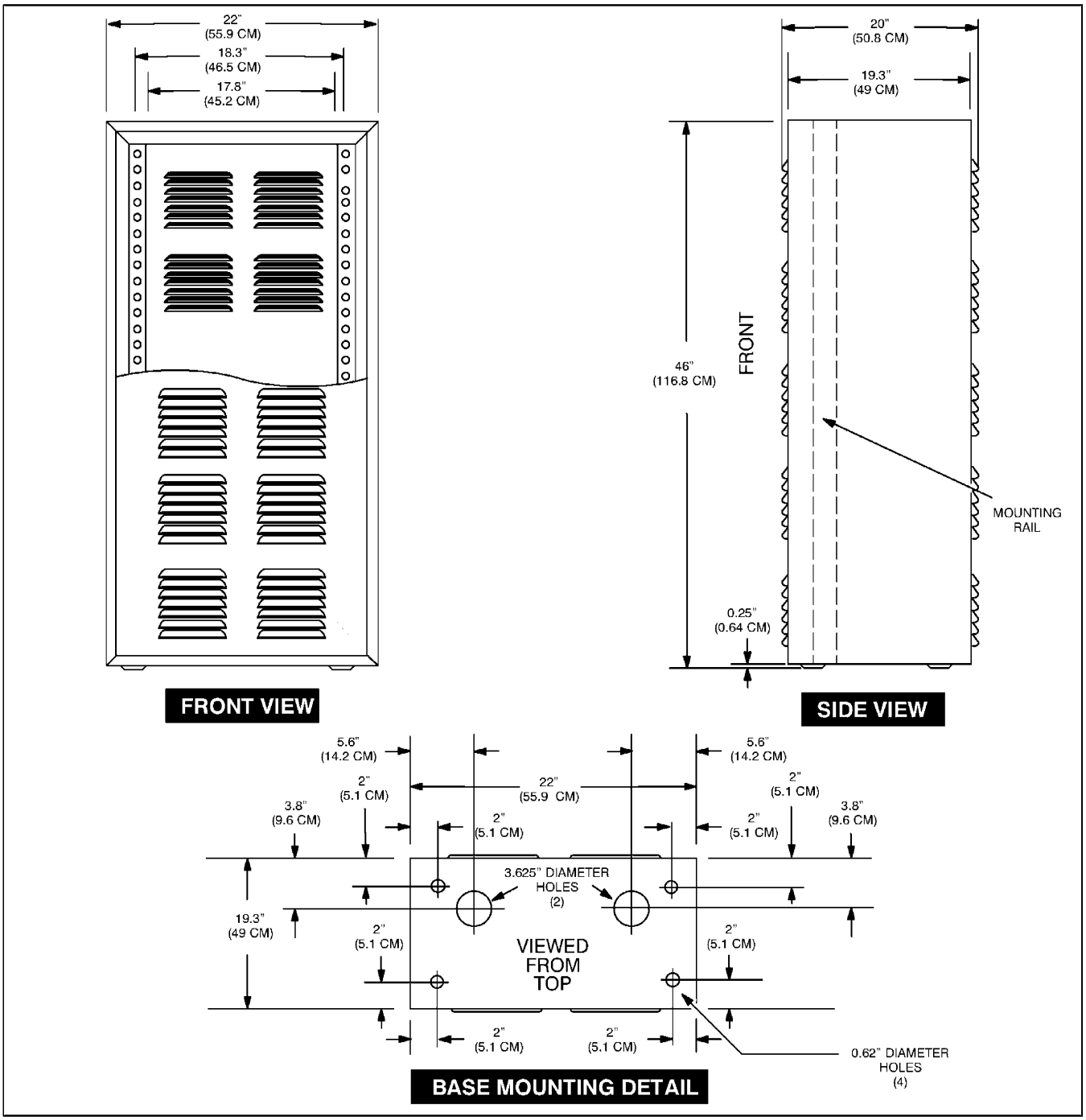


Figure 6. 46" x 20" Cabinet Dimensions

Physical Dimensions and Clearances (Continued)

60" Indoor Cabinet

Figure 7 shows the dimensions for a 60" indoor cabinet (Option X180AA). Minimum recommended clearances are 30"(front) and 36" (rear) for installation access. Refer to Equipment Ventilation on Page 3 for recommended ventilation clearances.

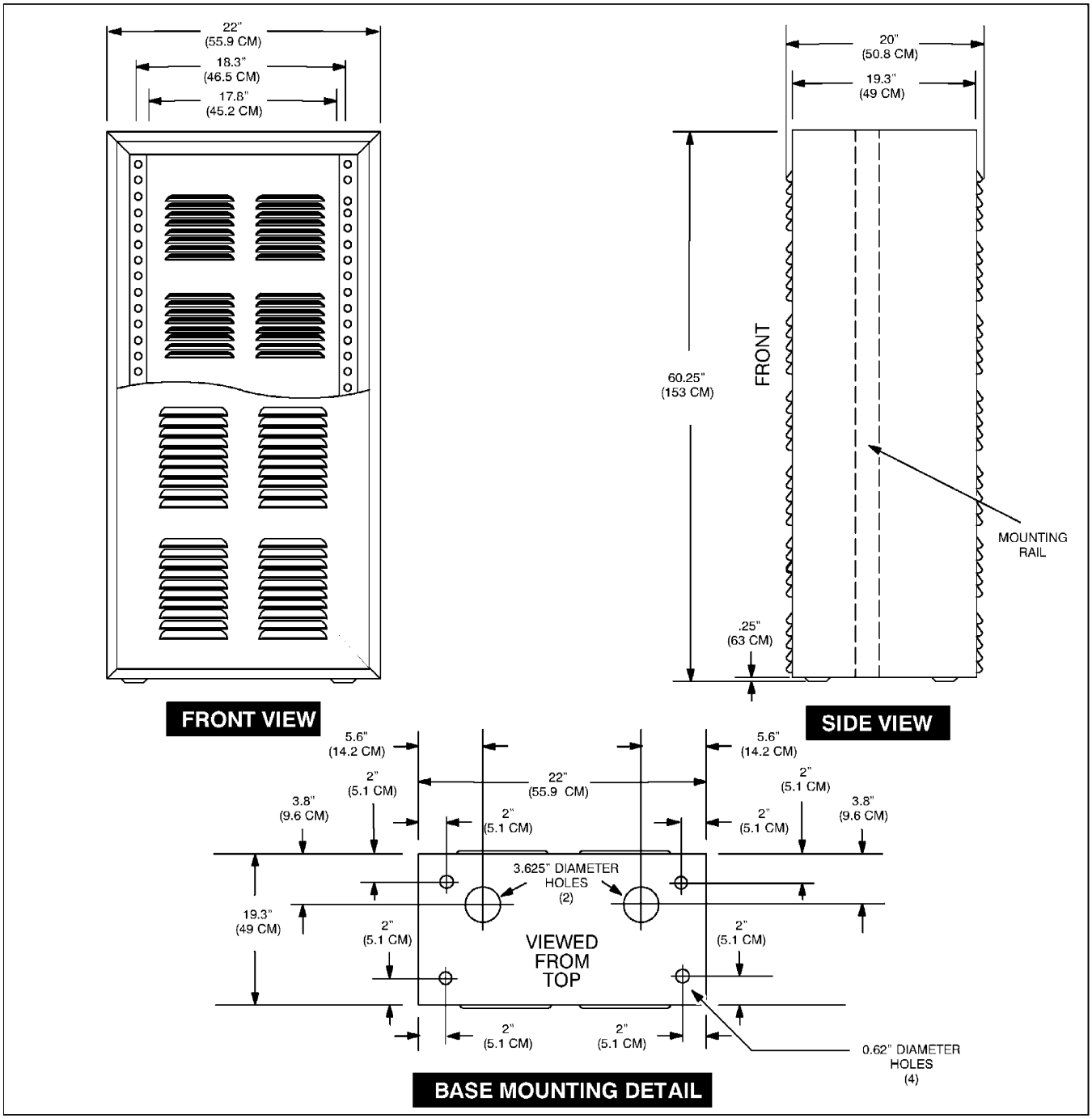


Figure 7. 60" Indoor Cabinet Dimensions

2 MECHANICAL INSTALLATION

This section describes the procedures necessary to unpack and mechanically install the *Quantar* station equipment. A variety of mounting methods are possible, depending on such factors as which type of cabinet or rack (if any) has been selected to house the station cage(s), whether stacking of cabinets is desired, etc. Procedures are provided for each of the cabinet/rack types.

If it becomes necessary to remove any of the modules, refer to the *Module Replacement Procedures* located in the **Troubleshooting** section of this manual for removal instructions. Be sure to observe proper electro–static discharge precautions if modules must be removed from the cage.

Unpacking the Equipment

Important: *Regardless of the packing method, immediately inspect the equipment for damage after unpacking and report the extent of any damage to the transportation company.*

Introduction

Quantar station equipment packing methods vary depending upon the type of optional rack or cabinet selected by the customer. *Quantar* station cages may also be packed and shipped as standalone units with no cabinet or cage. Unpacking procedures for these various methods are provided in the following paragraphs.

Unpacking Standalone Quantar *Station Cage*

Standalone cages (ordered with Option X87AA, omit cabinet) are packed in a cardboard box with styrofoam interior spacers and cardboard stiffeners. Unpack as described in Figure 8.

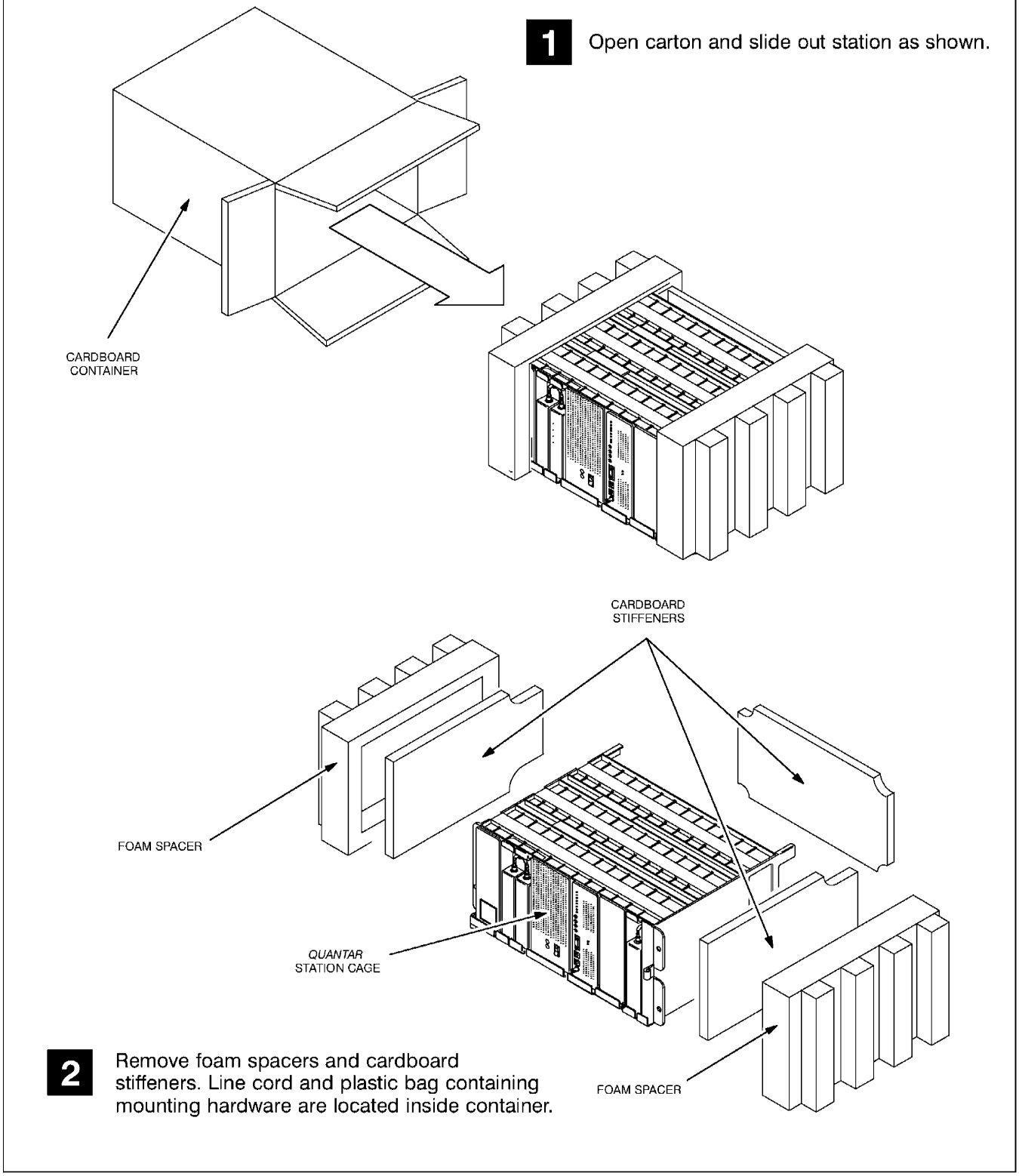


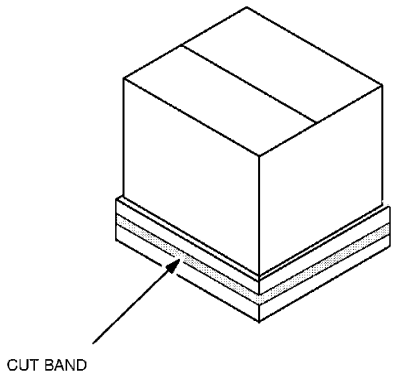
Figure 8. Unpacking Procedures for *Quantar* Station Cages

Unpacking the Equipment (Continued)

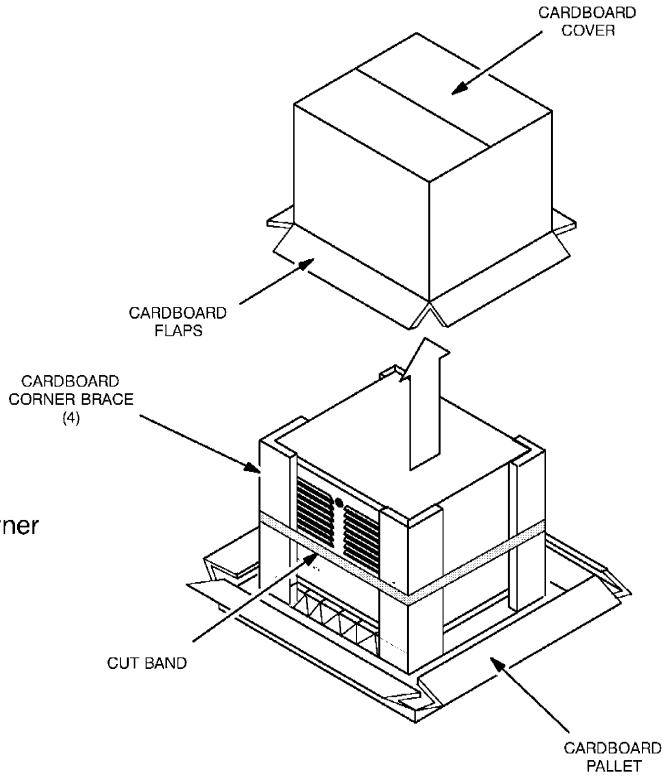
Unpacking 12" x 20" Cabinet

Quantar stations ordered with the 12" x 20" cabinet option are shipped installed in the cabinet and packed in a cardboard container with corrugated corner braces and a cardboard pallet. Unpack as described in Figure 9.

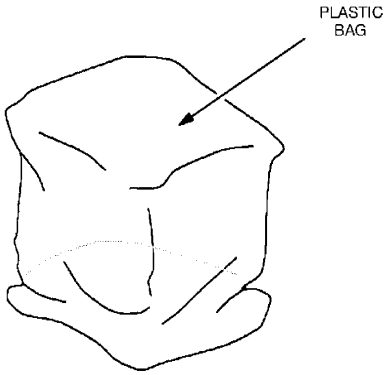
1 Cut band at bottom of carton.

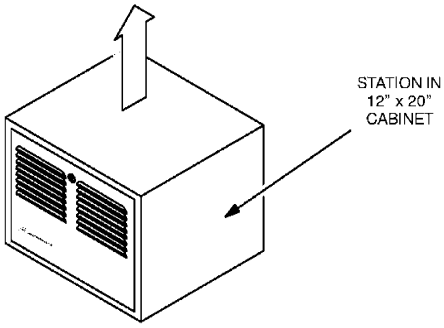


2 Unfold cardboard flaps from cardboard pallet and remove cardboard cover.



3 Cut band and remove cardboard corner braces.





4 Remove plastic bag.

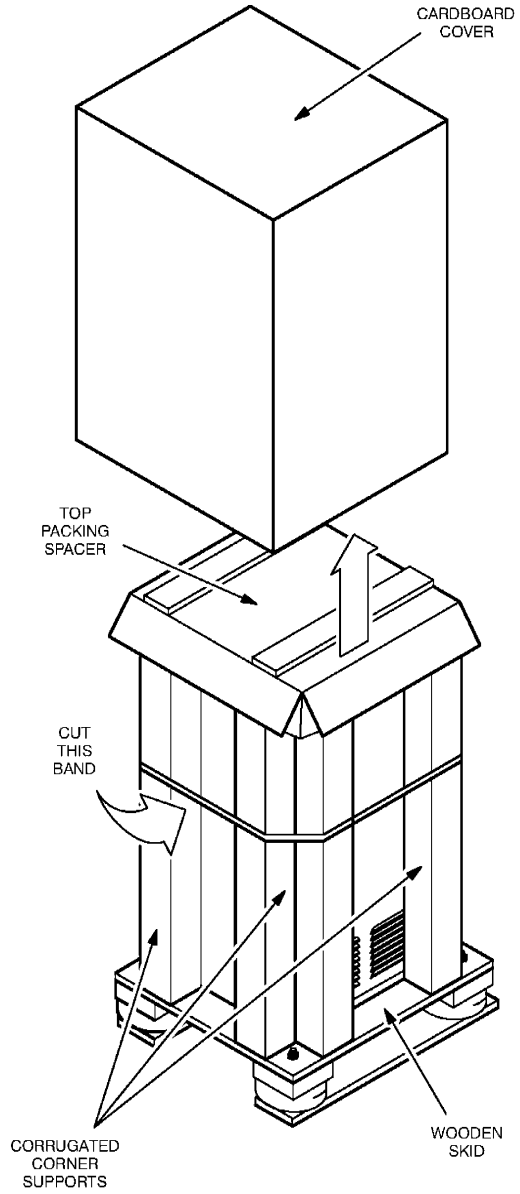
Figure 9. Unpacking Procedures for *Quantar* Station Cages Shipped in 12" x 20" Cabinets

Unpacking the Equipment (Continued)

Unpacking 30" x 20" Cabinet, 46" x 20" Cabinet, and 60" Indoor Cabinet

These cabinet styles 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 10.

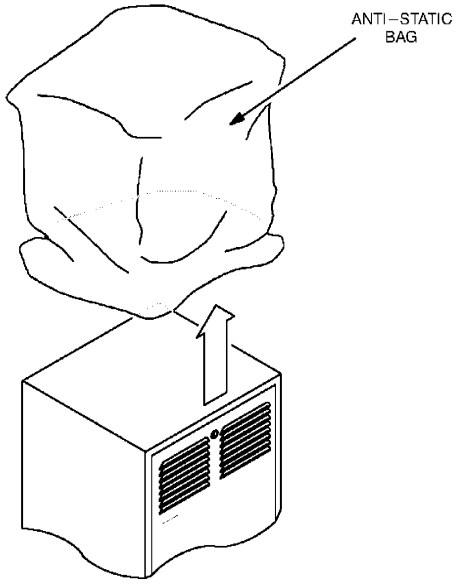
1 Remove cardboard cover from station.



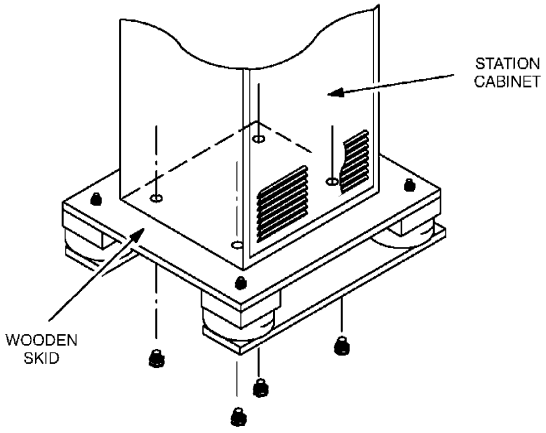
2 Cut band as shown.

3 Remove top packing spacer and corrugated corner supports.

4 Remove anti–static bag. **Do not** discard bag. It will be re–installed 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 anti–static bag over station to provide protection during installation.

Figure 10. Unpacking Procedures for 30", 46" (shown), and 60" Indoor *Quantar* Cabinets

Mounting Procedures

Introduction

Perform the following procedures to mechanically install the *Quantar* station equipment cages, racks, or cabinets. Note that racks and cabinets may house multiple *Quantar* station cages, and some cabinets may be stacked one atop the other to maximize use of space.

Mounting Quantar *Station Cage(s) in Customer–Supplied Cabinet*

The *Quantar* station cage is designed to fit in a standard EIA 19" enclosure. Mounting screws (M6 x 1.0 tapping) are provided to secure the cage flanges to the customer–supplied cabinet. Mount the cage(s) as follows:

Note: *Installing multiple cages one above the other is permitted as long as proper ventilation is maintained. Refer to Equipment Ventilation on page 3 for details.*

Step 1. Determine the location in the cabinet into which to mount the cage. Note that when installing multiple cages, it is recommended that you mount the first cage in the lowest possible position in the cabinet, making sure the modules clear the bottom frame of the cabinet, then continue towards the top with additional cages.

Step 2. Thread two of the supplied mounting screws into the lowest mounting holes of the cabinet mounting rails. Now insert the cage into the cabinet, resting the cage on the two screws.

Step 3. Insert the remaining two mounting screws through the bottom two mounting holes in the cage mounting flanges (left and right sides) and secure the cage to the cabinet mounting rails.

Step 4. Remove the two lower mounting screws and insert them through the upper two mounting holes in the cage mounting flanges.

Step 5. Tighten all four mounting screws securely.

Mounting Procedures (Continued)

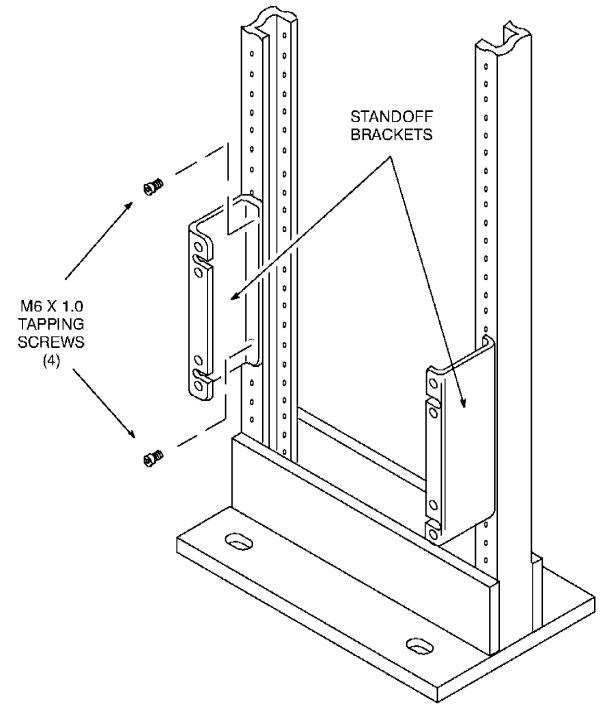
Note: *Option X153AA provides two (2) standoff brackets and four (4) self–tapping screws.*

Note: *Installing multiple cages one above the other is permitted as long as proper ventilation is maintained. Refer to Equipment Ventilation on page 3 for details.*

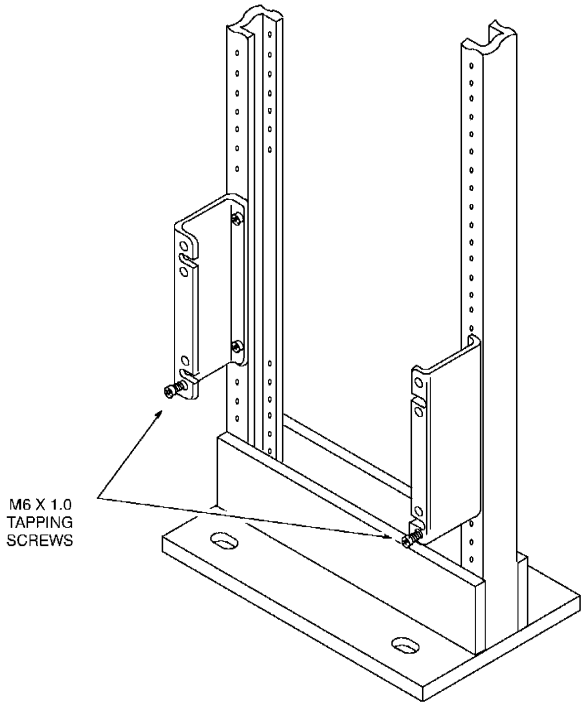
Mounting Quantar *Station Cage(s) in Customer–Supplied Rack*

Quantar station cages intended for field mounting in a customer–supplied rack require standoff brackets to center the cage within the rack mounting rails. Mount the cage(s) as described in Figure 11.

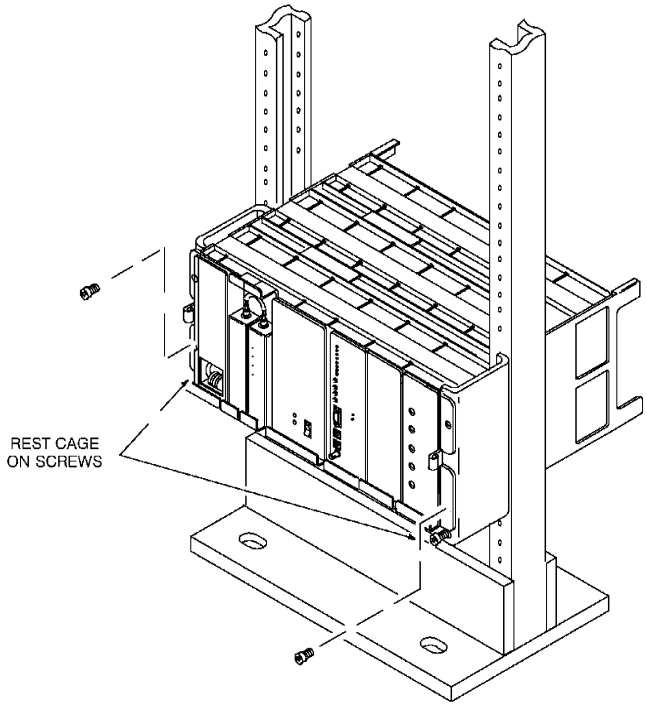
Note that when installing multiple cages, it is recommended that you mount the first cage in the lowest possible position in the rack, then continue building towards the top with additional cages. Mounting screws (M6 x 1.0 tapping) are provided with each cage to secure the cage flanges to the standoff brackets.



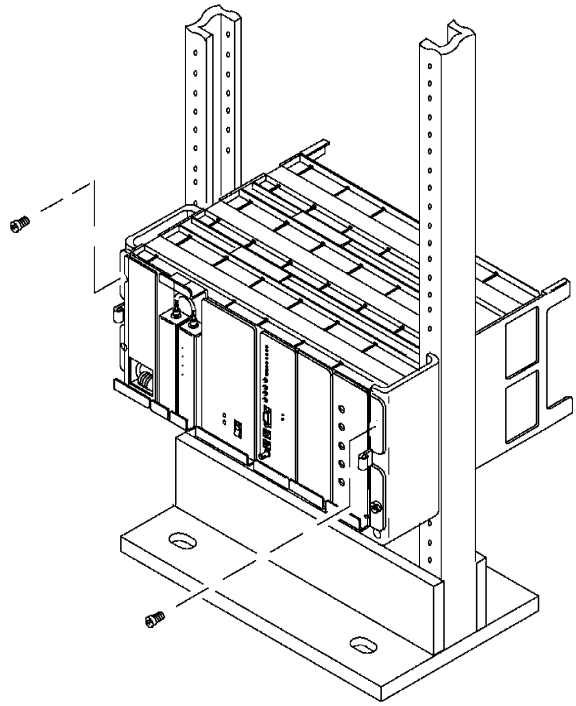
1 Position standoff brackets at desired position on rack (as shown). Secure to rack using M6 x 1.0 tapping screws.



2 Partially install M6 x 1.0 tapping screws in bottom holes in brackets, as shown.



3 Rest cage on lower two screws and install two M6 x 1.0 tapping screws in holes as shown. Tighten securely.



4 Remove two screws used to support cage and install in the upper two holes of the brackets. Tighten securely.

Figure 11. Installation Procedure for Rack Standoff Brackets

Mounting Procedures (Continued)

WARNING

A fully equipped 8' rack (ten *Quantar* cages) weighs approximately 650 lbs (245 kg). Handle with extreme caution to avoid tipping.

CAUTION

Cement dust from concrete flooring is harmful to electronic equipment and wiring. Make sure that the rack and any co–located 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 anti–static 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.

Installing 7', 7½', and 8' Open Racks and 30", 45", and 52" Modular 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***.

Step 1. Carefully align the rack at the desired anchoring location.

Step 2. Use the rack mounting foot as a template and mark the location of the six (open racks) ¾" (1.9 cm) or four (modular racks) .37" (.94 cm) diameter mounting holes. All four or six anchoring positions must be used.

Step 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.

Step 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.**

Step 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.

Step 6. Tightly secure the rack to the floor anchors making sure that it remains vertically plumb and horizontally level.

Step 7. After all debris is removed and cement dust is cleared away, remove whatever protective covering has been placed on the equipment, including the anti–static bag.

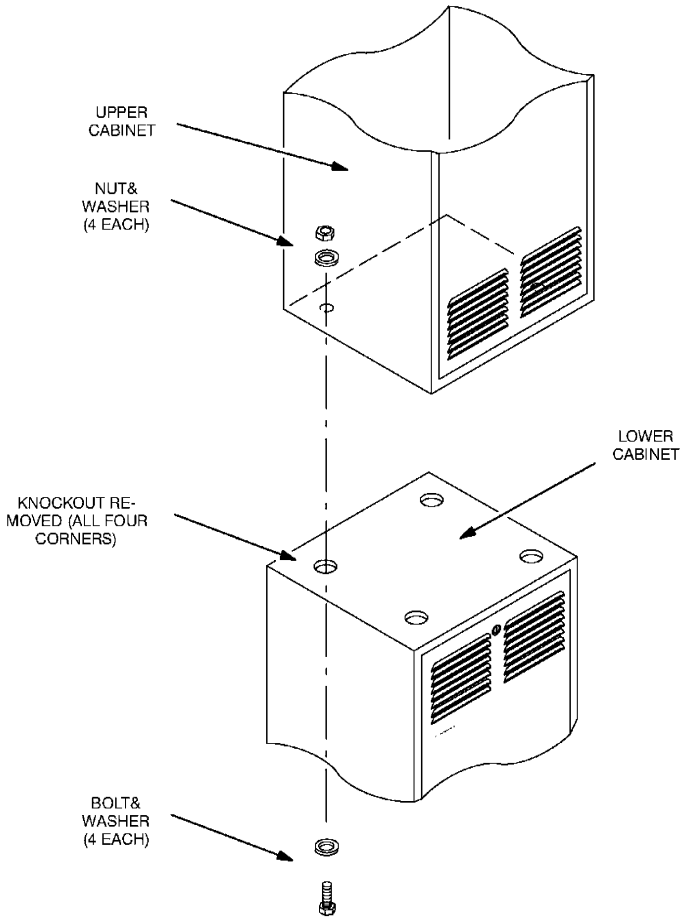
Mounting 30" x 20", 46" x 20", and 60" Indoor Cabinets

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 given for anchoring equipment racks (page 24). If installing on a wooden floor, use lag bolts and washers (customer supplied) to secure the cabinet to the floor.

Stacking Cabinets

The 12", 30", 46", and 60" cabinets may be stacked on atop another to maximize use of site space. Stacking kit TRN7750A contains the necessary bolts, nuts, and washers to stack one cabinet on another. Remove the knockouts on the top of the lower cabinet and use the hardware as shown below to attach the upper cabinet.

Note: *It is recommended that if different sizes of cabinets are being stacked (e.g., if a 30" cabinet is being stacked on top of a 46" cabinet), the larger size cabinet should be placed on the bottom.*



The table below lists the stacking limits for the available cabinet sizes.

Cabinet Stacking Limits

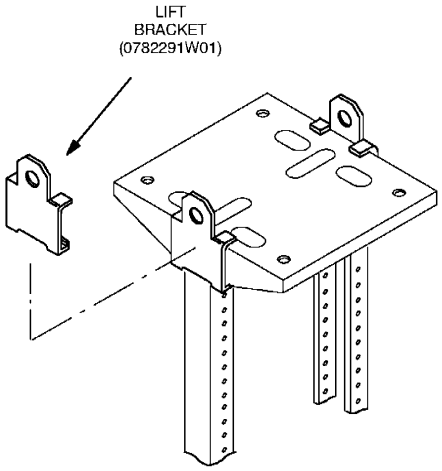
Cabinet Size	Maximum Stacking Number
12" x 20"	6 (72" max height)
30" x 20"	3 (90" max height)
46" x 20"	2 (92" max height)
60" Indoor	Not Stackable

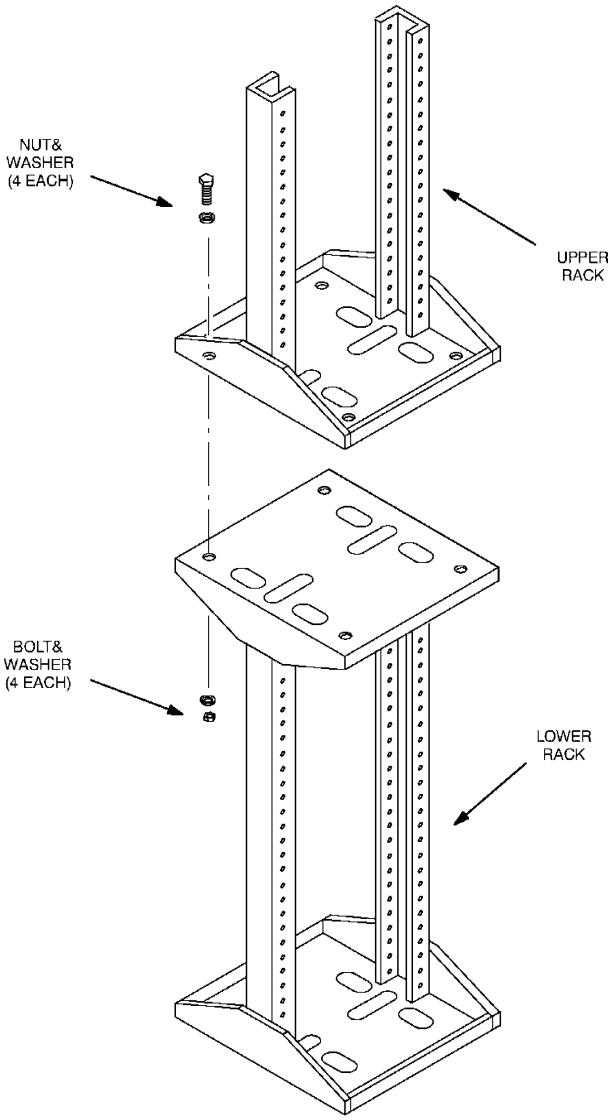
Stacking Modular Racks

The 30", 45", and 52" modular racks may be stacked one atop another to maximize use of site space. Stacking kit TRN7750A contains the necessary bolts, nuts, and washers to stack one rack on another. Use the hardware as shown below to attach the upper rack.

Note: *It is recommended that if different sizes of racks are being stacked (e.g., if a 30" rack and a 45" rack are being stacked), the larger rack should be placed on the bottom.*

Note: *Lift Brackets are available from WASPD to aid in lifting the racks. Install the brackets as shown below, and attach a lift bar or chain thru the bracket holes. A hoist may then be used to lift the rack.*



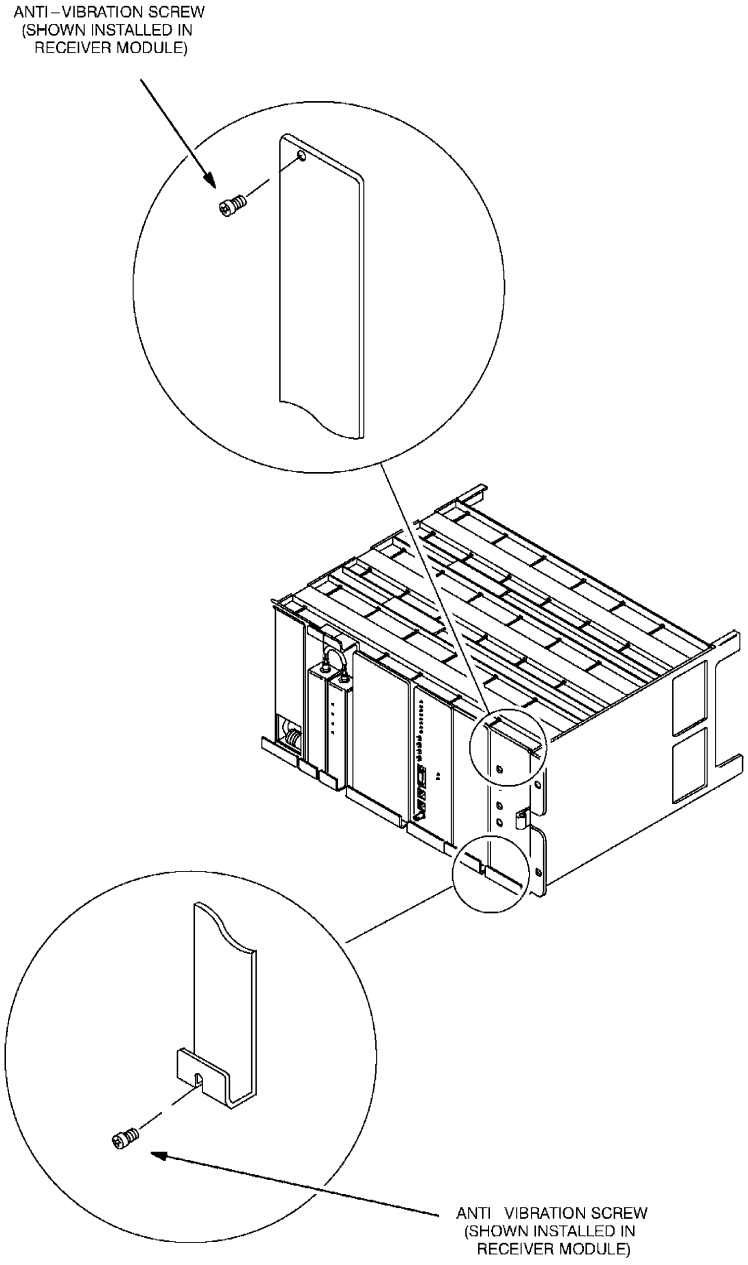


Modular Rack Stacking Limits

Stacking Combinations
Three 30" Modular Racks
One 45" and One 30" Modular Rack
One 30" and One 52" Modular Rack
Two 45" Modular Racks
One 45" and One 52" Modular Rack

Anti-Vibration/EMI Screws

Stations are shipped with Torx−head tapping screws installed at the top and bottom of each of the module front panels. These screws help reduce EMI emissions from the station modules, as well as provide additional mechanical stability for installations where a high amount of vibration (such as from nearby heavy machinery) is encountered.



3 ELECTRICAL CONNECTIONS

After the station equipment has been mechanically installed, electrical connections must be made. These include making power supply connections, connecting antenna coax cables, system cables, and telephone lines.

Power Supply Connections

CAUTION

Do not apply ac power to the station at this time. Make sure that the ac power switch (located on the front panel of the Power Supply Module is turned to OFF and that the circuit breaker associated with the ac outlet is also turned to OFF.

AC Input Power Connection

Each station cage is shipped with an eight foot 3−conductor line cord. Attach the receptacle end of the cord to the ac input plug located on the rear of the power supply module (as shown in Figure 12). Plug the 3−prong plug into a 110 V ac grounded outlet. (If you wish to connect the station to a 220 V ac outlet, you must obtain a line cord employing "HAR" flexible cord with fittings approved by a safety testing agency in the end use country.)

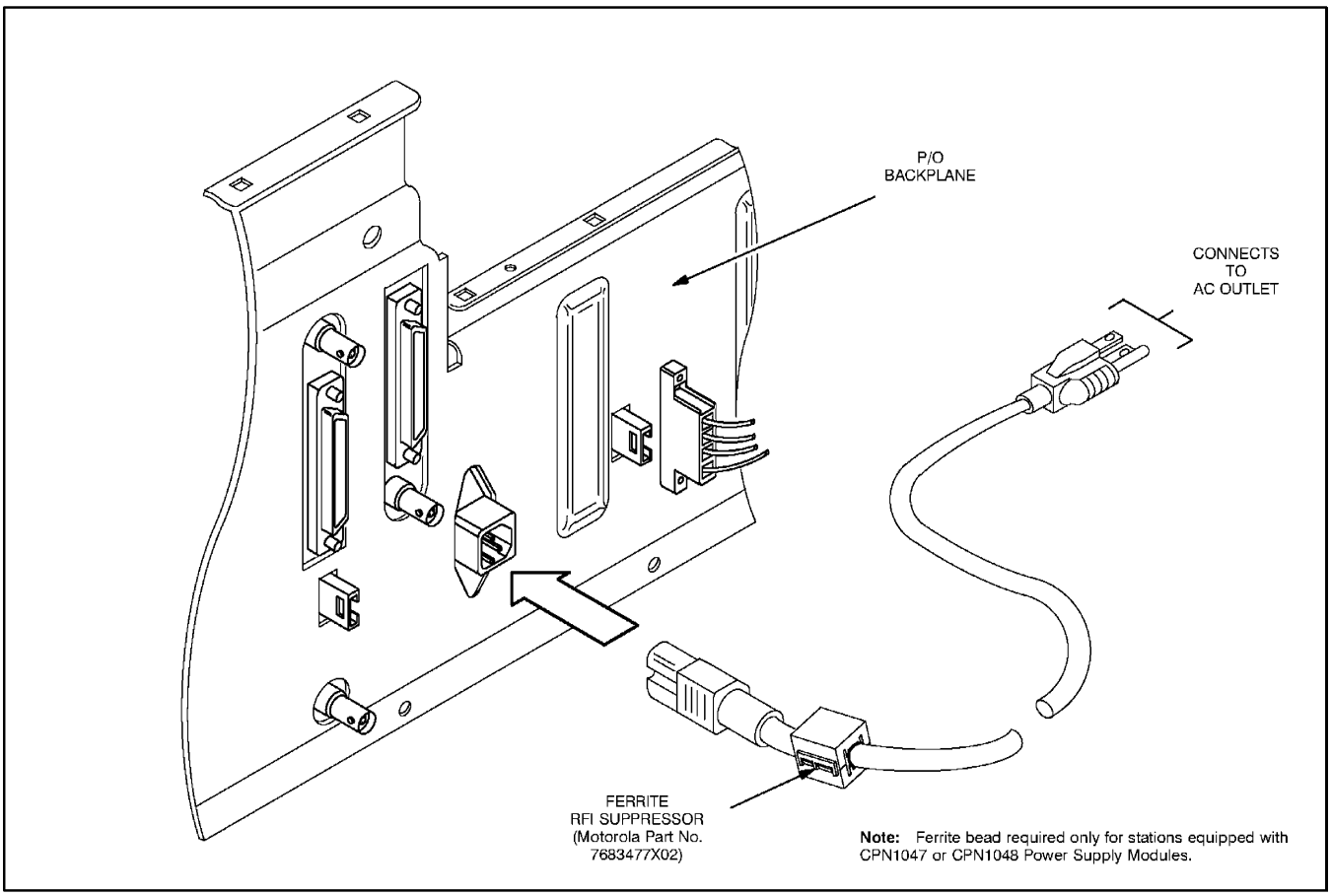


Figure 12. Connecting AC Line Cord

Power Supply Connections (Continued)

DC Input Power Connections

Stations shipped with the optional dc input power supply module accept a dc input from either a 12/24 V dc or 48/60 V dc source (e.g., a bank of storage batteries). Connections to the dc source are made via a 10' battery charger cable kit shipped with the station, as shown in Figure 13.

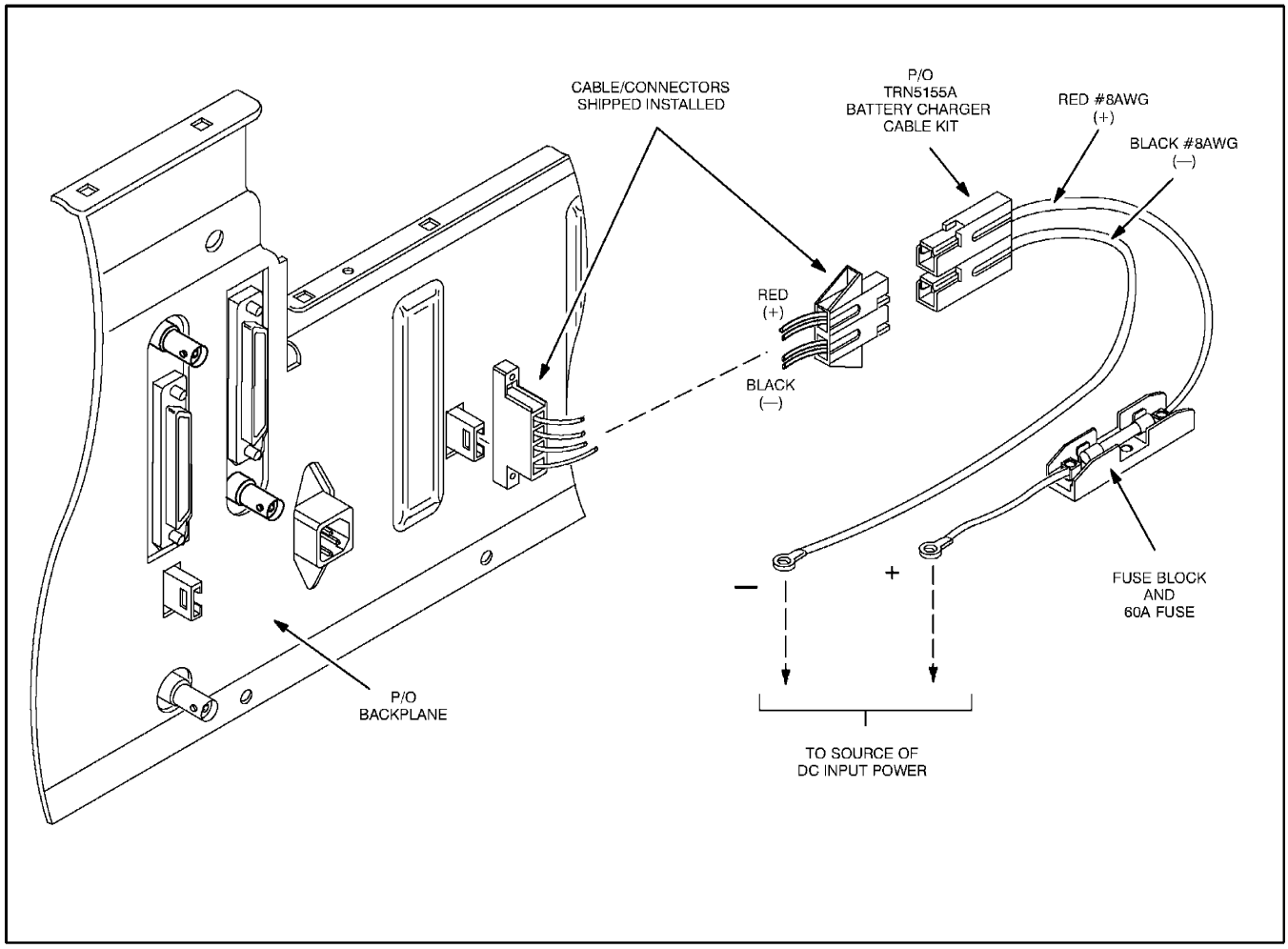


Figure 13. Making Connections to DC Power Source

Power Supply Connections (Continued)

Ground Connection

The *Quantar* station cage is equipped with a single ground lug located on the rear panel of the cage. Connect this lug to the site ground point as shown in Figure 14, and tighten the nut on the ground stud to 60 in-lbs (6.6 N-m).

Refer to *Standards and Guidelines for Communication Sites (R56) 68P81089E50-A* for complete information regarding lightning protection.

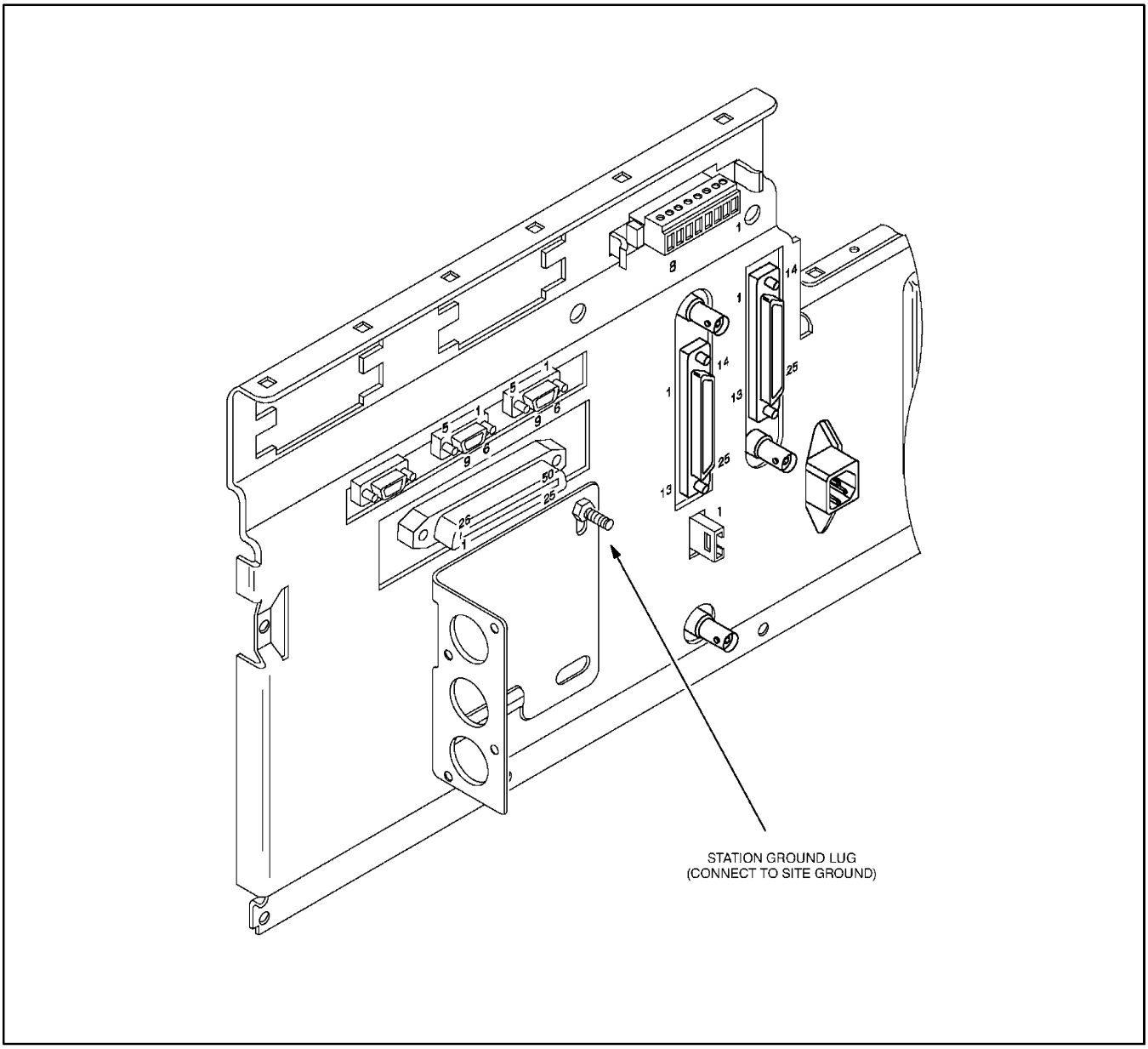


Figure 14. Connecting Station Ground Lug to Site Ground

Power Supply Connections (Continued)

Important! *Connect the charged battery to the station* ***before*** *applying AC power. Failure to do so may prevent the Power Supply Module from reverting to battery power upon AC failure.*

Important! *For Motorola Power Supply Modules with battery charging capability, the card edge connector used to connect to an external battery (located on the backplane)* ***may not*** *be used as a secondary source of dc output power. In order to prevent charging a battery with one or more dead cells, the supply is designed to provide charging current only if the battery is above +21.5 V (High Power Supplies) or +10.5 V (Low Power Supplies).*

Important! *Be sure to connect the battery cables* ***exactly*** *as shown in the illustration below, making certain to observe wire colors and polarities.*

Storage Battery Connections

Stations with a power supply module equipped with the battery charger/revert option offer the capability of reverting to battery backup power in the event of an ac power failure. Connections associated with the battery charger/revert feature are:

- Charger/Revert Cable — the station is shipped with a 4–wire cable terminated in a heavy duty 2–position connector; cable kit TRN5155A (shipped with station) contains mating connector, two 10' lengths of red and black #8 AWG gauge wires, a fuse block and 60A fuse, and crimp–on ring lugs. Make connections to the storage battery as shown in Figure 15.
- Battery Temperature Cable — thermistor (TKN8786A) and cable (TKN8732A) are shipped with charger–style power supply); cable with three wires carries a variable resistance signal from the thermistor which is mounted in close proximity to storage battery; resistance is proportional to battery temperature and is used by diagnostic circuitry in power supply module. Make thermistor connections as shown in Figure 15.

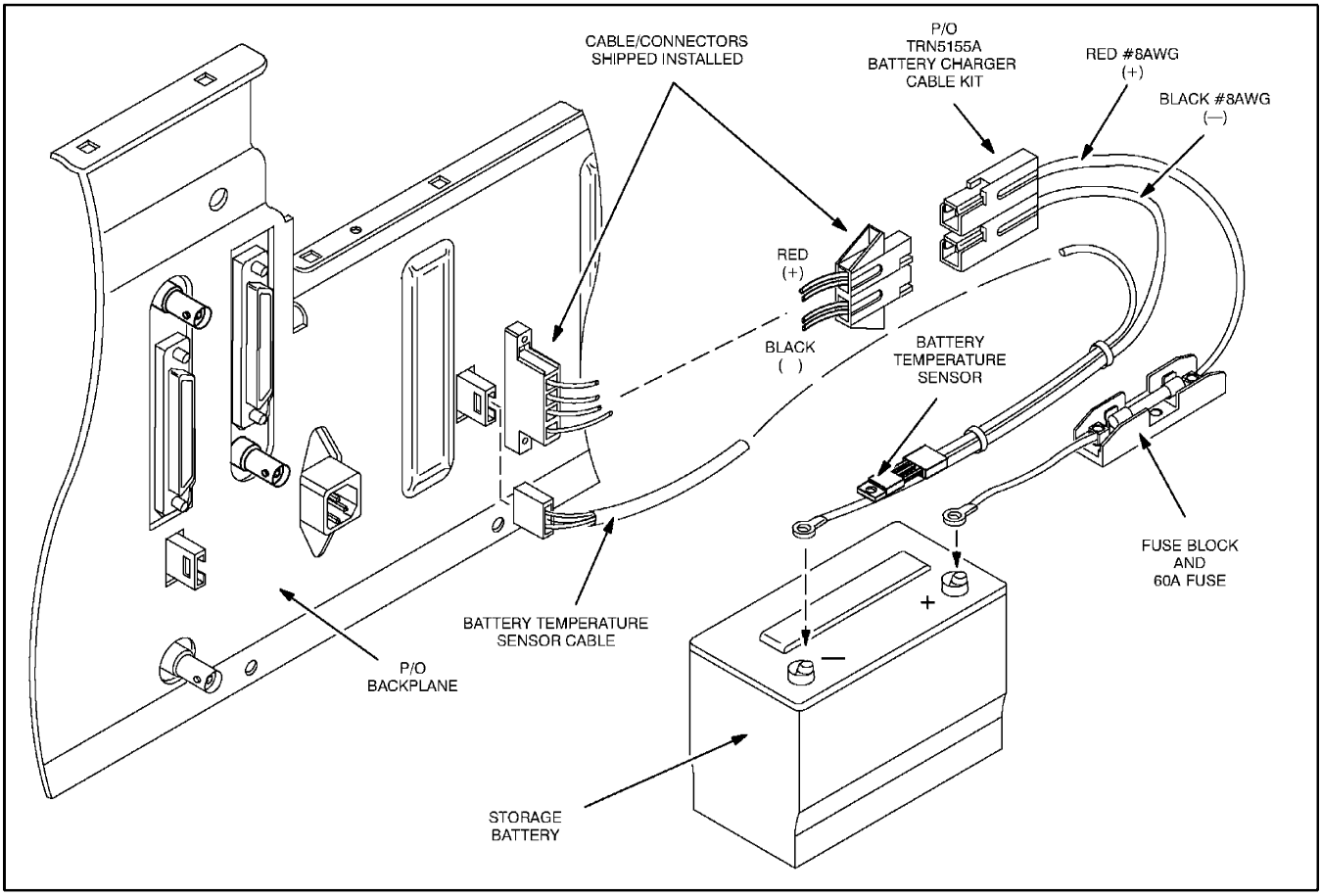


Figure 15. Making Connections to Storage Battery

RF Cabling Connections

Introduction

The transmit and receive antenna rf connections may be made in one of three fashions, depending on the options ordered with the station and system application.

- **Separate TX and RX Connectors** — A bracket located on the rear of the station holds two N–type connectors, one for RX and one for TX. Coax cables from the receive and transmit antennas must be connected to these N–type connectors.
- **Single Antenna with Antenna Relay Option**— An antenna relay module is mounted on the rear of the station. Coax cables from the station Receiver and Power Amplifier Modules are connected to the antenna relay module. A single N–type connector is provided for connection to a single RX/TX antenna. The relay module is controlled by a signal from the Station Control Module via a 3–wire cable connected between the antenna relay module and a 3–pin connector located on the backplane.
- **Duplexer Option** — The duplexer option equips the station with a Duplexer Module which is typically mounted in the same rack or cabinet as the station. Coax cables from the station Receiver and Power Amplifier Modules are connected to the Duplexer Module. A single N–type connector is provided for connection to a single RX/TX antenna.

RF Cabling Connections (Continued)

Separate RX and TX Connectors

Stations intended for separate transmit and receive antennas are shipped with the coax cables from the Power Amplifier and Receiver Modules connected to the bracket on the backplane, as shown below (Figure 16).

Connect the rf cables from the transmit and receive antennas to the station as shown below.

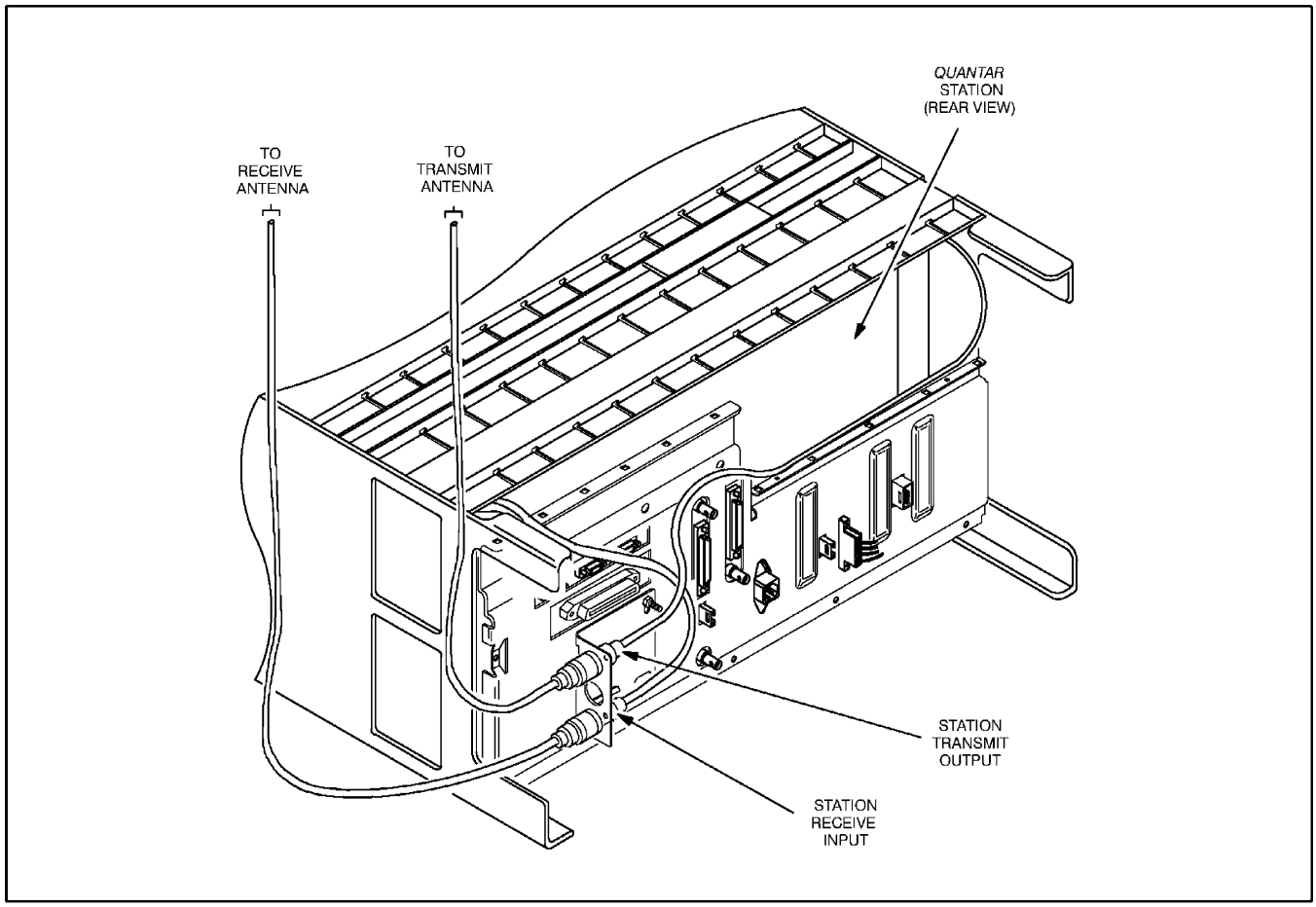


Figure 16. Separate RX and TX Antenna Connections

RF Cabling Connections (Continued)

Antenna Relay Option

Stations equipped with the antenna relay option are shipped with the antenna relay module installed in the bracket on the backplane, with the rf cables from the Power Amplifier and Receiver Modules connected as shown below (Figure 17). Note that the 3–wire control cable from the antenna relay to connector #23 located on the backplane has been installed.

Connect the single transmit/receive antenna rf cable to the center N–type connector on the antenna relay module.

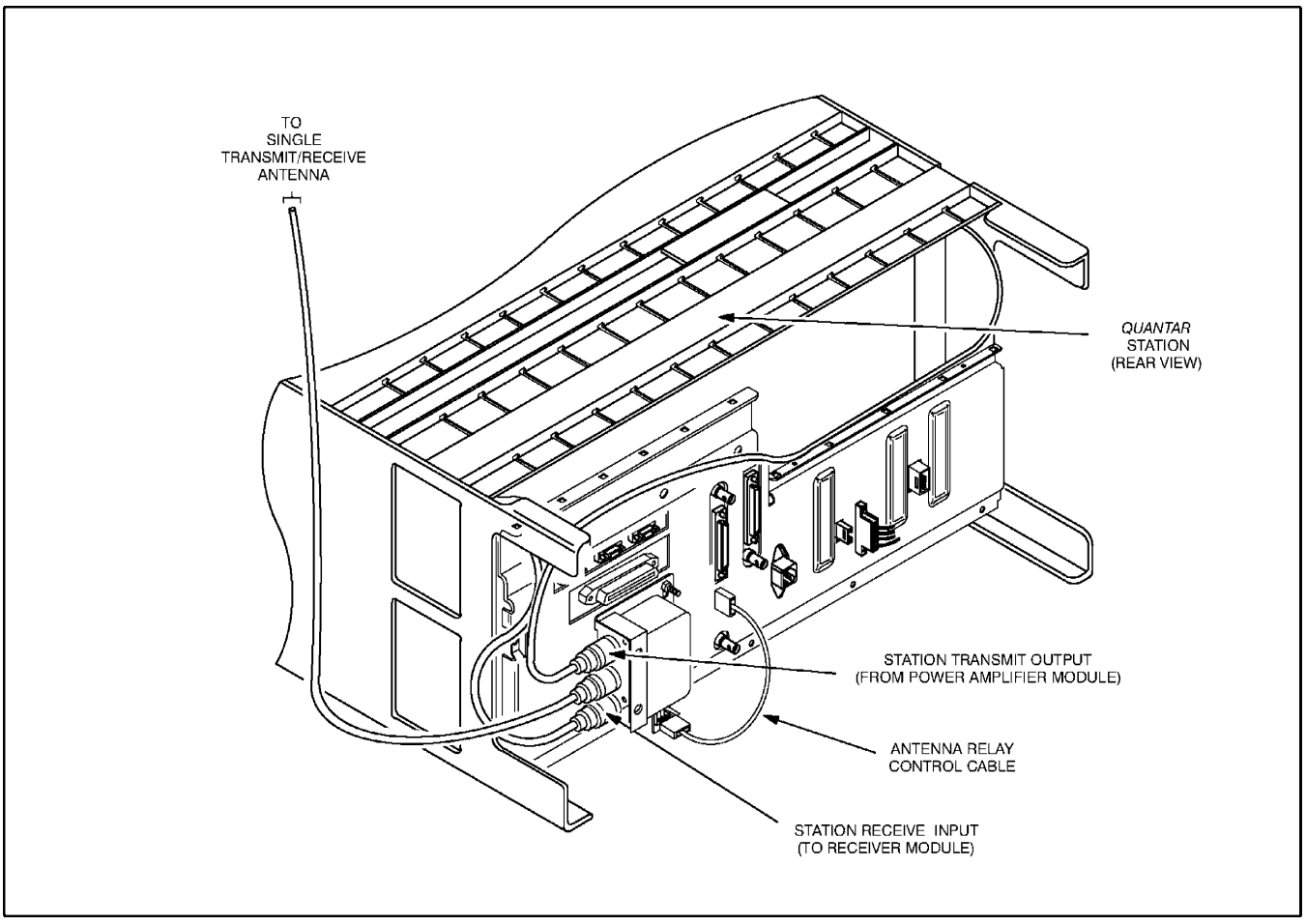


Figure 17. RF and Control Cable Connections for Station Equipped with Antenna Relay

RF Cabling Connections (Continued)

Duplexer Option

The Duplexer Option may be installed with or without the Triple Circulator Option. In either configuration, connect the rf cable to/from the single TX/RX antenna to the Duplexer Module as shown in Figure 18 (for VHF). Figure 19 (for UHF), or Figure 20 (for 800/900 MHz).

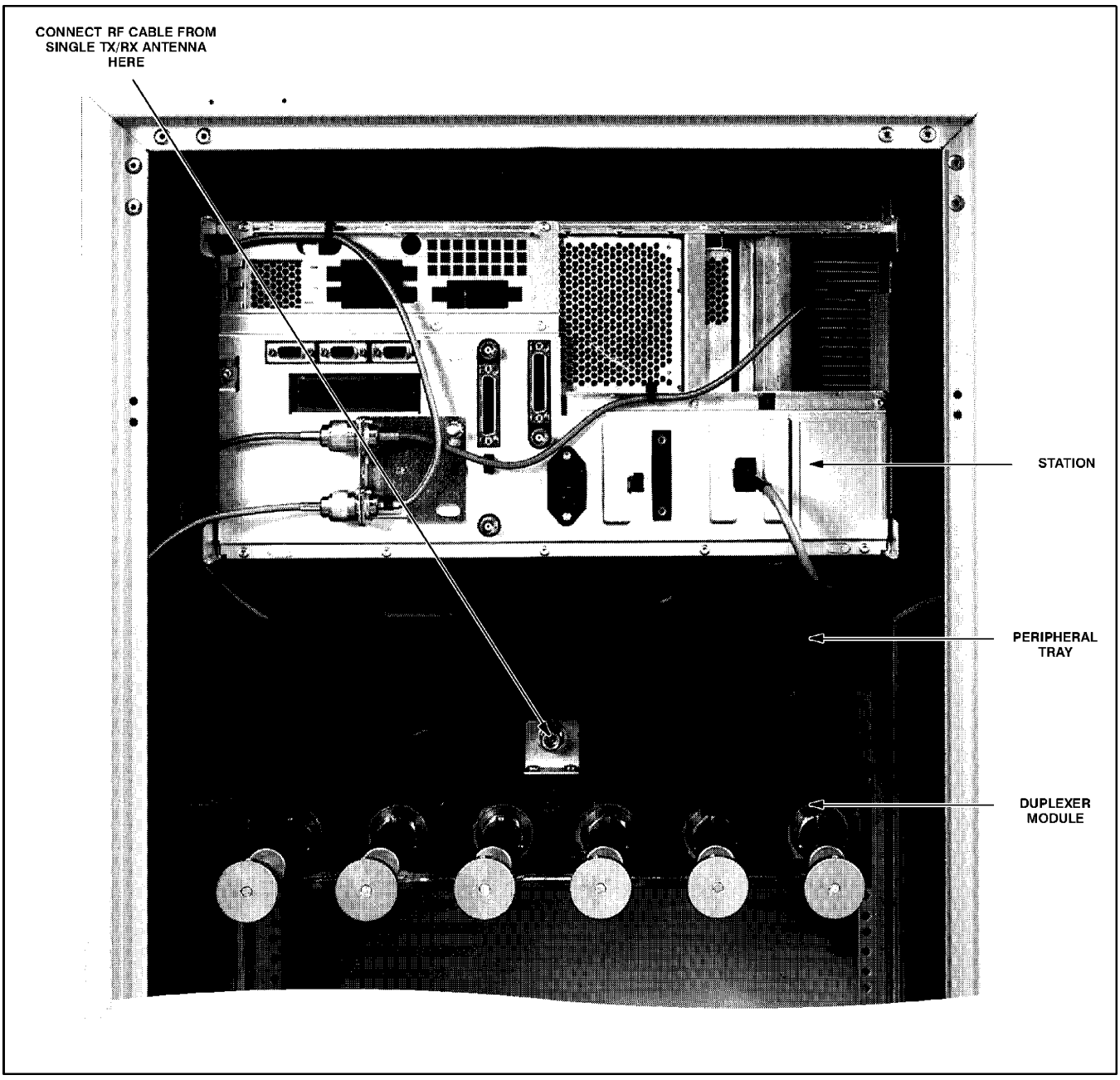


Figure 18. TX/RX Antenna Cable Connection to Duplexer Module (VHF; Triple Circulator Configuration Shown)

RF Cabling Connections (Continued)

Duplexer Option (continued)

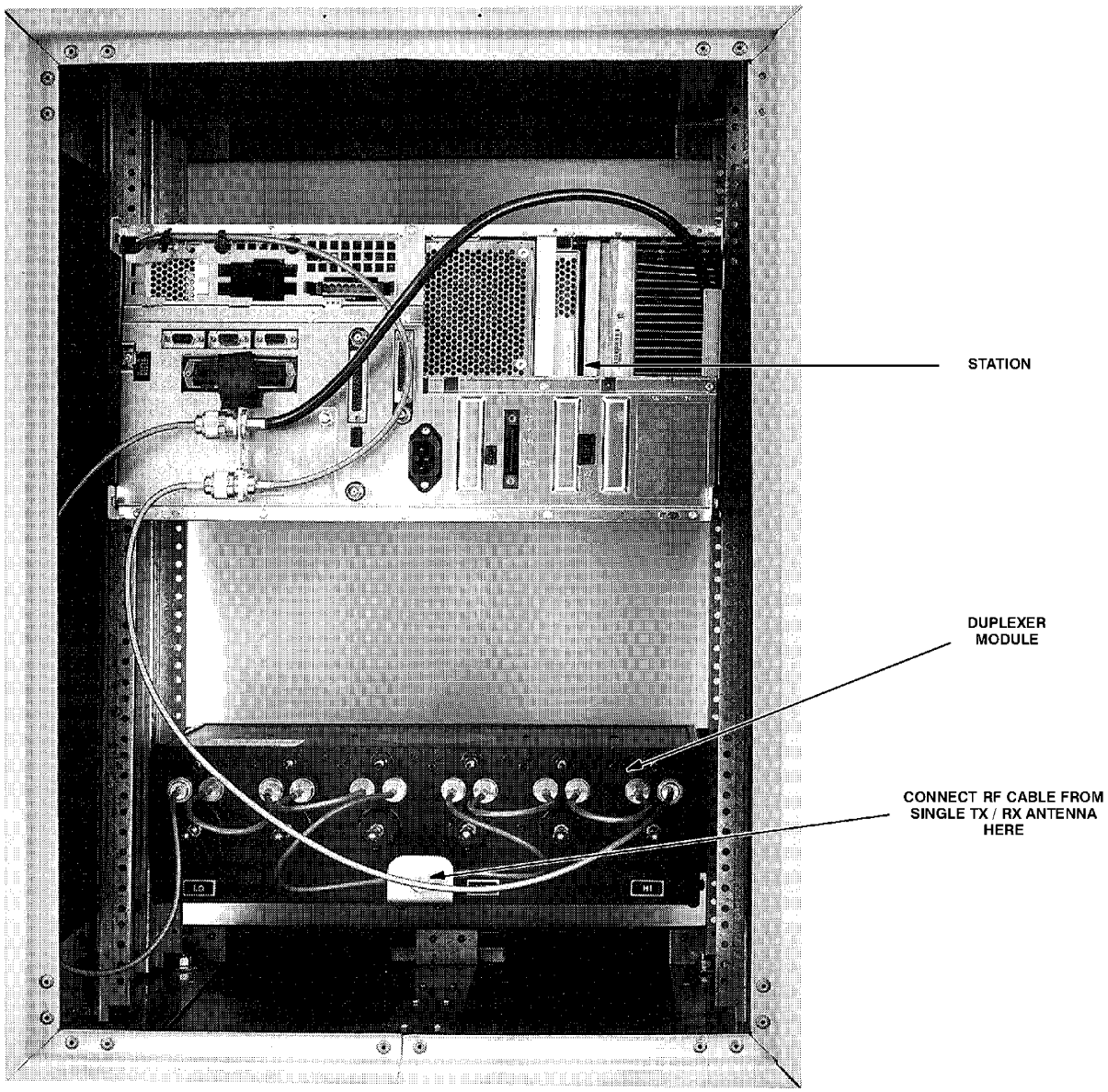


Figure 19. TX/RX Antenna Cable Connection to Duplexer Module (UHF)

RF Cabling Connections (Continued)

Duplexer Option (continued)

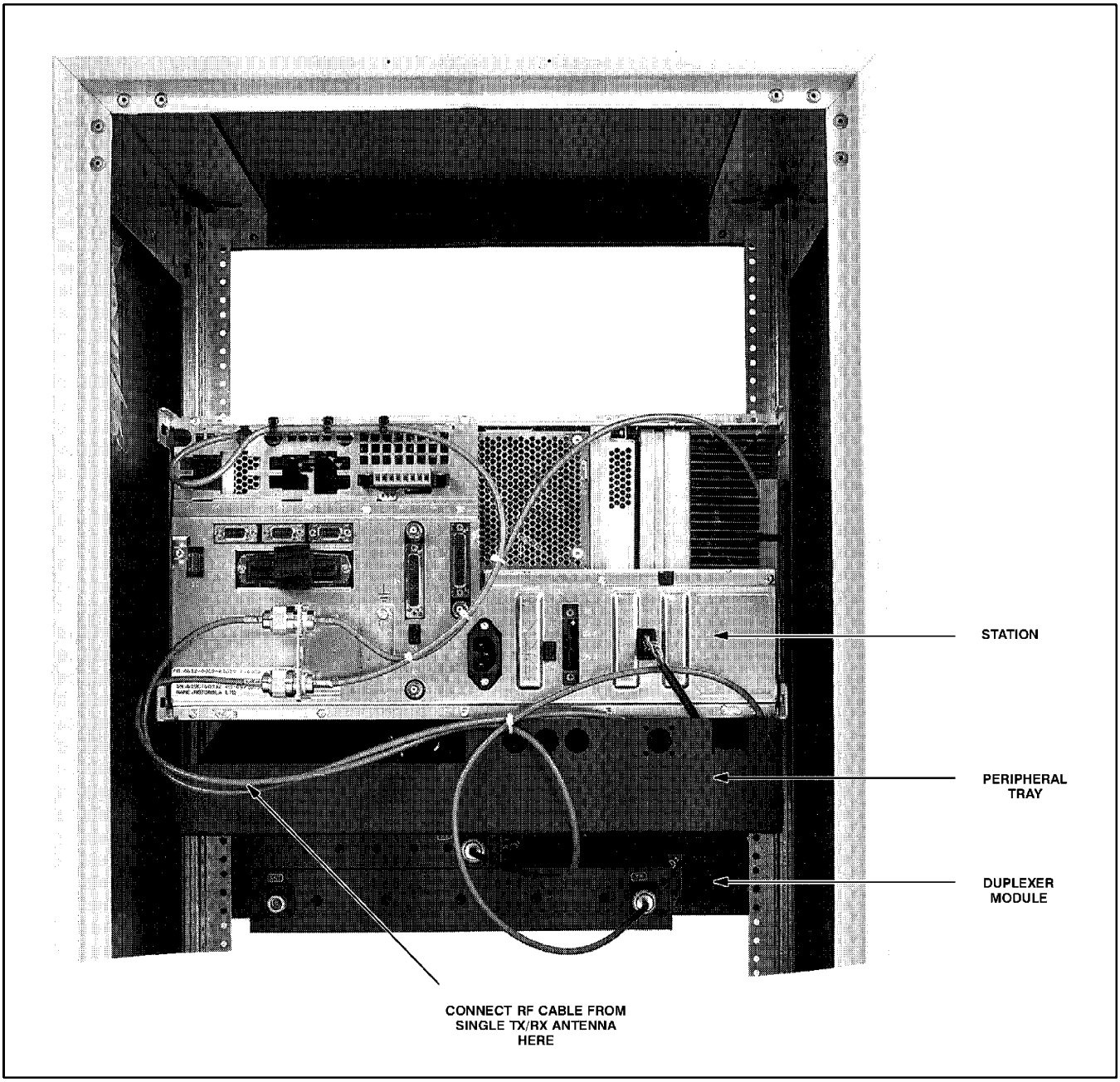


Figure 20. TX/RX Antenna Cable Connection to Duplexer Module (800/900 MHz; Triple Circulator Configuration Shown)

Connecting System Cables

Introduction

Depending on the type of communications system and options, various system cables must be connected to the station backplane. Make the connections as described in the following paragraphs.

IntelliRepeater *D-LAN Cabling Connections*

*Note: **IntelliRepeater** networks may be either D–LAN or Ethernet. Refer to page 40 for instructions on connecting the stations in an Ethernet network.*

A typical Motorola *IntelliRepeater* trunking site is comprised of multiple *IntelliRepeater*–capable stations connected together in a local area network. One of the stations is assigned to act as the current active master and is responsible for all call processing and channel assignments within the site. The other stations act as voice channel repeaters under control of the current active master.

Cabling for an *IntelliRepeater* trunking site using a D-LAN network consists of making the LAN connections between each of the stations. Make the cabling connections as follows.

*Note: Options X148AA–X150AA provide an **IntelliRepeater** LAN cable kit which includes a PhoneNet interface box, an RJ–11 terminator, and a length (10', 25', or 50') of telephone cable with RJ–11 connectors on each end.*

Step 1. Select a station to be at one end of the network. Note that the station need not be the station selected to serve as the current active master.

Step 2. Connect the 9–pin D–type connector (part of the *PhoneNet* interface box) to connector DLAN1 (located on the station backplane, as shown in Figure 21).

Step 3. Install an RJ–11 terminator in one of the RJ–11 ports on the *PhoneNet* interface box. (The empty RJ–11 port at each end of the network must be terminated with an RJ–11 terminator.)

Step 4. Select the end of the telephone cable with a ground wire and spade terminal attached. Connect the RJ–11 connector into the empty port of the *PhoneNet* interface box; connect the spade lug to the station chassis screw, as shown in Figure 21.

Step 5. Install a *PhoneNet* interface box to the remaining stations in the *IntelliRepeater* network.

Step 6. Connect the stations together in a "daisy chain" fashion, as shown in Figure 21. Remember to connect the ground wire and spade terminal to the station chassis screw on each station.

Step 7. Install an RJ–11 terminator in the empty RJ–11 port in the *PhoneNet* interface box on the last station in the network.

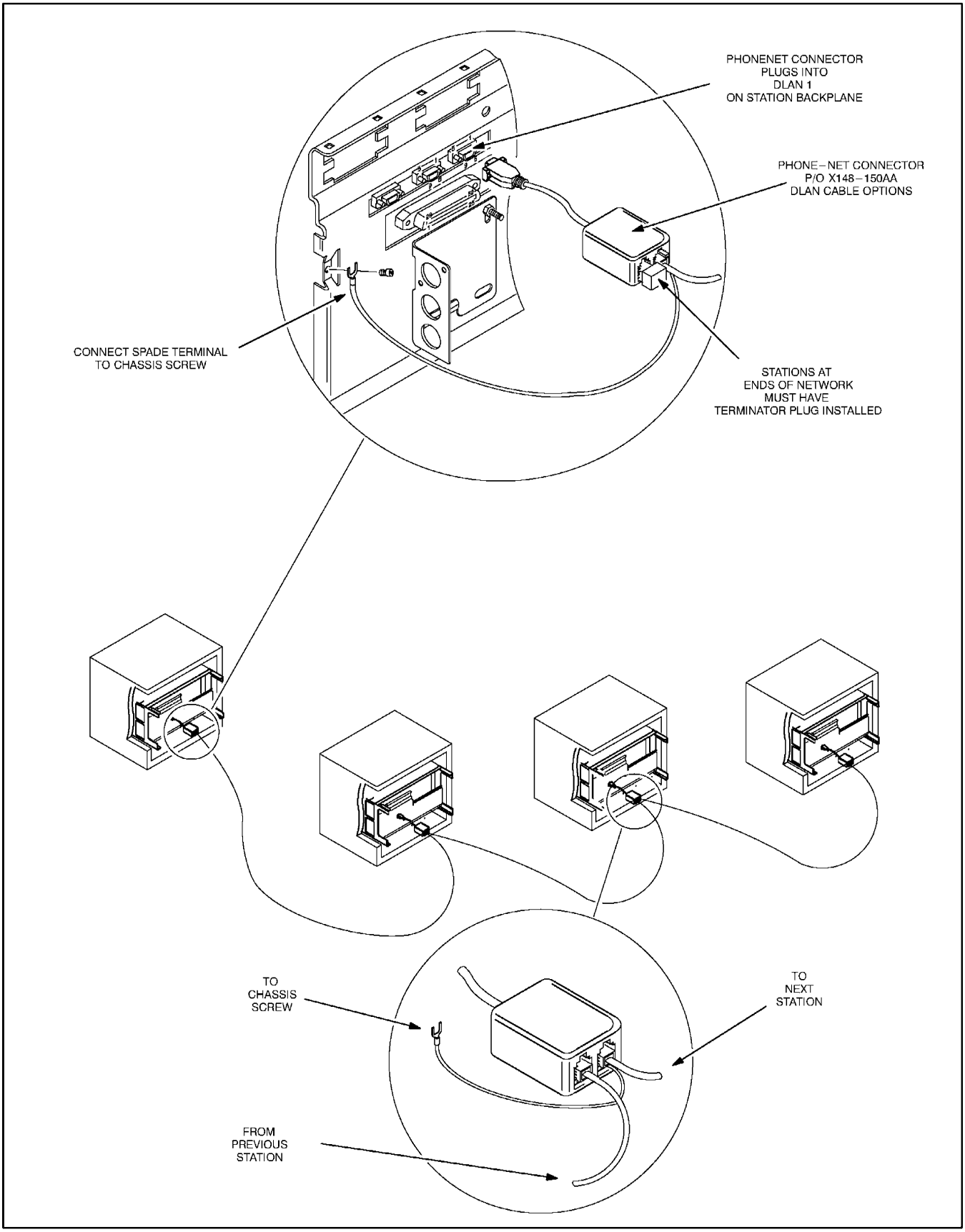


Figure 21. *IntelliRepeater* Trunking Site D–LAN Network Cabling Detail

Connecting System Cables (Continued)

IntelliRepeater *Ethernet Cabling Connections*

*Note: **IntelliRepeater** networks may be either D–LAN or Ethernet. Refer to page 38 for instructions on connecting the stations in a D–LAN network.*

Cabling for an *IntelliRepeater* trunking site using an Ethernet network consists of making the 10BASE–2 (coaxial) cabling connections between each of the stations. Make the cabling connections as follows.

*Note: A coaxial cable and a T-connector is provided with each **IntelliRepeater** station shipped from the factory. A site termination kit (Option X843AB) provides two terminators, a T-connector to serve as the network access point, and a circular insulating pad.*

Step 1. Connect a T-connector to BNC connector #22 on the backplane of each station in the network.

Step 2. Select two stations, one at each end of the network. One will be the terminated end of the Ethernet network, the other will be the access point of the Ethernet network.

Step 3. Place a terminator on one end of the T-connector on the station selected to be at the terminated end of the network, as shown in Figure 22.

Step 4. Using the supplied 10BASE–2 coaxial cables, connect the stations together in a "daisy chain" fashion, as shown in Figure 22.

Step 5. Create a network access point by connecting the last station to a T-connector and terminating the other end. This T-connector serves as the access point for the Ethernet network. This T-connector may be used to connect a PC to the network to download station software to the FLASH memory in each of the *IntelliRepeater* stations.

Step 6. Insulate each T-connector by folding the circular insulating pad around the connector and pressing it together until it sticks to itself, holding it in place.

Important! Ethernet networks utilize a floating ground. In order to eliminate possible data corruption resulting from multiple ground points in the network, the network should be grounded at **only one point**. This is typically accomplished at the terminated end of the network by using a terminator with an attached ground wire. Attach the ground wire to the station chassis. Make sure that the other T-connectors and cables in the network are not grounded to any station, either intentionally or accidentally, by using the circular insulating pads on every T-connector.

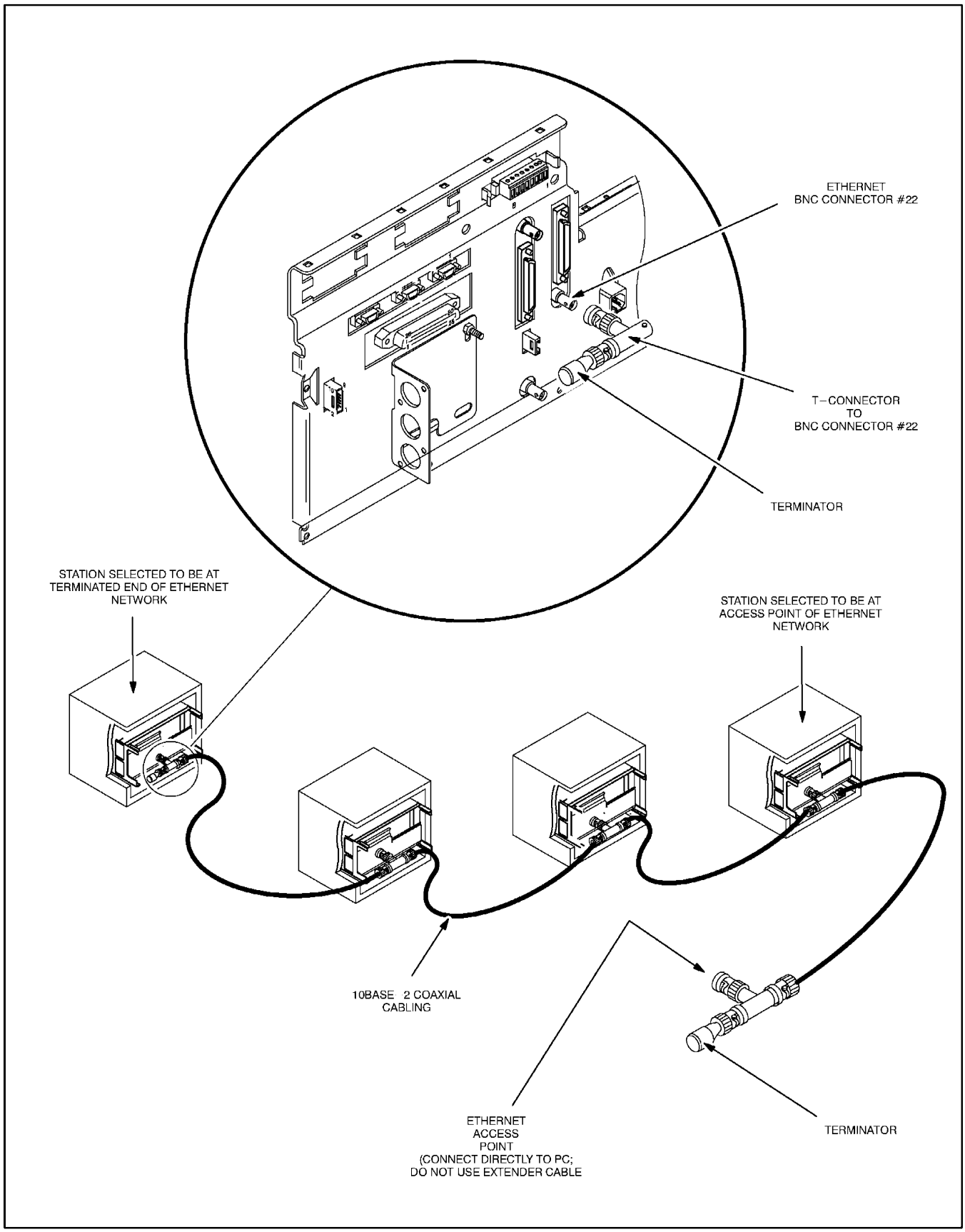


Figure 22. *IntelliRepeater* Trunking Site Ethernet Network Cabling Detail

Connecting System Cables (Continued)

6809 Trunking Cabling Connections

Connect the control cable from the 6809 Trunking Controller to the station backplane as shown in Figure 23 below.

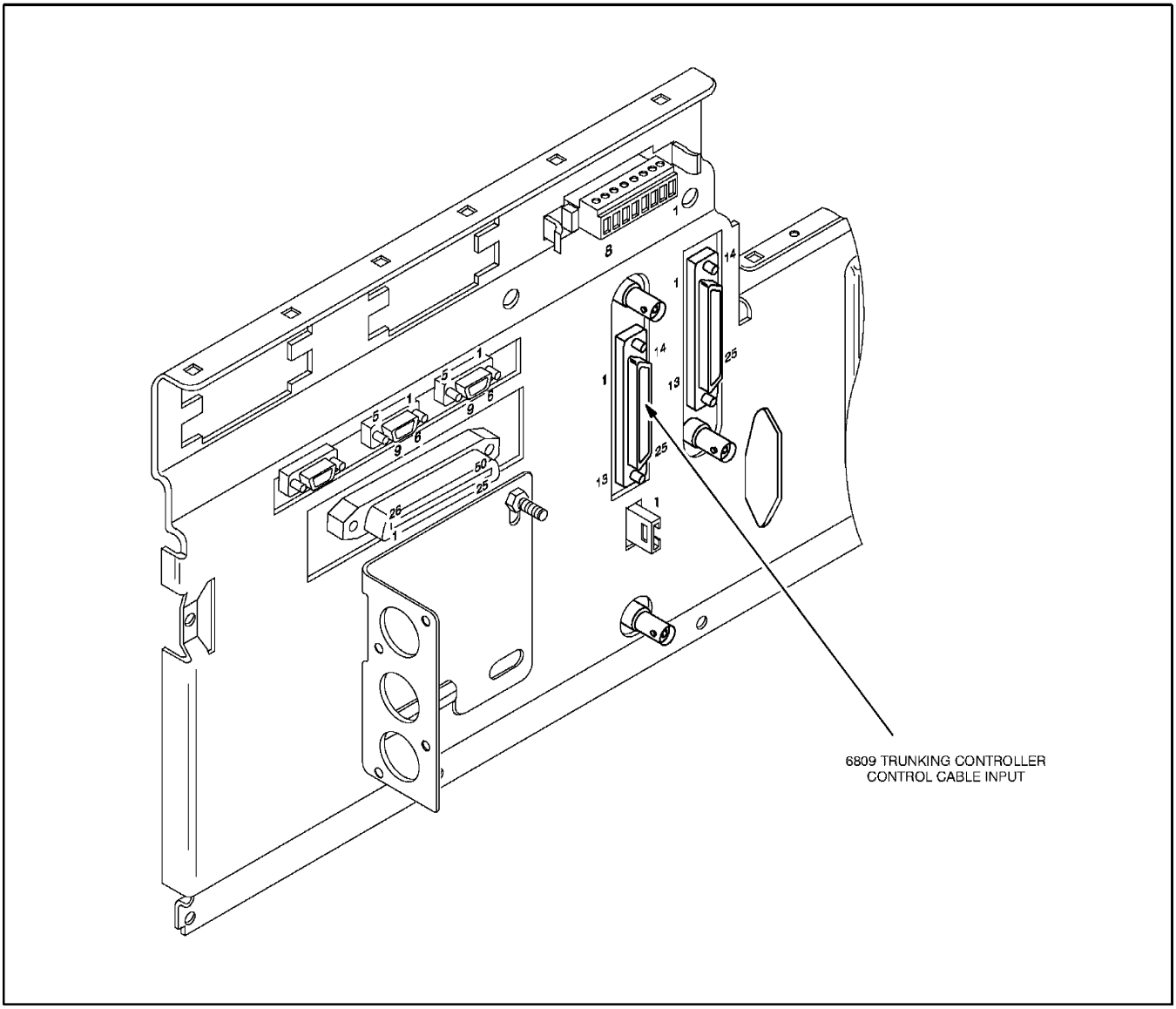


Figure 23. Connecting 6809 Trunking Controller Cable

Connecting System Cables (Continued)

Zone Controller Cabling Connections

Connect the control cable from the Zone Controller to the station backplane as shown in Figure 24 below.

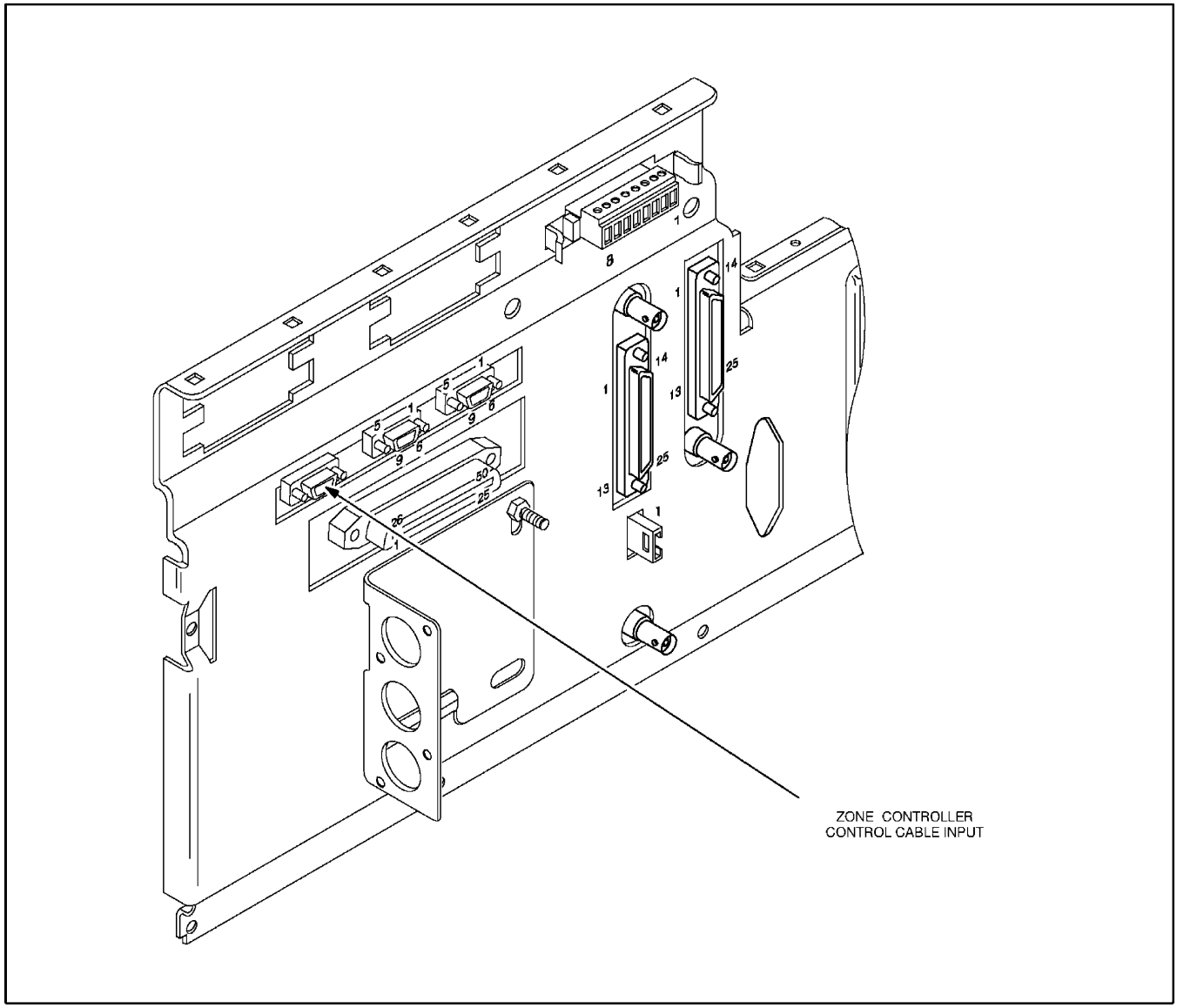


Figure 24. Connecting Zone Controller Cable

Connecting System Cables (Continued)

6809 Controller TSC/CSC Link Cabling Connections

Connect the TSC/CSC link cable (broadcast box) from the 6809 Controller to the station backplane as shown in Figure 25 below.

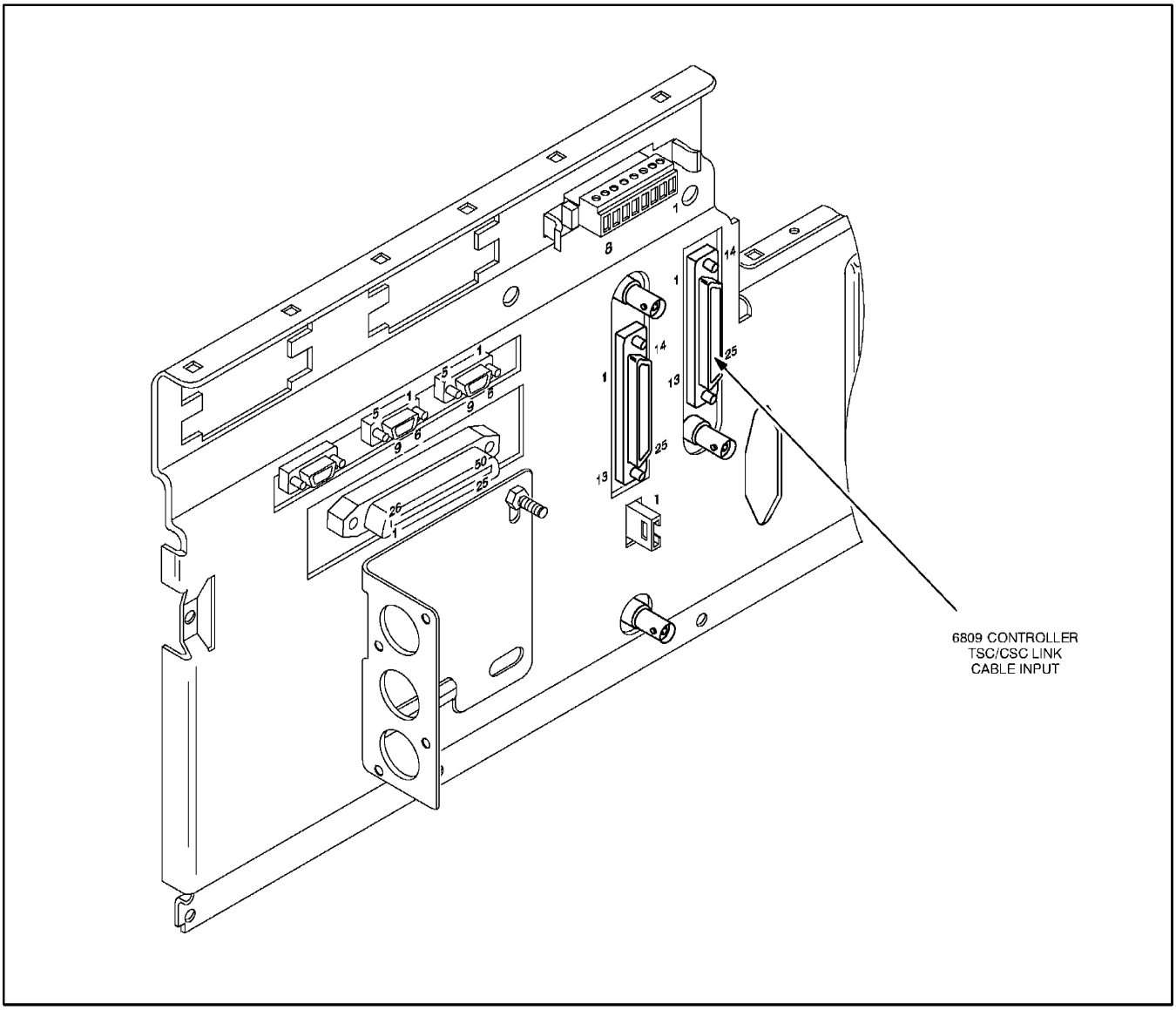


Figure 25. Connecting Zone Controller Cable

Connecting Telephone Lines

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 and/or *ASTRO*-encoded voice. Also carried on the phone lines is one of two types of remote control signaling (Tone Remote Control or *ASTRO* digital packets). 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 *Quantar* station. The following table shows the specifications for "3002" and "Type 5" phone line types.

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 dBrnCO	51 dBrnCO
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 spec not available −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
Impulse Noise Threshold	71 dBrnCO	
Intermodulation Distortion: R2 R3	 ≥ 27 dB ≥ 32 dB	 ≥ 25 dB ≥ 30
Phase Jitter: 20–300 Hz 4–300 Hz	 ≥ 10 Degrees ≥ 15 Degrees	 ≥ 25 Degrees ≥ 30 Degrees
Frequency Shift	± 3 Hz	± 5 Hz

Connecting Telephone Lines (Continued)

Location of Telephone Line Connections

For added convenience, telephone line connections may be made in one of two locations on the station rear panel.

- 50−pin Telco Systems Connector
- Orange 8−Position Screw Terminal Connector

The location of the telephone line connections is shown in Figure 26. Note that these connections are **not** surge or transient protected. Refer to *Standards and Guidelines for Communication Sites (R56) 68P81089E50-A* for details.

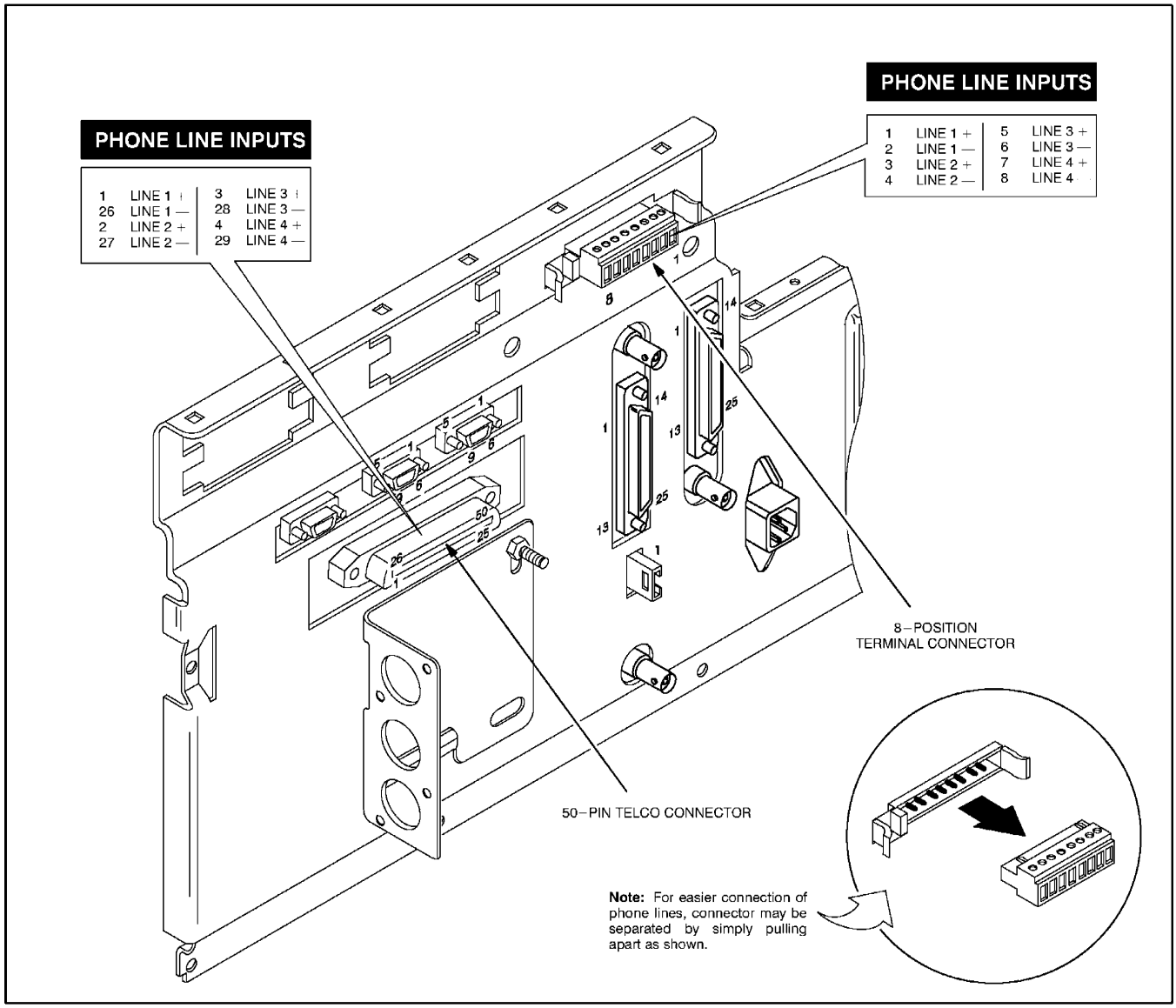


Figure 26. Two Locations for Telephone Line Connections

Connecting Telephone Lines (Continued)

Note: *Stations equipped with a 4–wire Wireline Interface Board (Model CLN6955) can support a single 4–wire or a single 2–wire telephone line connection.*
Stations equipped with an 8–wire Wireline Interface Board (Model CLN6956) can support two 4–wire or a single 2–wire telephone line connection. Refer to the Wireline Interface Board section in this manual for details.

2–Wire / 4–Wire Jumper Setting

Wireline Interface Boards are shipped with the 2–wire/4–wire jumper (JU1010) installed in the 4–wire position. If required for your installation, move the jumper to the 2–wire position. Refer to the appropriate (per model) Wireline Interface Board section in this manual for jumper details.

Input/Output Impedance Matching Jumper Settings

Wireline Interface Boards are shipped with the input/output impedance matching jumpers installed in the 600 Ω positions. If required for your installation, move the jumpers to the desired positions. Refer to the appropriate model Wireline Interface Board section in this manual for jumper details.

System Type vs Wireline Circuit Matrix

The following table shows which of the four (4) wireline circuits to use for various system types.

Connecting Telephone Lines (Continued)

System Type vs Wireline Circuit Matrix Table

System Type	Line 1 (Note 1)	Line 2 (Note 1)	Line 3 (Note 3)	Line 4 (Note 3)
Conventional Local Area Analog	Console	Console	Not Used	Not Used
Conventional Local Area Analog with Repeater Access	Console	Console	Not Used	Not Used
Conventional Wide Area Analog	Comparator	Comparator	Not Used	Not Used
Conventional Simulcast Wide Area Analog	(Note 2)	Comparator	Not Used	Not Used
Conventional Local Area *ASTRO*	DIU	DIU	Not Used	Not Used
Conventional Local Area *ASTRO* w/Repeater Access	DIU	DIU	Not Used	Not Used
IntelliRepeater Trunking Wide Area Analog	*SMARTZONE* Audio Switch	*SMARTZONE* Audio Switch	Not Used	Not Used
6809 Trunking Single Site Analog	Interconnect	Interconnect	Not Used	Not Used
6809 Trunking Single Site Analog w/Console Priority Interface	Console	Console	Interconnect (8−Wire WIB Req'd)	Interconnect (8−Wire WIB Req'd)
6809 Trunking Wide Area Analog	Comparator	Comparator	Not Used	Not Used
6809 Trunking Simulcast Wide Area Analog	(Note 2)	Comparator	Not Used	Not Used

Notes:

1. 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 (conventional local area analog only).
2. For Simulcast stations, transmit audio is connected from RDM (or equivalent) to GEN TX DATA+ and − on backplane.
3. Lines 3 and 4 can be used with the Enhanced WildCard Option for customer-specific applications (in analog stations only). The optional 8-wire Wireline Interface Module is required.

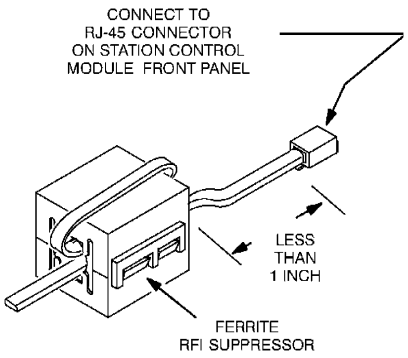
Connecting V.24 Board

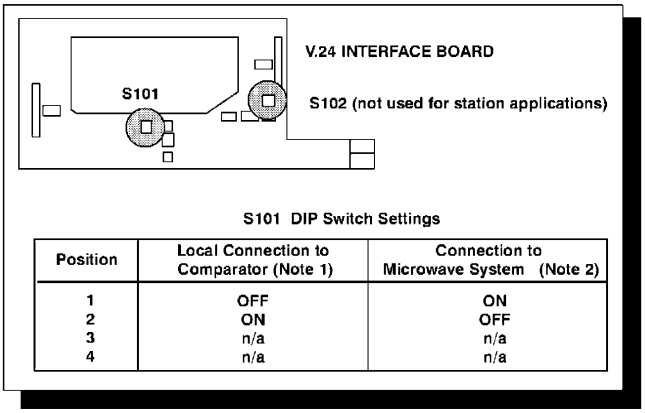
Note *Connecting to a local DIU or ASTRO-TAC Comparator requires a null modem cable and programming the station for Internal Clock Generation (refer to the RSS User's Guide for details).*

For *Quantar/Quantro* Conventional stations (hybrid links) and *SMARTZONE* Trunking stations (V.24 required), connections to/from the station are made using a V.24 Interface Board (installed on the Wireline Interface Board). This board (Option X889AC) allows connections to be made between external V.24 modem equipment and the station via an RJ-45 connector accessible on the front panel (as shown below).

Make the connections and DIP Switch settings as shown in Figure 27.

Note *The cable connected to the V.24 RJ-45 connector must have a ferrite RFI suppressor installed. This suppressor is supplied by Motorola with each station and must be installed as shown below.*



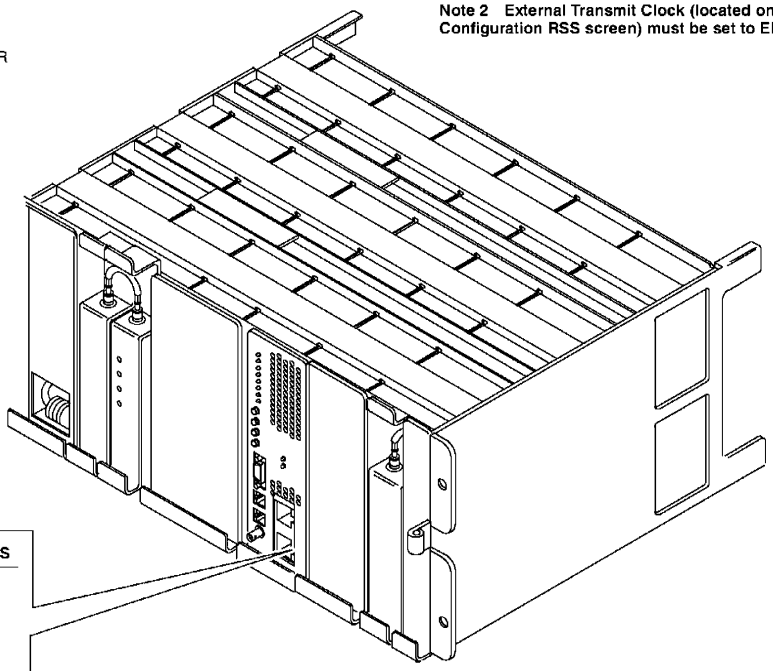


S101 DIP Switch Settings

Position	Local Connection to Comparator (Note 1)	Connection to Microwave System (Note 2)
1	OFF	ON
2	ON	OFF
3	n/a	n/a
4	n/a	n/a

Note 1 External Transmit Clock (located on the Wireline Configuration RSS screen) must be set to DISABLED.

Note 2 External Transmit Clock (located on the Wireline Configuration RSS screen) must be set to ENABLED.



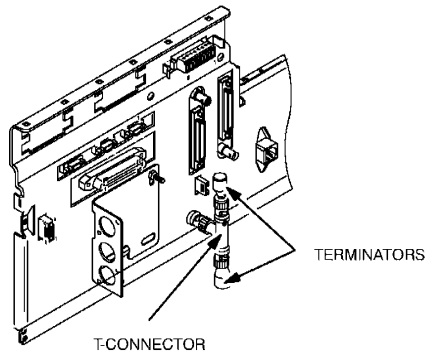
RJ-45 PIN-OUTS

1	RCLK
2	CD
3	TCLK
4	GND
5	RXD
6	TXD
7	CTS
8	RTS

Figure 27. Making V.24 Board Connections

Connecting External Reference

Note *For standalone stations equipped with an internal UHSO module, make sure the BNC connector #30 (located on the backplane) is terminated as shown below.*



Overview

In some cases (e.g., Simulcast, 900 MHz, etc.), the use of a frequency reference other than the internal reference oscillator (located on the Station Control Board) is required. In these cases, either an internal Ultra High Stability Oscillator (UHSO, available as an option) or an external 5 MHz or 10 MHz source (typically from a rubidium–based standard) must be employed. Without one of these sources connected, the station synthesizers will not maintain the required stability.

Single Station Connections

For stations without the internal UHSO option, connect the output of an external 5 MHz or 10 MHz reference source to one of two station connectors, as shown in Figure 28. (The external source must remain connected and powered at all times during station operation; otherwise, the synthesizers will fail to lock and the station will not transmit or receive.)

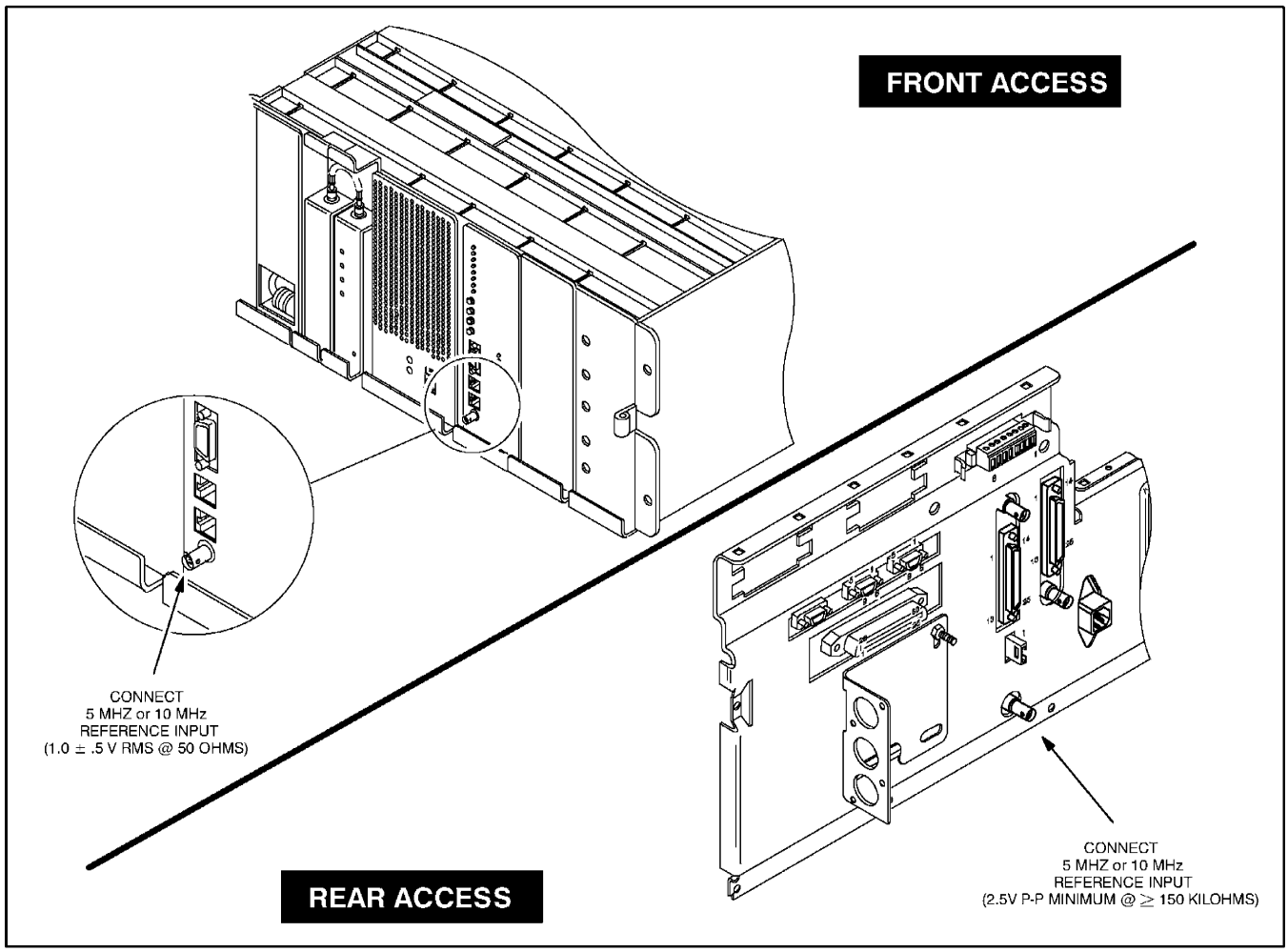


Figure 28. Connecting External 5 MHz or 10 MHz Reference Source to Single Station

Connecting External Reference (continued)

Multi-Drop Connections

For sites with multiple stations that require a high-stability reference signal, a multi-drop configuration may be used. In this configuration, a single source (either an external signal source or a station equipped with a UHSO module) provides the reference signal to all stations at the site. Make the connections as shown in Figure 29.

Note the following guidelines and requirements:

- A maximum of six (6) *Quantar* stations (mounted in same rack) can be connected in a multi-drop configuration.
- An Ultra High Stability Oscillator module (UHSO) must be installed in the bottom station only.
- RSS programming for bottom station must be set for **INTERNAL — HIGH STABILITY** (*Freq Ref:* field on the *Hardware Configuration* screen). All other stations must be set for EXTERNAL — 5 MHz. Refer to the *Radio Service Software User's Guide 68P81085E35* for details on RSS programming.

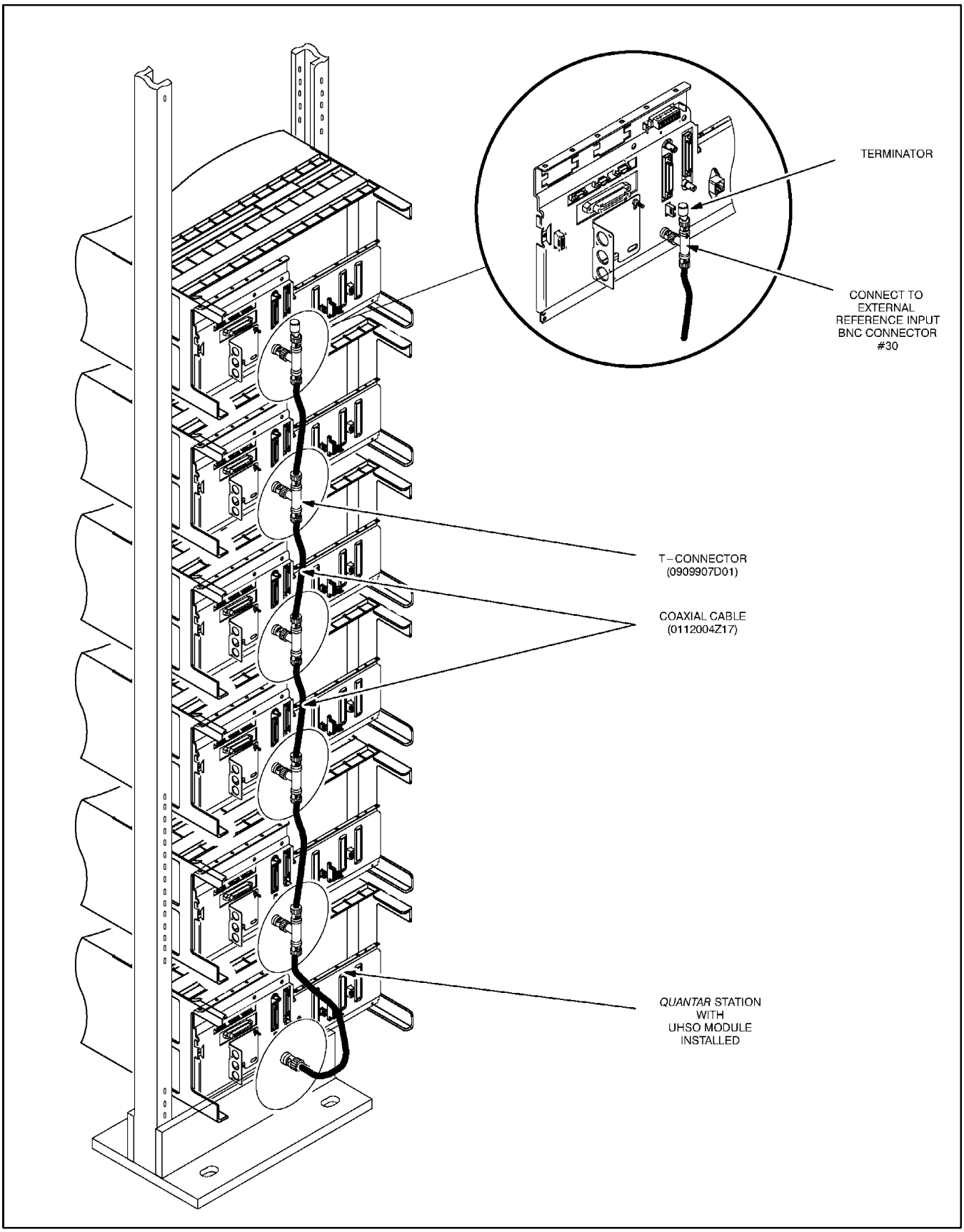


Figure 29. Multi-Drop Connections of Reference Source to Multiple Stations

4 POST–INSTALLATION CHECKOUT

After the station equipment has been mechanically installed and all electrical connections have been made, you may now apply power and check for proper operation prior to optimizing the station.

Applying Power

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

Step 1. Turn ON the circuit breaker controlling the ac outlet that is supplying power to the station Power Supply Module.

Step 2. Turn the station power ON using the rocker switch located on the Power Supply Module front panel.

Verifying Proper Operation

Introduction

Upon turning the station power ON, a start–up sequence begins which performs certain tests and initialization before entering normal station operation. The station LEDs provide a visual indication of the progress of the start–up sequence, and may be decoded to determine which test (if any) has failed.

The following describes the behavior of the LEDs upon powering up the station, as well as how to decode the LEDs to isolate potential hardware and software malfunctions.

Station Control Module LEDs Power Up Sequence

Step 1. The **Station Fail** LED momentarily lights, followed by all eight LEDs turning on.

Step 2. The start–up sequence tests now run, and the LEDs go out (top to bottom) as each test is completed.

Step 3. After **Aux LED** is turned off, the **Station Fail** LED is turned on and (for Conventional/6809 stations only) the **Intercom** LED flashes while the station software and hardware are initialized.

Step 4. Once initialized, the **Station Fail** and **Intercom** LEDs are turned off and the **Station On** LED (green) is turned on. This indicates that the module has passed all the start–up tests and is now operational.

continued on next page

Verifying Proper Operation (Continued)

Station Control Module Failures

- If the **Station Fail** lights and stays on (Step 1), check to see if the Station Control Module and Power Supply Module are seated properly in the backplane. Also check to make sure that the EPROMs (two 40–pin socket–mounted ICs located on Station Control Board) are seated properly and installed with pin 1 of each IC closest to the center of the board. Otherwise, replace Station Control Module.
- If LEDs #6 and #7 (**Rx 2 Active** and **Rx Fail**, respectively) alternately blink, one of the start–up tests has failed, as indicated by one of the first three LEDs being turned on.

  — If LED #1 is turned on, reseat the FLASH SIMM in its socket; otherwise, replace the FLASH SIMM.

  — If LED #2 or #3 is turned on, check to make sure DRAM SIMMs are correct size for system application (*IntelliRepeater* stations require one 8 Mbyte DRAM SIMM). If correct size, reseat the DRAM SIMMs in sockets. Otherwise, replace DRAM SIMMs.
- If start–up tests are run successfully (all LEDs light and go off one by one) and the **Station Fail** lights and stays on (Step 3), replace Station Control Module.
- If start-up tests are run successfully (all LEDs light and go out one by one) and the **Station Fail** lights momentarily followed by all LEDs blinking, perform a software download to FLASH memory as described in the *Quantar/Quantro* RSS User's Guide (68P81085E35).

Exciter Module LEDs Power Up Sequence

Step 1. After Station Control Module passes all start–up tests and becomes operational, all four Exciter LEDs momentarily light.

Step 2. The start-up sequence tests now run, and the LEDs go out (top to bottom) as each test is completed.

Step 3. Once **PA FAIL** is turned off, the **TX Lock** LED is turned on. This indicates that the module has passed all of the start–up tests and is now operational.

Exciter Module Failures

- If LEDs #1 and #2 (**TX Lock** and **PA Full**, respectively) alternately blink, one of the start–up tests has failed. Check to make sure that the EPROM (40-pin socket-mounted IC located on Exciter Board) is seated properly and installed with pin 1 of the IC closest to the center of the board. Otherwise, replace Exciter Module.

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Verifying Proper Operation (Continued)

Wireline Module LEDs Power Up Sequence

Step 1. After Station Control Module passes all start–up tests and becomes operational, the Wireline start–up tests now run.

Step 2. If all tests are passed, the **WL On** LED is turned on (green).

Wireline Module Failures

- If the two LEDs alternately flash slowly (in any one of several possible flashing patterns), replace the Wireline Interface Board.

Proceeding to Optimization

If all LEDs sequence properly, the station may be considered electrically functional and is ready for optimizing and alignment. Proceed to the *Optimization* section in this manual.