Chapter 2: Installation

Pre-installation

As was shown in Figure 4, prior to installing the equipment a number of planning and acquisition activities take place. The installation itself takes only about 2 days. The I&C crew may or may not be involved with all the pre-installation activities. Of these, they are most likely to be involved in the Site Candidate Evaluation, the gathering of data for the Interference Analysis, and the Antenna Power & Cable Selection step of the process.

Project Plan

A Project Plan is a document that lays out the work to be done, the objectives of the project, the schedule, resources required, and so forth. If Navini is performing the I&C activities, a Project Manager is assigned. The Project Manager prepares the Project Plan and shares it with the Navini and customer teams.

Coverage Prediction Map

Early in the planning of deployment of Ripwave Base Station equipment, an RF Engineer will go through the process of studying the RF environment of the candidate sites that the customer has identified. Readings are taken and analyzed at each site in order to predict what range of coverage can be expected from installing a Base Station at the site.

Coverage predictions account for both Base Station performance and Marketing objectives with the service. The customer accomplishes the latter as part of the decisions concerning site selection.

Site Candidate Evaluation

Often Technicians will be very comfortable with either the networking side or the wireless side of the system, but not usually both. To evaluate a potential install site, a form helps ensure all aspects of the site have been considered. Information about the site is recorded on the form. Since each site is unique, the form helps to ensure nothing is taken for granted or assumed about the installation site for the Ripwave equipment.

A copy of this form may be found in Appendix A. It includes places to capture the logistics of the site, tower or rooftop mount possibilities, GPS coordinates, type of antenna to be installed, whether or not an outdoor enclosure is provided, power availability, distance between connection points, ventilation, a place for drawings from every angle, etc. It is from this information that the site will be designed, then installed to plan.

Interference Analysis

As part of deploying a Ripwave Base Station, the Field Service Engineer must collect critical information from the site. The data is provided to the RF Engineering personnel, who can then evaluate the Radio Frequency (RF) conditions. The RF Engineer analyzes the data for existing interference from other sources, and takes that into account when creating the coverage prediction map.

The RF Engineer, in turn, supplies to the Field Service Engineer at the site valuable data parameters and configuration information unique to each system and each site. In addition to coverage, though, the interference analysis also helps to predict the quality of service, the power requirements to get above the noise floor, and other expectations regarding the site.

This study helps Navini and the customer decide which type of system (frequency) and antenna (panel or omni) will provide the best results. To collect the data the on-site Technician or Field Engineer performs an Interference Sweep Procedure (Appendix B) and supplies that data to the RF Engineer(s).

Site Selected & Designed

After evaluating the potential sites and the coverage prediction, the customer must select the specific site where the Base Station is to be deployed. The site must be carefully blueprinted to prepare for equipment ordering and installation. Navini can supply specifications and drawings to help the customer design the site. Refer to Appendices C D, E, F, and G for BTS Specifications, RFS Data Sheets, BTS Outdoor Enclosures Manufacturers, Rectifier/Battery Backup Manufacturers, and a sample Base Station drawing. Check all regulatory standards (refer to Chapter 1, Page 8 “Regulatory Information”) prior to installation.

Network Architecture Plan

The IP Networking community involved in the project, both from Navini and the customer, often work together to analyze and plan how the Ripwave system will be integrated into the customer’s network. Of course, they are looking for efficient operation of the system and seamless integration. They have to plan the traffic routing, IP addressing, protocol compatibility, and so forth.

Antenna Power & Cable Selection

The size and type of cable used to install the Base Station affect power loss and calibration range for the transmitter and receiver. It is at this point in the process that the specific cable manufacturer, type of cable, and cable size must be determined. A complete procedure and tool are explained in Appendix H. Refer, also, to Chapter 1, Page 8 "Regulatory Information" for FCC warning regarding RF, and UL and NEC/CEC information regarding cable length and connectors. All BTS and RF shelf Coax and Digital cables between the Digital and RF Shelves are 60 inches in length. Physical distance between Digital and RF Shelves will always be less than the cable length.

Bill of Materials

The customer has to generate the Bill of Materials (BoM) - the actual equipment order to be manufactured and shipped to the installation site. Navini can provide part numbers and ordering information, as well as recommendations and other details that will assist customers in the correct placement of orders. There is a sample Bill of Materials in Appendix I.

Acquire Materials

Once ordered, the customer ensures that everything required for installing the Base Station is secured and at the deployment site.

Confirm Backhaul Connection, EMS Server & FTP Server, Input Power & Grounding at Site

The Backhaul connection for the Ripwave Base Station consists of up to two (2) Ethernet cable connections with RJ-45 connectors for each BTS installed, OR, up to eight (8) T1/E1 connections with RJ-48 connectors for each BTS. The quantity of each connection will depend on the site requirements. These connections need to be made available before installation begins. Refer to the Regulatory Information in Chapter 1, Page 8 regarding backhaul connections, power and grounding.

The customer's EMS Server and FTP Server should be put into place prior to the installation crew's arrival at site. If the customer's EMS Server is not available until after installation begins, the crew can typically use a laptop to perform initial configuration. The FTP Server, however, must be in place in order to commission the Base Station and test its operation.

Power Requirements for the Base Station

Refer to Table 3 Technical Specifications and to the Regulatory Information found in Chapter 1, Page 8. The BTS must be connected to a power supply/rectifier that is UL listed to UL60950 or UL60950-1 and has a grounded SELV output; and it must be installed in accordance with NEC/CEC Articles 800/810/830. A UL listed disconnect device, such as a circuit breaker or fuse, must be installed between the power supply and the BTS chassis connections.

Ground Requirements for the Base Station

The Base Station requires an earth ground connection. Grounding from copper point to copper point shall be less than 1 ohm. Grounding from copper point to earth ground shall be less than 5 ohms. All power and ground conductors must be mechanically supported to avoid strain of the wires and connection points. Refer to the Regulatory Information in Chapter 1, Page 8.

NOTE: The installation procedures, which begin next, follow the same order as shown in the High-level I&C Process Flowchart in Figure 4.

Install Power & Grounding

Check all regulatory standards (refer to Chapter 1, Page 8 "Regulatory Information") prior to installation.

System Ground Buss Bar & Surge Protectors

The Base Station system ground buss bar and data/power cable surge protectors are mounted on the wall adjacent to the BTS rack or enclosure. They should be mounted per accepted telecom standards and procedures.

Step 1. Mount the data/power cable surge protectors (Figure 10) with the label 'lines' toward the RFS and the label 'BTS' toward the BTS.

Step 2. Apply a thin coat of anti-oxidant joint compound to both sides of the system ground buss bar to ensure proper connection between it and the surge protectors.

To install the eight (8) antenna and one (1) cal cable surge protectors (Figure 11), and the one (1) or two (2) Global Positioning System (GPS) surge protectors (Figure 11) in the system ground buss bar, follow the steps below.

1. Install the rubber gasket into the groove in the surge protector.
2. Install the surge protector in the system ground buss bar with the surge side toward the antenna and the protected side toward the BTS.
3. Install the star washer and nut on the top of the surge protector. Torque the nut to 140-150 inch-pounds.
4. When finished, the mounted surge protectors in the buss bar will appear as in Figure 12.

CAUTION! Navini Networks provides both Secondary (built-in) and Primary (optional) Lightning Protection. Lightning Protection helps to protect the RFS, the BTS, and the RF lines against "tower lightning" events occurring at the Base Station. The customer must exercise judgment when balancing risk against cost to decide whether to install the primary protection kit at an extra cost or to rely on the secondary protection only. NOTE: Navini does not warranty equipment against lightning

Figure 11: Surge Protectors

From left to right: PolyPhaser surge protectors are used with the Combo Chassis and Split Chassis configurations (PSX-ME for the Cal and RF cables, at the antenna, PSX for the Cal and RF cables at the ground Buss Bar, and DGXZ+06NFNF-A for the GPS antenna cable at the ground Buss Bar.

Huber+Suhner surge protectors are used with TTA configurations. The Female-Female model is used for Primary Surge protection* at the ground Buss Bar (RF and Cal cables near the BTS); and the Male-Female model is used for Primary Surge protection (RF and Cal cables) at the RFS and with the GPS cable.

PolyPhaser surge protectors block DC, are unidirectional (there is an "equipment side" and a "line side"), have multi-strike capability, and have no gas tubes. Huber+Suhner surge protectors allow the DC component that powers the PAs through but stop lightning surges and electrical transients, are bi-directional, and have a gas discharge tube.

The Navini Part Numbers for the Huber+Suhner surge protectors are 32-00228-00 and 32-00229-00, respectively. Similar surge protectors may be obtained from NexTek (Navini Part Numbers 32-00228-20 and 32-00229-20).

Figure 12: Surge Protectors in Buss Bar (Non-TTA system)

Antenna Ground Buss Bar

You should install the Antenna Ground Buss Bar on the mounting structure per accepted telecom standards and procedures (Figure 13). The location is decided on during the site survey and should be close to the RFS. Two or more buss bars may be installed per system.

Figure 13: Buss Bars

BTS Buss Bar

Antenna Buss Bar

System Ground Wiring

A minimum #6 stranded, green-coated copper wire and grounding hardware are used for ground connections. Install the system ground as a single-point connection between the system ground buss bars, the data/power surge protector, the BTS chassis, the BTS mounting rack, and the RFS antenna. Connect the system ground to earth ground. Apply anti-oxidant joint compound to all connections (Figure 14). Tighten all connections until secure.

CAUTION! Without proper grounding a BTS is much more susceptible to damage

Install Cables

All cable connections in the Combo and Split-Chassis configurations are made using standard RF coaxial cable. The Navini Networks minimum for cable connections from the GPS to the BTS is LMR 400, 3/8-inch coaxial cable. Other types of cable that are comparable may be used. These were determined under “Antenna Power & Cable Selection” (Appendix H) activities cited earlier. The TTA configuration uses a composite cable containing nine RG-6 or RG-11 individual strands to replace the 8 RF cables, the Cal cable and the Power/Data cable (the signal previously sent through the Power/Data cable is now sent through the center connector of the individual RG-6 or RG-11 strands).

All Coaxial and Digital cables between the Digital and RF shelves are 60 inches in length. Physical distance between Digital and RF shelves will always be less than the cable length.

Figure 15: Coaxial Cables

Cut Cables for the Combo and Split Chassis Configurations

The cable run is determined during the site survey. Note that the length of the cables may need to be slightly different, depending on the position of the buss bar relative to the BTS.

- Cut nine (9) pieces of cable for the main feeder cables to connect the nine RFS connectors to the surge protectors on the system ground buss bar. Leave enough extra length for the service loop below the RFS and for connection to the surge protectors.

- Cut eight (8) pieces of cable for the jumper cables to connect the surge protectors on the system ground buss bar to the eight (8) RF input connectors on the back of the BTS. Leave enough extra cable length for service.

- Cut one (1) piece of cable for the jumper cable to connect the surge protector on the system ground buss bar to the CAL connector on the back of the BTS. Leave enough extra cable length for service.

- Cut a piece of LMR 400 cable to connect each of the GPS antennas to the surge protectors on the system ground buss bar. Leave enough extra cable length for service. The maximum loss for the cable to the GPS antenna is 11 dB.

- Cut a piece of LMR 400 cable to connect the surge protectors on the system ground buss bar to each GPS connector on the back of the BTS. Leave enough extra cable length for service. If there is more than one BTS co-located in the installation, two GPS antennas can serve all BTSs in the installation.

- The cable from the GPS antenna (after it goes through the surge protector) is connected to the antenna input of the GPS distribution amplifier (Figure 16). The output ports of the GPS distribution amplifier are connected to the GPS inputs of the BTS. The GPS distribution amplifier is powered by the GPS antenna input. The drawing in Figure 17 depicts the placement of the shared GPS resources among three BTSs.

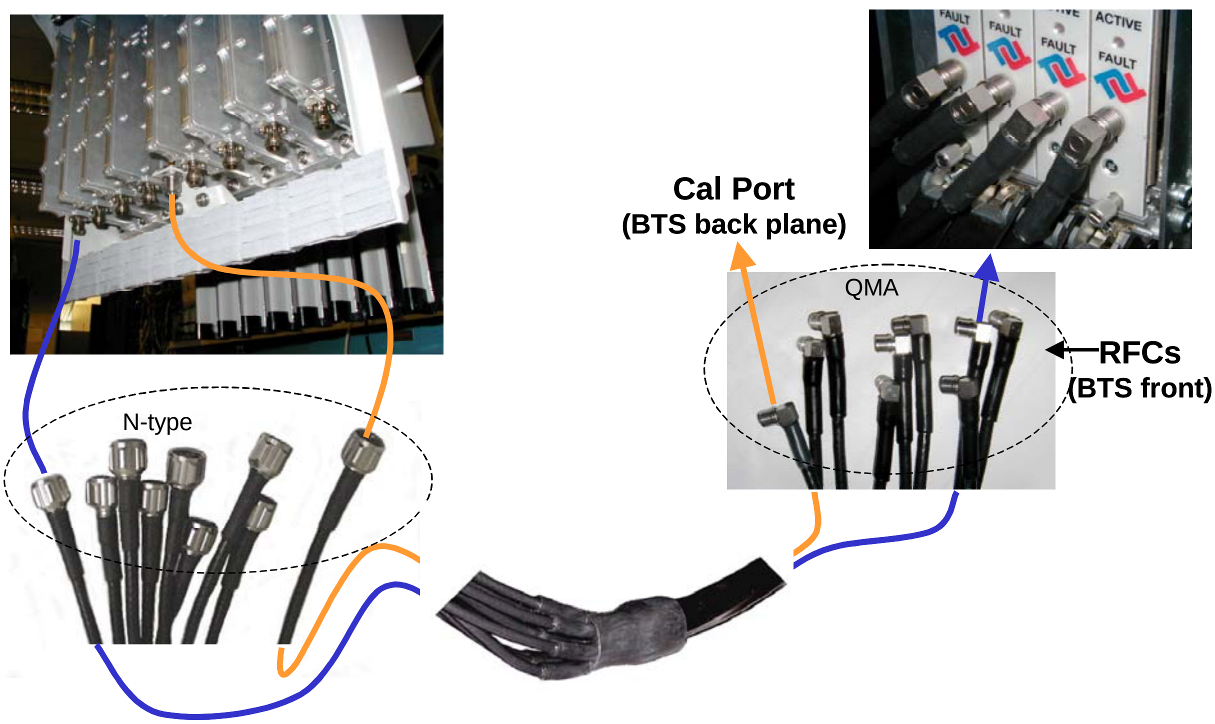
CAUTION! GPS is required to prevent the BTSs in a network from interfering with one another.

Bundle Cables for the TTA Configuration

The bundle cables are manufactured by CommScope in 5 m increments. On the end that attaches to the antenna, the RG-6 or RG-11 bundle cables come with a weatherized "boot" and nine the N-type Male connectors in place. At the other end, the connectors can be N-type, if the cables in the will be connected to surge protectors in a buss bar (Primary Protection); or QMA, if the cables are to be connected directly to the BTS (Secondary Protection only). In the first case, N-type to QMA jumper cables are needed to connect the surge protectors in the buss bar to the BTS.

You can optionally cut the bundle cable to the proper length, attach the connectors, and install the boot on site by yourself. Use a torch to heat-shrink the boot, being careful not to burn it.

Figure 18 Bundle Cable, Weatherized "Boot" and End Connectors

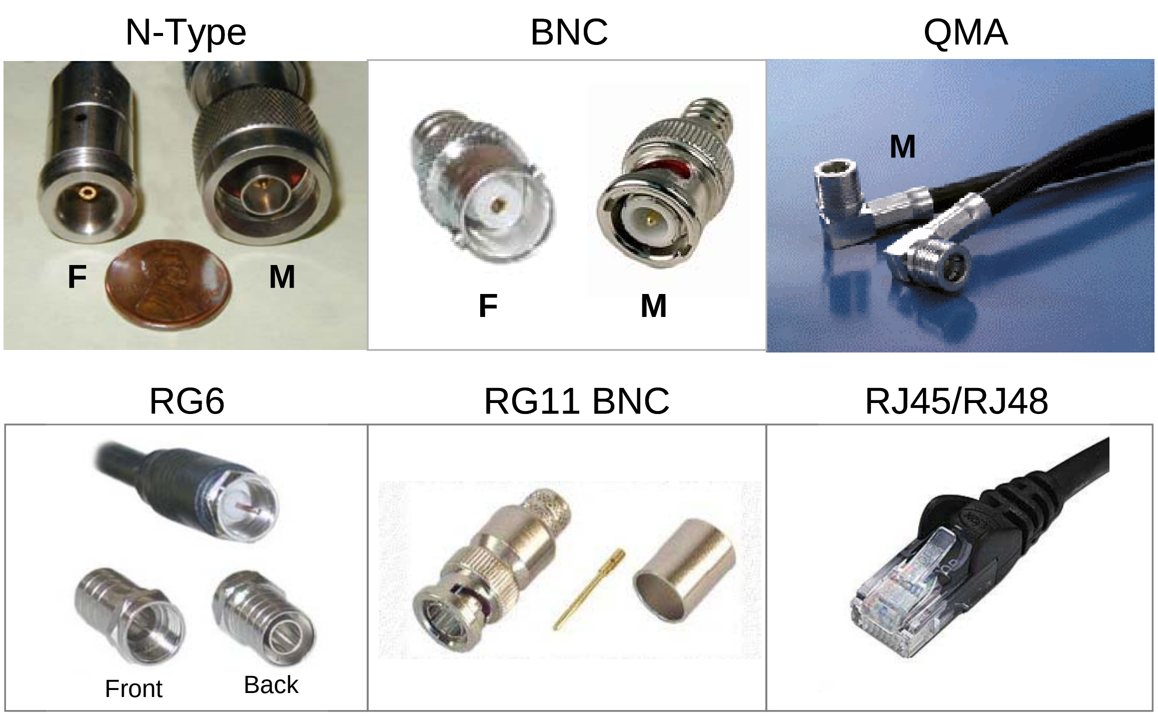


Install Connectors on Cables

Install connectors on both ends of each cable. For LMR 600 cables, install EZ-600 N-type male connectors. For LMR 400 cables, install EZ-400 N-type male connectors. Steps for installing both types of connectors can be found in Appendix J. For reference, Appendix H also provides a list of vendors who can make cables.

The Cal and RF cables in the Combo and Split Chassis configuration have N-type male connectors at both ends. The Bundle Cable used with the TTA configuration has N-type male connectors at the antenna end, but the connectors used at the other end depend on the degree of lightning protection desired. Is only the built-in protection is used, the connectors at the BTS end are QMA male, but if the Ancillary surge protectors are used, the connectors at the BTS end of this cable are N-type male.

Figure 19: Connectors.



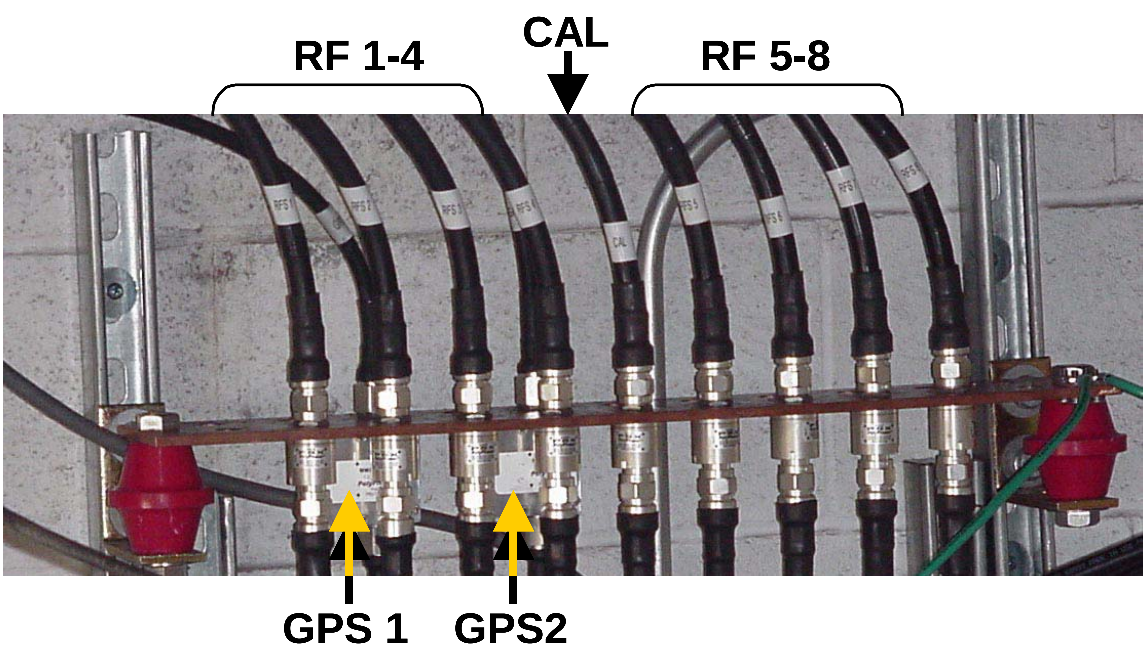
Sweep RF Cables

Sweep each individual cable, the RFS (8) and CAL main feeder and jumper cables, to check for line loss. Follow the instructions for sweeping the cables provided in Appendix K entering the results in the RFS System Test Form. Check continuity of the data/power cable. When finished, cover the cable connectors for protection until they are connected to the RFS or GPS.

Connectorize & Run Cables

Connect all of the RF cables to the surge protectors in the system ground buss bar. An example of a buss bar connection is shown in Figure 14. Ensure that the proper cable is connected to the proper surge protector. Connect the power/data cable to its surge protector. Also connect all the jumper cables to the surge protectors that will attach to the BTS. Do not connect these cables to the BTS at this time. Torque all the cable connectors to the surge protectors on the system ground buss bar to 20-24 inch-pounds.

Figure 20: Buss Bar Connections



Route all of the cables – RFS (8), CAL, DATA/POWER and GPS (1 or 2) - between the system ground buss bar and the RFS, and GPS mounting sites. If running the cables up a tower, use a hoisting grip to lift the cables.

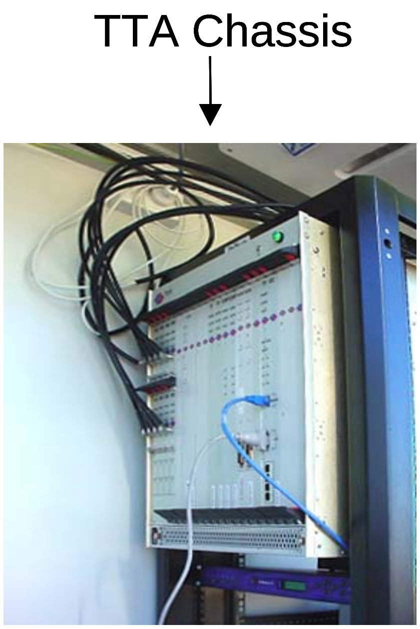
Install the BTS

Check all regulatory standards (refer to Chapter 1, Page 8 “Regulatory Information”) prior to installation.

Install Mounting Rack or Enclosure

The BTS mounting rack (Figure 22) or enclosure is to be installed in compliance with applicable portions of the National Electrical Code (NEC), articles 800 and 810. You will need to adhere to local installation standards, as well as Navini Networks standards and procedures. Refer to Appendix E for manufacturers of outdoor BTS enclosures.

Figure 22: BTS Mounting Racks



Install Chassis

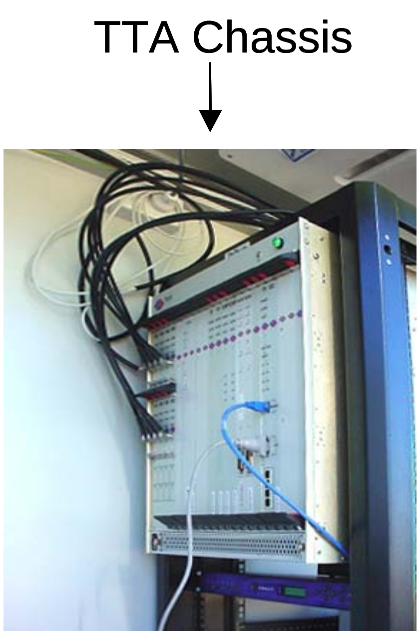
There are three types of BTS chassis: Combo, Split and TTA (Figure 23). Prior to Ripwave Release 1.19 (2.4 GHz systems), only the Combo Chassis was used, but with the licensed bands (2.3, 2.5, and 2.6 GHz systems) it is allowed to transmit at higher levels of power, which required better air circulation. This resulted in the introduction of the Split Chassis.

The recently introduced Tower Top Antenna (TTA) chassis, consists only of a digital shelf because the PAs are incorporated into the base of the RFS. Notice that the TTA digital shelf includes 8 new additional cards called RF Converters or RFC.

> **CAUTION**! - Please contact Navini Technical support before attempting to exchange cards between chassis of different type and frequency to verify compatibility.

> **CAUTION**! – In the TTA configurations, the RFCs output a +24 VDC current, which is carried to the RFS through the RF Cables. This DC current may damage test equipment connected directly to the RFC cards or to the end of the RF cables at the RFS. When connecting test equipment to the output of the RFC card, an external DC block may be required. Most signal generators and spectrum analyzers cannot handle DC voltage on the I/O ports. Please, read the caution stickers on the equipment and provide a DC block if the equipment cannot handle over "0"V DC.

Figure 23: BTS Chassis



Connect Input Power

Next, connect the power supply to the BTS card cage (Figure 24). The gauge of the wire is determined by the length of the run and by NEC/CEC standards (refer to Chapter 1, Page 8 “Regulatory Information”). Use a 60-amp circuit breaker when running the line. Terminate both of the input power wires and the ground wire with a ¼- inch terminal lug. Assuming a +24 VDC power supply, connect the +24 VDC input power connections and the +24 VDC return wires to the BTS card cage.

WARNING! Ensure that the power is off before connecting the input power wires to the BTS input terminals.

WARNING! Power supply range must be +24 ±3 VDC for TTA systems and +24 +4/-3 VDC for Non-TTA Systems.

If the input power is 120 VAC, plug the two power-supply input cables into 120 VAC outlets, and turn on the circuit breaker on the power supply. If the input power is 24 VDC, check for +24 VDC across the input terminals of the BTS card cage. If +24 VDC is not present across the input terminals, check all input power wiring for proper connections. Also, check the power supply for proper operation and the fuses for continuity.

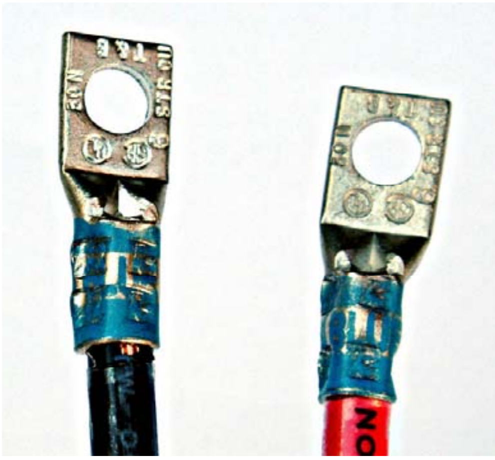
When finished, turn off the power supply.

A drawing of the non-TTA tri-sectored grounding is provided in Appendix M, and the power for the same type of system is shown in Appendix N.

Power-interconnect wires between the power supply/rectifier and the digital chassis must have heat shrink tubing applied over the barrel of the terminal lugs after crimping the wire. Refer to Figure 25 below.

Figure 25: Power-Interconnect Wires

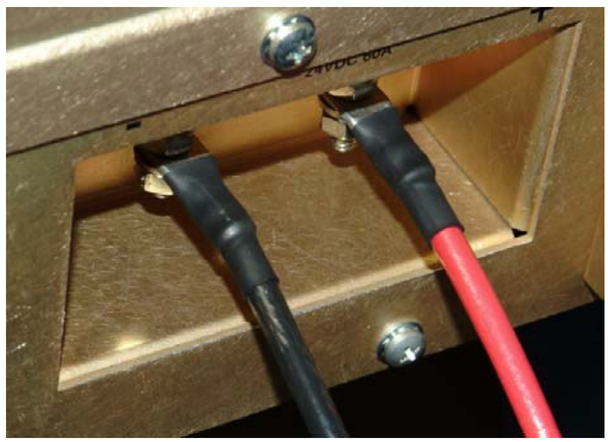
1. Install UL-Listed Terminals



2. Slide on heat-shrink tubing

3. Apply heat to shrink tubing

4. Install power cables



Cooling Fans

Visually inspect all fans to ensure that they are operating properly.

Connect BTS to Ground Connections

All connections need to be checked before power is applied to the system. At a minimum, perform the following:

- Ensure continuity across all ground connections.
- Ensure an open connection from the power supply output (positive input to the BTS card cage) to frame ground.

Check all regulatory standards (Chapter 1, Page 8 “Regulatory Information”) related to power and grounding. All power and ground conductors must be mechanically supported to avoid strain of the wires and connection points.

Connect Chassis Alarms

The chassis contains two connectors that are used to send alarm indications to the BTS when the BTS is housed in an outdoor enclosure. One of the connectors, labeled “CABINET ALARM”, is used to trigger alarm conditions that occur within the external chassis. The second connector, labeled “BBU”, is used to process alarms from a battery backup unit. Refer to Appendix L for instructions on connecting the alarms.

Install GPS Antennas

Check all regulatory standards (refer to Chapter 1, Page 8 “Regulatory Information”) prior to installation.

As mentioned earlier, the model of GPS antenna used with the Ripwave Base Station is the VIC 100, as shown in Figure 27.

Mount each GPS antenna module, run the cable through the pipe clamp mount. Connect the cable to the GPS antenna, then, weatherize the connection. Secure the antenna module to the pipe clamp mount using the captive mounting hardware. Install the GPS antenna module and the pipe clamp mount to the mounting pipe and tighten the two mounting screws.

Make sure that the total loss from the GPS antenna to the SYN card in the BTS (including main cable, jumper cable, splitter, lightning arrestor, etc.) does not exceed 11 dB.

The mounting location for the GPS antenna is determined during the site survey. When installing, ensure that the following requirements are met:

- The voltage measured on the coax cable at the point at which the GPS antenna unit is to be mounted (not at the rear of the BTS, but at the end of the cable run must be greater than 4.5 Volts.
- The GPS antenna is located to provide the widest view of the sky (objects such as buildings or trees can interfere with signals from the satellite).
- The number of satellites visible to the GPS antenna must be 6 or greater.

Install the RFS

Check all regulatory standards (refer to Chapter 1, Page 8 "Regulatory Information") prior to installation. Now that the BTS is in place, the RFS is readied for installation. Follow the Panel or Omni Antenna information and procedures below. Reference the specifications in Appendix D. Also reference the RFS List/Hoist Method in Appendix X.

Panel Antenna

The RFS Panel antenna is installed on a structure, such as a tower or a pole, which is defined in the site survey and design. Following are the steps to complete the installation of the panel antenna.

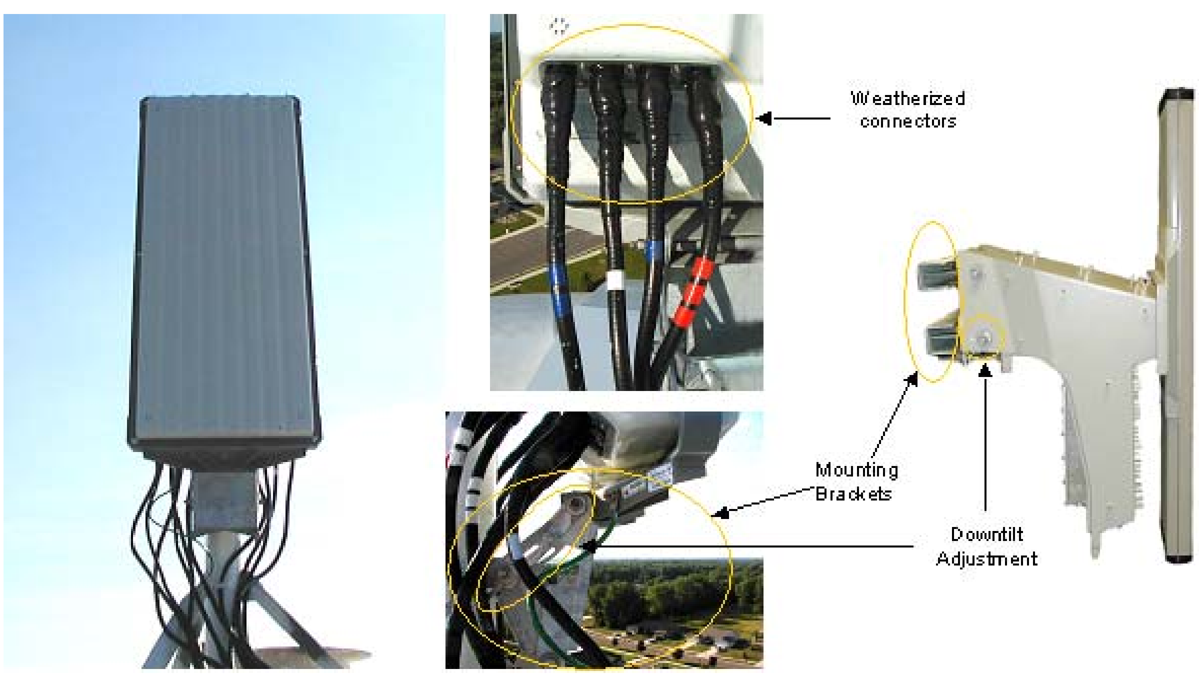
Verify RFS Operation

Verify proper operation of the RFS *before* installation. Test the transmit and the receive path of each antenna in the RFS per Appendix O, and using the RFS System Test Form in Appendix K.

Set the Downtilt

Check the engineering study for the required downtilt of the antenna. The panel antenna has 6^{o} of fixed electrical downtilt but it can be mechanically adjusted for an uptilt of 0 to 10^{o}. As a result, the main lobe of the beam can be pointed between 4 degrees above and 6 degrees below the horizon.

Figure 28: Panel Antenna Elements



Omni Antenna

An Omni antenna has 2 degrees of fixed electrical downtilt

Set the Azimuth

Position the RFS on the mounting pole or structure, ensuring that the antenna is pointing in the proper azimuth direction determined by the engineering study. For an omni, the first antenna element must face East (Figure 30).

The azimuth direction is stated in degrees from true North. Use the diagram shown in Figure 31 to determine the declination angle for your location. Add or subtract the declination angle from magnetic North to obtain true North.

Tighten the four nuts on each of the two antenna mounting brackets to secure the RFS to the mounting pole. Use a compass to check the direction from the center of the panel (this is magnetic North). Be sure that you are using a compass calibrated for the geographical region where you are. There are five such regions and a compass calibrated for one of them will not work properly in the others.

Since this is not the year 2000 anymore, you will want to check this reference map to learn how your magnetic declination shifts from year to year. Notice that the map measures annual shifts in minutes. Since it takes 60 minutes to equal 1 degree, if you notice that your location has a declination shift of 5 minutes per year, this means it will be another 12 years before your declination adjustment changes by one whole degree. The following web site provides more details on how to use these charts: **http://www.thecompassstore.com/decvar.html**

Verify the Downtilt

Using an inclinometer (Figure 32), check the downtilt of the RFS antenna. If required, adjust the angle using the downtilt adjustment brackets. Be sure to include any electrical uptilt or downtilt built into the antenna in the setting.

Tighten the mounting hardware to secure the RFS in the proper position. Recheck the downtilt angle again to verify proper position. Repeat the procedure for all other antennas that are installed in the system. Ensure that they are mounted in the proper direction and with the correct downtilt angle.

Install Surge Protectors

If lightning protection is required, as determined by the customer, the power/data lightning arrestors must comply with UL497. Cables, such as the RF and power/data cables, in excess of 140 feet in length must have protective devices installed that are UL497A or UL497B listed.

The RFS has ten cable connectors on the bottom of the unit. Eight are antenna connections, with the connectors alternately numbered from right to left as shown in Figure 33. The two connectors in the middle are for antenna calibration and data/DC power connections. Install surge protectors on nine (9) of the RFS connectors – the eight antenna connectors and the calibration connector. The surge protectors must be installed directly to the RFS to provide protection for the antenna elements. Torque the surge protectors to 20-24 inch-pounds.

Figure 33: PolyPhaser PSX-ME Surge Protectors at the Antenna (RF and Cal Cables)

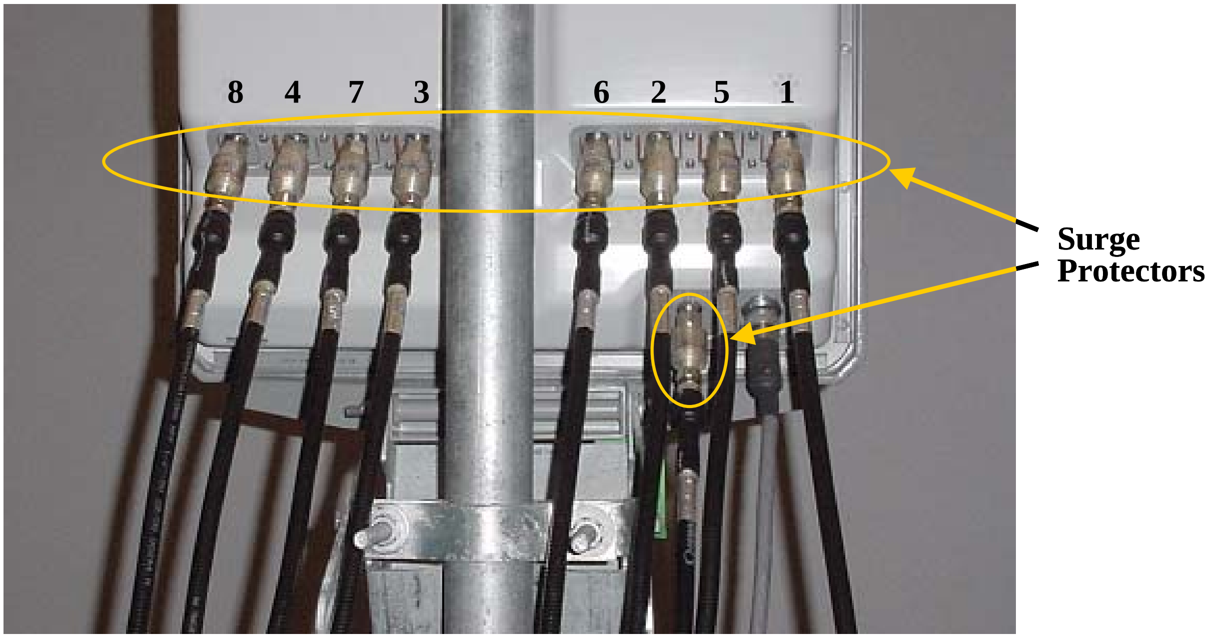
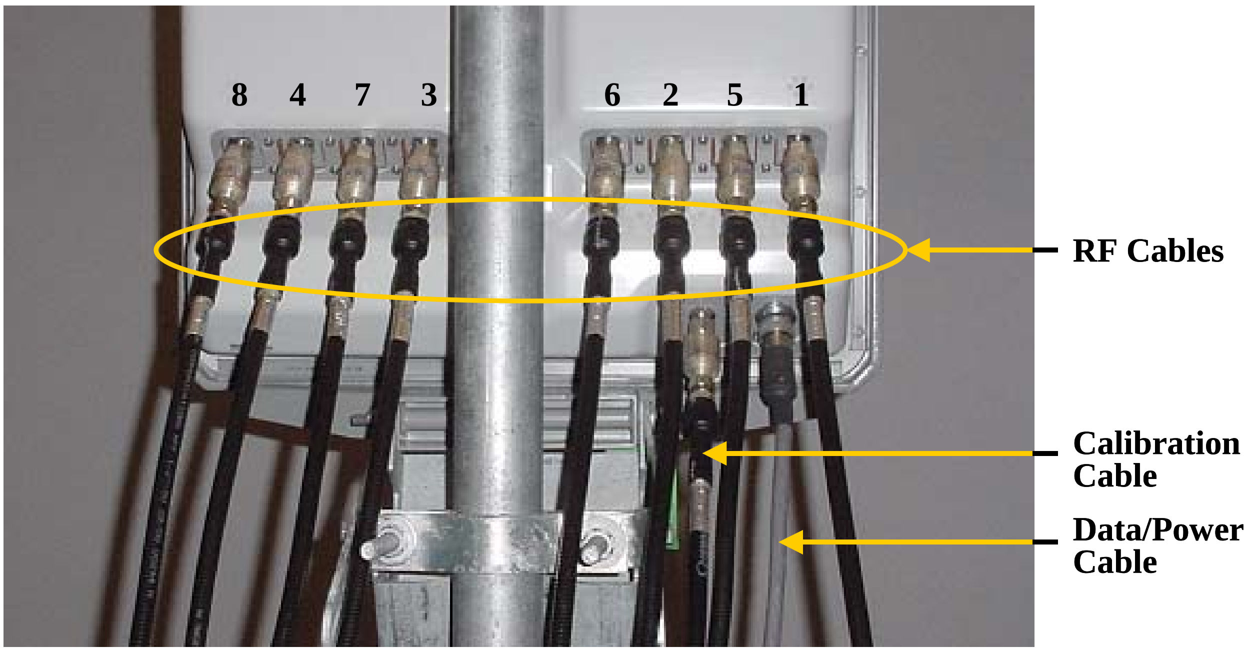


Figure 34: Surge Protectors

Install Cables Between the RFS & BTS

Connect all of the cables – the eight antenna cables, the calibration cable and the data/power cable – to the surge protectors on the RFS. For ease of installation, install the cables from the inside out. Ensure that the proper cable is connected to the proper antenna (Figure 35). Torque the RF cable connectors to 20-24 inch-pounds.

Figure 35: Completed Cable Installation at the Antenna



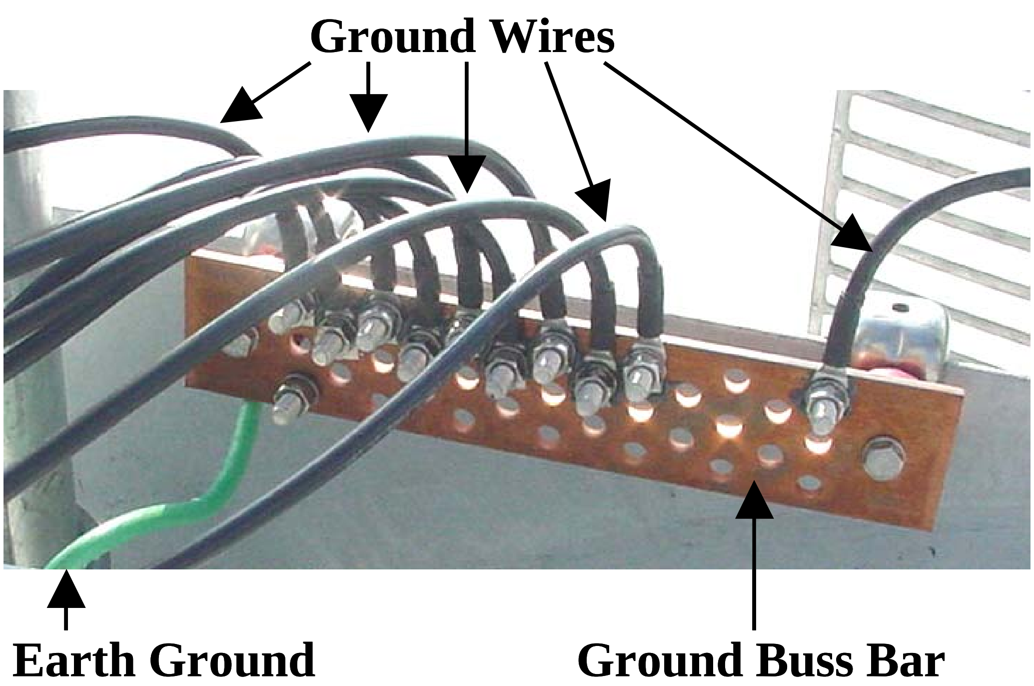
Install Grounding Kit on Cables

Install grounding kit wire connections on the eight (8) RFS cables and the one (1) CAL cable per the instruction sheet that comes with the grounding kit. Install the grounding wire in a position on the cable so that it can be attached to the ground buss bar that is mounted close to the RFS. More than one ground buss bar may be installed in the system, depending on the length of the cable run. Reference the Regulatory Information in Chapter 1, Page 8.

Connect Ground Wires to the Ground Buss Bar

Connect the ground wires on the cables to the ground buss bar using the hardware supplied with the grounding kit. Connect the ground stud on the RFS to the ground buss bar. Use a ¼-inch terminal lug to connect the ground wire to the ground stud on the RFS. Connect the ground buss bar to earth ground. Grounding from copper point to copper point shall be less than 1 ohm. Grounding from copper point to earth ground shall be less than 5 ohms. An example is shown in Figure 36.

Figure 36: RFS Grounding



Test the RFS & Cables

Test the RFS and the eight (8) cables using Appendix K, the RFS System Test Form. Record the results in the form. For this test, use the cable connectors that will be attached to the BTS. Include the jumpers and all surge protectors.

Weatherize the RFS Cable Connectors

Weatherize all ground wire connections exposed to weather using electrical tape and butyl mastic tape. Follow the instructions supplied with the weatherproofing kit. Examples are shown in Figure 37 and 38.

Figure 37: Weatherizing RFS Connectors Cables

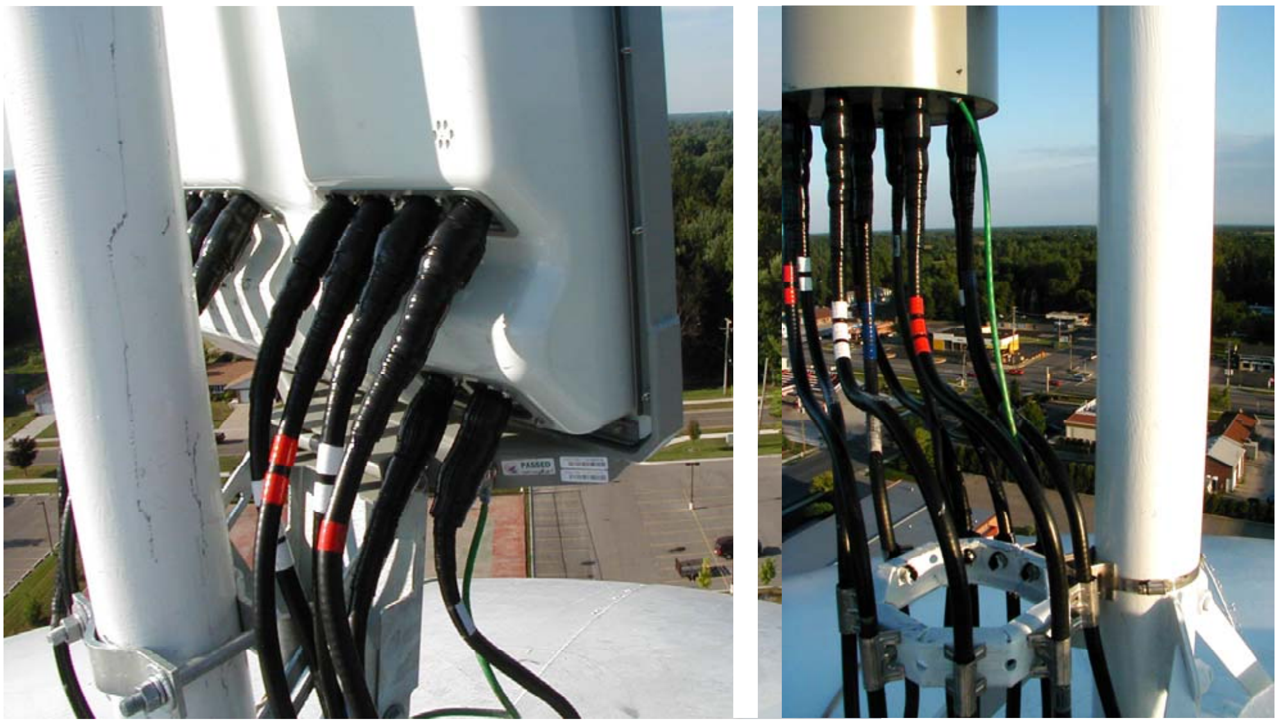
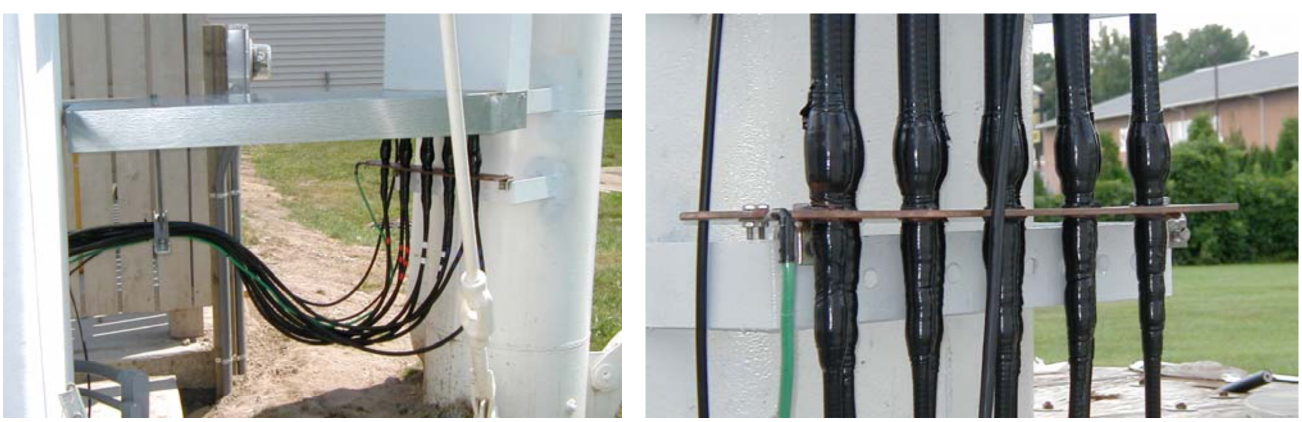


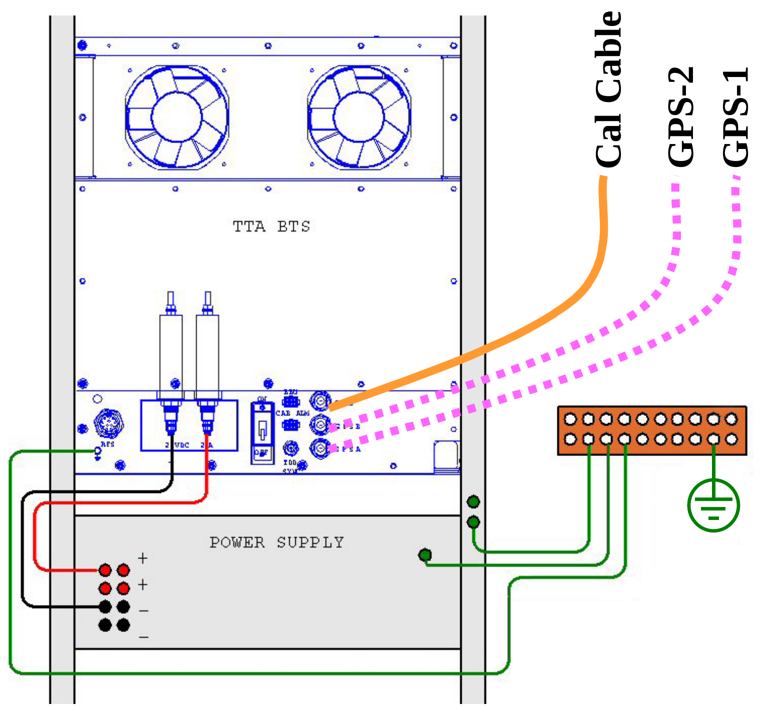
Figure 38: Weatherizing Ground Wires



Connect RF Cables & Alarms to BTS

Connect all of the cables to the BTS. The connection points are shown in Figures 39, 40, 41, and 42. Torque the cable connectors to 20-24 inch-pounds. If applicable, connect the cabinet alarm connector and Battery Backup connector (Cabinet Alarm and BBU) to the back of the chassis. More information on connecting alarms, rectifiers, and battery backup equipment are provided in Appendix L and Appendix F, respectively.

Figure 42: TTA Chassis Digital Shelf Rear View



NOTE: Do not ground the negative terminal of the rectifier for the TTA installation.

Omni Antenna

The RFS Omni antenna is installed on a structure, such as a tower or a pole, which is defined in the site survey and design. Following are the steps to complete the installation of the panel antenna. Refer to the Regulatory Information in Chapter 1, Page 8 prior to installing.

Assemble the Antenna Mount per the instructions that come with it (Figure 43). Use a compass to determine which direction is true East (incorporating declination angle - see Figure 31).

Position the Antenna Mount in a direction to provide accessibility to the RFS after it is installed. Position and install the Antenna Mount on the mounting structure so that any one of the eight mounting hole pins is facing East. Tighten the Antenna Mount hardware to secure it to the structure (Figure 44).

Sweep the RFS antenna inputs for dB loss. Record all results for later calculations. Position the RFS on the Antenna Mount, ensuring that the arrow on the bottom of the Antenna Mount faces true East. Secure the RFS antenna to the Antenna Mount (Figure 45). Install surge protectors on the 8 antenna and 1 cal connectors.
Connect the eight antenna cables, cal cable, and Data/Power cable to the RFS antenna. Attach the ground wire to the ground stud. Install grounding kits from RF cables to buss bars. Sweep the antenna and cables from the RF cable connectors that attach to the BTS. Record all measurements. Weatherize all connections (Figure 46).

Verify Installed Circuit Cards

WARNING! Ensure that power to the BTS chassis is off before installing the circuit cards or any of the RF Power Amplifiers in the chassis.

FUSES ARE NOT FIELD-REPLACEABLE. In case of need to replace a fuse on a CHP (F1), CC (F33, F17-32), SYN (F3), MDM (F1) or PA (F1) contact Navini Networks Technical Support

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

ATTENTION! Pour ne pas compromettre la protection contre les risques d'incendie, remplacer par un fusible du même type et des mêmes caractéristiques nominales.

CAUTION! - Please contact Navini Technical support before attempting to exchange cards between chassis of different type and frequency to verify compatibility.

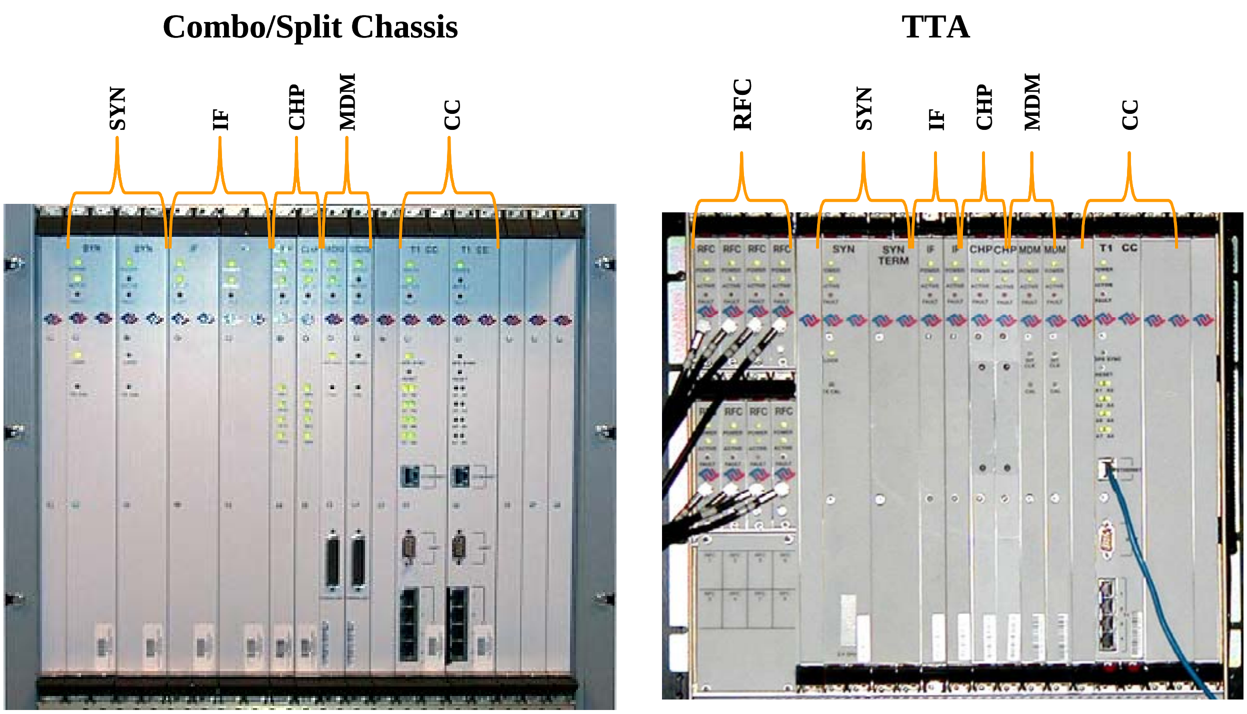
The circuit cards, including the RF/PA cards, normally come seated in the BTS chassis. If they are already installed, verify that the correct cards are placed and seated properly. The RF/PA modules may be installed in any position on the top (RF) shelf. For the Digital shelf, refer to Figure 47 for correct card placement. Table 4 describes the name of each type of card in the Digital shelf.

Tighten the screws to secure the RF/PAs into the RF shelf. For the circuit cards, follow the markings on the backplane for the position of each card in the Digital shelf. Make sure the ejectors on all cards are engaged in the chassis. Figure 46 represents a fully populated Digital shelf. If the BTS is not fully populated, blank panels are installed to fill in the empty card space. They are also used to fill in the empty space between the circuit cards and the end of the cabinet.

Table 4: Digital Card Names

Abbreviation	Card Name	Number of Cards
SYN	Synthesizer	1 or 2
IF	Intermediate Frequency	Always 2
CHP	Channel Processor	Always 2
MDM	Modem	Always 2
CC	Communications Controller	1 or 2

Figure 47: Digital Shelf



Base Station Installation Certification

When the installation of the equipment is complete, the Base Station Installation Certification form needs to be completed and signed off by both the installer and the customer. A copy of the first part of this form (check-up list) may be found in Appendix O. The second part (serial numbers) is contained in the "I&C Closeout Tool" described in Appendix V.