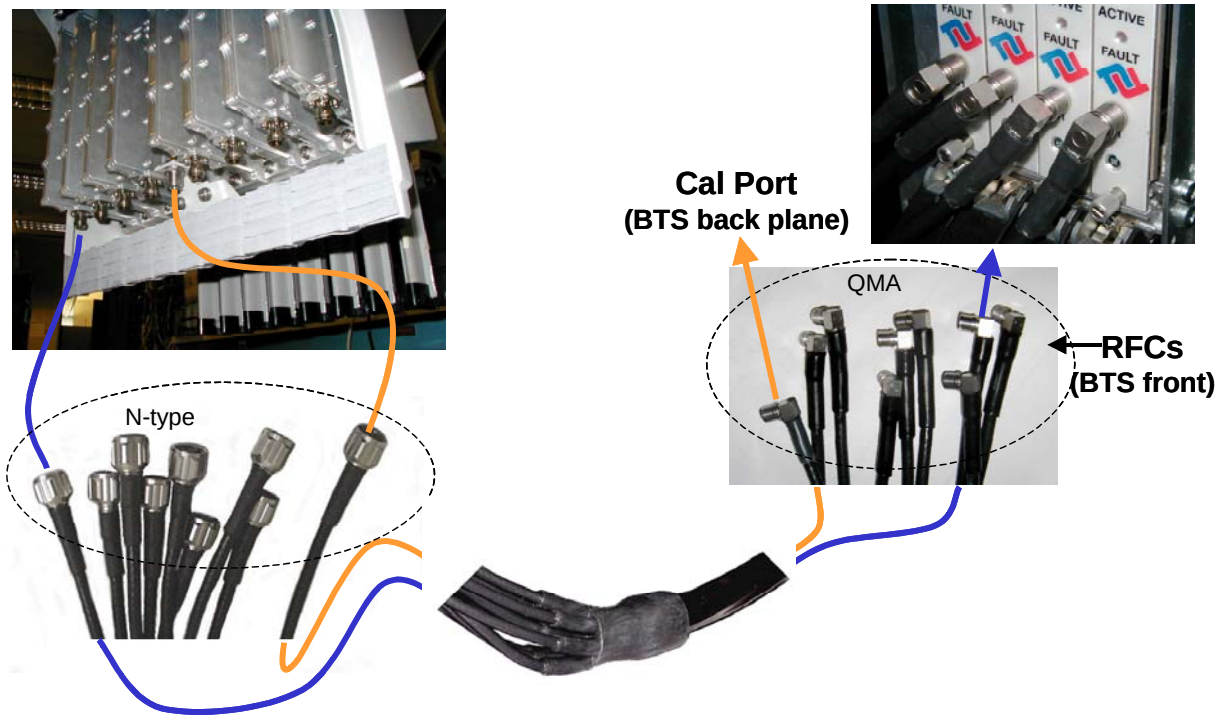
Bundle Cables for the TTA Configuration

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

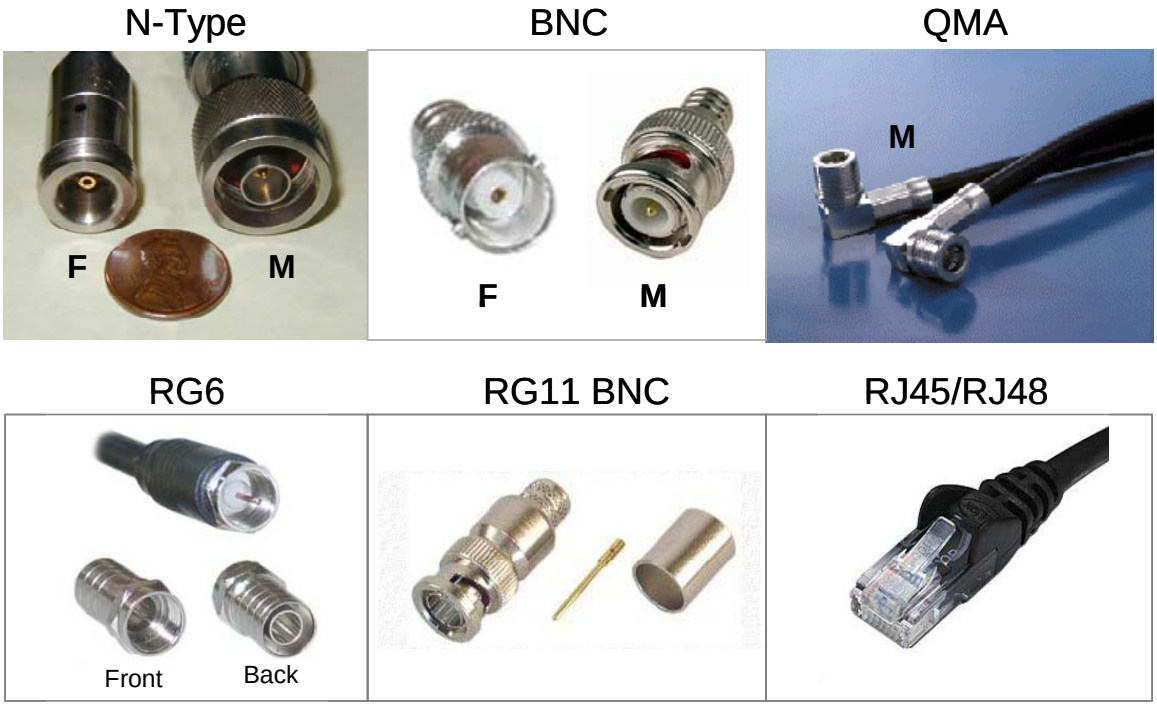


Install Connectors on Cables

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.



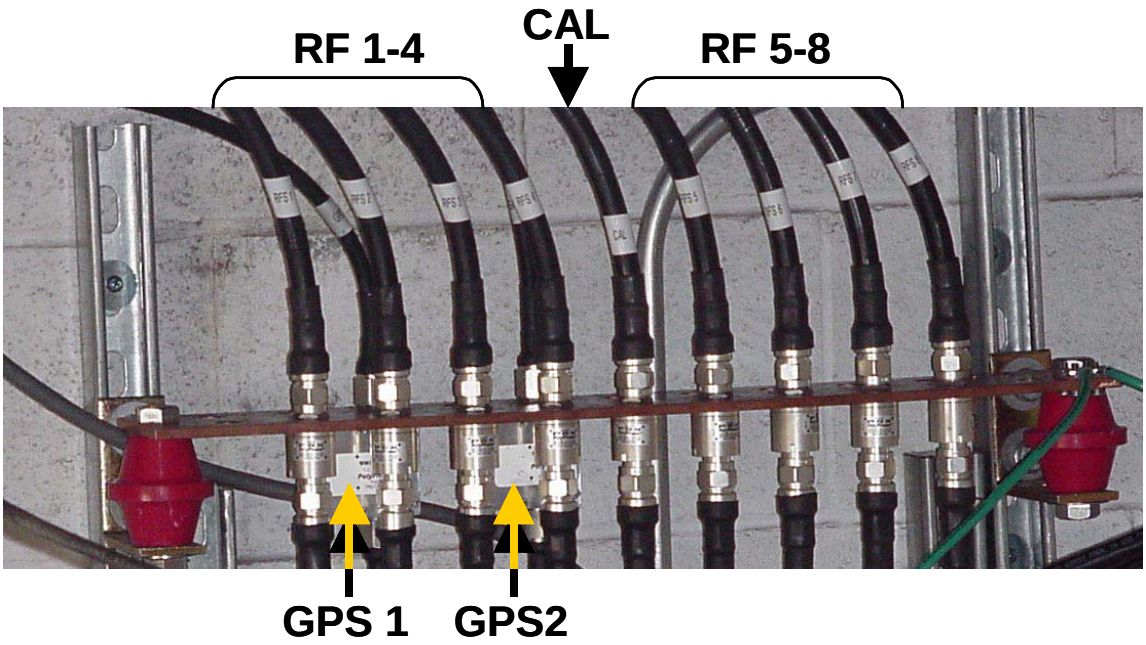
Sweep RF Cables

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.

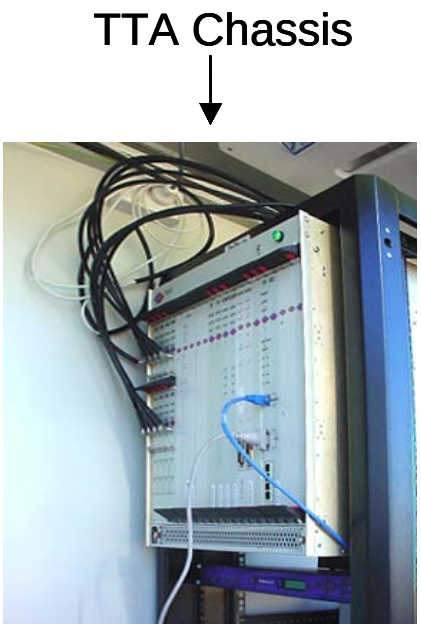
Install the BTS

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

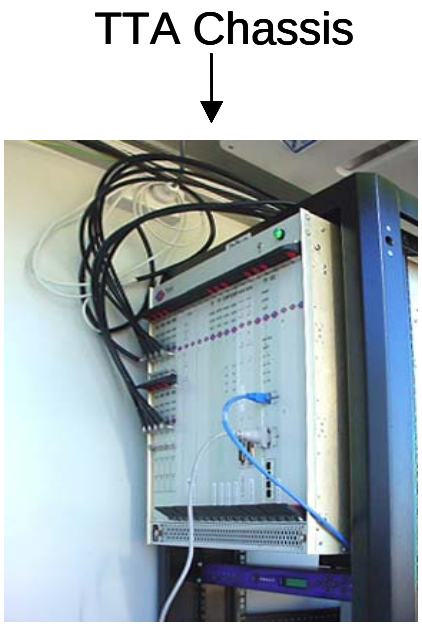
There are three types of BTS chassis: Combo, Split and TTA (Figure 23). Prior to Ripwave Release 1.19 (2.4 GHz systems), only the Combo Chassis was used, but with the licensed bands (2.3, 2.5, and 2.6 GHz systems) it is allowed to transmit at higher levels of power, which required better air circulation.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

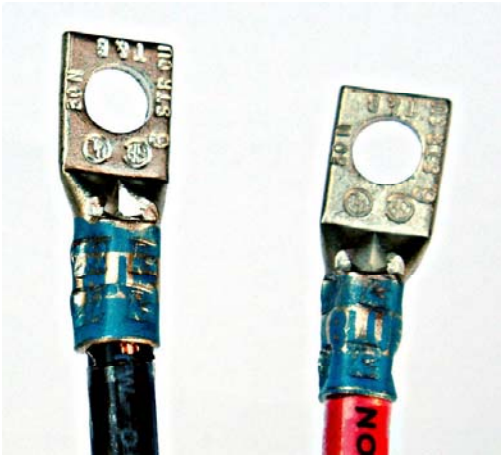
When finished, turn off the power supply.

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

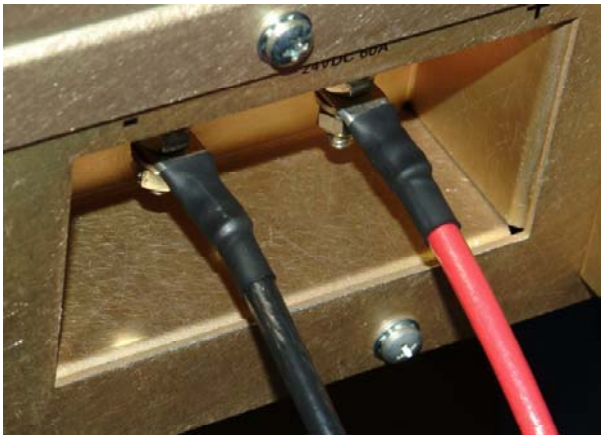
1. Install UL-Listed Terminals



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.

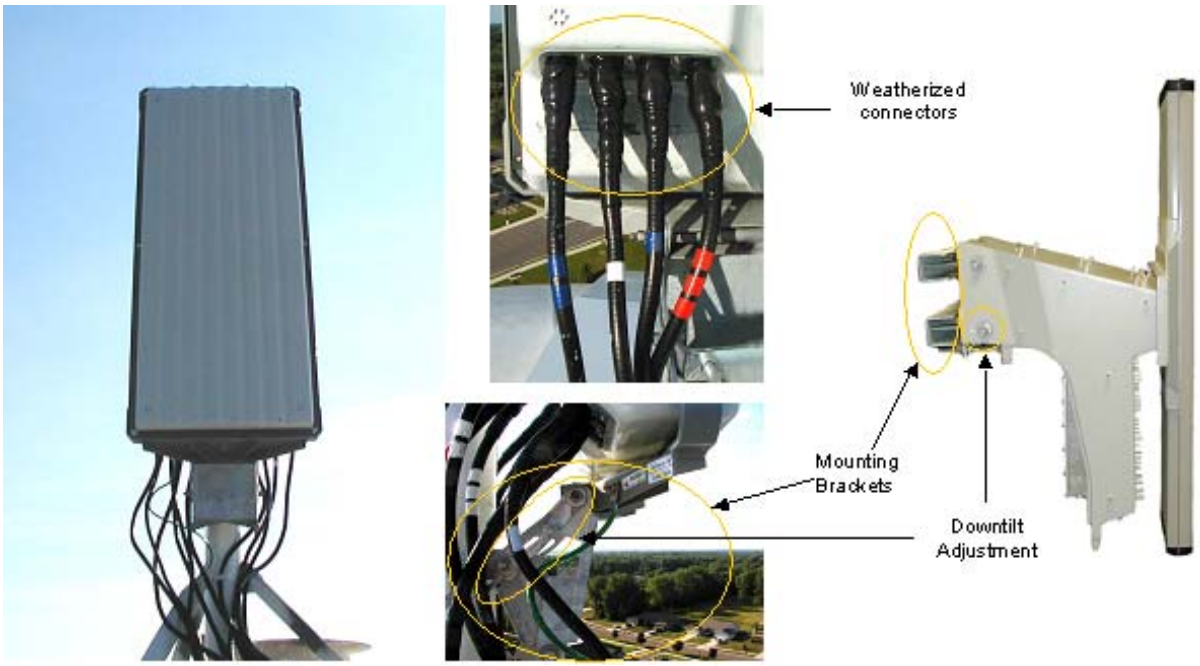
Verify RFS Operation

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)

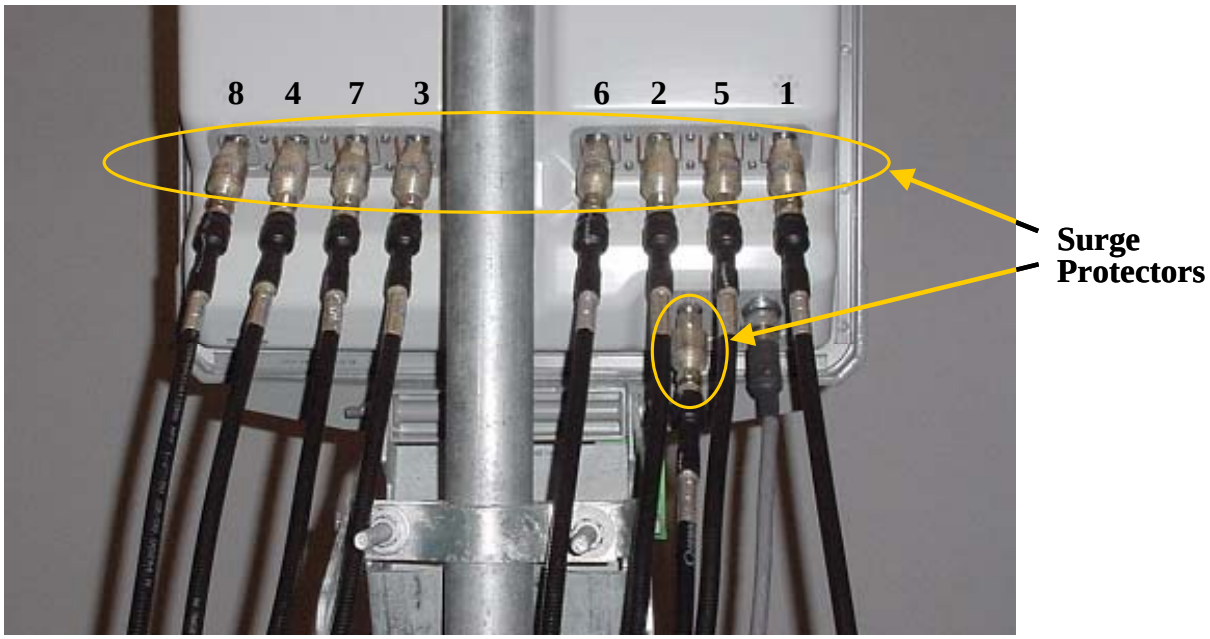
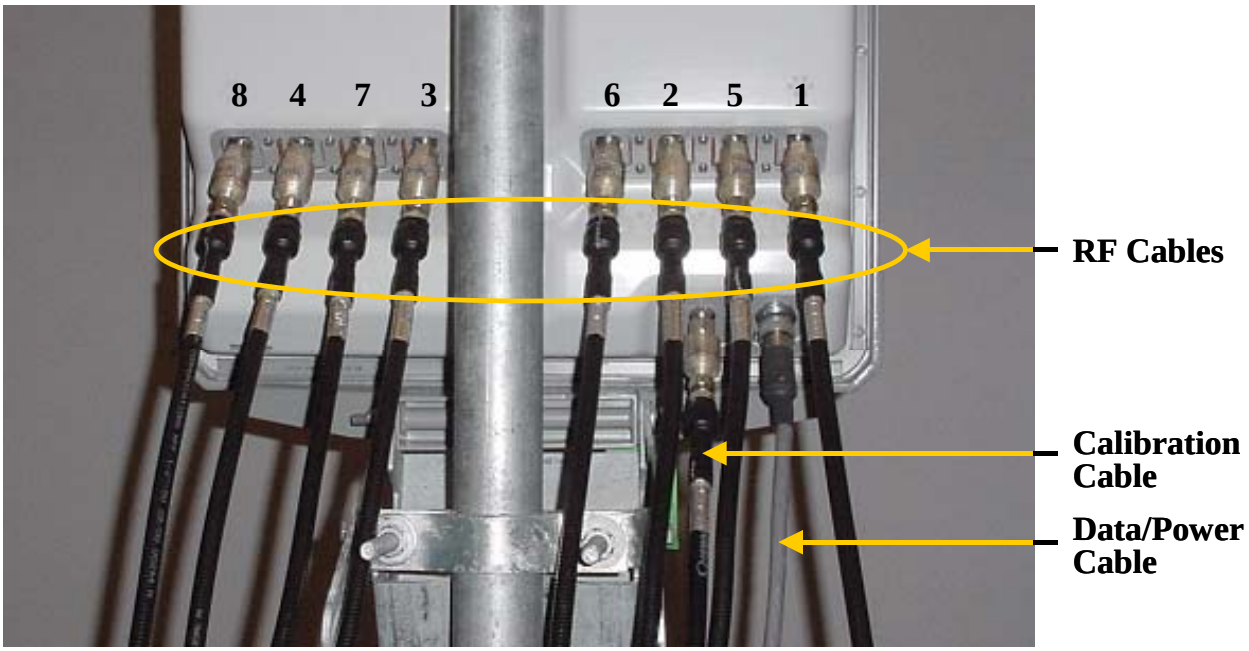


Figure 34: Surge Protectors

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



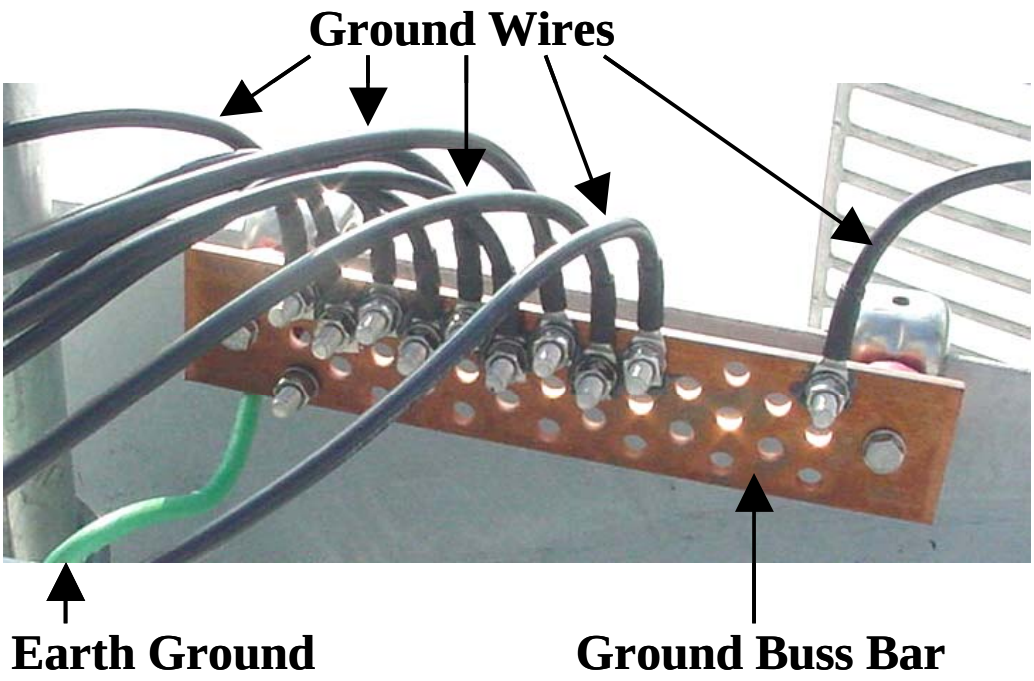
Install Grounding Kit on Cables

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

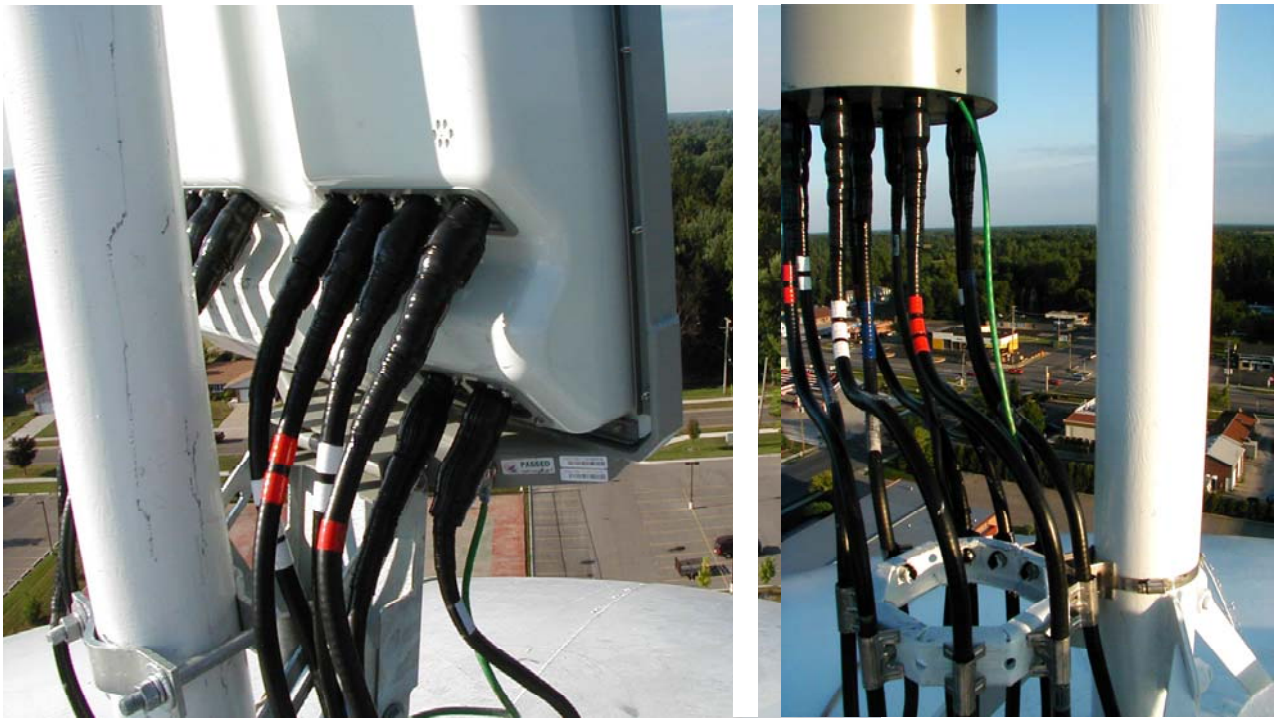


Figure 38: Weatherizing Ground Wires