

## 1.1 GPS Mounting Considerations

- The GPS Head requires specific mounting considerations in order to properly observe the GPS satellites. The mounting pipe for the GPS head should be mounted vertically with less than five degrees of tilt. It is recommended that the GPS head be installed using the supplied mounting mast and mounting hardware. Care should be taken to ensure that the GPS chassis does not come into contact with any metal surfaces.
- **Failure to properly isolate the GPS chassis from other conductive surfaces can lead to GPS head failure.**
- The supplied mounting hardware has been designed to provide the required GPS chassis isolation.
- Position the GPS head to have an unobstructed view of the sky and to minimize the chance of debris (leaves, dirt, etc.) accumulating on the radome of the GPS head.
- The GPS head must have a clear view of the sky, preferably to within 10 degrees of the horizon in all directions.
- The total blockage of the sky (due to buildings, mountains, etc.) should be less than 50%.
- Place the GPS head as far away from the transmit antenna as possible to avoid RF Interference issues.
- Place the GPS head away from lightning rods, towers, or structures that attract lightning.
- GPS head damage is usually not the result of a direct lightning strike, but of a lightning strike on a nearby structure. Also, since a lightning rod is connected to an earth ground, it can act as a shield and create a shadow that may block or reduce the signal from a satellite and the GPS antenna requires lightning protection.
- After the Base Control Unit (BCU) is powered up (approximately 15 minutes), check the GPS signal strengths using the AP Diagnostics Procedure .
- An optimal installation will have at least one satellite (SV) with an RSSI value 50, and at least four (4) satellites with RSSI values 45.
- A minimal installation should have at least four (4) satellites with RSSI values 40.

- The GPS head is rated for ambient air temperatures from –40°C (–40°F) to 75°C (167°F), and has ratings for humidity, shock, waterproof, UV light resistance, vibrations, salt fog, ESD, EMI, and altitude.
- The GPS cable used for the BCU is a combination of 6ft SMA-N cable, GPS SS and 50ft superflex cable which can be cut to length. Maximum overall cable loss should be less than or equal to 14dB.

## 2. RF GPS INPUT

### 2.1.1 Description

The BCU includes an optional, internal RF GPS receiver, located on the I/O board behind the Front Panel door. An SMA connector is provided for connection to the GPS antenna. DC power for the antenna is routed via the center conductor of the coaxial cable.

The BCU I/O board has an isolated power supply which provides power for both the internal RF GPS receiver and the antenna. This supply can be enabled/disabled by the Site Controller to power cycle the RF GPS system, if required. A maximum of 50 feet is permissible between the RF GPS antenna and the GPS Surge Suppressor and a 6 feet IF cable to the BCU.

### 2.1.2 Electrical Specification/Standard:

|  |                         |
|--|-------------------------|
| DC Voltage to GPS Antenna                | +5V                     |
| Maximum recommended antenna cable length | 150 ft ½ inch Superflex |
| Maximum cable loss                       | 14dB                    |

### 2.1.3 Connector Type/Diagram:

Type: SMA



### 2.1.4 Connector Pinout:

| Pin              | Description & Notes              |
|------------------|----------------------------------|
| Center conductor | RF Signal; 5V DC feed to antenna |
| Outer conductor  | Ground                           |

The GPS status is monitored and alarmed.

### 2.1.5 RF GPS Surge Suppressor kit

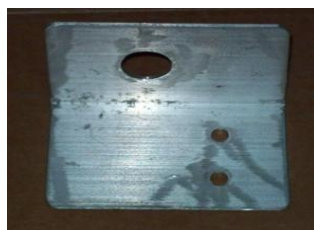
The surge suppressor kit for the RF GPS includes:



GPS surge



6 feet IF Cable



L- bar and Terminal Lug

### 2.1.6 Mounting considerations

When mounting the Local GPS Antenna consider the following items:

- The mounting pipe for the Local GPS head is mounted vertically with less than five (5) degrees of tilt.
- The Local GPS head requires a clear view of the sky, preferably within ten (10) degrees of the horizon in all directions. The more sky that is observed increases the number of potential satellites that can be tracked, resulting in better Local GPS performance.

- During normal operation, the Local GPS head continuously tracks a minimum of four (4) GPS satellites. However, it is theoretically possible to operate the BTS by tracking only one (1) GPS satellite. Motorola does not recommend tracking only one (1) GPS satellite unless there has been an accurate site survey.

- Place the Local GPS head where RF obstructions of the sky are minimal. The sky includes everything within ten (10) degrees of the horizon in all directions. RF obstructions include buildings, towers, natural rock formations, snow, foliage, and debris.

#### NOTE

The mounting of the Local GPS head on antenna towers is not recommended due to increased risk of damage by lightning strikes. If tower mounting is necessary, the Local GPS head is mounted at the lowest point possible and still maintain an unobstructed view of the sky.

- Separate the Local GPS head from other radiating sources. Excessive RF energy can degrade the ability of the Local GPS head to observe the GPS satellites. The Local GPS head receives on the GPS L1 frequency of 1575.42 MHz and incorporates filters to minimize the effects of potential RF interference. However, strong radiants can overwhelm the filters, thus degrading the unit's reception capability.

- The Local GPS head is rated for ambient air temperatures in the range -40°C to 50°C (-104°F to 122°F). It is also rated for humidity, shock, waterproofing, UV light resistance, vibrations, salt, fog, ESD, EMI, and altitude.

- An RF gain between +10 dB and +26 dB is provided to the Local GPS receiver antenna input. The GPS antenna supplied in the CGDSGPSTMG20NMS kit provides a nominal gain of +25 dB. The total signal loss from the CGDSGPSTMG20NMS antenna output and Local GPS antenna input must be less than 15 dB at 1.575 GHz.

#### 2.1.7 RF GPS Installation

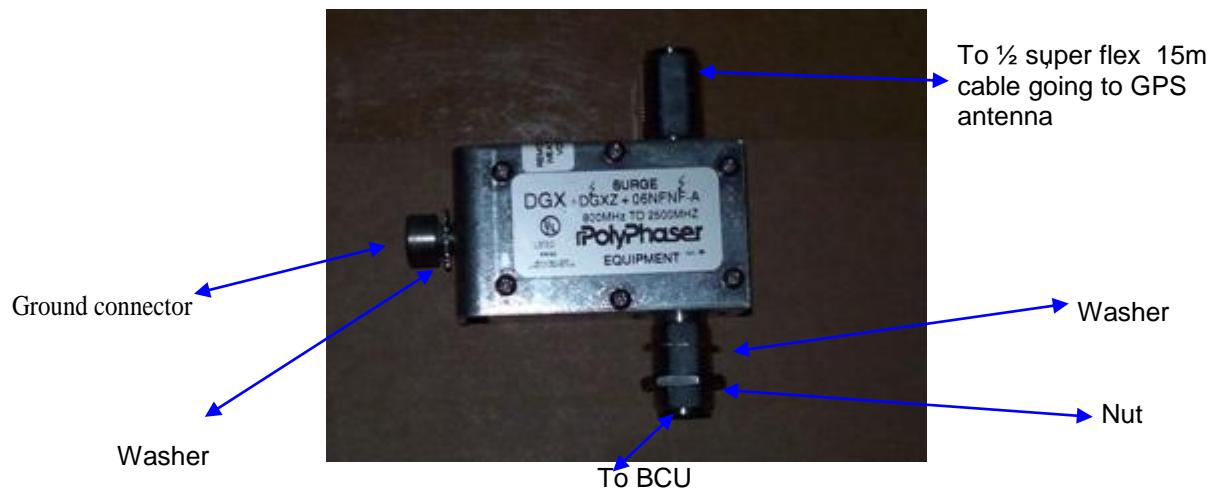
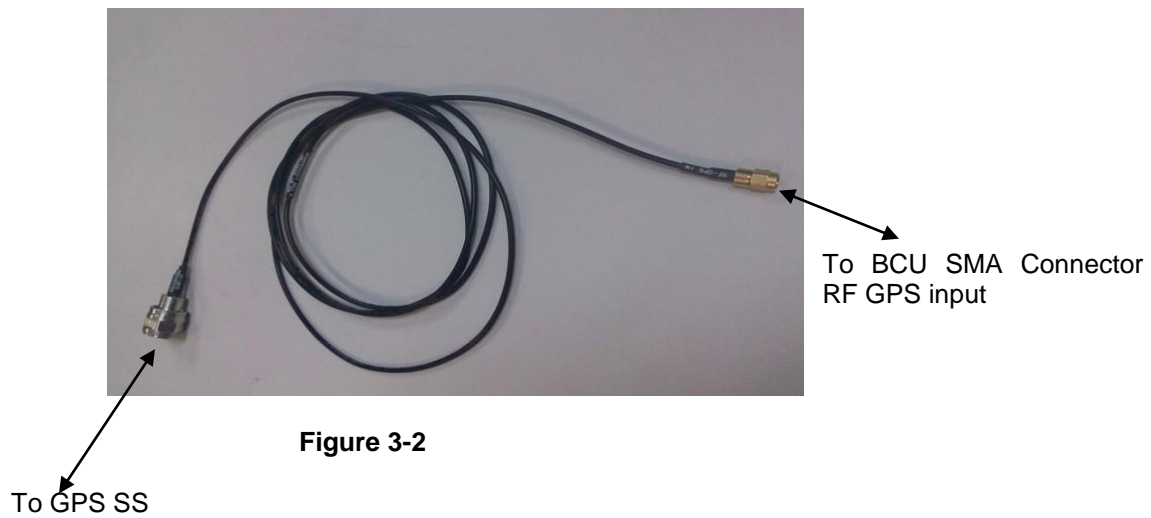


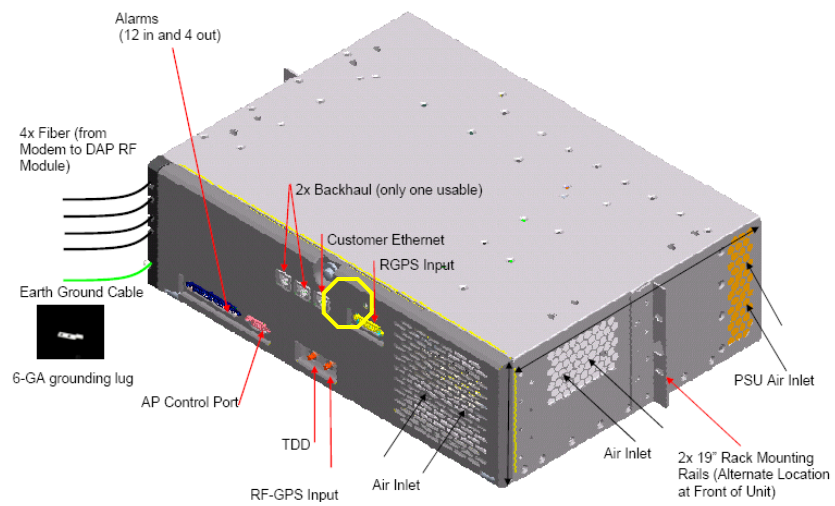
Figure 3-1



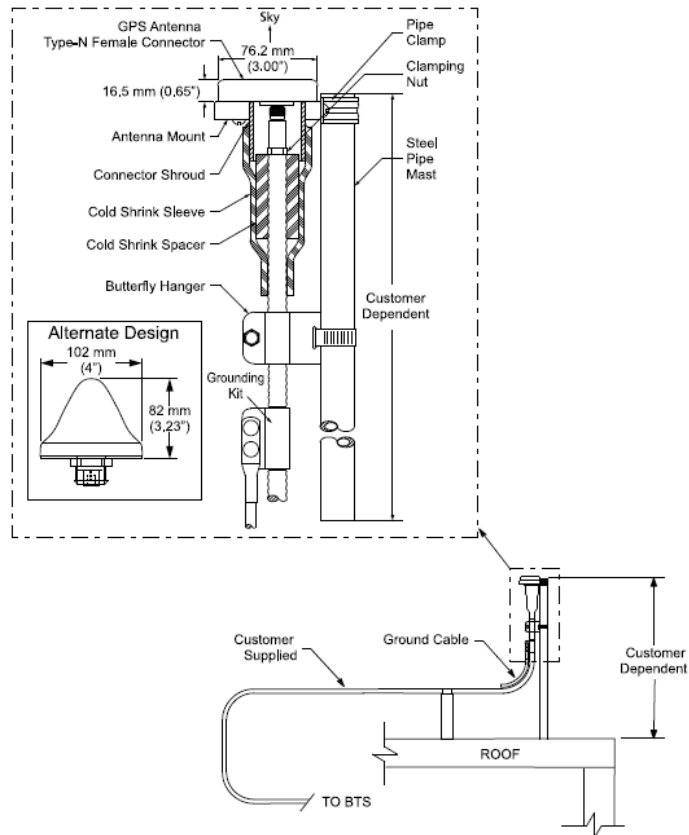
**Figure 3-2**

### Indoor BCU II Interfaces

**MOTOwi<sup>4</sup>**



**Figure 3-3**



**Figure 3-4**

### **GPS antenna assembly**

#### **2.1.8 Indoor RF GPS Installation ( from BCU to GPS SS)**

- 1** Connect SMA connector of the IF cable to the BCU RF GPS input. See figure 3-2 and 3-3
- 2** Route the IF cable to the cable guide at the right side of the cabinet. Connect the other end of the IF cable N-type connector to the GPS surge suppressor. See figure 3-2 and 3-1

Note: The GPS Surge Suppressor is located on the 19" rack or on the horizontal ladder of the cabin

- 3** Secure the IF cable with appropriate strain relief using tie wraps as necessary.

#### **2.1.9 Outdoor RF GPS Installation (GPS antenna to GPS surge: to be done at the field)**

- 1** Determine the mounting location. See Local GPS Mounting Considerations, Mounting considerations

**2** Install the mounting kit at the Local GPS location of choice. Use the appropriate mounting bolts for mounting surface.

**3** The roof structure on which the mounting pole is attached must be verified by a qualified structural engineer for the weight of the Local GPS engine and mounting hardware or under adverse conditions for the installation area.

Mounting the Local GPS antenna and hardware to an inadequate roof surface and/or using inadequate installation methods can result in serious injury.

**4** Attach the Local GPS antenna assembly to the mounting bracket and secure washer and custom nut supplied. See Figure 3-4

**5** Attach the grounding kit to the mounting pole with u-bolts and secure using washers and nuts supplied. See Figure 3- 4

**6** Connect one N-type connector of the 50 ft (15.24 m) superflex cable to the RFGPS antenna. Route the other end of the cable down to the GPS surge. Make allowances for strain relief.

**7** Secure the cable with appropriate strain relief using tie wraps as necessary.

**NOTE:** Consult site documentation for local electrical code.

### **3. REMOTE GPS (RGPS)**

#### **3.1.1 Description**

The BCU supports connectivity to an optional Remote GPS receiver via a DB 15 interface. The Remote GPS receiver may be located up to 2,000m from the BCU. Remote GPS is useful in lieu of RF GPS when distances from the BCU to the GPS antenna are greater than 50 feet, for instance, when the BCU is located indoors or inside of a building. There are three cable lengths offered to separate the R-GPS antenna from the BCU: 50 feet, 250 feet, and 1,000 feet.

#### **3.1.2 Electrical Specification/Standard:**

Data and sync signals conform to RS-485 standards.

#### **3.1.3 Connector Type/Diagram:**

Type: DB15



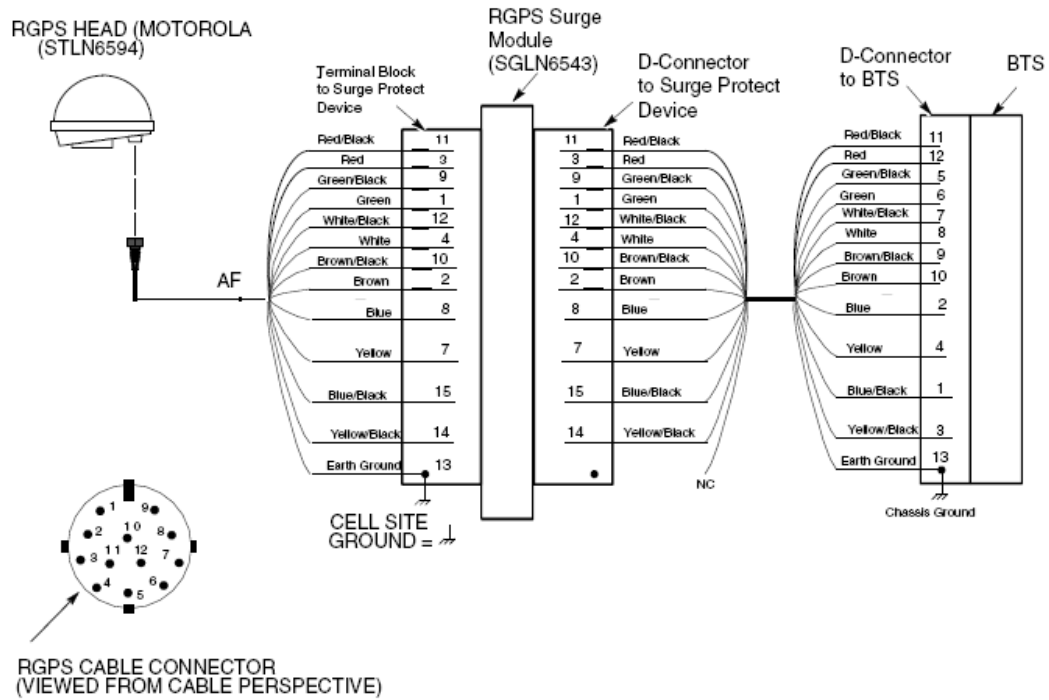
#### 3.1.4 Connector Pinout:

| Pin | Signal    | Description                           |
|-----|-----------|---------------------------------------|
| 1   | DATA_IN+  | Data from RGPS                        |
| 2   | SYNC_IN+  | 1PPS from RGPS                        |
| 3   | NC        |                                       |
| 4   | DATA_OUT+ | Data to RGPS                          |
| 5   | NC        |                                       |
| 6   | NC        |                                       |
| 7   | GPS_PWR   | Isolated 27 Volt power output to RGPS |
| 8   | GPS_PWR   | Isolated 27 Volt power output to RGPS |
| 9   | DATA_IN-  | Data from RGPS                        |
| 10  | SYNC_IN-  | 1PPS from RGPS                        |
| 11  | NC        |                                       |
| 12  | DATA_OUT- | Data to RGPS                          |
| 13  | NC        |                                       |
| 14  | GPS_RTN   | Return for 27 Volt power              |
| 15  | GPS_RTN   | Return for 27 Volt power              |

#### 3.1.5 RGPS cable installation

This section contains installation information on the Remote Global Positioning System (RGPS) cabling. Figure 4-17 shows the wiring for the RGPS.

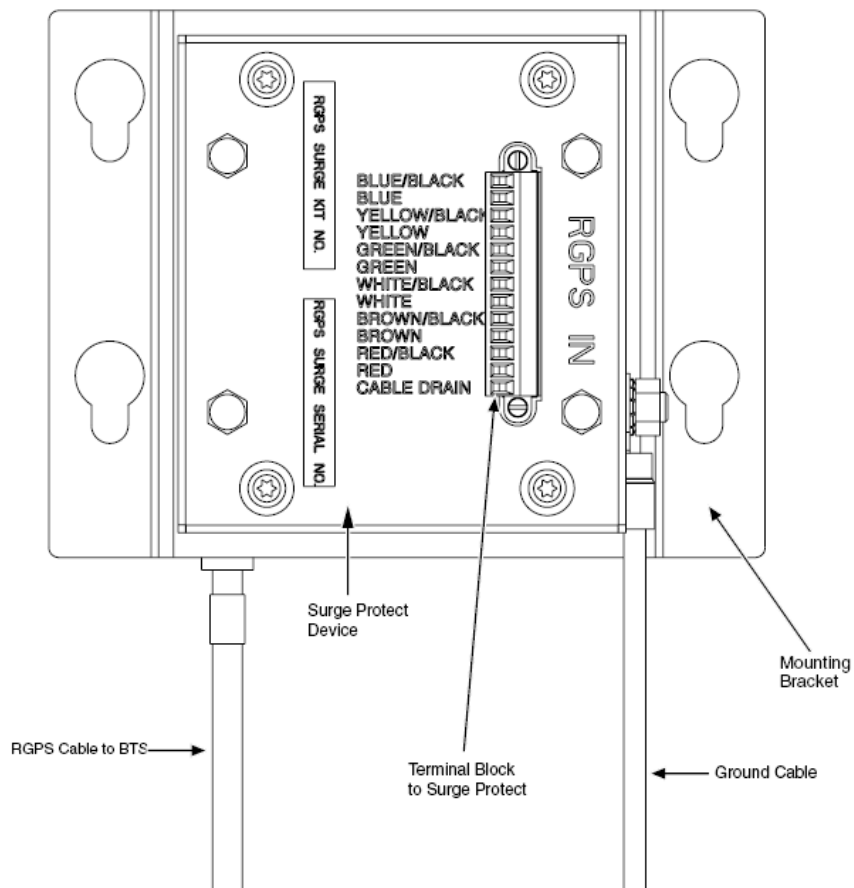




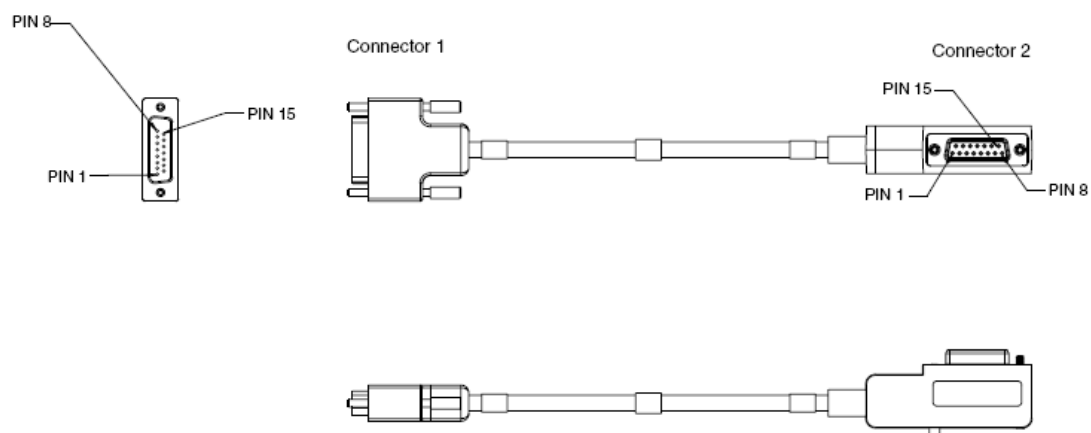
**Figure 4-17 RGPS cable connections**

When using the RGPS, the RGPS kit (**SGLN1944**) is required. The kit consists of the following main components and attaching hardware:

- RGPS Mounting Bracket (**PN 07010002001**)
- RGPS Surge Ground cable (**PN 3089759T02**)
- Surge Protect device (**SGLN6543A**)
- RGPS Cable (**PN 3015745A01**)



**Figure 4-18 RGPS surge assembly**



**Figure 4-19 RGPS surge to BTS cable**

#### **4. INSTALL PROCEDURES OF BCU RGPS HEAD AND CABLING:**

1) Determine the RGPS mounting location.

2) **WARNING:** Ensure that a qualified structural engineer verified the structure of the wall or tower.

Mounting the RGPS head and hardware to an inadequate wall structure and/or using inadequate instalment methods can result in serious personal injury. Use the appropriate mounting bolts for the mounting surface and install the two wall mounting brackets.

3) Route the 12-pin Deutsch connector end of the RGPS cable (AF) to the RGPS Head.

4) Connect the RGPS cable (AF) connector to the RGPS head 12-pin connector as shown in Figure 4-20. Tighten the spinning flange on the connector a quarter turn to secure the connection.

5) Install the RGPS mounting pipe into the mounting brackets. Tighten the U-bolt clamps to secure the assembly. Refer to Figure 4-17.

6) Route RGPS cable (AF) to RGPS Surge Protect Device location.

7) Attach the ground cable (PN 3089759T02) to Surge Protect device using M6 nut provided. Reference Figure 4-21 and Figure 4-22.

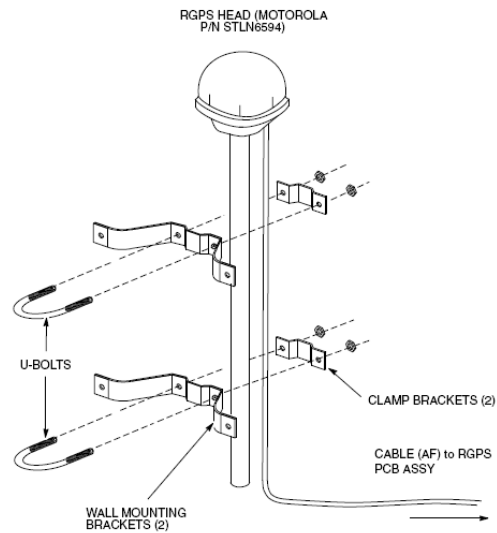
8) Attach RGPS Surge Protect Device to the RGPS mounting bracket. Secure Surge Protect device to RGPS mounting bracket using four screws. Reference Figure 4-23 and Figure 4-24.

9) Mount mounting bracket with Surge Protect device in a convenient location on the rack. Ensure that Surge Protect device ground cable is connected to Earth Ground.

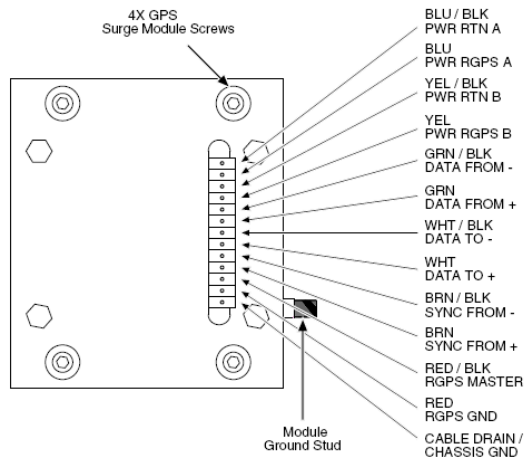
10) Connect the cable (AF) to the Surge Protect device on RGPS mounting bracket by terminating the wires into the terminal block provided. Match the wire colors with the colors listed on the Surge Protect Device in the sequence shown.

11) Connect Surge to RGPS cable (PN 3015745A01) between RGPS mounting bracket/Surge Protect Device to front panel of BCU. Refer to Figure 4-23 and Figure 4-24.

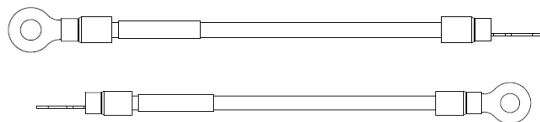
12) RGPS is connected. Secure cable with appropriate strain relief using tie wraps as necessary. Ensure that Fiber Optic and Earth Ground cables are installed and the front panel is latched closed.



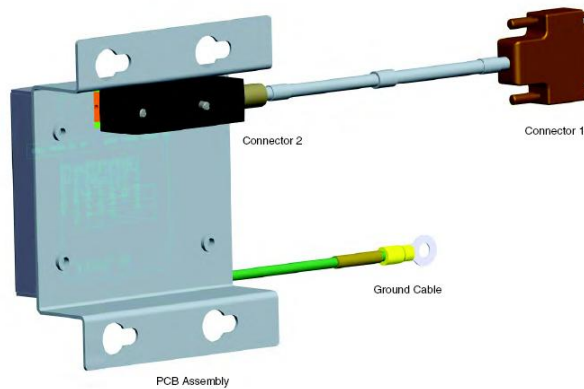
**Figure 4-20 RGPS head installation**



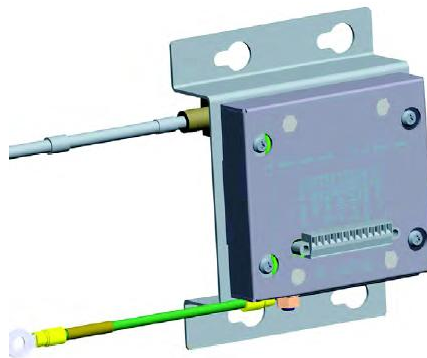
**Figure 4-21 RGPS surge protect device**



**Figure 4-22 RGPS surge protect device ground cable**



**Figure 4-23 Surge protect device and mounting bracket-rear**



**Figure 4-24 Surge protect device and mounting bracket-front**

## **5. CUSTOMER ETHERNET PORT**

### **5.1.1 Ethernet ports**

The Ethernet ports for the BCU are located on the front panel and are labeled ENET-A, ENET-B, and Cust. ENET. The following provides Ethernet port information:

- All three ports (ENET A, ENET B, and Cust) are operational.
- Redundant backhaul is not supported
- Only one port is used for the backhaul connection. Use either the ENET-A or ENET-B port, but not both, for the backhaul connection. Typically the ENET-A port is used.
- Do NOT connect more than one port (ENET A, ENET B, and Cust) to the same switch. ENET A, ENET B, and Cust ports are bridged by the BCU hardware. Connecting more than one port to a third party Ethernet switch creates an Ethernet loop.
- If the ENET A or ENET B port is connected to the backhaul, a device connected to the Customer port can connect to the backhaul network via the ENET A or ENET B port.