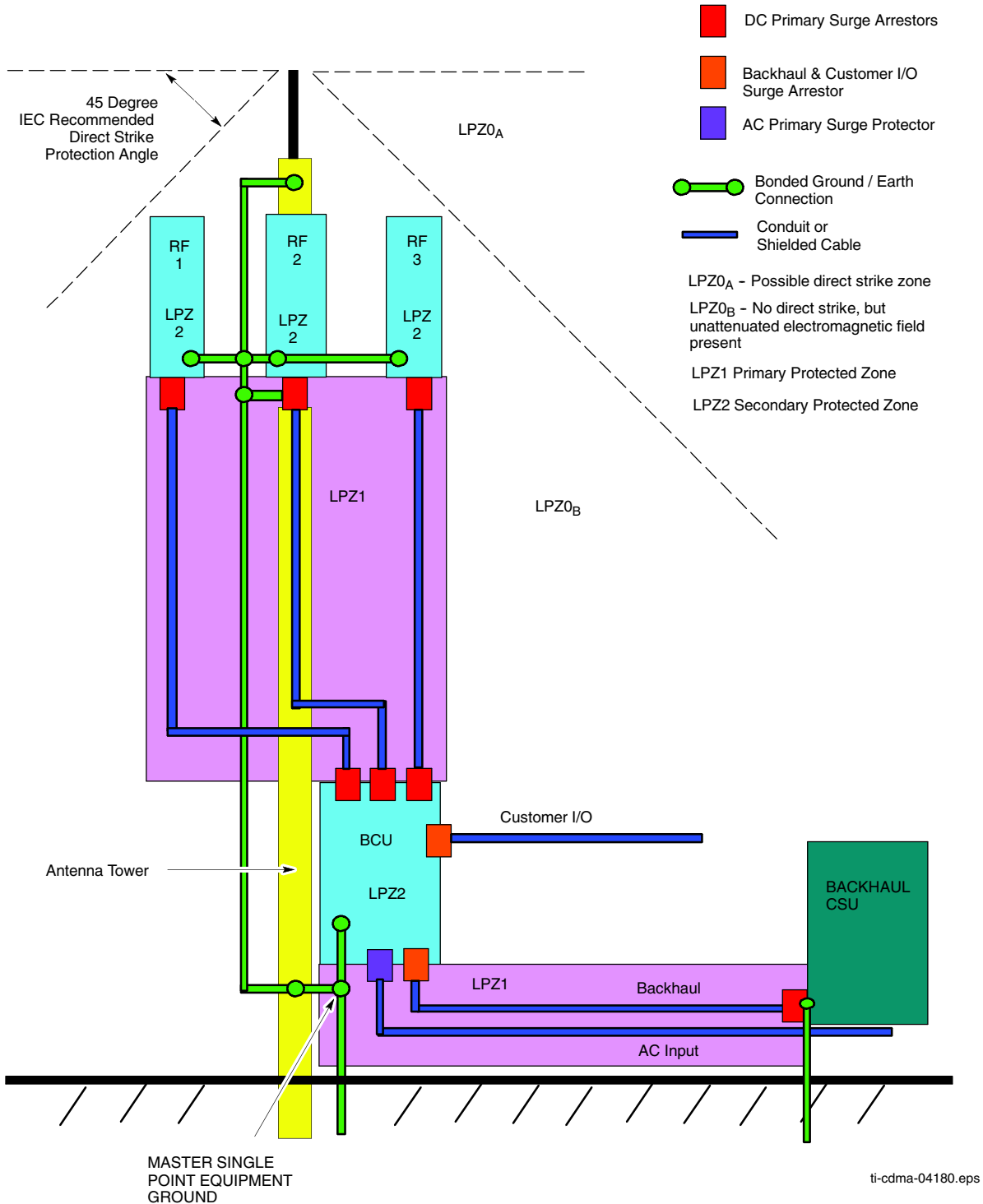


RGPS Grounding

Figure 4-6 Typical Outdoor Grounding Diagram



AC Power Cabling Installation

Objective

This section contains the procedure for installing the AC power cable.



CAUTION

This equipment uses dangerous voltages and is capable of causing death. Use extreme caution when handling and testing this equipment. Earth connection is essential before connecting the power due to the presence of high earth leakage current.

AC Cable Description

Cable E as listed in [Table 3-1](#) is required for this installation.



NOTE

The minimum bend radius for this cable is 90 mm.

Tools Required

The following tools are required to install the AC power cables.

- No. 2 Blade screw driver

AC Power Connection Procedure

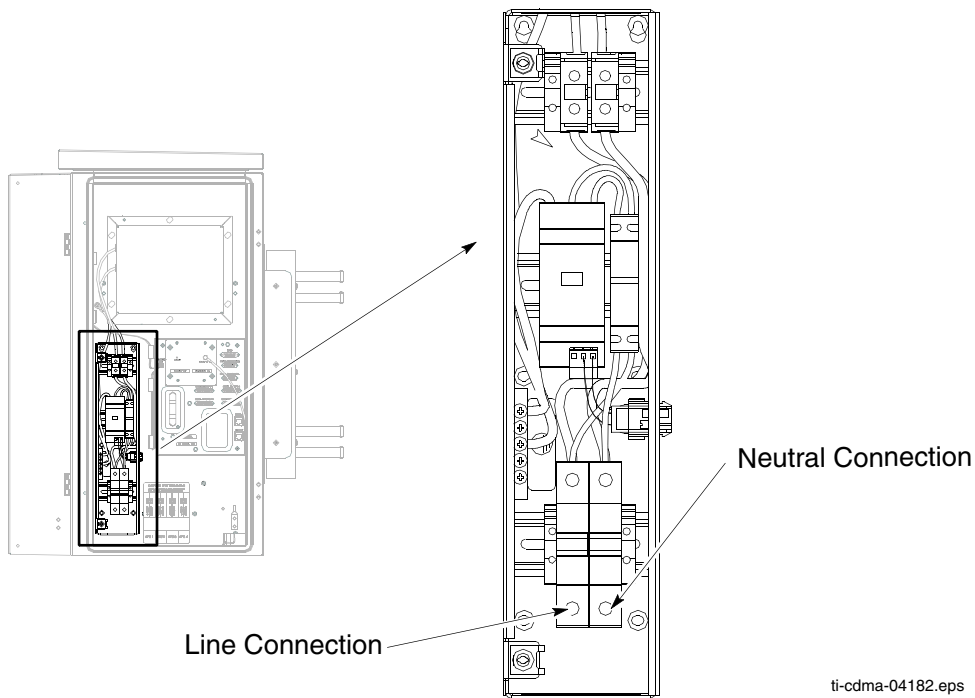
Follow the steps in [Procedure 4-4](#) to connect a 100/240 VAC (88–300 Vrms) Single Phase AC power cable to the Base Control Unit (BCU). The AC power cable will be routed through one and one-half inch conduit to the appropriate access hole on the underside of the BCU.

Continued

Procedure 4-4 Procedure to Install AC Power Cable

1	Ensure that AC power at the source is disabled before handling cable.
2	If not already done, route AC power cables through conduit to BCU Customer Interface compartment.
3	In the BCU Customer Interface compartment, open the AC power cover, by loosening two captive screws. AC Power cover is hinged.
4	Loosen screws on AC power circuit breaker terminal block. Insert AC power cables into LINE and NEUTRAL and tighten screws. Ensure a good connection.
5	Close AC power cover and secure by tightening two captive screws.

Figure 4-8 BCU AC Power Connection



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RF Head DC Power Cabling Installation

Objective

This section contains the procedure for installing the RF Head DC power cables.

DC Cable Description

Cable G listed in [Table 3-1](#) is required for installation

Tools Required

The following tools are required to install the DC Power cables.

DC Power Cable Installation

Follow the steps in [Procedure 4-5](#) to install the DC Power Cables.

Procedure 4-5 Procedure to Install DC Power Cables


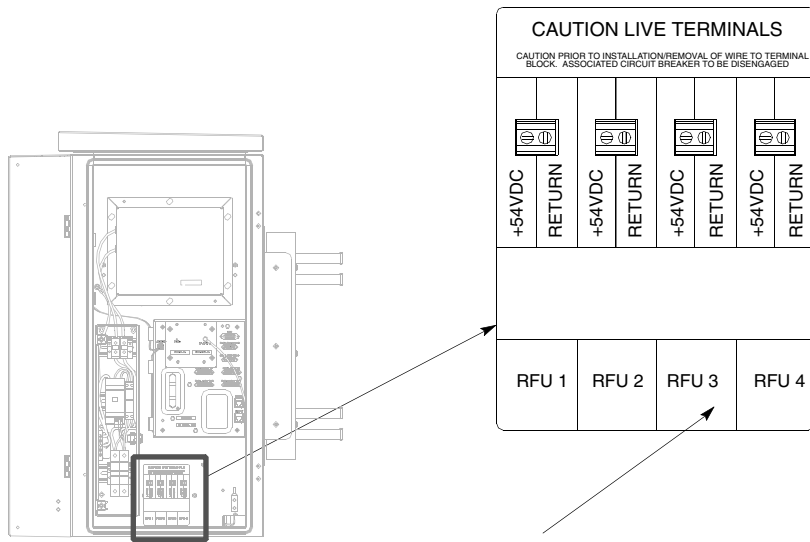
1	If not already open, open the BCU Customer Interface compartment.
2	<p>Before routing DC power cable, verify that it is properly color coded. If more than one RF Head in use, ensure that they are all properly color coded.</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>NOTE</p> <p>Color coded labels and tie-wraps can be found on the compartment side of the door of the BCU Customer Interface compartment. Tie-wraps should be attached near the connector.</p> </div> </div>
3	Connect the DC power cables to connector RFU1 — RFU4, as required.
4	Route the DC Power cables through conduit up to the tower. Bundle and secure the cables (if RF Head is not present) or connect to the appropriate RF Head.

Figure 4-9 Base Control Unit DC Power Connection



RFU 1, RFU 2, RFU 3, RFU4

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Antenna Cabling Installation

Objective

This section contains the procedure for installing the antenna cables.

Installing Antenna Cables

The antenna cables will already be installed between the antenna and the RF Head.

RGPS Cabling Installation

Objective

This section contains procedures for installing the Remote Global Positioning System (RGPS).

Cable Description

Cables C and C1 as listed in [Table 3-1](#) are required for installation.

Tools Required

Cable Pinout

Figure 4-10 Connector Pins Numbering for Cables C and C1

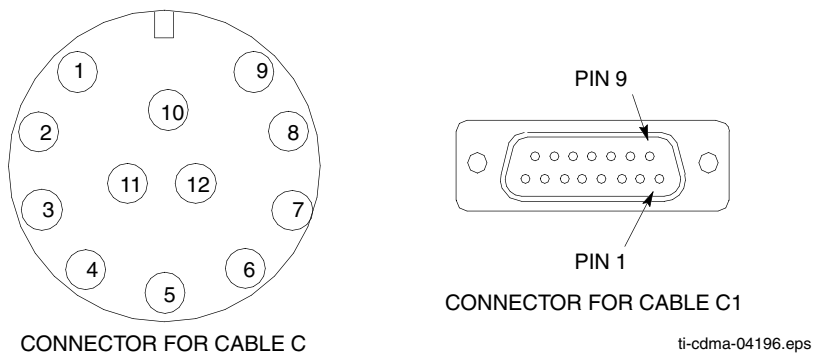


Table 4-4 Pinout for Cables C and C1

Cable C			Cable C1		
Pin No.	Signal Name	Wire Color	Connector A Pin No.	Signal Name	Connector B Pin No.
9	DC Ground 1	Blue-Black	15	RGPS Return	15
1	Power 1	Blue	8	RGPS +54V Supply	8
8	DC Ground 2	Yellow-Black	14	RGPS Return	14
10	Power 2	Yellow	7	RGPS +54V Supply	7
4	Transmit Port (-)	Green-Black	9	DATA (-) From Head	12
5	Transmit Port (+)	Green	1	DATA (+) From Head	4
2	Receive Port (-)	White-Black	12	DATA (-) To Head	9
3	Receive Port (+)	White	4	DATA (+) To Head	1
7	No Connect	Red-Black	No Connect	No Connect	No Connect
6	No Connect	Red	No Connect	No Connect	No Connect
12	PPS Timing (-)	Brown-Black	10	SYNC (-) From Head	10
11	PPS Timing (+)	Brown	2	SYNC (+) From Head	2

RGPS Installation


Figure 4-11 shows the RF GPS Head and Figure 4-12 shows the RGPS installation. Be sure to factor in mounting considerations as described in Chapter 3 Cable Descriptions.



CAUTION

The RGPS head must not make contact with any metal surface other than the provided hardware. Use only the equipment provided to mount the RGPS head. Failure to do so could damage the RGPS head.

Procedure 4-6 Procedure for Installing the RGPS Head and Cabling

1	Determine the RGPS mounting location.
2	 <h3>WARNING</h3> <p>The structure of the wall should be verified by a qualified structural engineer.</p>

Continued

Procedure 4-6 Procedure for Installing the RGPS Head and Cabling (Continued)

	Mounting the RGPS head and hardware to an inadequate wall structure and/or using inadequate installment methods can result in serious personal injury. Use the appropriate mounting bolts for the mounting surface and install the two wall mounting brackets. Refer to Figure 4-12 .
3	Route the 12-pin Deutsch connector of the RGPS cable (C) through the RGPS mounting pipe.
4	Connect the RGPS cable (C) connector to the RGPS head 12-pin connector as shown in Figure 4-12 and Figure 4-13 . Tighten the spinning flange on the connector a quarter turn to secure the connection.
5	Insert the RGPS mounting pipe into the threaded mount of the RGPS head and carefully hand-tighten.
6	Install the RGPS mounting pipe into the mounting brackets as shown in Figure 4-12 . Tighten the U-bolt clamps to secure the assembly.
7	Route the free ends of the BTS RGPS cable (C1) and RGPS cable (C) to the lightning arrestor. Remove any excess cable length and strip off approximately 15 cm of the cables outer insulation.
8	Connect the 12 individual connectors and cable drain of each cable end to the lightning arrestor as shown in Figure 4-14 . Double check the lightning arrestor connections for compliance with those presented in Figure 4-14 .
9	Route the RGPS cable from the lightning arrestor to the bottom of the BCU.
10	If not already open, open the Customer Interface compartment. If not already done, remove access hole cover.
11	Route the RGPS cable up through the access hole and connect to RGPS D-Connector.

Figure 4-11 RGPS Head

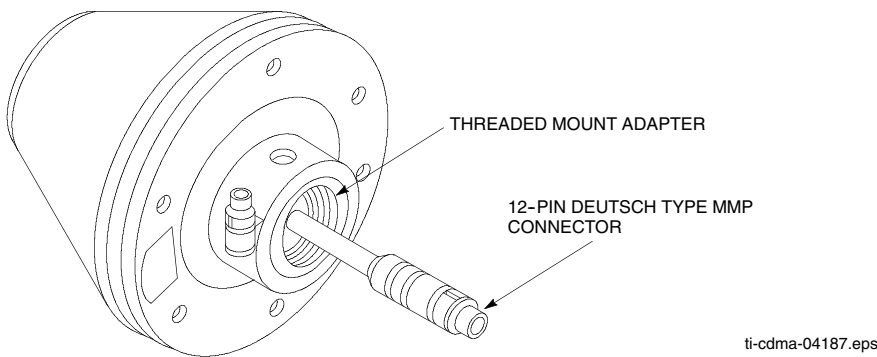
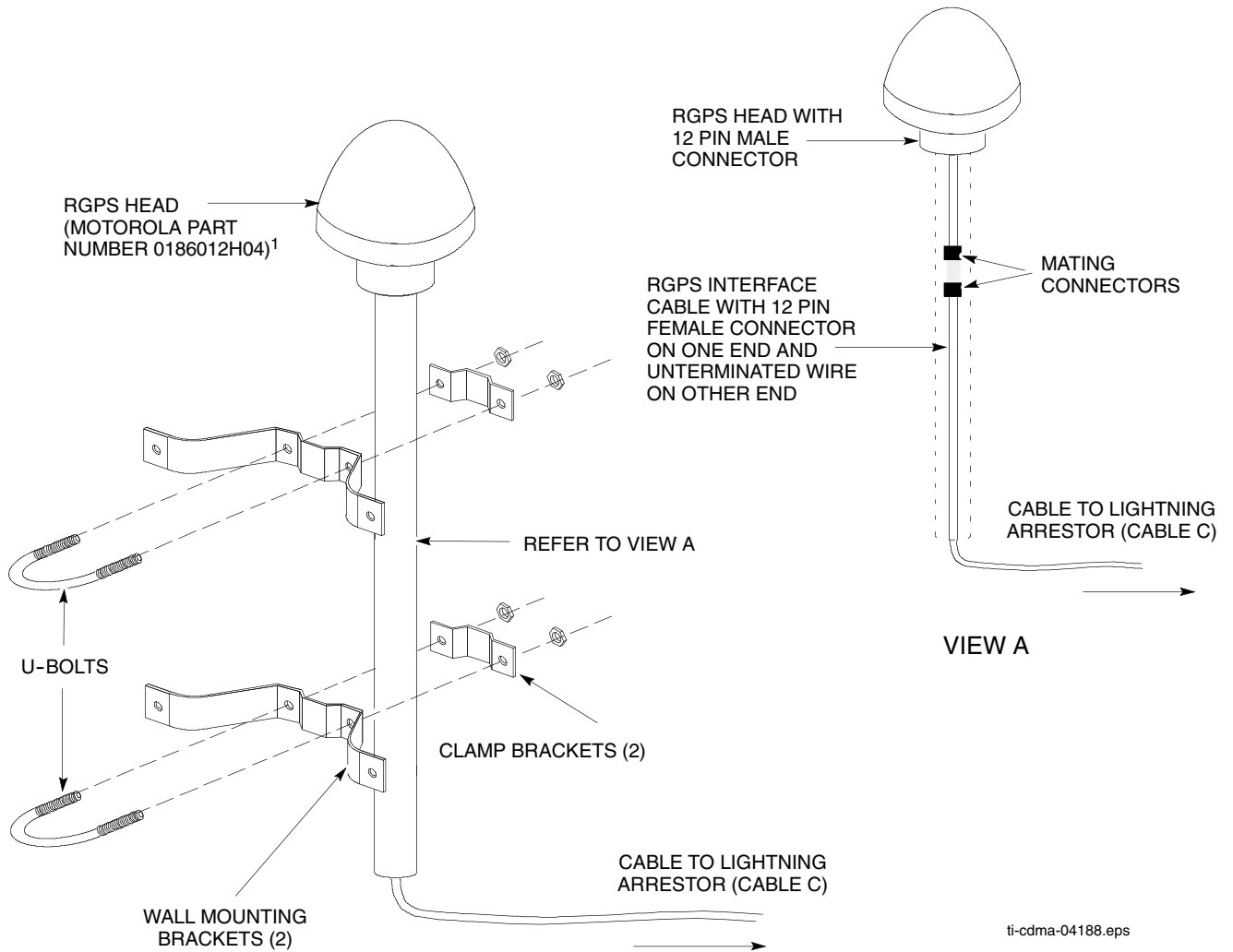


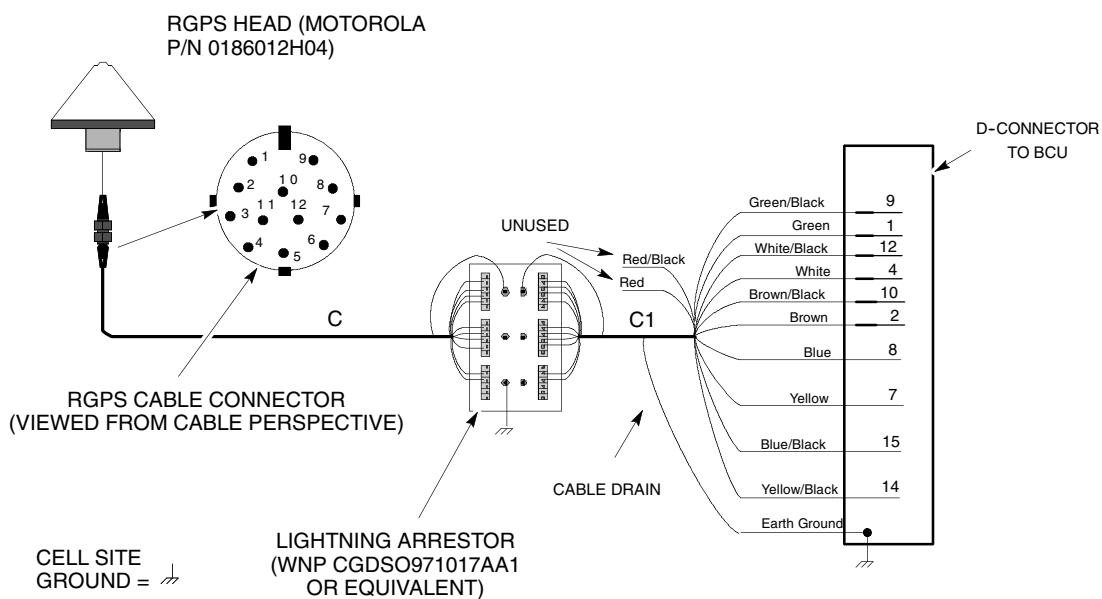
Figure 4-12 Installing the Remote GPS Head



Connecting the RGPS Cable to Lightning Arrestor

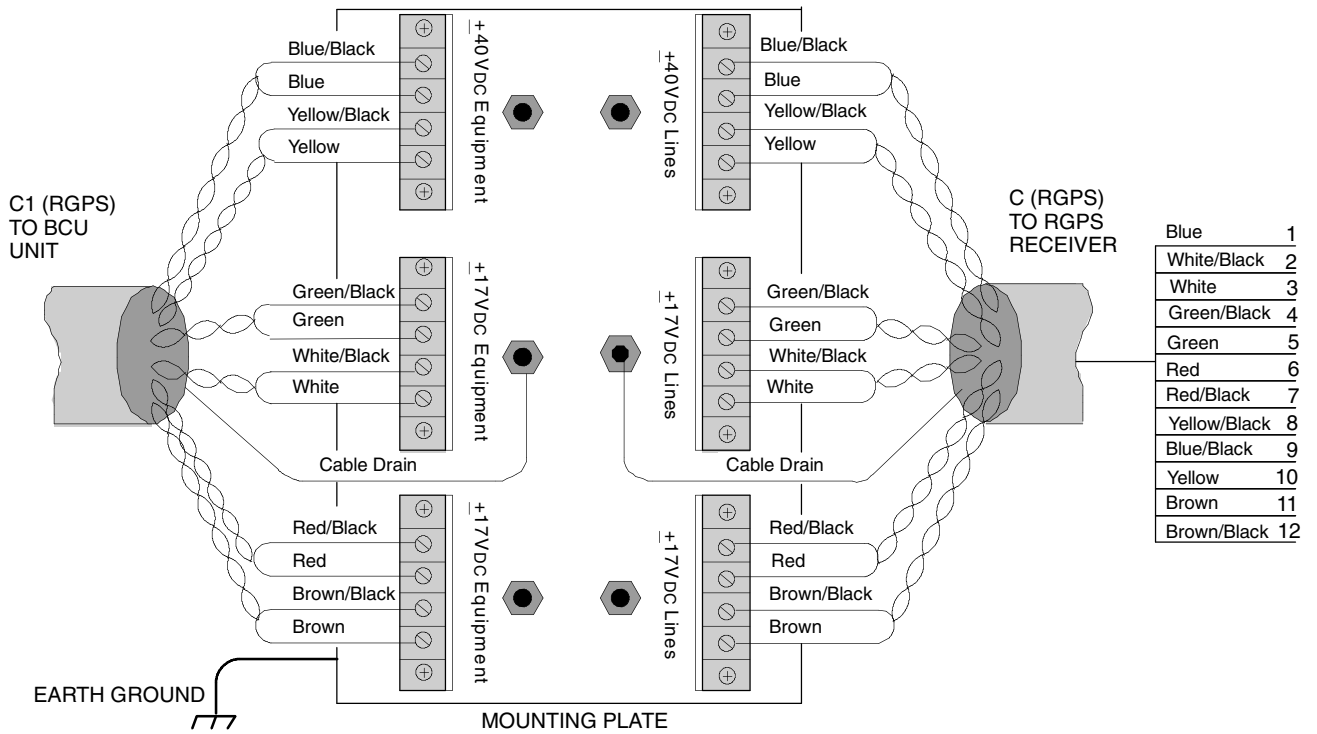
Figure 4-13 is a diagram of the RGPS connections. Figure 4-14 is a detail of the Lightning Arrestor connections.

Figure 4-13 RGPS to Base Control Unit Connection Diagram



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Figure 4-14 RGPS Lightning Arrestor Wiring



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RF GPS Cabling Installation

Objective

The objective of this procedure is to install the Local (RF) Global Positioning System (RF GPS) cabling.

Tools and Materials

provides the quantities and descriptions of the cables.

- 5/16 Breakaway Torque Wrench 9-in. lb
- Adjustable Torque Ratchet with metric socket set
- Flathead screwdriver
- N-SMA Adapter

Cable Description

Cable K as listed in [Table 3-1](#) is required for installation.

Installing RF GPS Antenna and Cable



[Figure 4-15](#) shows the components of the RF GPS. The RF GPS is connected to the BCU via the Customer Interface compartment.

Procedure 4-7 Procedure for Installing RF GPS Antenna and Cabling

1	Determine the mounting location (see RF GPS Mounting Considerations, Table 3-8).
2	Install the mounting kit at the RF GPS location of choice. Use the appropriate mounting bolts for mounting surface.

Continued

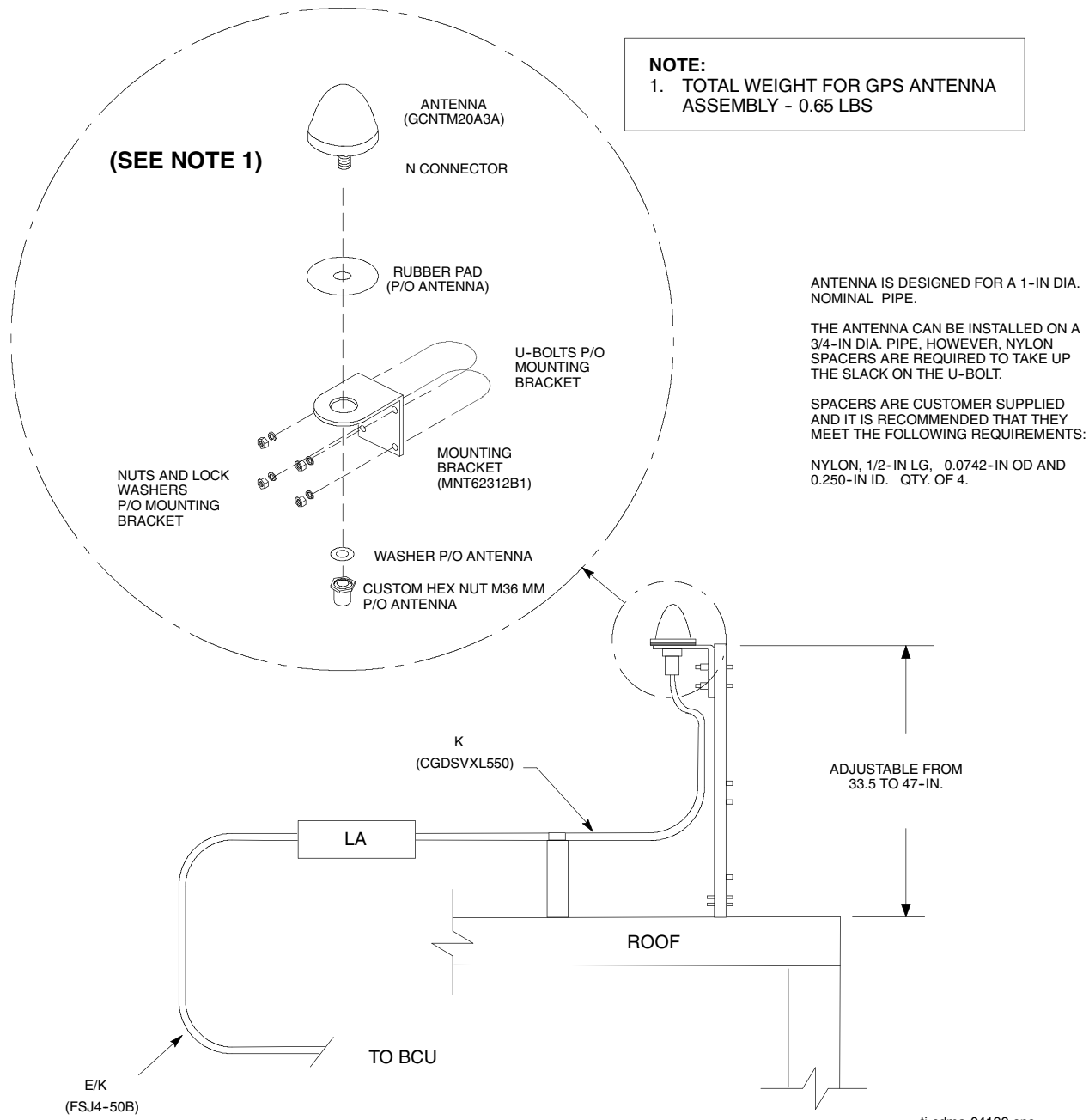
Procedure 4-7 Procedure for Installing RF GPS Antenna and Cabling (Continued)

3	 <div style="display: inline-block; border: 1px solid black; background-color: #f4a460; padding: 2px 5px; margin-left: 10px;">WARNING</div> <p>The roof structure on which the mounting pole is attached should be verified by a qualified structural engineer for the weight of the RF GPS engine and mounting hardware or under adverse conditions for the installation area</p> <p>Mounting the RF GPS antenna and hardware to an inadequate roof surface and/or using inadequate installation methods can result in serious injury.</p>
4	Attach the RF GPS antenna assembly to the post mounting assembly and secure the assembly to the assembly to the mounting kit using the screws and nuts supplied. See Figure 4-15
5	Attach the grounding kit to the mounting pole.
6	Connect one (1) N connector of the 50-foot superflex cable to the N jack of the RF GPS antenna cable and route the other end of the cable down to the BCU. If not already equipped with an SMA connector, attach an N-to-SMA adapter. Make allowances for strain relief.
7	Route the cable to the underside of the BCU to bulkhead connector (Customer Interface compartment).
	 <div style="display: inline-block; background-color: #00b050; color: white; padding: 2px 5px; margin-left: 10px;">NOTE</div> <p>If a lightning arrestor is in use, it will already be connected to the RF GPS Module in the Customer Interface compartment</p>

Continued

Procedure 4-7 Procedure for Installing RF GPS Antenna and Cabling (Continued)

Figure 4-15 RF GPS Installation and Components Diagram



Ethernet Cabling Installation

Objective

This section contains the procedure for installing the ethernet cables.

Cable Description

Cable J as listed in [Table 3-1](#) is required for installation.

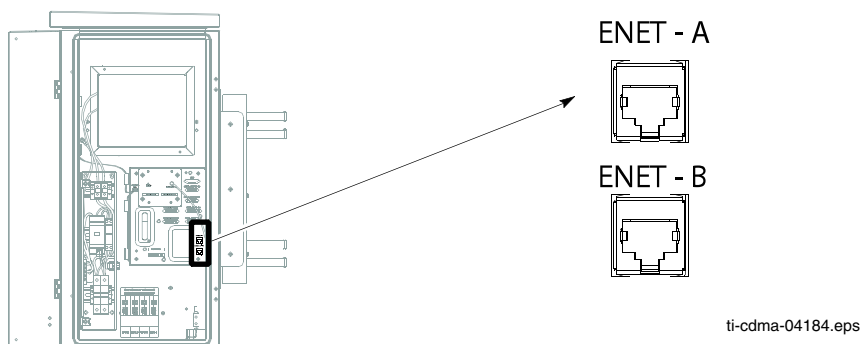
Installing Ethernet Cables

Follow the steps in [Procedure 4-8](#) to install the ethernet cables.

Procedure 4-8 Procedure to Install Ethernet Cables

1	If not already done, remove conduit plug at the bottom of the BCU.
2	If Ethernet cables are present, route them through conduit and through access hole in the bottom of the BCU.
3	Insert cable connectors in the sockets labeled ENET A and ENET B.
4	If there are no more cables to connect close and lock Customer Interface compartment.

Figure 4-16 Ethernet Cable Connection



Fiber Optic Cabling Installation

Objective

This section contains the procedure for installing the fiber optic cables.

Cable Description


Cable H as listed in [Table 3-1](#) is required for installation.



NOTE

The minimum bend radius for this cable is 90 mm.

Procedure 4-9 Procedure to Install Fiber Optic Cables

1	<p>Before routing the Fiber Optic cable up the tower, verify that is properly color coded.</p> <p>Red — RF Head 1 Blue — RF Head 2 Yellow — RF Head 3 Green — RF Head 4</p> <div style="margin-top: 10px;">  <div style="background-color: #00b050; color: white; padding: 2px 5px; display: inline-block;">NOTE</div> </div> <p style="margin-top: 10px;">Color coded labels and tie-wraps can be found on the compartment side of the door of the BCU Customer Interface compartment.</p>
2	<p>Connect the Fiber Optic cables to the bulkhead feedthroughs (FIBER) on the underside of the BCU.</p>
3	<p>Route the cable(s) up the tower(s), bundle and secure to tower (if RF Head is not present) or connect to the appropriate RF Head. Use tie-wraps or appropriate clamps to secure cable to tower.</p>

Customer Input/Output Cabling Installation

Objective

This section contains the procedures for installing the Customer Defined Input/Output cables.

Cable Descriptions

Cable F as listed in [Table 3-1](#) is required for installation.

Customer Input and Output Connector Pinouts

This section contains the procedures for installing the Customer Defined Input/Output cables. The CDI/CDO cables will be routed through one inch conduit to the access hole on the underside of the BCU.

Figure 4-17 Customer Defined Input and Output Connectors

Customer Defined Input/Output Cable Installation

Follow the procedure in [Procedure 4-10](#) to install the Customer Defined Input/Output Cables

Procedure 4-10 Procedure to Install the Customer Defined Input/Output Cables

1	If not already open, open the Customer Interface Compartment. If not already done, remove conduit plug from access hole.
2	Route the Customer Defined Input (CDI) Cable 1-2 through conduit to the underside of the BCU, through the access hole, and up to the connector labeled <i>CUST. INPUT 1-2</i>
3	Perform step 2 for CDI Cable 3-4.
4	Route the Customer Defined Output (CDO) Cable 1-4 through conduit to the underside of the BCU, through the access hole, and up to the connector labeled <i>CUST. OUTPUT 1-4</i>
5	Perform step 4 for CDO Cables 5-8, 9-12, and 13-16.
6	Ensure a good connection. Close and lock Customer Interface compartment.

Optional Equipment

Optional Band Pass Filters

Overview

This chapter contains general information and procedures for installing optional equipment. Band pass filters are available as optional equipment to accommodate customers with specific band allocations.

Filter Requirements

Weight and Dimensions The band pass filter(s) used should meet the following requirements:

- Weight: 1.6 kg (3.5 lbs)
- Dimensions: 50 mm (2 in) **W** x 150 mm (6 in) **H** x 100 mm (4 in) **D**.

Figure 5-1 Band Pass Filter

Filter Mounting [Figure 5-2](#) shows the optimal mounting position on the RF Carrier Unit (RFCU). The filters are mounted such that cable lengths are kept to a minimum.

Figure 5-2 Filter Mounting

Motorola Stability Oscillator (MSO)

Overview

The Motorola Stability Oscillator (MSO) is available as optional equipment to accommodate customers that want this backup timing module.

What's Next and Cleanup

What's Next

Introduction

Optimization is the next procedure you should perform. There are two things left to do before you begin the optimization:

1. Clean up the site
2. Fill out the installation completion checklist

Clean Up Site

Clean up the site by following the information given in the *Site Cleanup* area in this chapter.

Fill Out Checklist

After the site is cleaned up, fill out the installation completion checklist. This checklist is located in the *Installation Completion Checklist* area of this chapter.

Optimize the System

Optimize the system by following the procedures given in the appropriate optimization manual.

The hardware installation does not include card placement and turning on power. These things and more are covered in the appropriate optimization manual.

Site Cleanup

Tools

Place all hand and power tools in the installation tool kit or other appropriate place. Note any tools that need replacement, cleaning, or adjustment.

Materials

Place any leftover materials in a location specified by the site manager.

Remove Debris

Remove any packing material. Ensure that all scrap materials have been removed. Clean/sweep the floor. Ensure that all chalk line marks have been removed.

Environment

Organize any items (manuals, materials, etc.) left on site and place them in a location specified by the site manager.

Installation Completion Checklist

Installation Completion Checklist

Check the items listed in [Table 6-1](#).

Directions

Fill out the installation completion checklist and make any necessary copies. You may copy this check sheet as needed. The item numbers do not represent a specific order, they are supplied for convenience.

Installation Checklist

Hardware Installation Completion Date: _____

Site: _____

Serial Number: _____

Checklist Completed By: _____

Checklist Reviewed By: _____

Table 6-1 Hardware Installation Checklist

Item No.	Item	Notes
1	Equipment is not damaged.	
2	Air flow clearance requirements are met.	
3	Base Control Unit (BCU) is securely mounted to wall or pole.	
4	BCU and RF Carrier Unit (RFCU) are RF cabled correctly.	
5	BCU and RFCU are DC power cabled correctly.	
6	BCU is ethernet cabled. (If installed)	
7	RF Head is securely mounted to pole.	
8	Band Pass filters are cabled to RFCU correctly (If used)	
9	Conduit is sufficiently grounded	
10	Antennas are grounded to tower	
11	The antenna cables are protected by lightning arrestors (if applicable).	
12	BCU is grounded	
13	RF Head is grounded.	
14	RGPS is cabled to BCU.	
15	RGPS head and mast are secure.	
16	RGPS connection is protected by lightning arrestors (if applicable).	
17	RGPS head has a clear view of the sky and is not in a location which accumulates debris. Make sure the RGPS is located away from the transmit antennas.	
18	Local GPS (RF GPS) antenna is secure. (If used)	
19	Local GPS cabling is installed (If used).	
20	Installation hardware is removed.	
21	The site is cleaned, swept and trash removed.	
22	The site specific documentation is present at the site.	

Alternate Installation Procedures

Manual RF Head Installation Procedures

Overview

This section contains the procedures for installing the Diversity Access Point RF Head which is comprised of the TRX Module and antenna radome. Refer to Figure 1-2.

DAP RF Head

Refer to [Figure 1-4](#) for the major components of the DAP RF Head.

Electrical Requirements

The RF Head is designed to use 40 to 59 VDC (nominal +54 VDC) supplied through the Base Control Unit (BCU).

Dimensions and Weight

- Dimension: 228.6 mm (9 in) **W** x 712 mm (28 in) **H** x 406 mm (16 in) **D**
- Weight: 27.2 kg (60 lbs)

The dimension measurements do not include connectors, hinges, handles, or latches.

Conduit Sizes

Refer to [Table A-1](#) for conduit sizes.

Table A-1 Conduit Requirements

No.	Designation	Required Size
1	Power	1-1/4 in
2	Fiber Optic	None

Tools and Materials

- Mounting Bracket Assembly
- U-bolts
- Set of metric sockets (3/8-in or 1/4-in)
- Set of standard sockets (3/8-in or 1/4-in)
- 3/8-in or 1/4-in driver
- Torque Driver
- Cordless Power Driver
- Ground Lug
- Crimp Tool
- T30 Torx Screw Driver
- Adjustable Crescent Wrench

U-Bolt Specifications

Reference [Figure A-1](#) and [Table A-2](#) to determine the proper U-bolt to use.

Figure A-1 U-Bolt Sizing

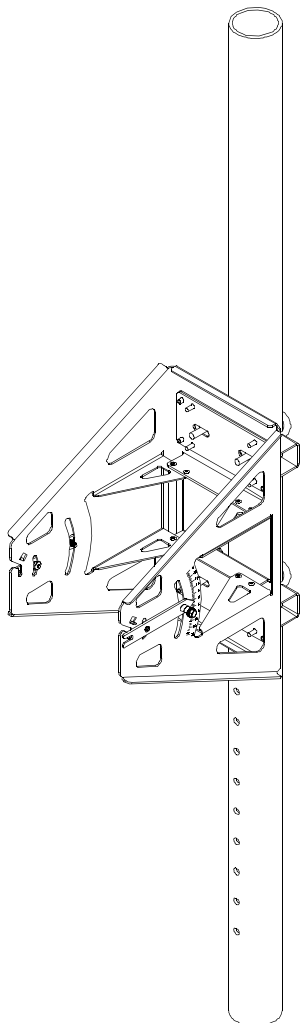
Table A-2 DAP U-Bolt Sizing

Nominal Pipe Size (in)	Pipe OD		Minimum Dimension B		Minimum Dimension C	
	(in)	(mm)	(in)	(mm)	(in)	(mm)
2	2.067	52.50	3.886	98.70	0.6	15
2.5	2.469	62.71	4.429	112.50	0.6	15
3	3.068	77.93	5.098	129.50	0.6	15

Increasing dimension B beyond that indicated above will result in a corresponding increase in dimension C in order to maintain proper clamping force

RF Head Mounting Bracket Assembly Installation

[Figure A-2](#) shows the Mounting Bracket Assembly for the RF Head.


Figure A-2 RF Head Mounting Bracket Assembly

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RF Head Mounting Bracket Assembly Procedure

Follow the steps in [Procedure A-1](#) to install the pole mounting bracket for the RF Head.

Procedure A-1 Procedure to Install RF Head Main Support Bracket Assembly

1	Remove nuts and plate (or washers) from both ends of the U-bolt.
2	Set Main Support Bracket Assembly at the required height.
	 <div style="display: inline-block; background-color: #00FFFF; padding: 5px; margin-left: 10px;">NOTE</div> <p style="margin-left: 100px;">It is recommended that two people perform attach the bracket to the pole.</p>
3	Slide first U-bolt around pole and through top slots of Main Support Bracket Assembly. Slide plate (or washers) over threads. Thread nuts on U-bolt and hand tighten.
4	Slide second U-bolt around pole and through bottom slots of Main Support Bracket Assembly. Slide plate (or washers) over threads. Thread nuts on U-bolt and hand tighten.
5	Align Main Support Bracket Assembly on pole facing the appropriate direction and tighten nuts using a socket wrench or power driver. Torque nuts to 45 in-lbs (5 N-m).


Installing the RF Head

Follow the steps in [Procedure A-2](#) to install the RF Head.

Procedure A-2 Procedure to Install the RF Head

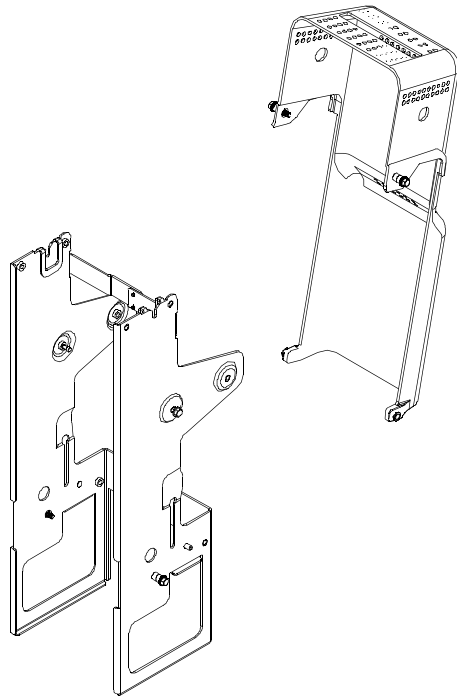
1	Place the RF Head on a flat surface, large finned-side down.
2	Attach the left and right side mounting brackets to RF Head using a T30 Torx screw driver. The brackets straight edges face away from Main Support Bracket Assembly.
3	If the optional filter is being used, proceed to Procedure A-3 to attach it to the RF Head. Otherwise, proceed with step 4
4	Attach solar shield to side brackets by snapping the tabs on the bottom of the shield into side bracket slots. Refer to Figure A-3 .
5	Lift shield and drop over the top of the RF Head. Handle of RF Head slips through slot in solar shield. Tighten two captive screws on solar shield to secure it to side mounting bracket. Torque captive screws to 45 in-lbs (8.2 N-m)
6	Set the RF Head so that it is resting on the side brackets support arms and RF Head bottom (filter if attached).

Procedure A-2 Procedure to Install the RF Head (Continued)

7	Install the antenna (Radome). Hook the antenna top support brackets over the bolts near the top of the RF Head. Loosen antenna hook bolts as required. Push the bottom of the antenna and hook those brackets over the bolts near the bottom of the RF Head.
8	Secure antenna using a 10 mm socket and driver to tighten the 4 screws. Torque the bolts to 45 in-lbs (8.2 N-m).
9	Attach RF cables between antenna and RF Head. Torque the bolts to 30 in-lbs (3.4 N-m). If the Filter is used, connect antenna to RF Filter, then to RF Head. Refer to Figure A-4 .
10	If more than one RF Head is in use tag the DC Power cable pairs using the color coded labels supplied inside the BCU Customer Interface compartment. Label the cables RFU1 through RFU4 as required. Place the color coded labels close to the DC power and Fiber Optic connectors.
11	Connect DC power cables to RF Heads. If not already done, use the color tie-wraps to mark the cables near the connector.
NOTE	<div style="display: flex; align-items: center;">  <div style="background-color: #00ffff; padding: 5px; color: white; font-weight: bold; text-align: center;">NOTE</div> </div> <p style="margin-left: 40px;">Ensure that the cable for RFU 1 uses the Red tie-wrap, RFU 2 — Blue, RFU 3 — Yellow, and RFU 4 — Green.</p> <p style="margin-left: 40px;">Route DC power cables to bottom of the BCU and connect to RFU 1 —RFU 4 connectors in the BCU Customer Interface compartment. The BCU RFU 1 — RFU 4 connector locations are color coded.</p>
12	Attach (crimp) ground wire to ground lug. Attach opposite end of ground wire to master ground. Attach ground lug to RF Head. Do the same for the remaining ground lugs, if any.
13	Connect Fiber Optic Cables (color coded as well) to RF Head. Torque nut 18 in-lbs (2.1 N-m).
14	At this point, proceed to the Site Commissioning document for BCU and RF Head test information and operational verification.
15	The BCU and RF Head have been verified as operational, proceed with step 16 .
16	Verify that the DC power cables are disconnected from the BCU.

Procedure A-2 Procedure to Install the RF Head (Continued)

17	<p>Attach solar shield. Insert mushroom head knobs near bottom of shield into keyhole slots on sides of mounting bracket. Slide solar shield into position over handle and into slots on top of mounting bracket. Tighten screws to secure shield to brackets.</p>
18	<p>Prepare the RF Head for hoisting. Attach carabiner to handle of RF Head. Use the block and tackle to hoist the RF Head to the Main Support Bracket Assembly. Carefully hoist RF Head (so cables will not be damaged) to Main Support Bracket Assembly.</p>
19	<p>Loosen retention bracket screws on main support bracket. Align to captive screws on side support bracket with the Main Support Bracket Assembly curved slots and drop into place. (Retention brackets on each side of the Main Support Bracket Assembly should automatically slide upward to help hold the RF Head.) If not, slide retention bracket on Main Support Bracket Assembly up, aligning the RF Head screw with captive nut on the side support bracket. Hand tighten captive screw. Do not fully tighten screw. Refer to Figure A-3.</p>
20	<p>Ensure that the RF Head is properly mounted and its movement is not obstructed. Adjust the azimuth (up/down angle) loosen two M6 screws on each side of unit using a 10 mm socket or crescent wrench. Range of motion is ± 25 degrees from horizontal. The retention bracket serves as an indicator of the azimuth in degrees. When RF Head is set at the desired position, tighten captive screws on retention bracket. Torque bolts to 45 in-lbs (8.2 N-m). Tighten captive screws at pivot of each side of unit to secure RF Head. Torque bolts to 45 in-lbs (8.2 N-m).</p>
21	<p>Route DC power cables through conduit to underside of the BCU and up into the Customer Interface compartment. Connect the color coded cables to the appropriate RF U connector.</p>
22	<p>Route Fiber Optic cables down the tower to the under side of the BCU. Connect cable to the appropriate FIBER feedthrough connector.</p>

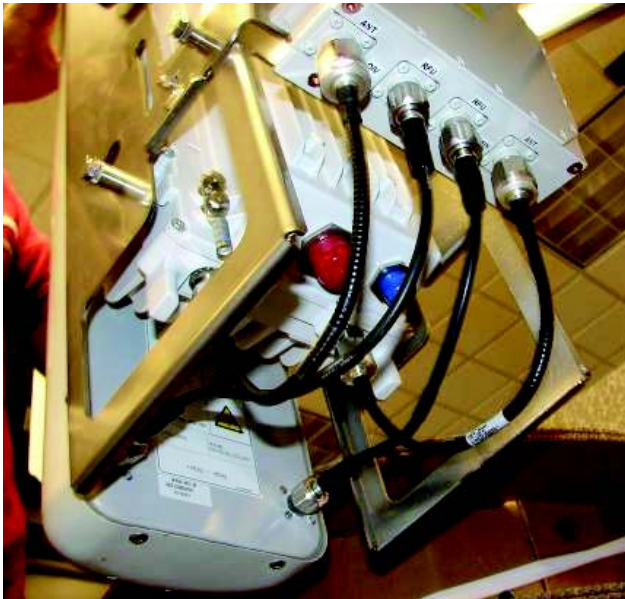
Figure A-3 RF Head Side Mounting Brackets and Solar Shield

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Procedure A-3 Procedure to Install Optional RF Filter

1	From Procedure A-2, step 3 , attach the filter mounting plate to the rear of the RF Filter using four screws. Torque screws to 45 in-lbs (5 N-m).
2	Hook filter mounting plate to side support brackets. Secure filter mounting plate to side support brackets by tightening the filter mounting plate captive screws.
3	Return to Procedure A-2, step 4 .

Figure A-4 Antenna to Filter RF Cable Connection Diagram



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