

PMP 320 Hardware Installation

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<http://www.motorola.com>

Network Resolution Center contact information. Alternatively if you do not have access to CNRC or the internet, contact the Local Motorola Office.

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PMP 320 Hardware Installation

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What is covered in this manual?

The audience for this document includes network planners, system operators, network administrators, and equipment installers.

This installation manual covers the physical installation procedures of the hardware for the PMP 320 product line which encompass the Cluster Access Point (CAP or AP), Cluster Manager Module 4 (CMM4), and the Cluster Subscriber Module (CSM).

Software installation and configuration information for the AP and the CSM are covered in the PMP 320 Administration and Configuration Guide.

Revision history

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The following sections show the revision status of this document.

Version information

The following table describes the changes made to this document:

Version	Date of issue	Description
1	JUL 2010	Preliminary version for FCC/UL review.

General information

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Cross references

References made to external publications are shown in italics. Other cross references, emphasized in blue text in electronic versions, are active links to the references.

This document is divided into numbered chapters that are divided into sections. Sections are not numbered, but are individually named at the top of each page, and are listed in the table of contents.

Document banner definitions

A banner indicates that some information contained in the document is not yet approved for general customer use. A banner is oversized text on the bottom of the page, for example, **PRELIMINARY — UNDER DEVELOPMENT**

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The following conventions are used in Motorola documents to represent keyboard input text, screen output text, and special key sequences.

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Characters typed in at the keyboard are shown like this sentence.
Items of interest within a command appear like this sentence.

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Messages, prompts, file listings, directories, utilities, and environmental variables that appear on the screen are shown like this sentence.
Items of interest within a screen display appear like this sentence.

Special key sequences

Special key sequences are represented as follows:

CTRL-c or CTRL+C	Press the Ctrl and C keys at the same time.
CTRL-SHIFT-c or CTRL+SHIFT+C	Press the Ctrl , Shift , and C keys at the same time.
ALT-f or ALT+F	Press the Alt and F keys at the same time.
ALT+SHIFT+F11	Press the Alt , Shift and F11 keys at the same time.
 	Press the pipe symbol key.
RETURN or ENTER	Press the Return or Enter key.

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When sending E-mail or calling Motorola for technical support, please include, as appropriate, the software release on each module, the IP addresses, MAC addresses, and features enabled on the system.

Escalate the problem to the PMP 320 Support Team

Escalate any issues to the Wireless Broadband Support Team by contacting the support team in your area.

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- Norway: 24159815
- Portugal: 0217616160
- Spain: 0912754787
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Product Description

A PMP 320 Access Network provides a low cost point-to-multipoint broadband solution optimized for fixed outdoor applications. The access point is an 802.16e micro base station with WiMAX 802.16e CSM interoperability. The system offers an integrated, all-outdoor solution with simple installation for rapid deployment.

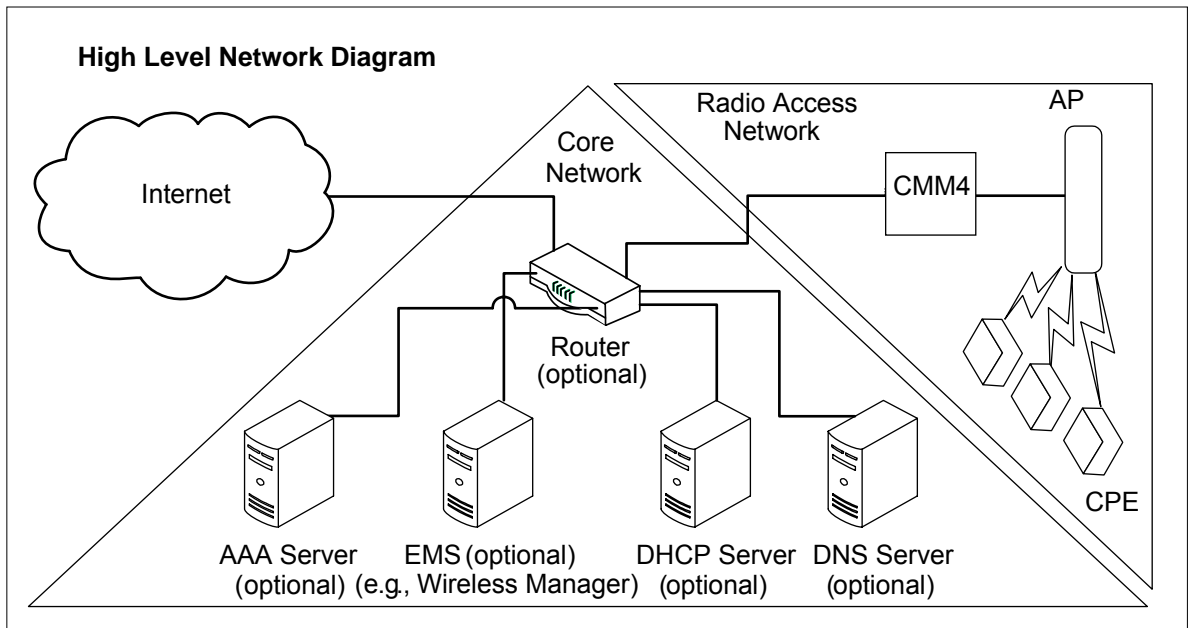
Target applications for the PMP 320 Access Network include:

- Tier 1, Tier2, or Tier 3 carriers. Where the PMP 320 system provides a cost-effective, reliable broadband connectivity for residential and business customers.
- Government network operators, where the PMP 320 system provides broadband-based infrastructure for administrative networks.
- Wireless service providers, with broadband network service for any size operation.
- Wireline service providers, with broadband wireless extensions for existing DSL or cable networks.

As shown in [Figure 1-1](#), a **"Raintight" PMP 320 network consists of :**

- APs - Cluster Access Point (CAP) 320 Access Points, usually tower-mounted in a four-sector configuration.
- CPE - Cluster Subscriber Module (CSM) 320, Customer Premise Equipment (CPE), or also known as Subscriber Module (SM) is usually mounted on a residence or other structure, and powered by a power adapter providing standard 802.3af power over Ethernet.
- CMM4 (Cluster Management Module 4) – is an outdoor enclosed unit housing a GPS module connected to a GPS antenna. It contains synchronization and power-injection circuitry, surge protection, and a managed switch. The CMM is used to provide custom synchronization over power over Ethernet to the APs as well as offering a networked, managed switch.

Figure 1-1 High Level Network Diagram



In addition, a PMP 320 network normally requires:

- AAA Server – Authentication, Authorization, and Accounting server using the RADIUS (Remote Authentication Dial In User Service) protocol
- EMS – an Element Management System, such as the Motorola One Point Wireless Manager
- DHCP Server – Dynamic Host Configuration Protocol server
- DNS Server – Domain Name System server
- CNUT – Network Update Tool for updating device software
- Router – optional

Motorola offers PMP 320 equipment that operates in the spectrum ranges as shown in

Table 1-1 Spectrum Range Operation

Licensed Spectrum Ranges	System Name	AP Name	SM Name	AP Model Number	SM Model Number	Supported Frequencies
3.3 GHz to 3.4 GHz 3.4 GHz to 3.6 GHz	PMP 35320	CAP 35320	CSM 35320	3530APC	3530SM	3.3 GHz to 3.6 GHz
3.6 GHz to 3.8 GHz	PMP 36320	CAP 36320	CSM 36320	3630APC	3630SM	3.6 GHz to 3.8 GHz (Includes 3.65 GHz)

Access Point (AP)



A PMP 320 Access Point (AP) is an 802.16e micro base station that connects wirelessly to up to 200 PMP 320 Cluster Subscriber Modules (CSMs) or CPEs (Customer Premise Equipment). The AP consists of a antenna and radio, as shown in [Figure 1-2](#), with the radio shown separately in [Figure 1-3](#). The standard antenna is a dual-polarity 16.5 dBi antenna typically mounted in a four 90° sector configuration. The AP is manageable by local web interface, as well as SNMP or the Motorola One Point Wireless Manager.

⚠ WARNING

Installing an AP involves height, electricity, and exposure to RF (radio frequency) energy. To avoid personal injury, follow applicable national and local safety regulations along with industry best practices. Also follow the specific guidelines in this document, including maintaining a sustained exposure separation distance of 50 cm (~20 inches) as described in the Regulatory, Legal, and Safety Notice in this document.

Figure 1-2 Access Point (AP) shown with antenna attached and mounted on pole

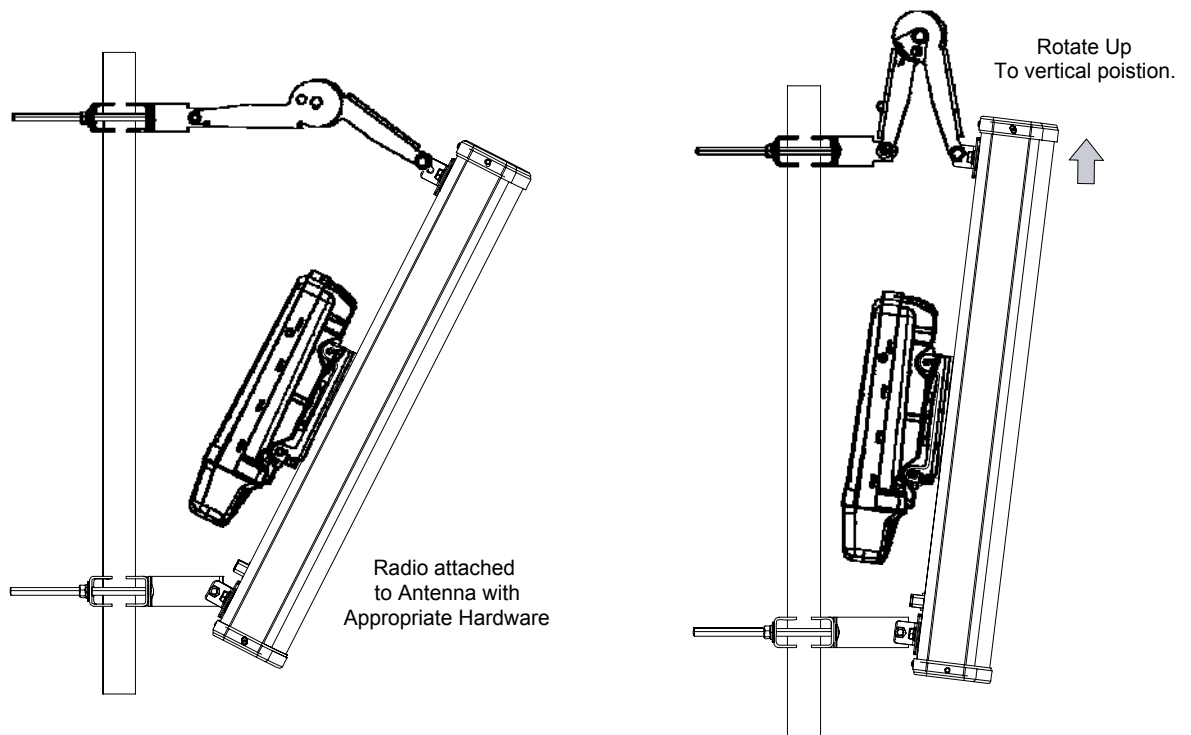
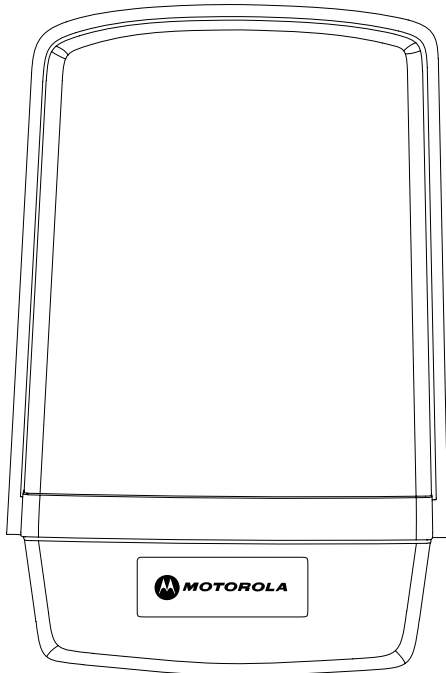


Figure 1-3 AP, radio only

The PMP 320 AP uses 802.16e for the over-the-air connection to the SMs or CSM. It is 802.16e PHY and MAC compliant, and complies with the WiMAX Wave2 profile, except for mobility.

The AP uses a custom 56 VDC power system, typically powered by a CMM4. The AP uses less than 25 W per AP, or less than 100 watts for 360° coverage. The AP includes integrated surge suppression that is the equivalent to the 600SSD surge suppressor recommended for the CSM (Cluster Subscriber Module) installations.

The AP functions as a router in the network, with routes to the CSMs (or SMs) auto-configured. The AP supports ICMP and ARP.

The AP:

- can be configured to either receive its IP address from a network DHCP server, or be manually assigned its IP address.
- can be configured to respond to SM DHCP requests either by relaying the requests to a network DHCP server, or function as a DHCP server itself.
- can be configured either to use an external AAA (Authentication, Authorization, and Accounting) server, or use a minimal internal AAA server. When configured to use an external AAA server, the AP serves as a relay between CSMs (SMs) and the AAA server for authentication requests, and serves as a RADIUS client communicating with the AAA server for authorization of SM services.
- has an embedded web server for configuring using a web browser.
- supports SNMP v1, and uses standard 802.16e MIBs (Management Information Base) as well as the Motorola 802.16e AP MIB. The AP supports all Object Identifiers (OIDs) with SNMP v1 and SNMP v2, however all traps are SNMP v1.

Table 1-2 CAP 320 Antenna Specifications

CAP 320 Antenna Specifications	
Antenna Beam Width	16.5 dBi gain Dual Polarity +/- 45 4 sector application (actual 3 dB antenna pattern: 60 degree horizontal)

Table 1-3 CAP 320 Physical Specifications

CAP 320 Physical Specifications	
Power Consumption	< 25 Watts
Temperature	-40° F to +131° F (-40° C to +55° C)
Wind Survival	118 miles/hr (190 km/hr)
Dimensions (LxWxD)	Integrated: ~711 x 195 x 240mm Connectorized: ~330 x 195 x 140mm
Weight	Integrated: 5.5 kg Connectorized: 2.2 kg

For additional information regarding spectrum and frequency information, refer to the PMP 320 Administration and Configuration Guide located at: <http://motorola.wirelessbroadbandsupport.com/support/library/>.

Site preparation

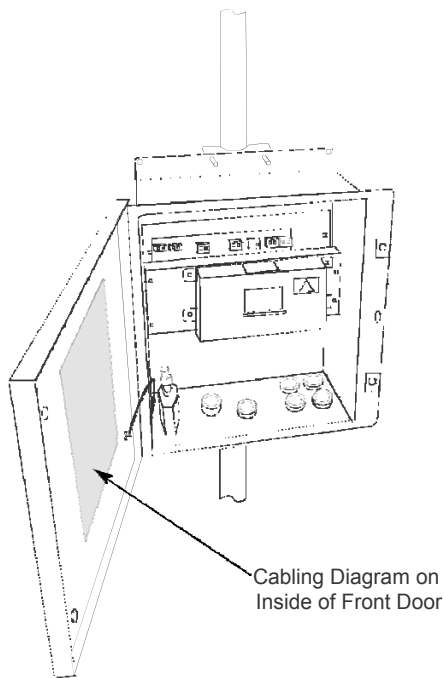
Review the following site requirements before selecting the site for the installation of the PMP 320 CAP:

- Verify that a good Earth Ground can be achieved at the site.
- Verify that the power to the site is reliable and can be backed up by an uninterruptible power supply (UPS).
- Verify that access to the site is easy if an urgent need arises. (It can take up to forty-five minutes to key-down the transmitters at certain locations.)
- Verify that the site is secure.
- Be sure to negotiate a contract with the site owner that allows easy swap-out of existing equipment without an added cost.
- Accurately measure the latitude and longitude of the location for future reference.

Cluster Management Module 4 (CMM4)

The Cluster Management Module 4 (CMM4) provides power, synchronization, and network connectivity for up to eight APs, backhauls, and Ethernet terrestrial feeds in a variety of configurations.

Figure 1-4 CMM4 with door open



The CMM4 provides:

- Sync over Power over Ethernet and integrated surge suppression on the controller board for up to 8 APs or BHs. Both a custom 30 VDC power scheme and a custom 56 VDC power scheme are available. Neither is the same as the later IEEE Standard 802.3af, and neither is compatible with it.
- Managed switching using a hardened EtherWAN switch. The CMM4 ships with a 14-port EtherWAN switch and is also available without a switch.
- A weather-tight enclosure with either 4 or 7 glands/ports for Ethernet and power cables.
- Surge suppression on the controller board for the incoming 30V DC and 56V DC power lines and GPS coax cable.

- Auto-negotiation on the Ethernet ports. Ports will auto-negotiate to match inputs that are either 100Base-T or 10Base-T, and either full duplex or half duplex, when the connected device is set to auto-negotiate. Alternatively, these parameters are settable.
- An always-on NTP (Network Time Protocol) server that can provide date and time to any radio that can reach the CMM’s management IP address.

Table 1-4 CMM4 Model Numbers and Ethernet Switch Configurations

CMM4 Model Number	CMM4 Extended Model Number	EtherWAN Switch			Cable Glands (ports)
		Total Ports	10/100 Base - TX Ports	10/100/1000 Base-TX Ports	
1090CK	1090CKBA (current units)	14	12	2	7
	1090CKAA (earlier units)	9	8	1	4
1091	NA	No Switch			7

Inside the CMM4 enclosure is a controller board, an EtherWAN switch, and a GPS coax surge suppressor. Also inside the CMM4 enclosure is the EtherWAN switch port. This connection is where the Ethernet Gigabit connection is made. For more information about the EtherWAN switch and how the port is managed or for information on earlier versions of the CMM4 units refer to the Cluster Management Module 4 User Guide located at: <http://motorola.wirelessbroadbandsupport.com/>.

The controller board injects power and synchronization on up to eight Ethernet ports and provides the equivalent of 600SSD surge suppression on each of the eight ports. The controller board is managed using a web browser, or SNMP, and is supported by the Prizm Element Management System (EMS). The controller board receives 30 VDC power and/or 56 VDC from external power supplies, and provides 20 VDC power for the EtherWAN switch and other auxiliary equipment. The controller board includes a GPS module, which provides sync and GPS information to the CMM, a management port, an override toggle switch, and an auxiliary sync port for connecting to another CMM.

 **NOTE**

The controller board does not convert 30 VDC to 56 VDC or 56 VDC to 30 VDC. To power 56 VDC equipment from a CMM4 you must provide a 56 VDC power supply, and to power 30 VDC equipment from a CMM4 you must provide a 30 VDC power supply.

The CMM4 requires a GPS antenna and a power supply. The directions for installing the power supply and the GPS are provided in [Chapter 3 CMM4 Hardware Installation](#).

What is included when the CMM4 unit is shipped

The CMM4 as shipped includes:

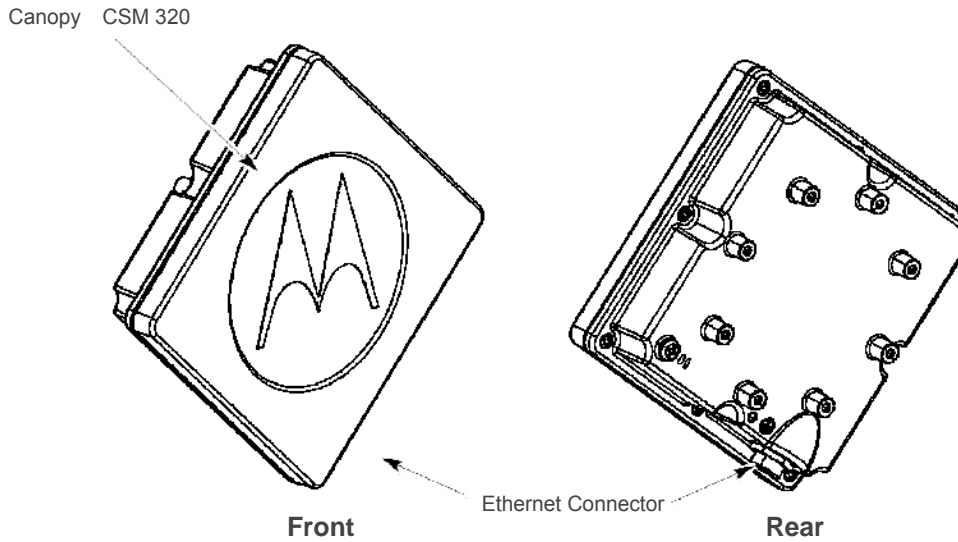
- Weatherized enclosure containing the controller board, EtherWAN Ethernet Switch, and GPS coax surge suppressor
- Patch cables between the controller board and the EtherWAN Ethernet Switch
- U-bolts and V-brackets for pole-mounting the CMM4
- GPS Antenna
- GPS antenna pole-mount kit
- A 1-hole cable gland insert for use on the DC power cable

The CMM4 as shipped does not include:

- Any power supply. The appropriate power supply(s), 30 VDC and/or 56 VDC, must be ordered separately
- Ethernet cables to connect the CMM4 to APs, backhauls, or terrestrial feeds
- Coax cable connecting the CMM4 to the GPS antenna
- DC power line cables are not provided (AC power line cables are not included with the power supplies)

Point to Multi-point Cluster Subscriber Module 320

Figure 1-5 CSM 320 subscriber module



The PMP 320 Cluster Subscriber Module (CSM) or also known as the Customer Premise Equipment (CPE), or the Subscriber Module (SM) is the device that extends the broadband network or internet services to the end user through communication with the PMP 320 AP. The key features of the CSM are:

- an integrated 14.5 dBi gain antenna
- 802.3af power over Ethernet (4 VDC)
- 802.16e standard fixed, outdoor solution
- products that are available in the 3.3 GHz – 3.8 GHz spectrum

The CSM is managed by a local web interface, SNMP, or the Motorola Wireless Manager. The CSM also functions as a Network Address Translation (NAT) device.

Site considerations

Review the following site requirements before selecting the site for the installation of the PMP 320 CSM:

- When ordering CSMs for the site, ensure that the same band CSM is ordered as is used for the AP.
- Mount the CSM as high off the ground as possible to minimize theft.
- Communicate to the end-user that they are responsible for the loss/damage to the CSM while in their care.
- Route and hide the ENET cables against the house following local installation codes. This extra effort lowers the chance of a new home owner taking down the CSM and its wiring.
- Avoid penetrating the roof; this will help mitigate issues with leaks.
- Work with the local home owners association (HOA) to receive approval of the CSM solution.
- Take several measurements to several different AP locations, the closest AP might not be the best signal.
- Perform a RF survey of the surrounding area; chances are that this installation will ignite more interest in this solution in the area.

Point to Multi-point Connectorized Cluster Subscriber Module 320



Figure 1-6 Connectorized CSM 320 subscriber module



G1_CCsMfrtpanelview.eps

Figure 1-7 Connectorized CSM 320 rear view subscriber module



G1_CCsM_rearviewconn.ext

The PMP 320 Connectorized Cluster Subscriber Module (CSM) or also known as the Customer Premise Equipment (CPE), or the Subscriber Module (SM) is the device that extends the broadband network or internet services to the end user through communication with the PMP 320 AP. The key features of the CSM are:

- 802.3af power over Ethernet (48 VDC)
- 802.16e standard fixed, outdoor solution
- products that are available in the 3.3 GHz – 3.8 GHz spectrum

The Connectorized CSM is managed by a local web interface, SNMP, or the Motorola Wireless Manager. The Connectorized CSM also functions as a Network Address Translation (NAT) device.

Site considerations

Review the following site requirements before selecting the site for the installation of the PMP 320 CSM:

- When ordering Connectorized CSMs for the site, ensure that the same band Connectorized CSM is ordered as is used for the AP.
- Mount the Connectorized CSM as high off the ground as possible to minimize theft.
- Communicate to the end-user that they are responsible for the loss/damage to the Connectorized CSM while in their care.
- Route and hide the ENET cables against the house following local installation codes. This extra effort lowers the chance of a new home owner taking down the Connectorized CSM and its wiring.
- Avoid penetrating the roof; this will help mitigate issues with leaks.
- Work with the local home owners association (HOA) to receive approval of the Connectorized CSM solution.
- Take several measurements to several different AP locations, the closest AP might not be the best signal.
- Perform a RF survey of the surrounding area; chances are that this installation will ignite more interest in this solution in the area.

AP Hardware Installation

This chapter provides the instructions and procedures needed to:

- connect the antenna brackets
- connect the AP radio antenna to the antenna
- cable the unit
- mount the unit to a pole, mounting fixture, or tower
- ground the unit
- connect surge suppression

Installing the AP Hardware



General communications equipment, infrastructure, and facilities site design should be performed in line with Motorola’s Standards and Guidelines for Communications Sites (also known as the R56 manual) available from: https://motorolawls.motolms.com/Secure/Course_Description.asp?number=ANT001-

A short coaxial cable from the radio terminates in a male N connector. The antenna has a chassis-mounted female N connector. The antenna includes tower mount brackets with adjustable down-tilt.

Installing an AP typically consists of the following phases:

1. Configure the AP at an operator's facility or at the installation site using the information and settings defined in the Planning and Configuring sections of the PMP 320 Administration and Configuration
2. Assemble the AP (radio, antenna, and brackets) and physically install it using [Procedure 2-1](#). A CMM4 is typically installed at the same time, if not previously installed.
3. Cable the AP to the CMM4 and ground it to Protective Earth – PE using [Procedure 2-2](#).
4. This phase can also include cabling to backhauls, or running terrestrial feeds.
5. Confirm operation, using CSMs in the field.

Local practices and choices of installation options will dictate the actual processes. For example, variations on these generalized procedures can be used to install on a building or install multiple APs on a pipe mount before hoisting up a tower for final attachment.

Assembling the AP and attaching to a tower

Review the following parts identification graphics to ensure that all the top pipe clamp assembly brackets parts are present before beginning the installation. Refer to [Figure 2-1](#) and [Figure 2-2](#) to see the parts that make up the antenna and AP.

The parts consist of:

Table 2-1 Part list for the antenna and AP

Part name	Quantity
Antenna	1
AP radio	1
Attaching brackets to antenna	
Scissors bracket	1
Top pipe clamp assembly	1
Bottom pipe clamp assembly	1
2.24 inch spacer	2
2.36 inch spacer	1
5/16-18 x 3.5 inch hex pivot bolt	3
5/16-18 inch split lock washer	3
5/16-18 flat washer	3
5/16-18 hex nut	3
Attaching AP to Antenna	
M6 carriage bolt	2
M6 split lock washer	2
M6 flat washer	2
M6 hex nut	2
Attaching pipe clamps to pipe	
3/8-16 inch split lock washer	4
3/8-16 inch flat washer	4
3/8-16 hex nut	4

Figure 2-1 Pipe Clamp Assembly Identification

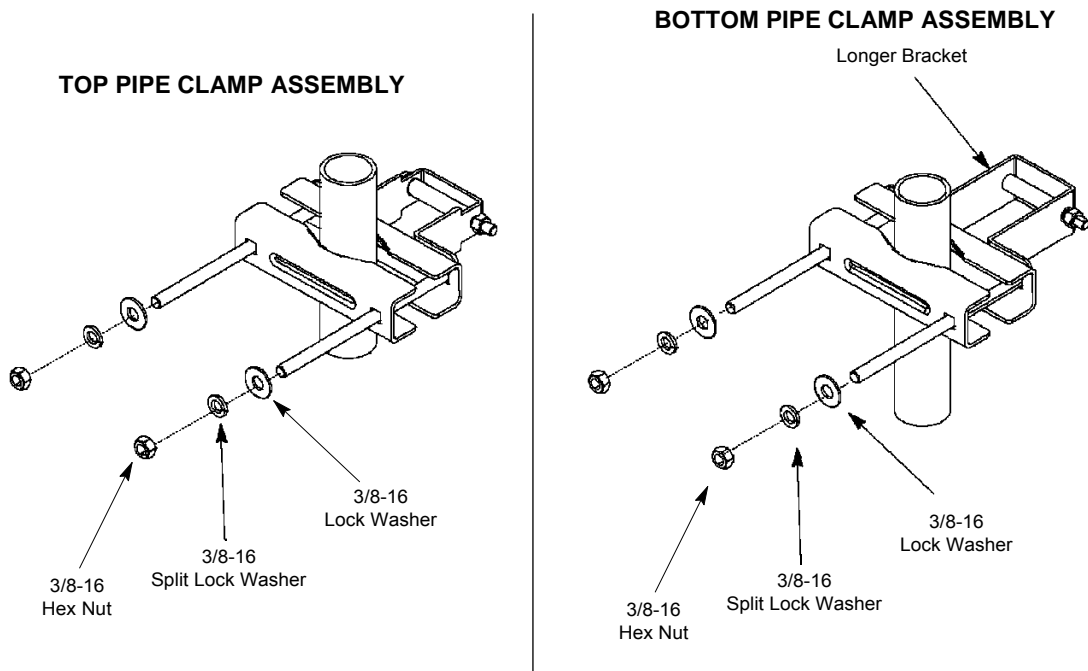
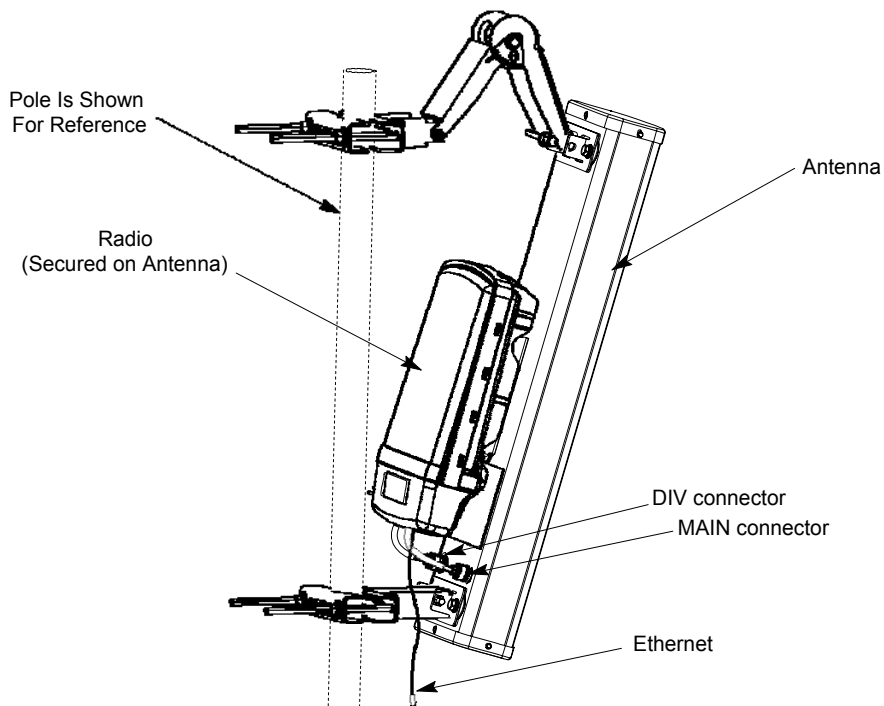


Figure 2-2 AP and antenna parts with scissors bracket



Assembling the AP and connecting the antenna

Use the following procedure to assemble the pipe clamp brackets to the AP, and attach the radio to the antenna. These steps are performed before the AP is mounted on the pole.

Required Tools

- Two ½ inch wrenches
- 9/16 inch wrench and inclinometer
- 10mm socket wrench

Torque Requirements

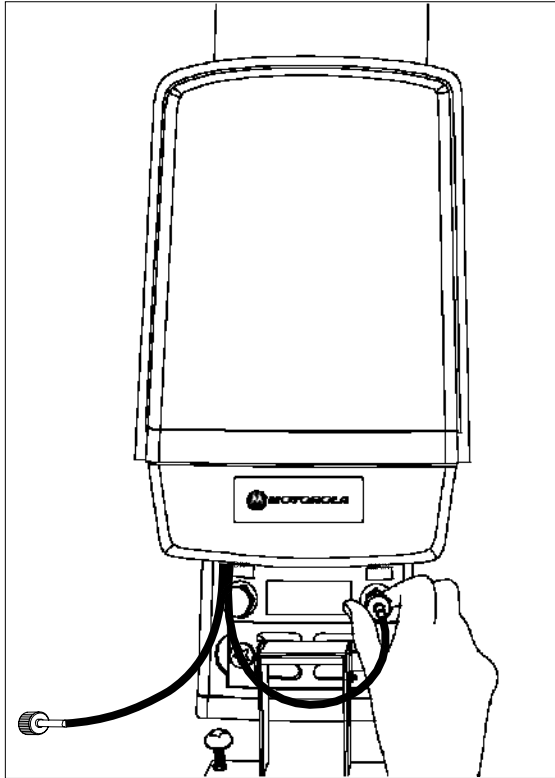
- 3/8 -16 pipe clamp hardware to 9 ft-lbs (12.2 N.m)
- 5/16-18 mount hardware 10 ft-lbs (13.5 N.m)
- M6 hardware 7 ft-lbs (9.5 N.m)

Procedure 2-1 Assemble the AP and antenna for pole mounting

Continued

Procedure 2-1 Assemble the AP and antenna for pole mounting (Continued)

- 1 Perform a parts check to ensure all parts are present.



- 2 Connect the pipe clamp assembly brackets to the antenna.

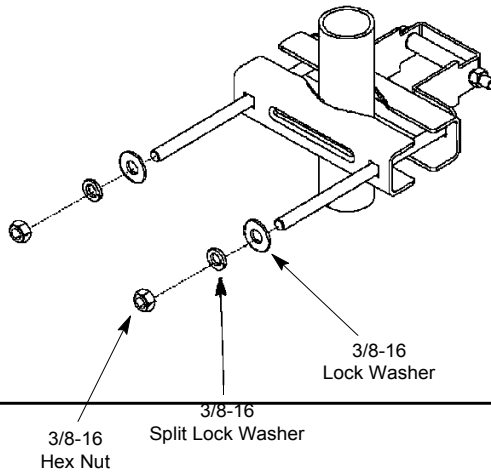
NOTE

Determine between the two pipe clamp assemblies which bracket has the longer bracket bar. The bracket with the longer bar is attached to the bottom of the antenna. The bracket with the shorter bar is used for the top of the antenna and connected to the scissors downtilt bracket.

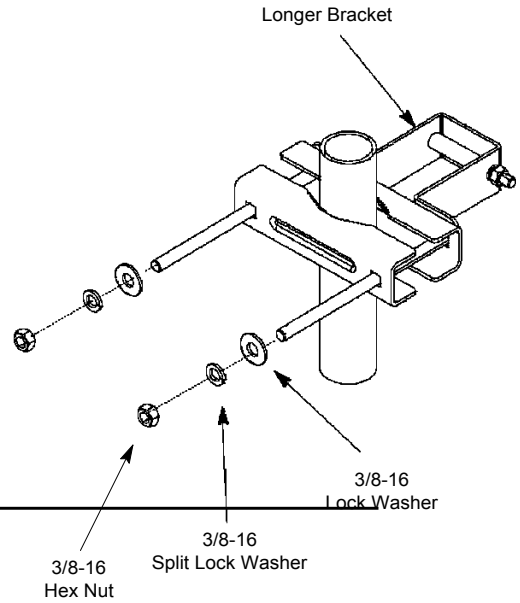
Continued

Procedure 2-1 Assemble the AP and antenna for pole mounting (Continued)

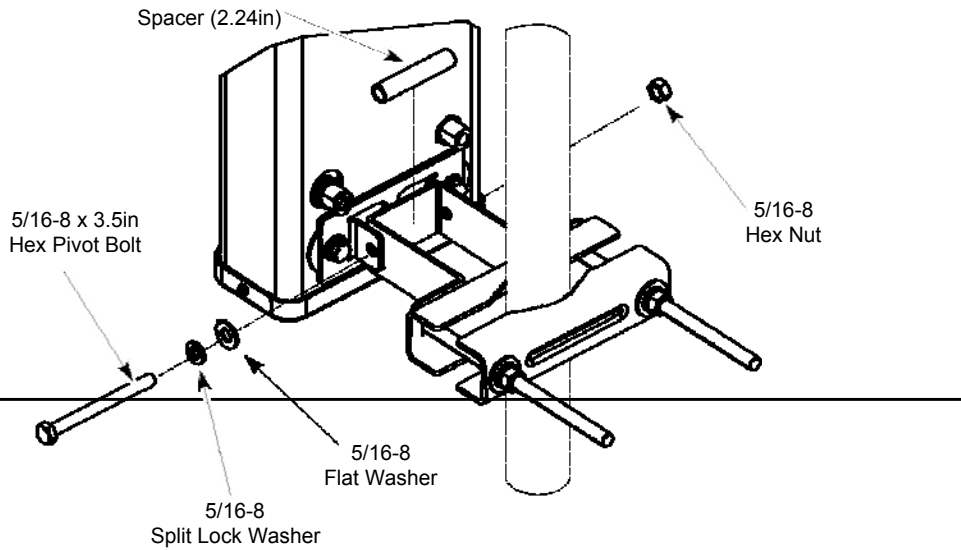
TOP PIPE CLAMP ASSEMBLY



BOTTOM PIPE CLAMP ASSEMBLY



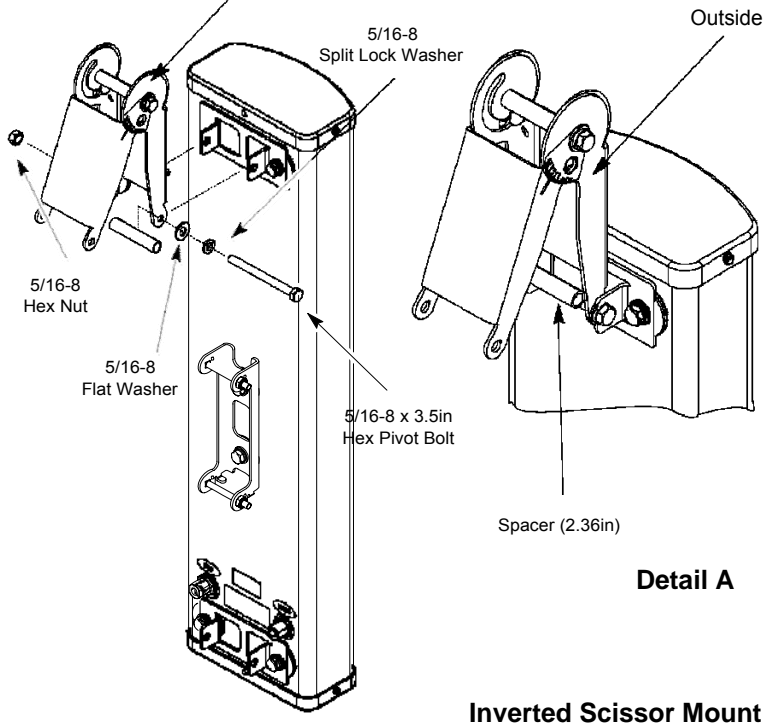
- 3 Using the longer bracket pipe clamp (Bottom pipe clamp assembly) attach the bracket to the bottom of the antenna using a 5/16-18 x 3.5 inch hex pivot bolt, 5-16 hex nut.



Continued

Procedure 2-1 Assemble the AP and antenna for pole mounting (Continued)

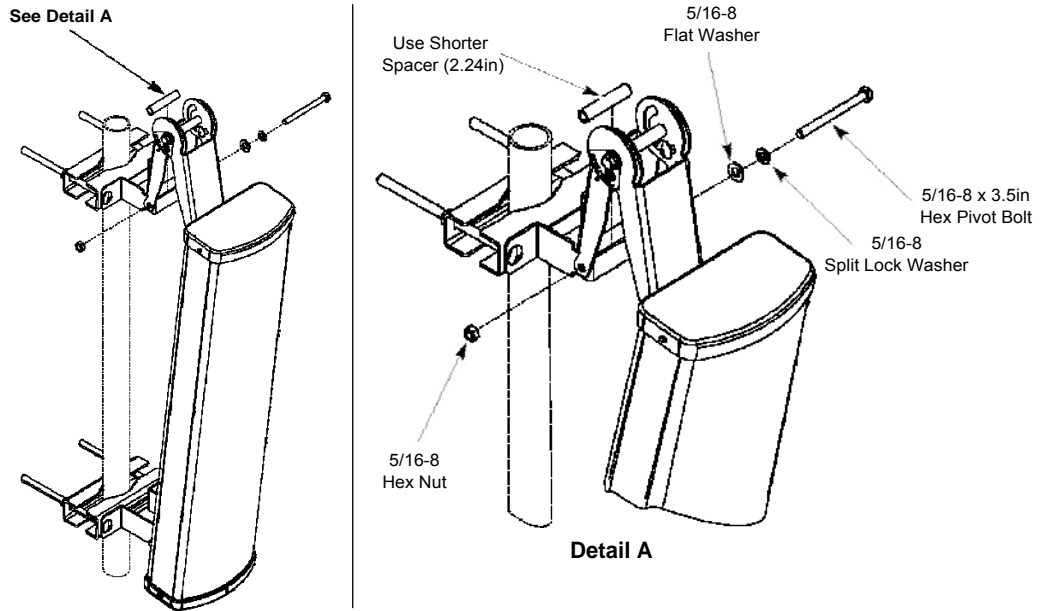
- 4 Using a 5/16-18 x 3.5 hex pivot bolt, 5-16 split lock washer, 5/16 split flat washer, smaller spacer (2.36 inches) and a 5/16 hex nut, connect the scissor bracket to the top of the antenna.
See Detail A



- 5 Using the bracket with the shorter bar, attach the downtilt scissor bracket pointing up (inverted scissor mount) to avoid physical interference between the bracket and the radio housing. Connect the scissor bracket to the short pipe bracket to the scissor bracket by attaching the 5/16-18 x 3.5 inch hex pivot bolt, 5/16-18 flat washer, shorter spacer (2.24 inches) and the 5/16 - 18 hex nut.

Continued

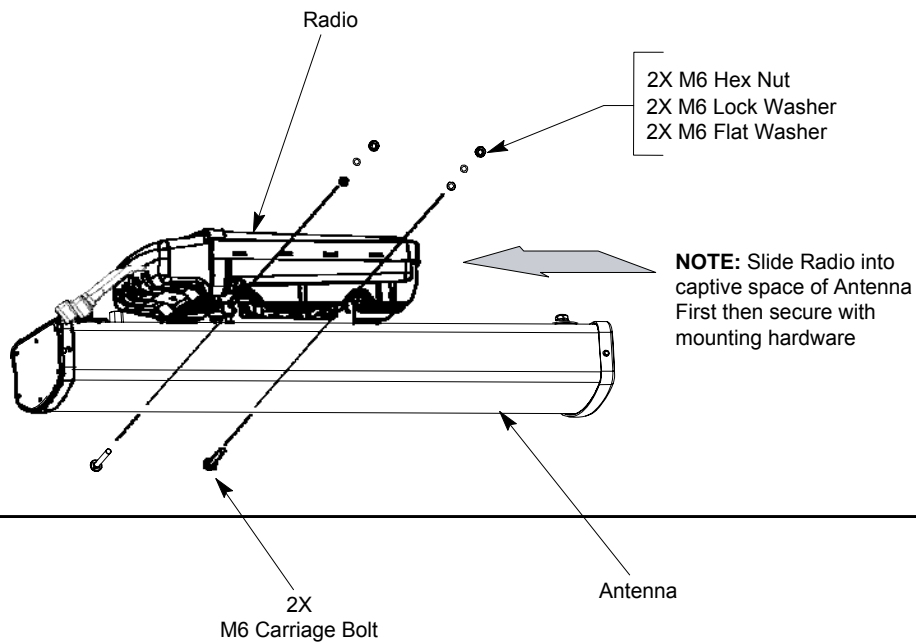
Procedure 2-1 Assemble the AP and antenna for pole mounting (Continued)



NOTE

Use a level (inclinometer) to tilt of the antenna when installing at the site. The scissor bracket has degree markings from 0 to 15 on the bracket, but it is recommended for accuracy to use a level.

- 6 Connect the radio to the antenna by sliding it into the captive space.



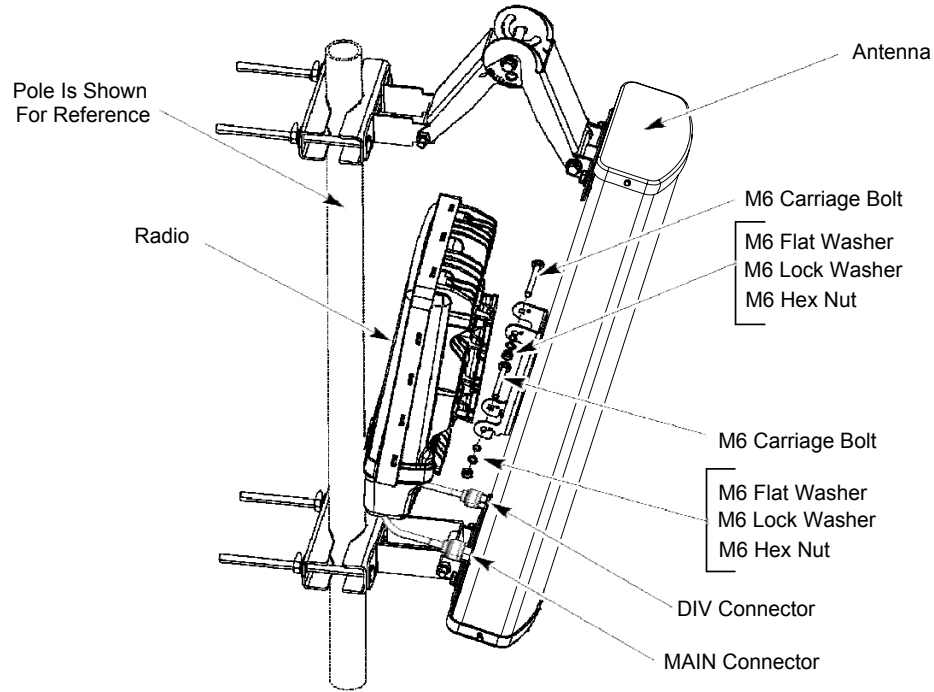
Continued

Procedure 2-1 Assemble the AP and antenna for pole mounting (Continued)

7

Secure the radio to the antenna using the two M6 carriage bolts, M6 flat washers; M6 split lock washer and the M6 hex nut. Torque the M6 nut 7 ft-lbs (9.5 N.m).

The unit is shown away from the antenna in order to illustrate bolt locations.

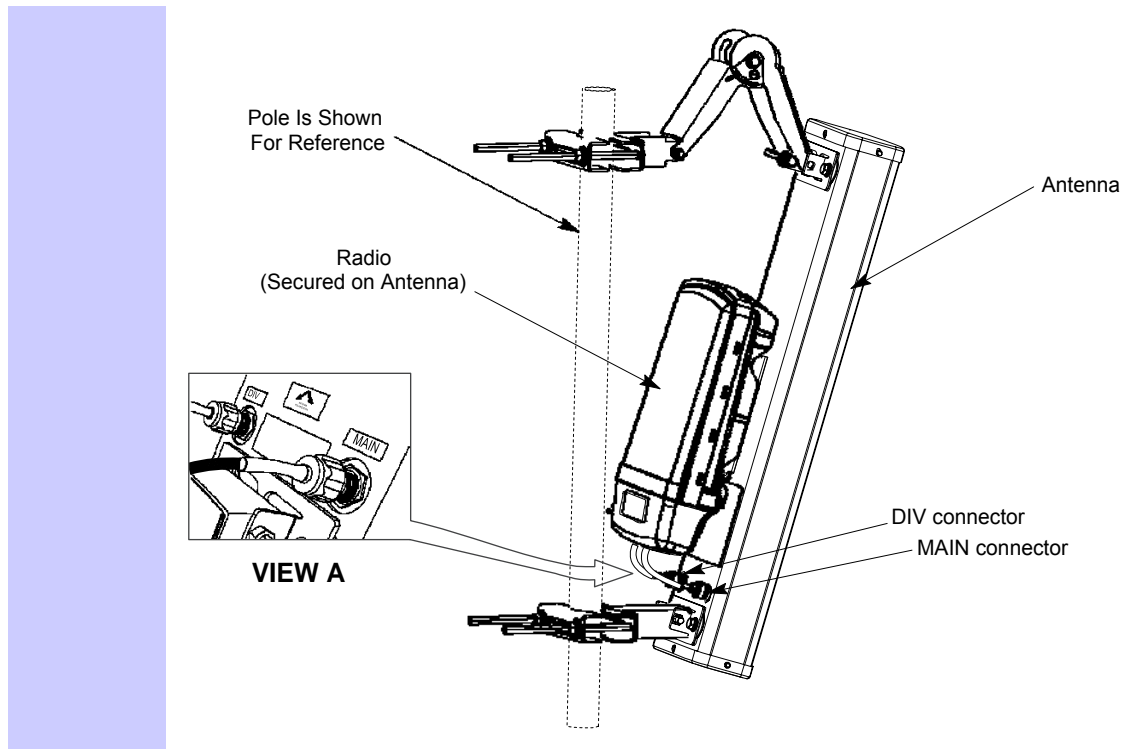


8

Connect the cable labeled:

- MAIN to the antenna connector labeled MAIN
- with no label to the antenna connector labeled DIV (Diversity).

Continued

Procedure 2-1 Assemble the AP and antenna for pole mounting (Continued)**Earth Ground cable assembly and connection**

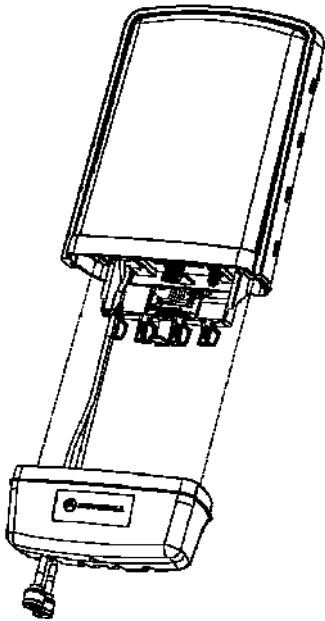
Standard installation practices apply which include:

- use of shielded Ethernet cable for all infrastructure cabling
- use of drip loops at any point where the cable changes direction
- extra cable (a splice loop) is provided for future use at any termination
- ensuring the tower or structure is fully grounded (Protective Earth – PE)
- use water tight tape, followed by electrical tape on all N-connectors

Procedure 2-2 Cabling and grounding the AP**Continued**

Procedure 2-2 Cabling and grounding the AP (Continued)

- 1 Remove the connection protection casing using the thumb release at the back of the AP Unit.

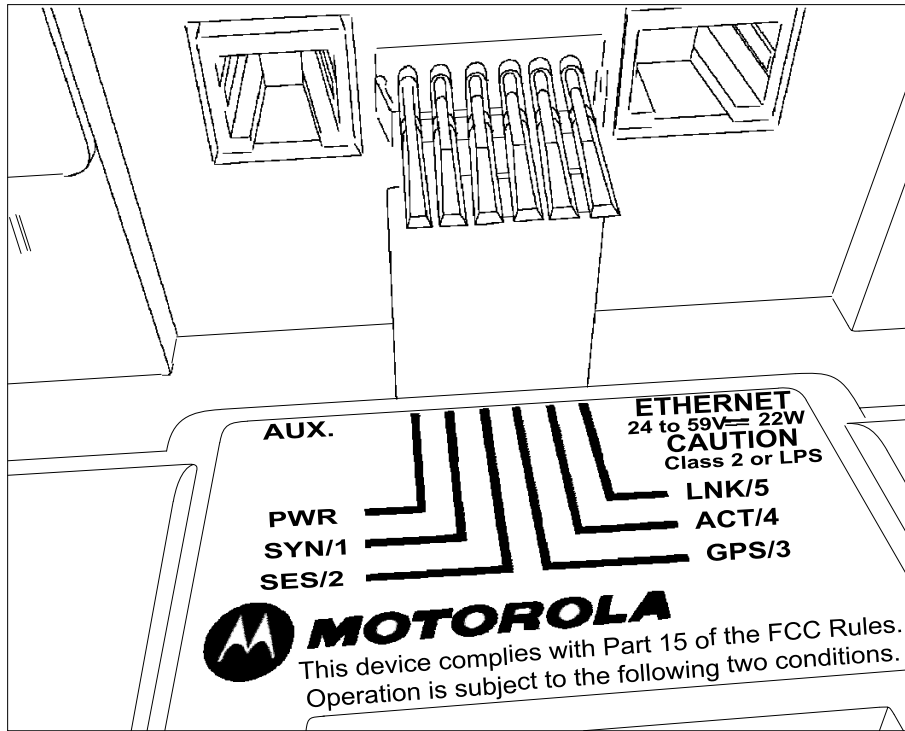


- 2 Use dielectric grease (which is uniformly non-conducting) on all connections and in all RJ-45 Ethernet connectors. The best practice is to use enough grease to fill the RJ-45 female connector, and then insert the RJ-45 male connector and push the grease further into the unit and around the RJ-45 connector. Excess grease can be wiped over the connector area to provide some resistance to water ingress around the connector.

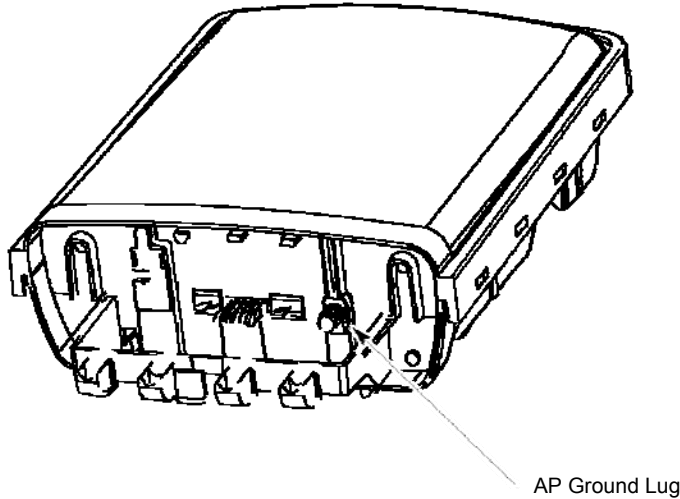
Connect the Ethernet cable to the connector labeled **ETHERNET**. Note that the AUX port is not used at this time.

Continued

Procedure 2-2 Cabling and grounding the AP (Continued)



- 3 Run a 10 AWG ground strap from the ground lug on the AP to known good ground (Protective Earth - PE).



Ground the radio to the tower.

- 4 Be sure to reattach the bottom cover of the AP connection cover.

LED indicator

The LED display for the AP are either Green or off.

Figure 2-3 LED location diagram

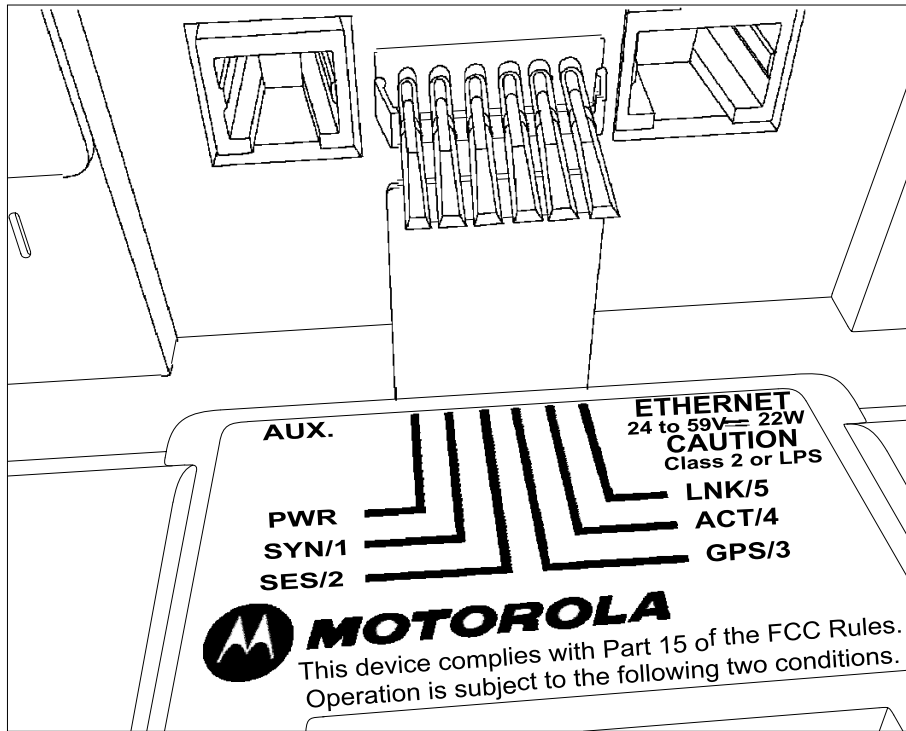


Table 2-2 LED indicators for the AP

LED	Description
PWR (D14)	Power – green indicates the DC power is on. This LED indicates that the board is powered on.
SYN/1 (D13)	Synchronization indicator – this indicator is on whenever the AP is synchronized with the GPS, or when ever the GPS is not used at all.
SES/2 (D12)	Not used, but is always ON.
LNK/5 (D9)	GMAC Ethernet – the LED is on when the GMAC Ethernet link is up.
ACT/4 (D10)	Activity – indicates activity on the ENET port.
GPS/3 (D11)	GPS pulse indicator – this LED is on every 1 pps interrupt, and turned off 20 frames after 100 milliseconds).

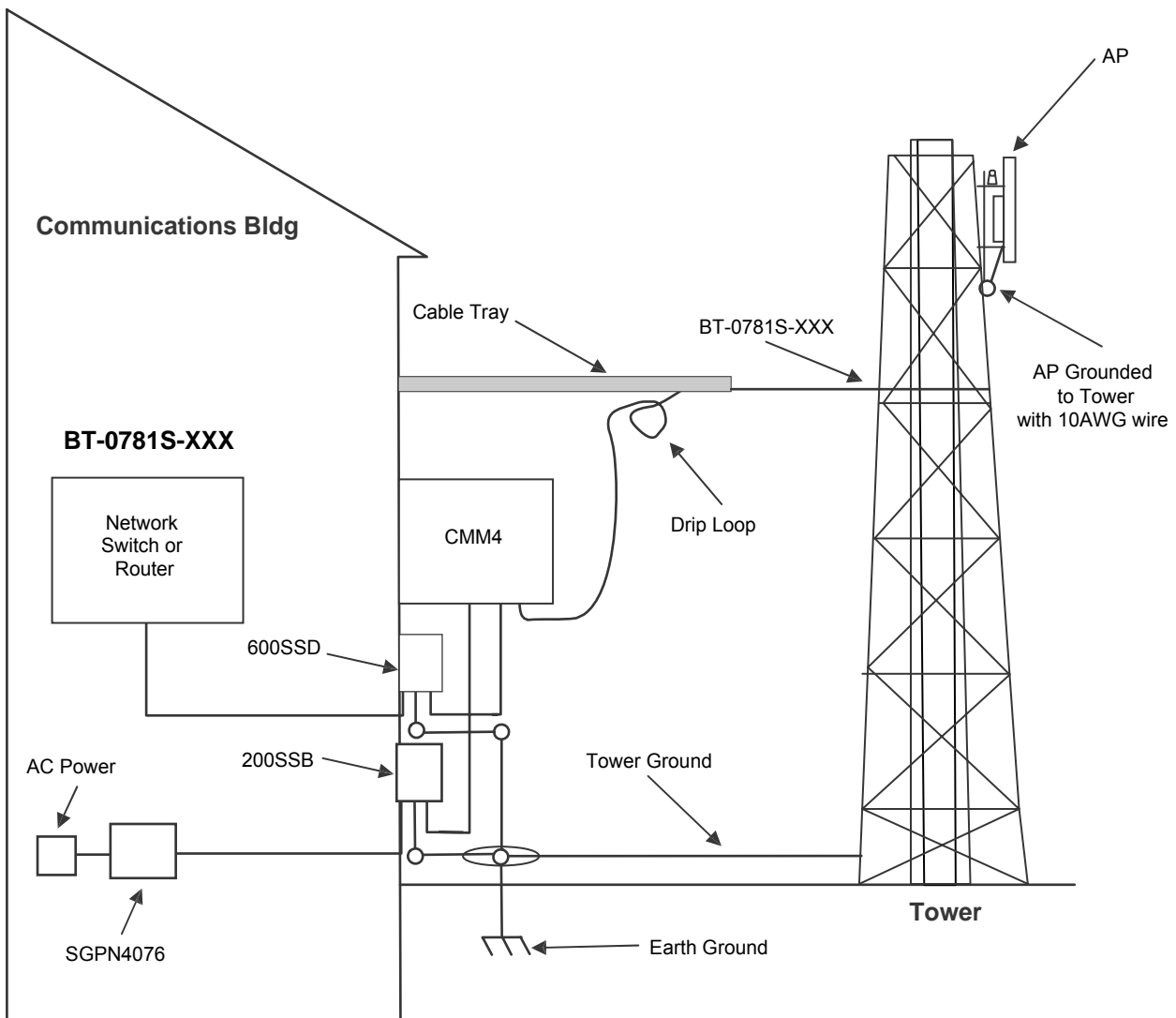
Attach the AP assembly to a pole

⚠ WARNING

Maintain a safe distance from RF exposure when mounting the AP on the tower 50 cm (20 inches). Maintain a safe distance from power lines.

The network planner should provide the antenna pattern information for the installation. The network is planned from true north 0 degrees. Use a compass to ensure there is no overlap of the antennas as they are installed.

Figure 2-4 Mounting the AP to the tower



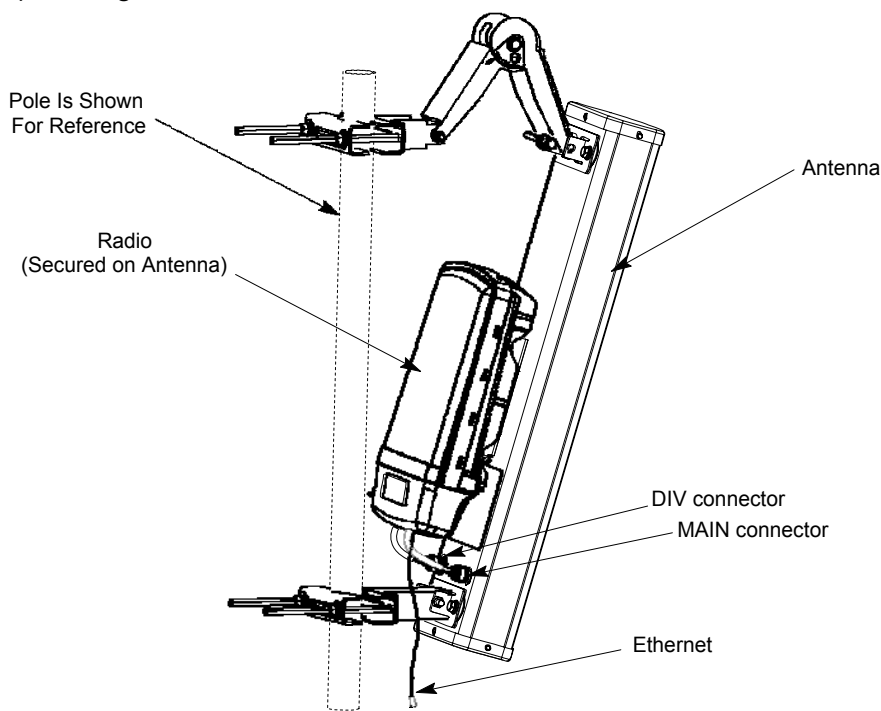
NOTE

- The L-COM surge suppressor is used if the Gigabit Ethernet port is used in the CMM4. The L-COM when used is installed either in the CMM4 cabinet, or installed inside the communications building.
- This figure shows the GPS near the top of the AP unit. For installation information about the GPS refer to [Installing the GPS Antenna on page 3-7](#).
- The AC line cord is not provided with the hardware.

This figure shows the GPS near the top of the AP unit. For installation information about the GPS refer to [Installing the GPS Antenna on page 3-7](#).

Procedure 2-3 Attaching the AP assembly to a pole

1 Using standard work and safety practices for tower climbing, connect the assembled unit (assembled antenna, brackets and radio) to a pole, mounting fixture, or a tower. The unit must be mounted to avoid accidental touching by personnel. The standard mounting height is typically at least 4 m (13 ft) above ground level.



NOTE

Approximate cable distance between the AP and the CMM4 is 100 meters.

Continued

Procedure 2-3 Attaching the AP assembly to a pole (Continued)

2

Install the top and bottom clamps to the pipe. Slide the clamp bracket on to the carriage bolts. Slide on a 3/8-16 flat washer, 3/8-16 split lock washer and a 3/8-16 hex nut to each carriage bolt.

 **NOTE**

- Align the AP setting the desired downtilt degree using the inclinometer.
- The network planner should provide the antenna pattern information for the installation. The network is planned from true north 0 degrees. Use a compass to ensure there is no overlap of the antennas as they are installed.

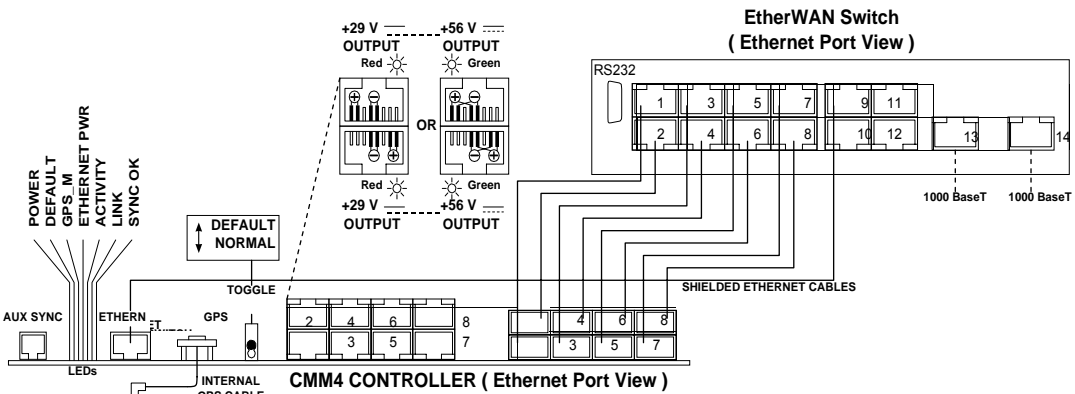
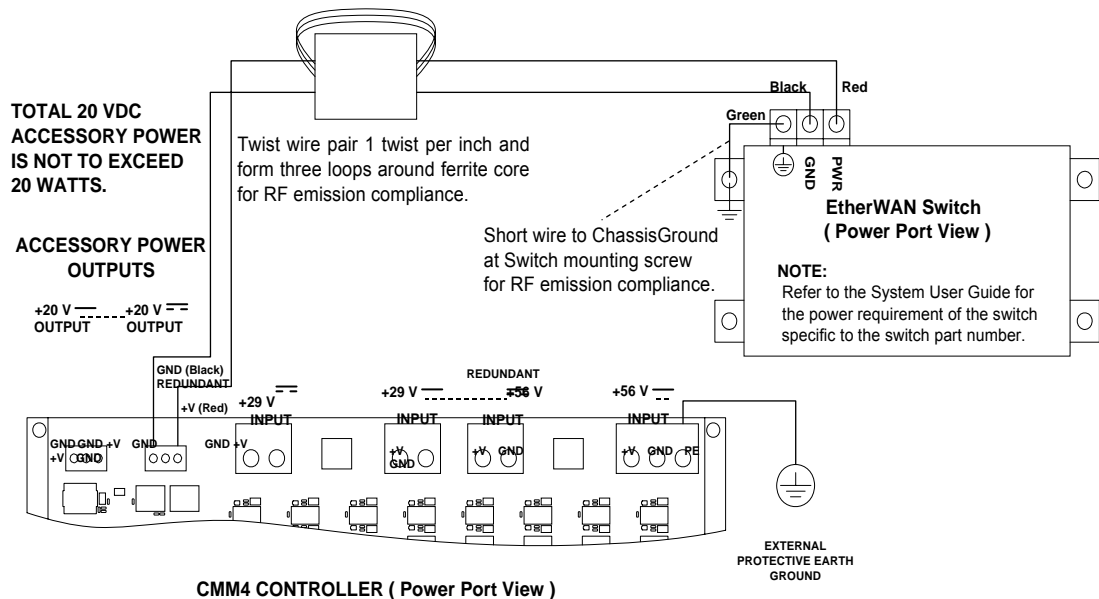
Tighten the hex nut to 10 ft-lbs (13.5 N.m) after the AP has been aligned to the optimum downtilt position.

3

~~Connect the Ethernet cable from the AP to the CMM4 port controller. There are up to 14 ports in one CMM4 switch, but only 8 ports on the CMM4 motherboard that can power up a radio. Ensure that surge suppression has been installed for this connection. See the section on Surge Suppression Information. Follow the site plan created by the network planner when connecting cables to the CMM4 switch.~~

Continued

Procedure 2-3 Attaching the AP assembly to a pole (Continued)



CAUTION:
Damage may result if non-approved equipment is connected to powered parts.

IMPORTANT
See the System User Guide before connecting to power. The Guide is available on-line at <http://motorola.wirelessbroadbandsupport.com/software/>



www.motorola.com

P/N: 5487639D03

CMM4 CONTROLLER

	MAC ADDRESS	IP ADDRESS
PORT 1	_____	_____
PORT 2	_____	_____
PORT 3	_____	_____
PORT 4	_____	_____
PORT 5	_____	_____
PORT 6	_____	_____
PORT 7	_____	_____
PORT 8	_____	_____
PORT 9	_____	_____
PORT 10	_____	_____
PORT 11	_____	_____
PORT 12	_____	_____
PORT 13	_____	_____
PORT 14	_____	_____

Surge Suppression Information

The AP has metal-to-metal contact from the tower or support structure, through the antenna, through the coax cable, to the radio. Installing surge suppression at the AP is strongly recommended to provide the best protection from lightning strikes.

Up to four 600SSD surge suppressors can be mounted in series on an Ethernet link without degrading the link. The equivalent of a 600SSD is built into each of the 8 ports on a CMM4 and counts as one of the four.

As an example, a typical installation might have properly-grounded 600SSD units within 3 ft (1 m) of each AP and additional properly-grounded 600SSD units on each Ethernet cable mounted outside at the point of cable entry to a telecommunications hut that contains the CMM4.

AP Hardware Installation complete

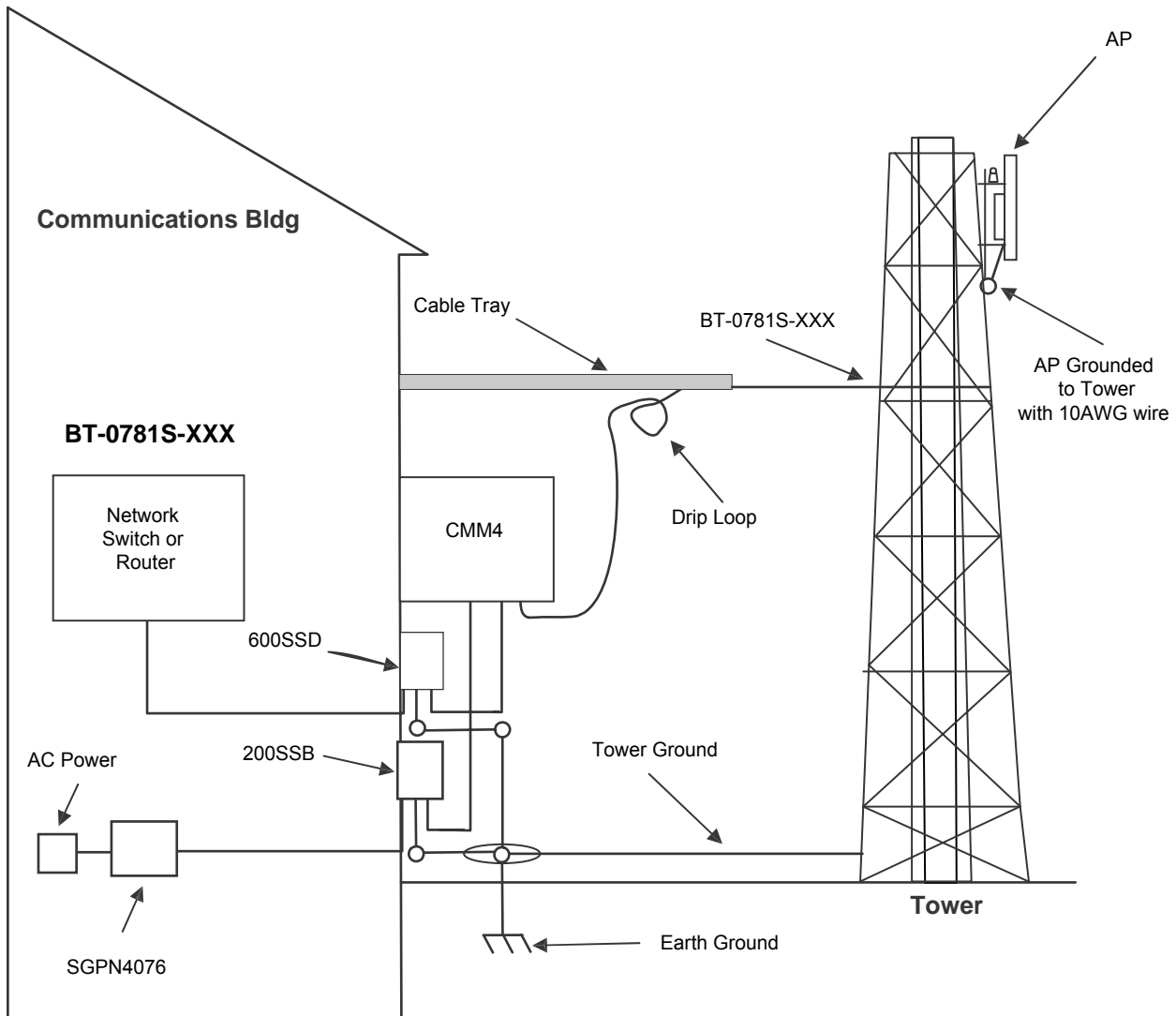
The AP hardware installation is complete. Refer to the PMP 320 Administration and Configuration Guide to update software or configure the device.

CMM4 Hardware Installation

The CMM4 consists of three subsystems:

- the CMM4 enclosure and controller board
- power supplies
- an EtherWAN switch (mounted in the CMM4 enclosure).

Figure 3-1 AP Installation and wiring



NOTE

- The L-COM surge suppressor is used if the Gigabit Ethernet port is used in the CMM4. The L-COM when used is installed either in the CMM4 cabinet, or installed inside the communications building.
- This figure shows the GPS near the top of the AP unit. For installation information about the GPS refer to [Installing the GPS Antenna on page 3-7](#).
- The AC line cord is not provided with the hardware.

Before you begin



Ensure that you comply with standard local or national electrical and climbing procedures when you install the CMM4.

WARNING

Installing a CMM involves electrical power and can involve height and exposure to RF (Radio Frequency) energy. To avoid personal injury, know and follow applicable national and local safety regulations and industry best practices, and follow the specific guidelines in this document

If the CMM4 is being installed on a tower instead of a communications hut, the operator will have to calculate the wind loading on the tower for the addition of the CMM4.

Avoiding Hazards

Use simple precautions to protect staff and equipment. Hazards include exposure to RF waves, lightning strikes, and power surges. This section specifically recommends actions to abate these hazards.

Grounding Equipment

Effective lightning protection diverts lightning current safely to ground, Protective Earth (PE). It neither attracts nor prevents lightning strikes.

Grounding Infrastructure Equipment

To protect both your staff and your infrastructure equipment, implement lightning protection as follows:

- Observe all local and national codes that apply to grounding for lightning protection.
- Before you install your modules, perform the following steps:
 - Engage a grounding professional if you have any questions on grounding.
 - Install lightning arrestors to transport lightning strikes away from equipment. For example, install a lightning rod on a tower leg other than the leg to which you mount your module.
 - Connect your lightning rod to ground.
 - Plan to use an appropriate surge suppressor on any Ethernet cable at the point where it enters any building or structure.
- Install your modules at least 2 feet (0.6 meters) below the tallest point on the tower, pole, or roof.

Conforming to Regulations

For all electrical purposes, ensure that your network conforms to applicable country and local codes, such as the NEC (National Electrical Code) in the U.S.A. If you are uncertain of code requirements, engage the services of a licensed electrician.

In particular, many codes require that wired electrical devices like the 56 VDC power supply either terminate in a plug connection or be wired with an on/off switch, and not be hard-wired to AC/mains.

Protecting Cables and Connections

Cables that move in the wind can be damaged, impart vibrations to the connected device, or both. At installation time, prevent these problems by securing all cables with cable ties, cleats, or weather-resistant tape.

The cable can be a path for water to follow to enter the cable connector or even the module. You can prevent this problem by including and securing a drip loop where the cable enters the module enclosure.

Testing the Components

The best practice is to connect all the components - BHs, APs, GPS antenna, and CMM4 - in a test setting and initially configure and verify them before deploying them to an installation. However, circumstances or local practice may require a different practice.

Unpacking Components

When you receive products, carefully inspect all shipping boxes for signs of damage. If you find damage, immediately notify the transportation company.

As you unpack the equipment, verify that all the components that you ordered have arrived. Save all the packing materials to use later, as you transport the equipment to and from installation sites.

Installation Overview

Before beginning the physical installation of the CMM4 hardware make sure the GUI configuration is completed. Refer to configuration details in the PMP 320 Administration and Configuration Guide for additional information on the GUI configuration procedures.

The physical installation of the CMM4 includes the following:

- physically install the CMM on the tower (or near the communications hut)
- physically install the GPS unit (included with the CMM4, does not have to be ordered separately)
- physically install the surge suppressors
- cable the following CMM4 components:
 - GPS
 - Power
 - ENET
 - 600SSD surge suppressor
 - 200SB surge suppressor
 - L-COM surge suppressor (if the Gigabit Ethernet port is in use at this site, the L-COM must be installed inside the CMM4 unit, or inside the communication's hut, this item is never installed out doors)
 - Earth to ground

Installing the GPS Antenna

Outside the CMM4 enclosure, the CMM4 requires a GPS antenna and power supply. The GPS antenna must be installed in an area with clear access for strong signal reception, but does not need to be mounted high on the tower.

NOTE

Orient the GPS antenna so it has clear access to the southern horizon, up to 20 degrees. Do not install the GPS as the highest object at the site.

Information on GPS cable planning, ordering, and design is covered in [GPS Coax Cable on page 3-8](#).

The following information describes the recommended tools and procedures to mount the GPS antenna.

Recommended Tools for GPS Antenna Mounting

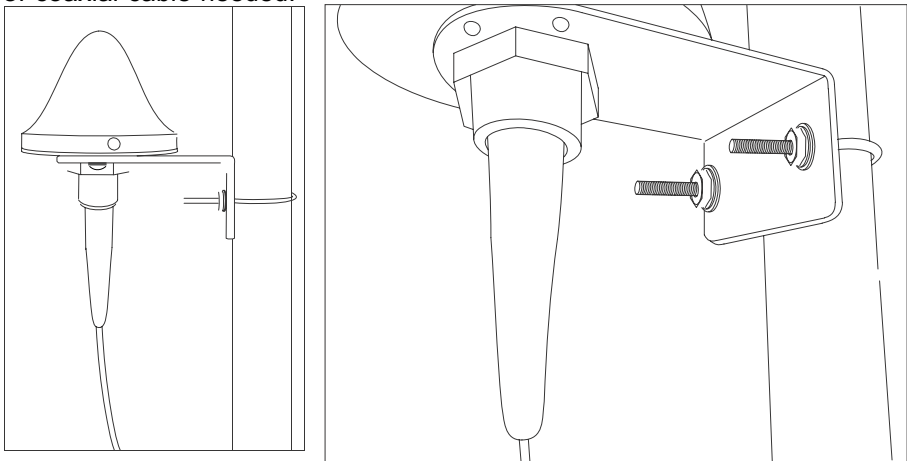
The following tools and materials are needed for mounting the GPS antenna:

- 3/8 inch nut driver
- 12 inch adjustable wrench
- 7/16 inch wrench
- Needle-nose pliers
- electrical tape for all GPS connections
- water-tight tape for all GPS connections

Mounting a GPS Antenna

Perform the following procedure to mount a GPS antenna.

Procedure 3-1 Mounting the GPS Antenna

1	<p>Ensure that the mounting position:</p> <ul style="list-style-type: none"> • has an unobstructed view of the sky to 20° above the horizon. • must not be the highest object on the tower. (The GPS antenna does not need to be particularly high on a site, which would give it more exposure to lightning. It just needs to have an unobstructed view of the southern horizon.) • is not further than 100 feet (30.4 meters) of cable from the CMM.
2	Select a pole that has an outside diameter of 1.25 to 1.5 inches (3 to 4 cm) to which the GPS antenna bracket can be mounted.
3	Attach the GPS unit to the bracket using 4 screws.
4	Place the U-bolts (provided) around the pole.
5	Slide the GPS antenna bracket onto the U-bolts.
6	Slide the ring washers (provided) onto the U-bolts.
7	Slide the lock washers (provided) onto the U-bolts.
8	Use the nuts (provided) to securely fasten the bracket to the U-bolts.
9	<p>Connect the GPS coax cable to the female N-connector on the GPS antenna. See the section GPS Coax Cable for additional details on the length and type of coaxial cable needed.</p> 
10	Use water type tape and electrical tape to seal the connector.

GPS Coax Cable

The operator provides the GPS antenna coaxial cable between the CMM4 and the GPS antenna. It must be engineered to length, and is not included with the CMM4. In most cases, the cable length from the CMM4 to the GPS antenna must be less than 30 m (~100 ft).

Antenna cables can be ordered from Best-Tronics, Inc., <http://best-tronics.com/motorola.htm>. Antenna cables can be ordered in lengths up to 100 ft (30.4 m).

Table 3-1 Cable description

Best-Tronics Part Number	Description
BT-0564	N to N GPS antenna cable

Alternatively, equivalent cables may be procured by the operator, fabricated by the operator in a depot, or fabricated at site using

- Up to 100 feet (30.4 meters) of LMR200 coaxial cable
- 2 Times Microwave N-male connectors (Times Microwave P/N TC-200-NM) or equivalent connectors

 **NOTE**

The CMM4 has a female N-type coax connector on the outside of the enclosure, whereas the CMM micro has a female BNC-type connector inside the enclosure. Take this into account when ordering or fabricating cables, and when replacing a CMM micro with a CMM4.

Installing the power supply for the CMM4

⚠ WARNING

Although the output of the power supply is 29 VDC or 56 VDC, the power rating classifies the converter as a Class 2 electric device. For this reason, whenever you work on power in the CMM4, you must first disconnect the DC supply from the AC power source.

Select the appropriate procedure to install the power supply for the CMM4. Directions are provided for a 56 VDC power supply and a procedure on how to install the 30 VDC power supply.

If using both 30 VDC and 56 VDC, a 1000 Ohm 5W resistor must be installed across the 30 VDC +V and GND at the terminal block.

56 VDC Power Supply Installation

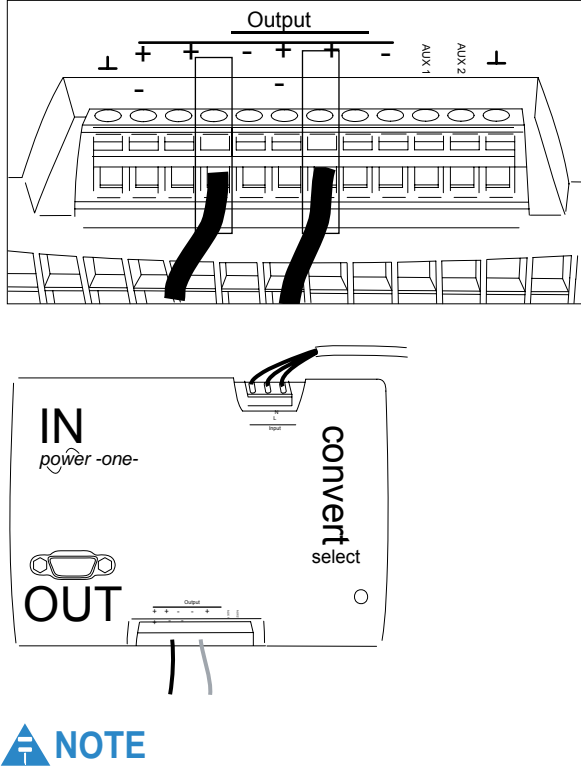
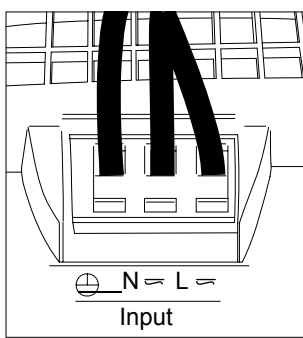
Use the following procedure to install a 56 VDC power supply for the CMM4.

Procedure 3-2 Installing a 56 VDC Power Supply for the CMM4

1	Install the CMM4 power supply in a hut, wiring closet, or weatherized NEMA-approved enclosure. It is designed for extreme temperatures but it is imperative to keep moisture away from the power converter.
2	Do not install the power supply within the CMM4 enclosure as it will increase the heat within the enclosure to an unacceptable level. The CMM4 enclosure is large to provide surface area for heat dissipation without the use of forced convection fans, not to provide space for additional high-power electronics.
3	For the DC side of a 56 VDC power supply, engineer the DC cable, selecting the wire gage from Table 4-1 . Use either UV-resistant cable or shield the cable (as in a conduit) from UV rays.
4	Connect the DC cable on the top of the connector. Insert the +V lead into the terminal 7 cage clamp and insert the GND (ground/return) lead into the terminal 4 cage clamp. To insert a lead into a cage clamp, insert a thin-blade screwdriver in the secondary cage clamp hole and lever the screwdriver away from the main cage clamp hole.

Continued

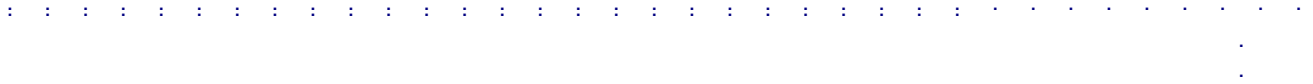
Procedure 3-2 Installing a 56 VDC Power Supply for the CMM4 (Continued)

	 <p>NOTE AC connection on top, DC on bottom.</p>
<p>5</p>	<p>For the AC side of a 56 VDC power supply, connect an AC cable to the power supply using Ground/protective earth, Neutral (N), and Line (L). To insert a lead into a cage clamp, insert a thin-blade screwdriver in the secondary cage clamp hole and lever the screwdriver away from the main cage clamp hole.</p>  <p>The AC line cord is not provided with the hardware.</p>
<p>6</p>	<p>Terminate the other end of the AC cable to a country-specific AC connector or wire to a switch in accordance with local electrical codes.</p>

30 VDC Power Supply Installation

If the PMP 320 will be co-located with PMP 100 equipment on the same CMM4, refer to the Cluster Management Module 4 User Guide at <http://motorola.wirelessbroadbandsupport.com/> for additional information on how to install the 30 VDC power supply, and the 1000 Ohm 5 W resistor that must be installed along with that power supply.

Surge Suppressors



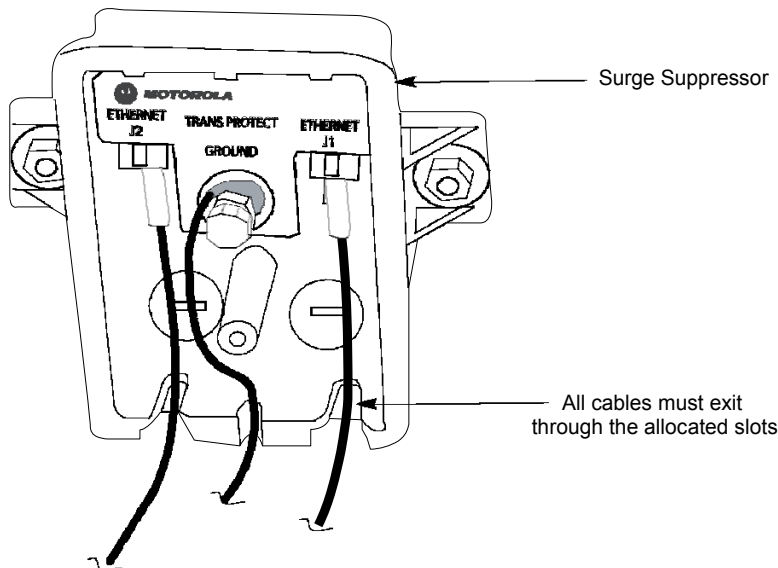
The outdoor mounting of the CMM4 requires the 600SSD, 200SSB, and in certain cases the LCOM surge suppressor. The L-COM surge suppressor is used only if the Gigabit Ethernet port is being used on the CMM4 switch. The L-COM surge suppressor can be installed in the CMM4 unit. The overall installation instructions are as follows:

- ground the 600SSD and the 200SSB to Earth Ground
- connect the protected side of the 200SSB to the AC power supply SGPN4076
- connect the protected side of the 600SSD to the network switch or router in the communications hut.
- add drip loops at any point in the cabling where the cable changes direction.

NOTE

Additional L-COM considerations during installation: if the CMM4 unit is mounted on the antenna and is located more that three feet away from the communications hut, an additional L-COM surge suppressor must be installed.

Figure 3-2 600SSD surge suppressor connectors




600SSD and 200SSB Surge Suppressor installation

Use the following procedure to install the 600SSD and the 200SB surge suppressors.

CAUTION

Observe caution when drilling through the wall of the building. Ensure that there are no power lines, gas lines, water lines, or data lines in the wall at the desired location where the drilling takes place.

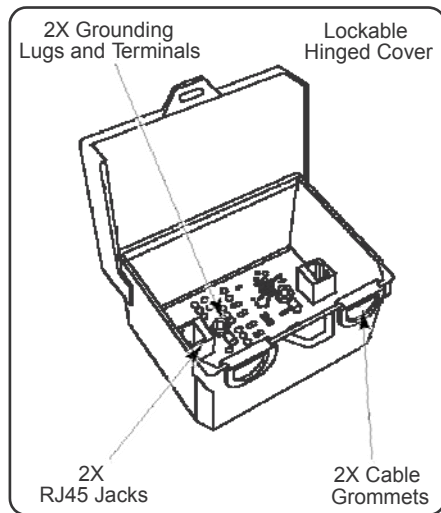
Procedure 3-3 Surge suppressor installation and cable connections

1	Attach the surge suppressor to the communication hut near the cable access point to the inside of the communications hut using two screws.
2	Remove the surge suppressor front cover to access the Ethernet RJ-45 jacks.
3	Connect the Ethernet cable from the CMM4 to the Ethernet port on the surge suppressor port.
4	<div data-bbox="437 779 683 824" data-label="Section-Header"> <h3> CAUTION</h3> </div> <p>Follow local building codes for penetrating buildings. Observe caution when drilling through the wall of the building. Ensure that there are no power lines, gas lines, water lines, or data lines in the wall at the desired location.</p> <p>Drill a 3/4 inch (18 mm) hole through the wall of the communications hut at the desired location.</p>
5	Connect the Ethernet cable from the network or switch router from the communications hut to the Ethernet port on the 600SSD surge suppressor.
6	Use dielectric grease (which is uniformly non-conducting) on all connections and in all RJ-45 Ethernet connectors. The best practice is to use enough grease to fill the RJ-45 female connector, and then insert the RJ-45 male connector and push the grease further into the unit and around the RJ-45 connector. Excess grease can be wiped over the connector area to provide some resistance to water ingress around the connector.
7	Ground the surge suppressor to Earth Ground.
8	Install the surge suppressor front cover to the base of the unit ensuring that the cables are all routed through the cable slots.

L-COM Surge Suppressor installation

The L-COM surge suppressor is used only when the Gigabit Ethernet port is used on the CMM4 switch. The L-COM must be installed inside the CMM4 unit, or inside the communication's hut, this item is never installed outdoors.

Figure 3-3 L-COM surge suppressor



Procedure 3-4 L-COM surge suppressor installation

1	Determine whether the L-COM surge suppressor will be installed inside the CMM4 unit or outside the unit.
2	Remove the front cover of the surge suppressor to access the Ethernet RJ-45 jacks.
3	If the unit is installed: <ul style="list-style-type: none"> • inside the CMM4 unit, continue to step 4. • outside the CMM4 unit in the communications hut, continue to step 8.
4	Place the L-COM surge suppression unit inside the CMM4 housing. Be careful not to place the surge suppressor in the unit as to crush any cables in the CMM4 unit or cables going through the cable glands.
5	Connect the Gigabit Ethernet connection from the CMM4 to the L-COM Ethernet connector.
6	Connect the Ethernet cable from the L-COM surge suppressor and feed the cable through the cable gland on the CMM4 and connect to the switch in the communications hut.
7	Connect the Earth Ground on the surge suppressor to the Earth Ground in the CMM4 cabinet, continue to step 13 .
8	Install the L-COM surge suppressor inside the communications hut using two screws.
9	Connect the Gigabit Ethernet cable to the Ethernet cable connection in the L-COM surge suppressor.
10	Connect the Ethernet cable from the surge suppressor to the switch in the communications hut.

Continued

Procedure 3-4 L-COM surge suppressor installation (Continued)

11	Connect the Ethernet cable from the CMM4 to the Ethernet port on the surge suppressor port.
12	Connect the surge suppressor to the Earth Ground.
13	Place the cover on the L-COM unit and attach the L-COM cover.

Installing the CMM4



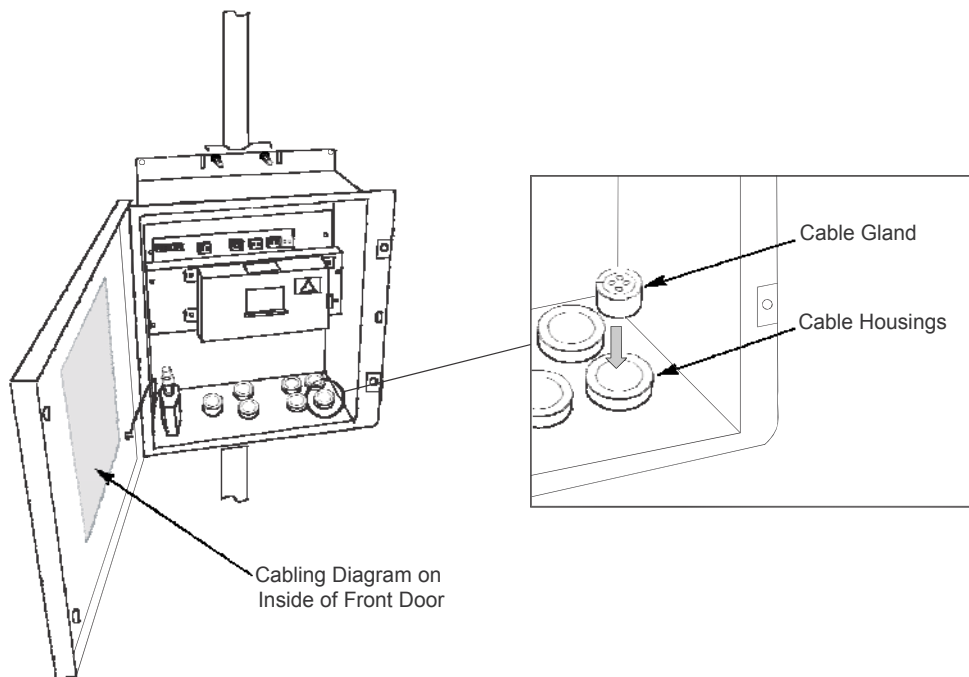
Install the CMM4 outside only when temperatures are above -4° F (-20° C). The gland openings and the bushings and inserts in the gland openings are rated for the full -40° to +131° F (-40° to +55° C) range of the CMM4. However, for dynamic operations (loosening, tightening, and inserting), they are compliant at, and rated for, only temperatures at or above -4° F (-20° C).

For more information about configuring the CMM4 device, refer to the Cluster Manager Module User Guide located at: <http://motorola.wirelessbroadbandsupport.com/software/>.

When performing the installation of the CMM4 unit, remember to:

- install the CMM4 outside the communications hut whenever possible.
- do not mount the power supply inside the CMM4 enclosure.
- use 200SS for all the DC cables powering the CMM4.
- label all the CMM4 connections.
- do not accidentally toggle the default switch on the CMM4 during installation.
- use the provided glands for all connections for the CMM4.
- Use drip loops at all the transition points on all cables.
- Ensure that the pin 4 selector in the surge suppressor is set isolated (factory default).
- Connect the ground bolt on the CMM4 to the Earth Ground.
- Run the redundant power supplies on different paths

Figure 3-4 CMM4 unit opened showing connection details



Prizm and Wireless Manager treat the EtherWAN Switch in a CMM4 as a generic switch. For Prizm or Wireless Manager to correctly associate each EtherWAN Switch with its CMM4:

- before you install the CMM4, read and note the MAC address of both the CMM4 controller and EtherWAN switch from the physical units.
- after you discover a CMM4 and its switch, use these MAC addresses for moving the switch to the place in your Prizm or Wireless Manager network view where the CMM4 was discovered.
- always maintain a record that associates these two MAC addresses.

CAUTION

When an EMS discovers an EtherWAN switch in your network, it can't tell which CMM4 the switch is associated with, nor can it tell CMM4 EtherWAN switches from any other EtherWAN switches you may have in your network. The pair of MAC addresses you record directly from the CMM4 and its EtherWAN switch are the only means for you to establish the logical connection.

Perform the following procedure to install the CMM4.

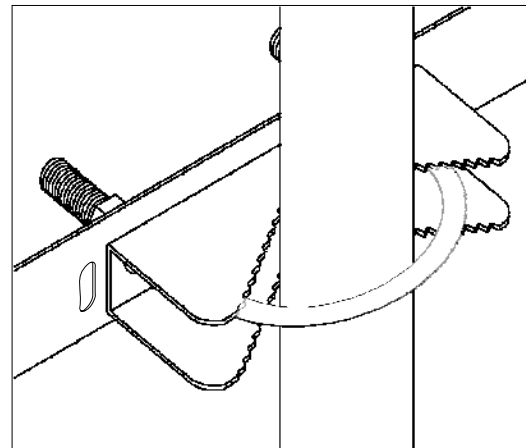
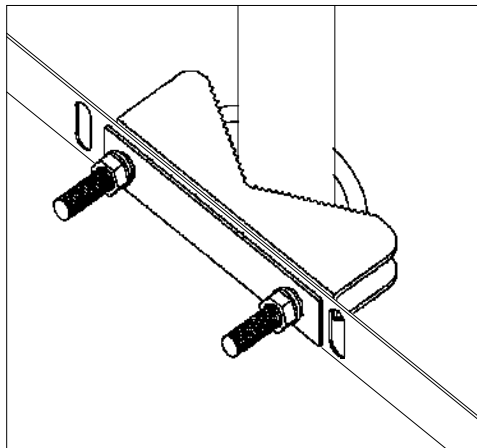
Procedure 3-5 Installing the CMM4

- 1 Ensure that the mounting position:
- is not farther than 328 feet (100 meters) from the furthest AP or BH that the CMM4 will serve.
 - is not closer than 10 feet (3 meters) to the nearest AP or BH.
 - is not further than 100 feet (30.5 meters) of cable from the intended mounting position of the GPS antenna.
 - allows the doors to open fully open for service.

2 Select a support structure to which the flanges can be mounted.

3 If the support structure is:

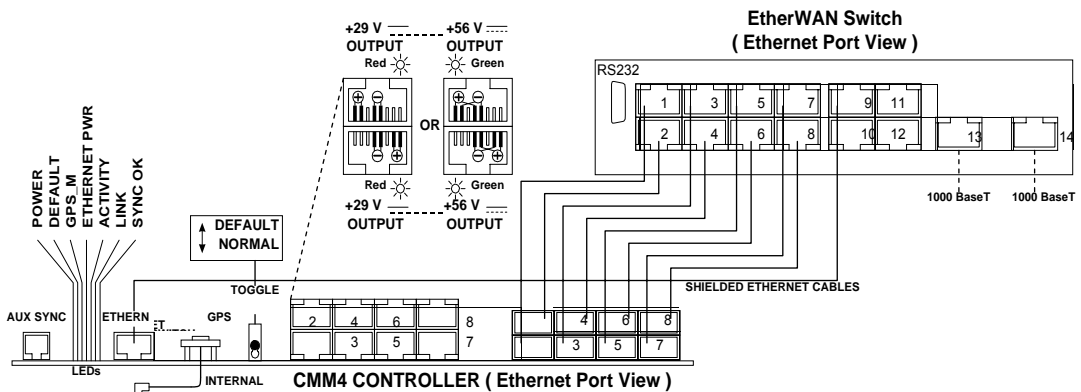
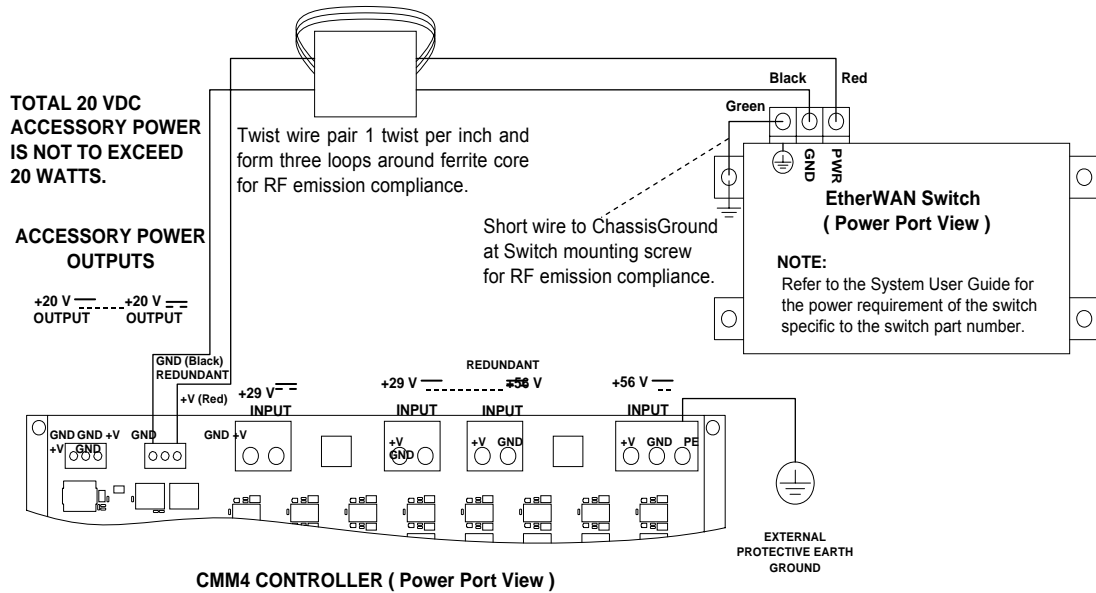
- a wall, use screws or bolts (neither is provided) to attach the flanges to the wall.
- an irregular-shaped object, use adjustable stainless steel bands (provided) to attach the CMM4 to the object.
- a pole that has an outside diameter of 1.25 to 3 inches (3 to 8 cm), use a toothed V-bracket (provided) to attach the V-bracket to the pole. Then attach the CMM4 flanges to the V-bracket.



4 If the CMM4 is mounted to a non-conducting structure (cinder block wall, for example) or there is any doubt as to a good ground through the structure, run a 10 AWG ground cable from one of the Ground/Earth terminations of one of the terminal blocks inside the CMM4, through a cable gland, and to known good ground.

Cabling a CMM4

Figure 3-5 CMM4 connection diagram located on the door of the unit



CAUTION:
Damage may result if non-approved equipment is connected to powered parts.

IMPORTANT
See the System User Guide before connecting to power. The Guide is available on-line at <http://motorola.wirelessbroadbandsupport.com/software/>



www.motorola.com

P/N: 5487639D03

CMM4 CONTROLLER

- PORT 1
- PORT 2
- PORT 3
- PORT 4
- PORT 5
- PORT 6
- PORT 7
- PORT 8
- PORT 9
- PORT 10
- PORT 11
- PORT 12
- PORT 13
- PORT 14

MAC ADDRESS

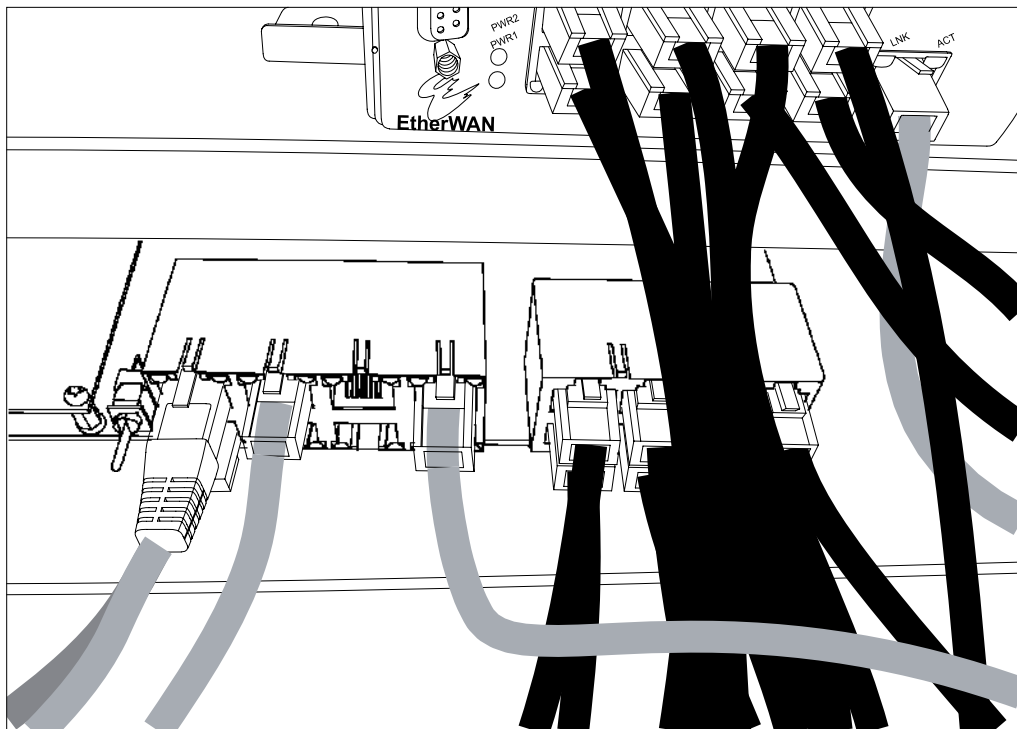
IP ADDRESS

MAC ADDRESS	IP ADDRESS
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Perform the following procedure to cable the CMM4.

Procedure 3-6 Cabling the CMM4

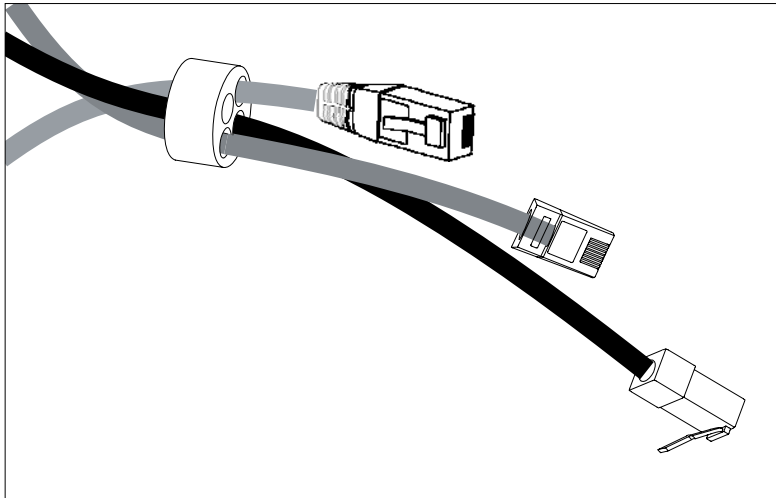
- 1 Review the diagram inside the door of the CMM4. Refer to [Figure 3-5](#).
- 2 The inserts in the gland openings of the CMM4 have precut holes.
- 3 Route Ethernet cables through the cable gland connectors to the Ethernet ports inside the CMM4 cabinet (see the grey cables in the illustration). Stagger the cables as shown in the figure to make it easier to feed them through the gland.



Continued

Procedure 3-6 Cabling the CMM4 (Continued)

- 4 Stagger the cables as shown in the figure to make it easier to feed them through the gland.




- 5 Connect Ethernet cables as follows:

- **APs, BH10s, or BH20s (PTP 100 Series bridges):** cable to powered ports of the controller board. The controller board provides sync, power, and surge suppression for these connections. If the CMM4 is mounted inside a building or communications hut, a Motorola 600SSD surge suppressor (model number 600SSC or later) should be mounted outside the building or communications hut on each line at the point of cable penetration to prevent overvoltages and over-currents from entering the building and potentially damaging other electronic equipment.
- **Terrestrial feeds under 100 Mbps (10/100BaseT):** cable to an unpowered port of the controller board. The controller board provides surge suppression for these connections. If the CMM4 is mounted inside a building or communications hut, a Motorola 600SSD surge suppressor (model number 600SSC or later) should be mounted outside the building or communications hut on each line at the point of cable penetration to prevent over-voltages and over-currents from entering the building and potentially damaging other electronic equipment.
- **Terrestrial feeds over 100 Mbps (1000BaseT Gigabit Ethernet):** cable directly to the Gigabit port of the EtherWAN switch, and mount a Motorola PTP-LPU lightning protection unit or equivalent within 3 ft (1 m) of the CMM4 if the CMM4 is located outdoors on the outside of the building or communications hut at the point of cable penetration if the CMM4 is located indoors.
- **PTP 400 Series bridges:** cable to an unpowered port of the controller board. If the CMM4 is inside a building or communication hut, install the bridge's PIDU (Powered InDoor Unit) also inside the building, and install a Hyperlink Technologies AL-CAT6HP-JW surge suppressor (only needed in special cases) or equivalent on the outside of the building or communications hut at the point of cable penetration. If the CMM4 is

Continued

Procedure 3-6 Cabling the CMM4 (Continued)

	<p>mounted outside, locate the PIDU in a weather-tight enclosure within 3 ft (1 m) of the CMM4 and install a Hyperlink Technologies AL-CAT6HP-JW surge suppressor or equivalent within 3 ft (1 m) of the PIDU.</p> <ul style="list-style-type: none"> PTP 500 and 600 Series bridges: cable directly to the Gigabit port of the EtherWAN switch. If the CMM4 is inside a building or communication hut, install the bridge's PIDU (Powered InDoor Unit) also inside the building, and install a Hyperlink Technologies AL-CAT6HP-JW surge suppressor or equivalent on the outside of the building or communications hut at the point of cable penetration. If the CMM4 is mounted outside, locate the PIDU in a weather-tight enclosure within 3 ft (1 m) of the CMM4 and install a Hyperlink Technologies AL-CAT6HP-JW surge suppressor or equivalent within 3 ft (1 m) of the PIDU.
6	On the door label, record the MAC and IP addresses of the CMM4 and all connected equipment.
7	Record also the MAC address of the EtherWAN switch.
8	Consistent with practices in your company, note the above information to add later to the company equipment database.
9	Connect the coax cable from the female N-connector on the GPS antenna to the female N-connector on the outside of the CMM4.
10	Ensure there is an Ethernet cable between the management port on the controller board and one of the Ethernet ports on the EtherWAN switch.
11	Feed the DC power cord through a cable gland. A 1-hole gland insert is provided, as the DC power cable is too thick to share a gland with other cables. The 1-hole insert is either connected to one of the patch cables or included in the parts bag.
12	<p>Connecting power to the terminal block:</p> <ul style="list-style-type: none"> For 29 V: Connect the white wire to +29V on either of the 29 VDC terminal blocks. Connect the black wire to -V (GND) on the same 29 VDC terminal block. For 56V: Connect the black and white wire to +56V on either of the 56 VDC terminal blocks. Connect the black wire to -V (GND) on the same 56 VDC terminal block.
13	<p>Plug the DC power supply into an AC receptacle (AC mains).</p> <p> NOTE</p> <p>The AC line cord is not provided with the hardware.</p>
14	Verify that the LEDs light.

LED indicators

The indicator LEDs color indicates position, but not the state. For example, the red Power LED, in the left most position, lights when power is applied to the unit, but does not change color at any point.

Table 3-2 LED Indicators for the CMM4

LED Color	Item
Red	Power
Amber	Default
Green	GPS Master
Red	Ethernet Switch Power
Amber	Link
Green	Activity
Amber	Sync OK

 **CAUTION**

Surge suppressors should be installed on any cables where they enter a building to reduce the possibility of over voltages or over currents damaging any equipment in the building.









The following equipment, mounted outside of a communications hut or building at the point where the cables penetrate the building, is recommended:

- Motorola 600SSD surge suppressors for Ethernet cables
- Motorola 200SS surge suppressors for DC cables
- A PolyPhaser DGXZ+06NFNF-A surge suppressor for the coaxial cable from the GPS antenna

Power Faults

If excessive current is drawn on a port, the analog circuitry reports a PoE fault. The system then turns the port power off. The power will be restored when the fault is removed. The following illustration shows the port status screen with a power fault on port 1.

Figure 3-6 Port Status Showing Power Fault

Port Status								
Port Number	1	2	3	4	5	6	7	8
Port Text	Port 1 Description	Port 2 Description	Port 3 Description	Port 4 Description	Port 5 Description	Port 6 Description	Port 7 Description	Port 8 Description
Power	 Power Fault! 0 V	 29 V	 29 V	 29 V	 29 V	 29 V	 29 V	 29 V
Device Type	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy	Canopy
<p>Power fault on port:1 Please check the devices and port configurations.</p>								

Configuring CMM4 ports

To configure the ports that have been connected in this installation procedure, refer to the **CMM4 User Guide** located at: <http://motorola.wirelessbroadbandsupport.com/software/>.

Other Installation Considerations

If two CMM4 devices are synchronized together, the CMM4 that does not have a GPS needs to be set up via the GUI as a CMM slave device. Refer to the CMM4 User guide located at : <http://motorola.wirelessbroadbandsupport.com/software/>.

Cables

DC Cables

Motorola recommends the use of flame-retardant, moisture and sunlight-resistant cable rated to 75° C wet and bendable at -25° C for the DC cable between the power supply(s) and the CMM4. Examples of such cable include General Cable (<http://www.generalcable.com>), catalog number 234580 for 12 AWG cable and catalog number 236300 for 10 AWG cable, found in the Telecommunications Catalog.

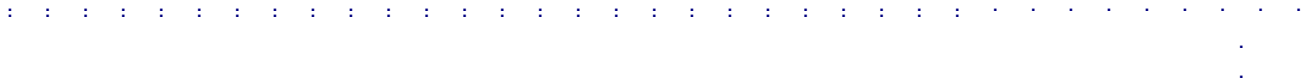
Recommended wire size for the DC cable of the CMM4 in most systems is shown in [Table 4-1](#). These wire sizes support up to 8 radios (30 VDC or 56 VDC radios) at up to 100 m (328 ft) Ethernet cable length from the CMM4.

Table 4-1 Wire size for CMM4 DC cable

DC Power Cord Length	Wire Gage
Up to 90 ft (3–25 m)	12 AWG (4 mm ²)
91–145 ft (26–45 m)	10 AWG (6 mm ²)
146–230 ft (46–70 m)	8 AWG (10 mm ²)

For supporting 8 PMP 54400 APs or PTP 54200 BHs (which are 12 W 30 VDC radios), reduce either the maximum DC cable length or the Ethernet cable length by half. For example, if the Ethernet cable length from CMM4 to 8 PMP 54400 APs is 50 m (164 ft) or less, the DC lengths in [Table 4-1](#) can be used. If the Ethernet cable length from CMM4 to 8 PMP 54400 APs is 100 m (328 ft), then halve the lengths shown in [Table 4-1](#).

Ethernet Cables



The operator provides the Ethernet cables between the CMM4 and the radios it supports. They must be engineered to length and are not included with the CMM4. The cable length from the CMM4 to any radio must be under 100 m (328 ft).

Cables are available from Best-Tronics, Inc., <http://best-tronics.com/motorola.htm>. These cables can be ordered in lengths up to 328 ft (100 m) and are listed in the following tables.

Table 4-2 Recommended Ethernet Cables

Typical Use	Best-Tronics Part Number	Description
Infrastructure Ethernet cable	BT-0781S-XXX	RJ-45 to RJ-45 straight, shielded, UV-resistant Ethernet cable using outdoor STP Cat 5e cable, lower cost than plenum-rated, available only in black.
Infrastructure Ethernet cable for plenums	BT-0562S-XXX	RJ-45 to RJ-45 straight, shielded, UV-resistant, plenum-rated Ethernet cable using outdoor STP Cat 5e cable, available in beige, blue, grey, or white.

 **NOTE**

Shielded Ethernet cable is strongly recommended for AP and BH installations.

Alternatively, equivalent cables may be procured by the operator, fabricated by the operator in a depot, or fabricated at site. The modules have auto MDX/MDIX and so either straight-through or crossover Ethernet cables may be used. Pinouts for straight-through cables are shown the following figures.

Figure 4-1 RJ-45 Straight-through connections

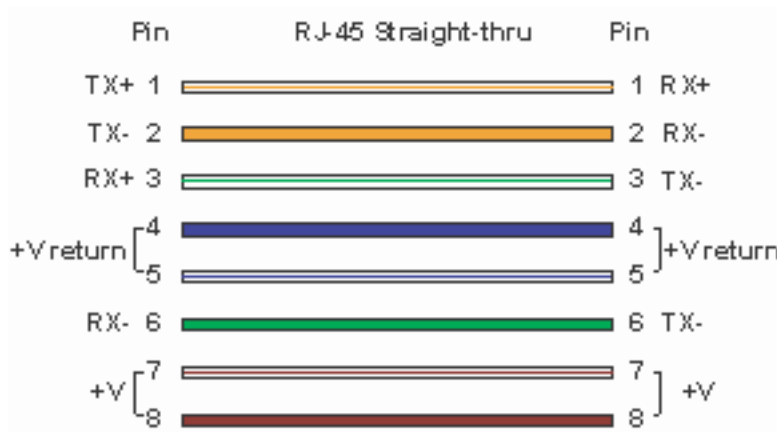


Table 4-3 Recommended Ethernet Cables

Pin	Color
1	white / orange
2	orange
3	white / green
4	blue
5	white / blue
6	green
7	white / brown
8	brown

Figure 4-2 Pin 1 Location diagram



(Lock tab underneath)

Bulk unterminated Ethernet cable can be ordered from Best-Tronics as bulk cable:

- CA-0287S: (shielded, plenum rated)
- CA-0367S: (lower cost, shielded, non-plenum-rated)

CMM Sync Cable



Two CMMs (two CMMmicros, two CMM4s, or a CMMmicro and a CMM4) can be connected together with a CMM sync cable to provide either

- The ability to have one GPS antenna support two CMMs
- Warm spare redundant sync

Pinouts for the CMM sync cable are shown in the following figures. [Figure 4-4](#) shows the location of Pin 1, relative to the lock tab on the connector.

NOTE

The CMM sync cable used to connect two CMMs for sync purposes has different pinouts than the straight-through sync cable used to connect a “remote AP” to an SM, or an AP or BHM to a CMM2.

Figure 4-3 CMM sync cable pinouts

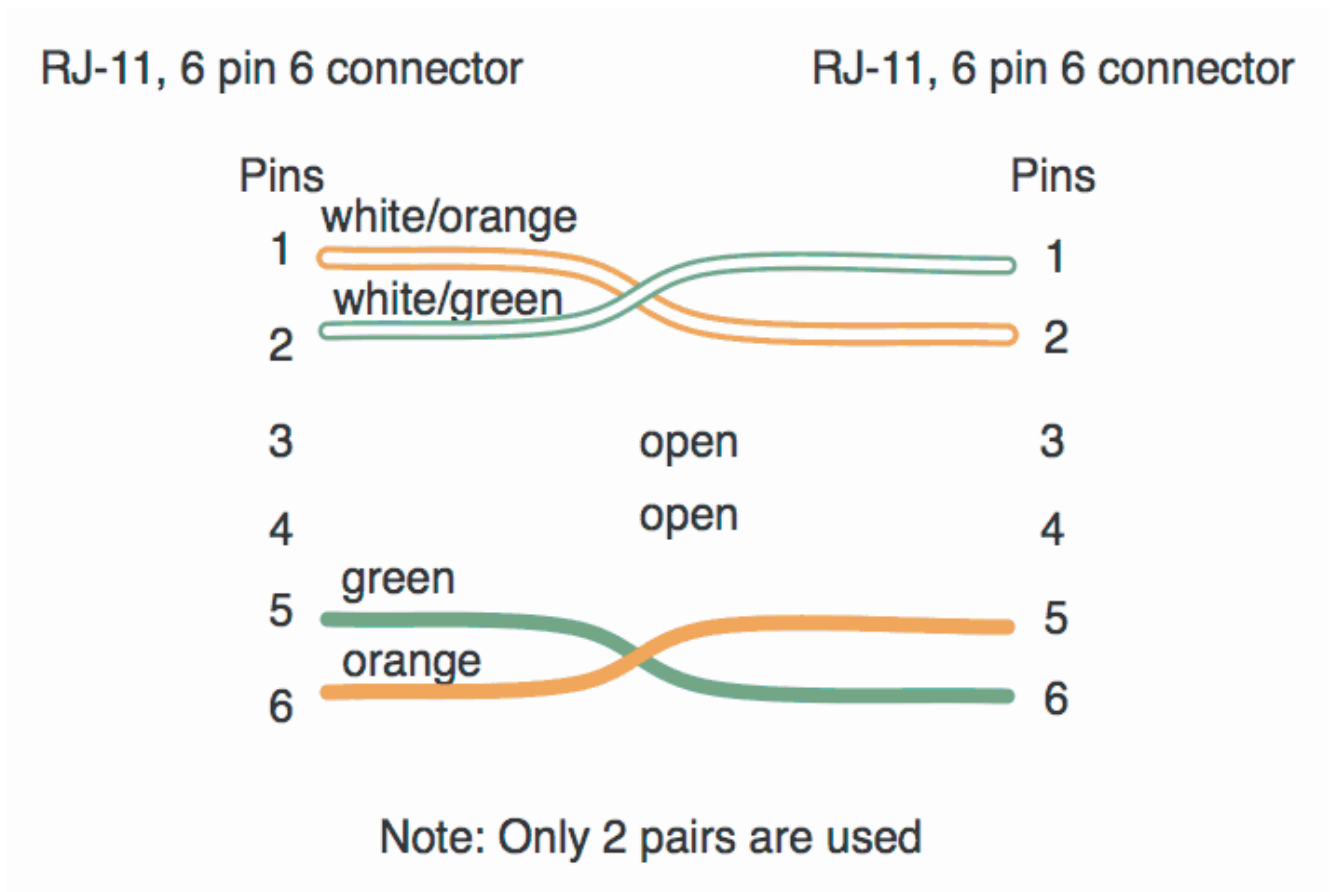
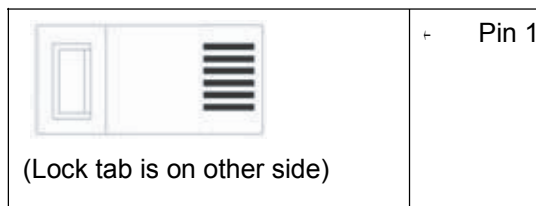


Figure 4-4 CMM sync cable pinouts



CSM Hardware Installation

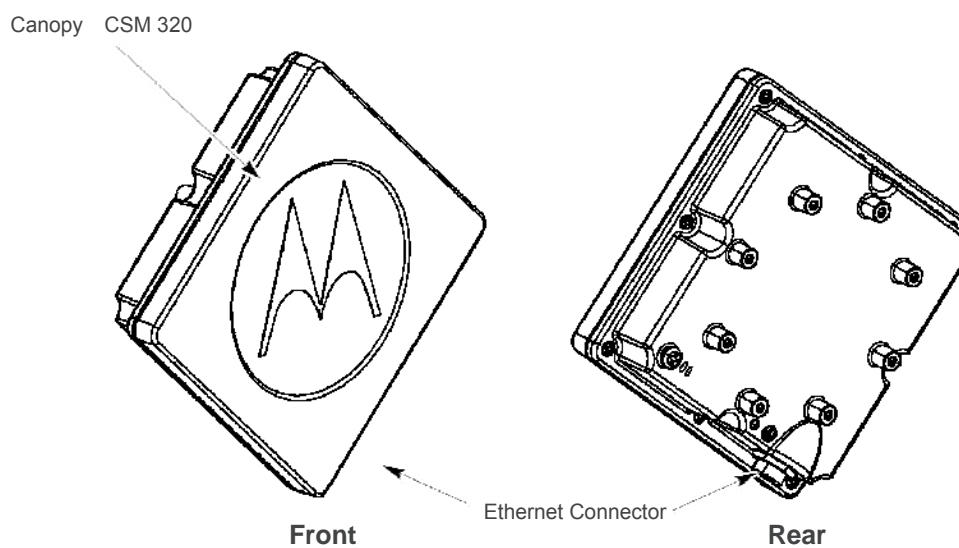
This chapter provides the instructions and procedures used to:

- connect the CSM device to a pole or wall
- pre-power up alignment for level of service connection
- cable the unit
- ground the unit
- add surge suppression
- post power up connection
- IP connectivity alignment correction

CAUTION

The orientation of the CSM when installed is important. The face of the CSM with the Motorola logo must be pointing in the direction of the antenna facing outwards from the building. The Ethernet connector must be oriented so it is on the bottom right corner of the CSM.

Figure 5-1 CSM (CPE) 320 Identification



Before you begin



This section describes items that the installer or subscriber must purchase before installing the CSM. This section also describes items that must be available and points to consider before beginning the CSM installation.

Additional material required for installation

The additional materials required for installation are as follows:

- The computer of the subscriber must be equipped with an Ethernet network interface card (NIC).



The NIC is not provided with the CSM, but subscribers can purchase a NIC at most computer and electronics stores.

- An RJ-45 Ethernet cable to connect the CSM plug-in power supply to the computer.
- Ground wire of sufficient length to run between the CSM and the home ground point.



- It is recommended that the ground wire be a 6 AWG, solid copper wire.
- It is recommended that if a ground rod is used it should be an 8 ft (2.5m) copper rod.
- Most buildings have an existing ground rod outside, at the main power connection site. If desired, a rod can be installed into the ground outside the building after consulting the local electrical codes.
- The AC line cord is not provided with the hardware. Acquire the appropriate power line cord for the country where the unit is installed.

- Lead screw anchors if the CSM is mounted on a brick or masonry surface.
- Outdoor-rated category 5e Ethernet cable to connect the CSM plug-in power supply through the building wall to the CSM.
- RJ-45 plug connectors and the tools required for field termination of the category 5e cable
- Grommet to cover a 3/4 inch. (18 mm) hole
- Silicone or acrylic caulking

Pre-installation planning

While on the ground, find an appropriate location outside the building to mount the CSM.

NOTE

To provide Internet service, the CSM communicates with a base station on the communications tower of the service provider. Information about the nearest communications tower is provided by the service provider. For example, if the tower nearest to the building is towards the north of the building, install the CSM on the north side of the building.

After determining the optimal side of the building, select an CSM mounting point at a high location is unlikely to be touched by user/passers on the building such as under the eaves.

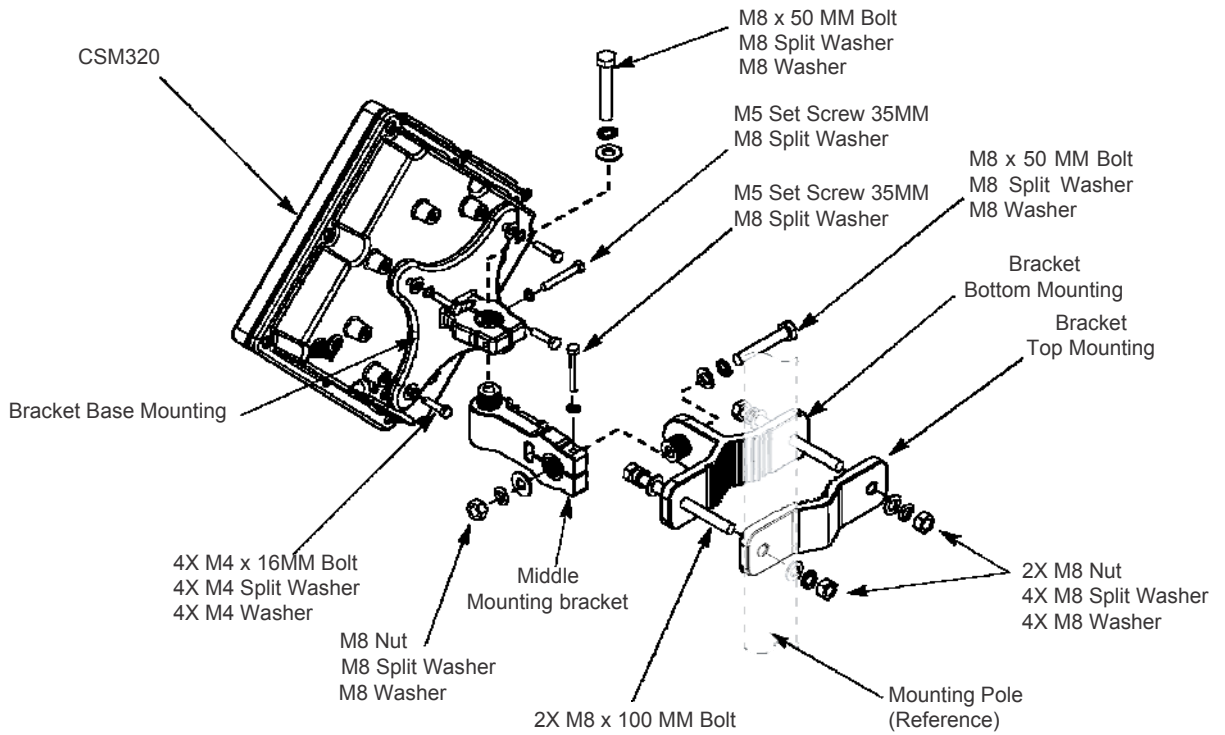
Components shipped with the CSM

Locate the components shipped with the CSM device. The parts list for the CSM installation consists of the following items:

Table 5-1 CSM parts list

Component	Quantity
CSM 320 device (vertical)	1
Bracket base mounting	1
Bracket Bottom Mounting	1
Bracket Top Mounting	1
Middle mounting bracket	1
M8 (50 mm) hex head bolt	2
M8 (100 mm) bolt	2
M8 split washer	13
M8 washer	11
M8 nut	3
M5 (35 mm) set screw	2
M4 (16 mm) bolt	4
M4 split washer	4
M4 washer	4
Dsign power supply	1
ENET cable	1

Figure 5-2 CSM components



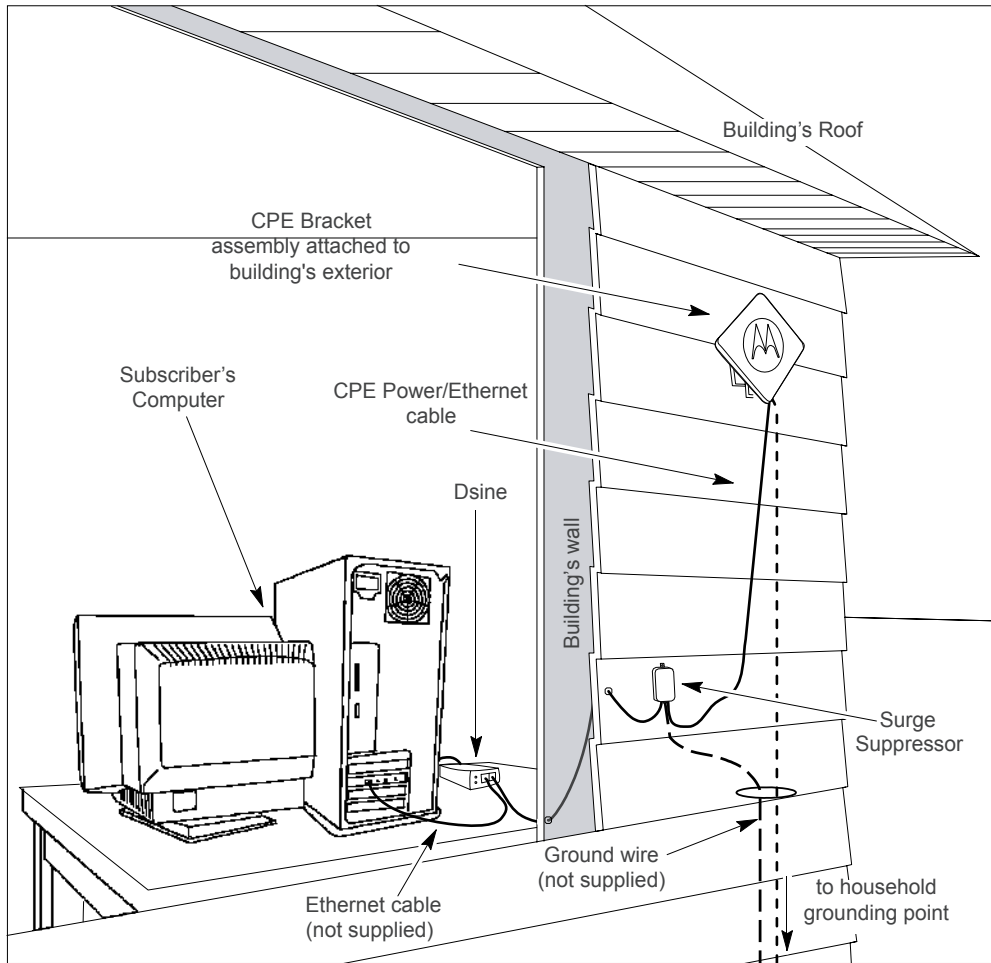
Cabling Overview

The following items are not supplied with the system:

- Ground wire
- Grounding rod
- Outdoor power/Ethernet cable
- Ethernet cable
- Computer NIC

Figure 6-4 illustrates the routing of the ground wire, the category 5e Ethernet cable, and the CSM power/Ethernet cable.

Figure 5-3 CSM mounted to a wall



Installing the CSM


This section describes how to find an appropriate installation location for the CSM, and how to install the CSM on the building.

Selecting a location for the CSM

Determine the optimum installation location for the CSM before physically mounting the CSM to the building.

Most often, if the CSM is mounted on the side of the building facing the base station of the service provider, the CSM can detect adequate signal to provide high-speed Internet access. However, unless there is an obvious line of sight to the correct base station, the correct orientation of the CSM is often not apparent. There may also be practical reasons why the CSM cannot be mounted on the side of the building that faces the base station.


Procedure 5-1 Selecting an installation location for the CSM

1	Using a laptop and a temporary power source connected to the CSM locate the optimal site for the CSM to be installed. Refer to the PMP 320 Administration and Configuration Guide for additional information on accessing the CSM GUI and status settings. =8
2	Start by pointing the front of the CSM in the direction that is most likely to be optimal.
3	Try pointing the CSM in different directions. If required, perform this task while standing in the upper stories or on the roof of the building. At each elevation and in each direction the CSM is pointed.
4	After determining the place where the best signal can be detected using the CSM GUI screen information, choose a corresponding CSM installation location on the building.
<div style="display: flex; align-items: center;">  <div> <p>NOTE</p> <p>The CSM can be mounted either directly on the building or on a pole.</p> </div> </div>	

Installation Overview

After finding the best installation location on the building, perform the following procedure to install the CSM.

Procedure 5-2 Installing the CSM

1	<p>Complete the mounting bracket assembly; leave the screws on the bracket arm slightly loose. If the screws are too tight, the vertical and horizontal tilt of the CSM cannot be adjusted later.</p> <p> NOTE</p> <p style="padding-left: 40px;">If fastening the CSM to a pole, add the pole clamp to the assembly. Otherwise, set the pole clamp aside.</p>
2	<p>Perform one of the following:</p> <ol style="list-style-type: none"> 1. If attaching the CSM to the side of a building, attach the CSM to the building using the wall bracket of the bracket assembly. 2. Mount the CSM to a pole using the wall bracket and pole clamp of the bracket assembly.
3	Adjust the vertical and horizontal tilt of the CSM so that it can obtain the best signal.
4	Fully tighten the bracket assembly into the desired position.

Completing the mounting bracket assembly


Perform the following procedure to complete the mounting bracket assembly. Refer to [Figure 6-3](#) to reference the brackets and the assembly of the brackets.

Procedure 5-3 Mounting bracket assembly

1	Attach one end of the bracket arm to the arch on this wall bracket.
2	Insert a 5/16×1½ hex bolt into the arch of the wall bracket that was attached to the CSM in step 1 . Ensure that the head of the medium hex bolt rests inside the bolt jam of the arch.
3	Guide the rest of the bolt through the arch of the wall bracket.
4	Slide a tooth lock washer on the end of the hex bolt.
5	Align the hole on one tab of the bracket arm with the end of the bolt.

Continued

Procedure 5-3 Mounting bracket assembly (Continued)

6	Slide the bracket arm tab onto the bolt, and then place a flat washer over the end of the bolt.
7	Tighten the end of the bolt with a hex nut. Leave the hex nut loose enough so that the vertical tilt of the CSM can be adjusted later.
8	Attach the other end of the bracket arm to the second wall bracket.
9	Insert a 5/16×1½ hex bolt into the arch of the second wall bracket. This bracket is attached to the wall or clamped to a pole.
	<div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;">  <p>NOTE</p> </div> <div> <p>Ensure that the head of the hex bolt rests inside the bolt jam found on the arch. When the assembly is complete, ensure that the bolt jam is facing the ground.</p> </div> </div>
10	Guide the rest of the bolt through the arch of the wall bracket.
11	Slide a tooth lock washer at the end of the hex bolt.
12	Align the hole on the tab of the bracket arm with the end of the bolt.
13	Slide the tab of the bracket arm onto the bolt, and then place a flat washer over the end of the bolt.
14	Tighten the end of the bolt with a hex nut. Leave the hex nut loose enough so that the horizontal tilt of the CSM can be adjusted later.
15	If fastening the CSM to a pole, loosely attach the clamp to wall bracket 2. Perform the steps listed in the section Fastening the CSM and mounting the bracket assembly to a pole.


Attaching the CSM and mounting the bracket assembly outside the building

⚠ WARNING

Maintain a safe distance from RF exposure at least 120 cm when installing the CSM to the subscriber building. Maintain safe distances from power lines.

Perform the following procedure to attach the CSM to the outside of the building.

Procedure 5-4 Attaching the CSM and mounting the bracket assembly outside the building

1	Where possible, install the CSM on the side of the building that has the greatest exposure to the communications tower of the service provider. The service provider can provide information about tower locations that can provide the CSM with the greatest signal exposure.
2	<p>Drill holes into the exterior wall of the building where the CSM must be hung.</p> <ul style="list-style-type: none"> • Drill the two top holes 2.5 inches apart. Drill the bottom holes 2.5 inches below the top holes. • If possible, drill one upper hole and its corresponding lower hole into a stud. Do not allow the CSM to be supported by the siding of the building. • If installing the CSM on a brick or masonry surface, use appropriate anchors. <div style="background-color: #ffff00; padding: 5px; margin: 10px 0;">  CAUTION </div> <p>Observe caution when drilling through the wall of the building. Ensure that there are no power lines, gas lines, water lines, or data lines in the wall at the desired location where the drilling takes place.</p>
3	After the holes are drilled into the building, drive the screws through the holes on the wall bracket and into the building. While attaching the bracket assembly to the wall, ensure that the bottom of the CSM is pointing towards the ground. The bottom of the CSM is the side with the five lights and the grounding lug. The CSM must be installed vertically.

Fastening the CSM and mounting the bracket assembly to a pole

If fastening the CSM to a pole, add the pole clamp to the assembly. Perform the following procedure to fasten the CSM to a pole.

Procedure 5-5 Fastening the CSM and mounting the bracket assembly to a pole

1	<p>Insert the following through the holes on the clamp:</p> <ul style="list-style-type: none"> • Large hex bolt • Large split washer • Large washer
2	Place the clamp around the pole.
3	Align the screw assembly with the center holes on the wall bracket.
4	Tighten the clamp so that the bracket assembly and the attached CSM are tight on the pole.

Aligning the CSM for best signal strength


NOTE

This alignment procedure assumes that the installer has reviewed the site interference values collected for the area of the installation.

The bolts connecting the two pole/wall brackets to the bracket arm are not yet fully tightened. Hence, use the bracket arm to adjust the vertical and horizontal tilt of the CSM. This adjustment helps the CSM to obtain the strongest signal from the service provider.

Perform the following procedure to adjust the vertical and horizontal tilts of the CSM.

Procedure 5-6 Adjusting the vertical and horizontal tilt of the CSM for level of service connection

1	<p>Temporarily apply power to the CSM to adjust the CSM for signal strength.</p> <p> NOTE</p> <p style="padding-left: 40px;">Do not connect to the consumer computer at this time.</p> <p style="padding-left: 40px;">The AC line cord is not provided with the hardware. Acquire the appropriate power line cord for the country where the unit is installed.</p>
2	Connect an Ethernet cable to the CSM and to a laptop.
3	<p>Log into the CSM GUI application to view the status of the signal strength of the CSM unit. Enter the following default user name and password IDs:</p> <ul style="list-style-type: none"> • Login ID - operator • Password - wimax
4	Adjust the CSM by rotating the CSM to the left and right. Find the position of the CSM where the CSM GUI indicates the strongest signal strength to the unit. Verify the signal strength on the status page of the CSM GUI screen.

Continued

Procedure 5-6 Adjusting the vertical and horizontal tilt of the CSM for level of service connection (Continued)



- 5 After finding the strongest signal from the service provider, tighten all the bolts on the mounting bracket assembly. Once the screws are tightened, the CSM will no longer move sideways, nor up and down.
- 6 Log out of the CSM GUI once optimal signal strength is achieved.

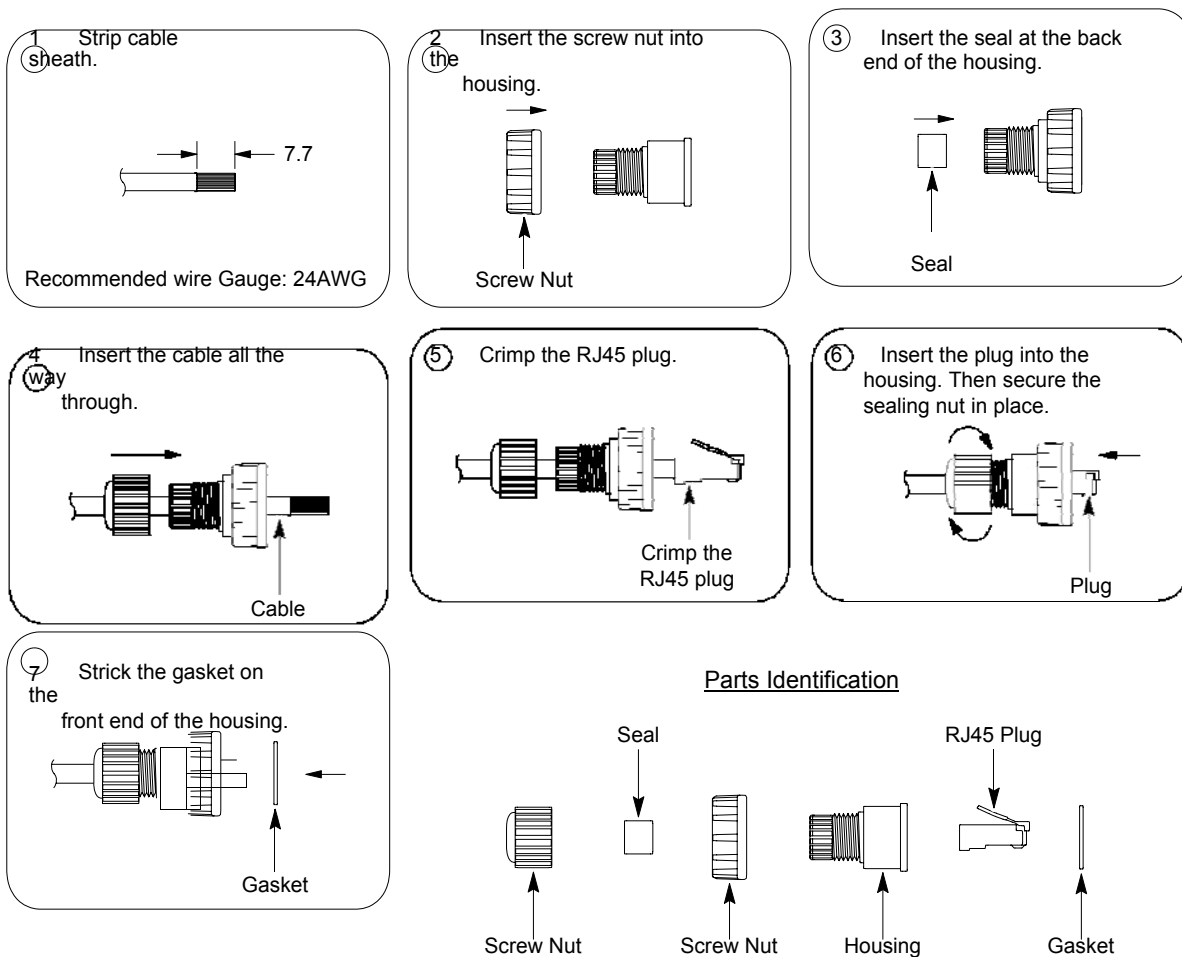
After completing the alignment and mounting of the CSM on the outside of the building, proceed with the installation procedures for the subscriber Ethernet, surge suppression, and unit Earth Grounding procedures.

Connecting the CSM to the Ethernet cable, Earth Ground, the Surge Suppressor

Ethernet Cable Assembly


Before installing the CSM Ethernet cable, ensure that the Ethernet cable is constructed with the weather protection kit that is contained with the CSM device. Use [Figure 6-6](#) to construct the weather protection housing around the Ethernet cable and RJ-45 plug. This weatherized cable connects to the ENET connector of the CSM.

Figure 5-4 Ethernet cable weather protection assembly



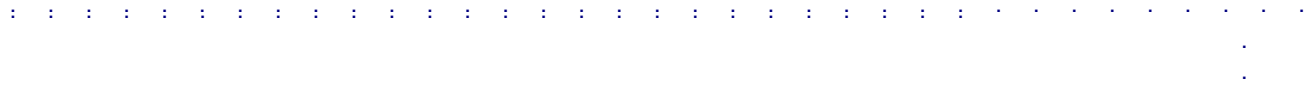
Perform the following procedure to connect the Ethernet/power cable to the CSM.

Procedure 5-7 Connecting the Ethernet cable to the CSM

1	<p>Cut the required length of the outdoor-rated Category-5 Ethernet cable for the chosen installation site. The maximum cable length is 100 m (~330 ft).</p>
2	<p>Terminate the cable using standard RJ-45 connectors using the procedure as shown in Figure 6-6.</p> <p>Use dielectric grease (which is uniformly non-conducting) on all connections and in all RJ-45 Ethernet connectors. The best practice is to use enough grease to fill the RJ-45 female connector, and then insert the RJ-45 male connector and push the grease further into the unit and around the RJ-45 connector. Excess grease can be wiped over the connector area to provide some resistance to water ingress around the connector.</p>
3	<p>Wrap a drip-loop in the cable at any point where the cable changes direction.</p>
4	<p>Measure the cable so it will span from the CSM to the surge suppressor box.</p>
5	<p>Fasten the cable to the building according to local building codes.</p> <div style="margin-top: 10px;"> <p> NOTE</p> <p>Cables that move in the wind can be damaged, impart vibrations to the connected device, or both. At installation time, prevent these problems by securing all cables with cable ties, cleats, or weather resistant tape. The cable can be a path for water to follow to enter the cable connector or even the module. Prevent this problem by including and securing a drip loop where the cable enters the building.</p> </div>

Note: "Please select antenna cables suitable for outdoor communication system according to the requirements of NFPA 70, National Electrical Code, 830.179."

Running cables through the wall of the building




The power/Ethernet cable runs from inside the building to the CSM. The following procedure describes how to run the cables through the wall of the building.

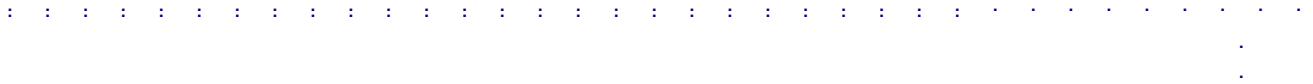
 **CAUTION**

Observe caution when drilling through the wall of the building. Ensure that there are no power lines, gas lines, water lines, or data lines in the wall at the desired location where the drilling takes place.

Procedure 5-8 Running cables through the wall of the building

1	<p> CAUTION</p> <p>Follow local building codes for penetrating buildings. Observe caution when drilling through the wall of the building. Ensure that there are no power lines, gas lines, water lines, or data lines in the wall at the desired location.</p> <p>Drill a 3/4 inch. (18 mm) hole through the wall at the desired location.</p>
2	Draw one end of the category 5e cable through the hole.
3	Route the category 5e power/Ethernet cable from the surge suppressor to the location where the power supply is to be plugged in.
4	After completing the installation, use a grommet for the hole and seal the hole with a silicone or acrylic caulking material.

Installing the 600SSD Surge Suppressor



Use the following procedure to install the 600SSD Surge suppressor.

 **CAUTION**

Observe caution when drilling through the wall of the building. Ensure that there are no power lines, gas lines, water lines, or data lines in the wall at the desired location where the drilling takes place.

Procedure 5-9 Installing the 600SSD Surge Suppressor

1	With the cable openings facing downward, install the 600SSD surge suppressor above the site where the hole in the residence has been drilled. Use two screws to attach the unit following regulatory building guidelines.
2	Connect the surge suppressor to Earth Ground. Refer to Connecting the CSM to the Ethernet cable, Earth Ground, the Surge Suppressor on page 6-13 . Refer to Figure 6-7 .
3	Pack both of the 600SSD surge suppressor Ethernet jacks with dielectric grease.
4	Include a splicing loop in the Ethernet cable from the CSM (extra cable to allow future repositioning or reconnectorization) and position and secure the Ethernet cable with UV-resistant wire ties or other locally-approved fasteners so it forms a drip loop (so water drips off the cable instead of following the cable into the 600SSD surge suppressor).
5	Connect the Ethernet connection from the CSM to the surge suppressor.
6	Build another Ethernet cable to span from the surge suppressor through the residence wall to the area where the power injector will be placed in the subscriber's residence.
7	Guide the Ethernet cable through the grommet where the drilled hole was made into the residence.
8	Seal the cable entry point into the building using accepted industry or local practices.
9	Connect the Ethernet cable to the Data In port of the CSM power injector. Refer to Figure 6-8 .

Figure 5-5 Cable connections from the surge suppressor to the CSM power injector and the CSM

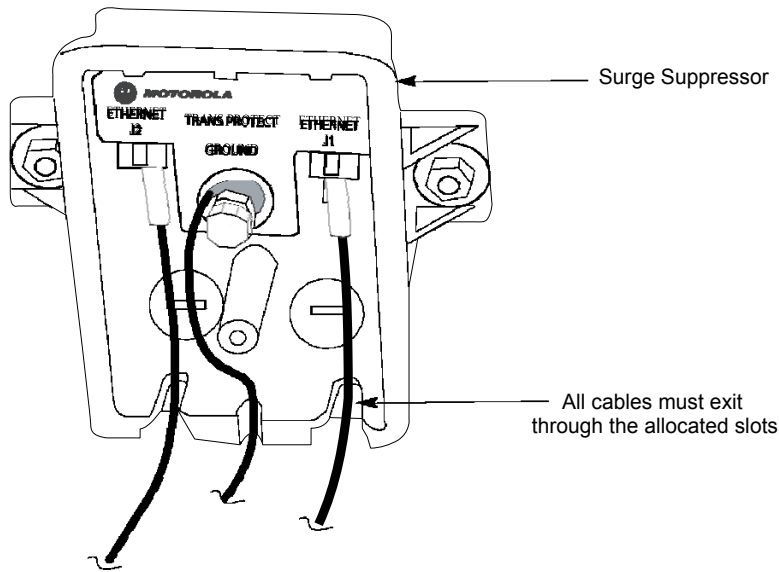
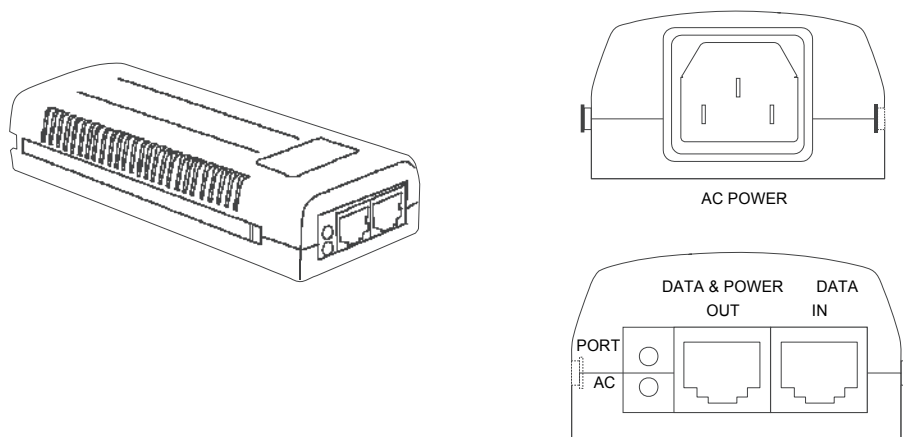


Figure 5-6 CSM 320 power injector



Connecting the ground wire

The CSM must be grounded to a household ground point or to a grounding rod according to the applicable electrical code. Equipment grounding practices vary with local building codes and established practices of the service provider. Following is the CSM grounding procedure as recommended by Motorola. The ground wire must be a minimum of 18 AWG, with 14 AWG recommended for runs up to 45 m (~150 ft) and 10 AWG recommended for runs over 45 m (~150 ft) .

 **NOTE**

If not using an existing approved grounding system, install a grounding system (Protective Earth) according to applicable regulations or codes.

Ground the CSM using one of the following methods:

- If grounding a CSM installed below the roof line, connect the CSM to the ground point of the building and then attach all wires to the building using electrical staples. Use drip loops as required.
- If grounding an CSM that is installed above the roof line, then perform the following:
 - Connect the ground wire from the CSM/surge suppressor to the ground rod in the ground next to the building.
 - Connect the ground rod to the household ground point according to the applicable electrical code.
 - Attach all wires to the building using electrical staples. Use drip loops as required.

Use the following procedure to ground the CSM at the residence premises.

Procedure 5-10 Grounding the CSM

1	Wrap the AWG 10 (6mm ²) copper ground wire around the ground post of the CSM.
2	Remove the cover of the 600SSD surge suppressor.
3	Wrap the AWG 10 (6mm ²) copper ground wire around the ground post of the 600SSD.
4	Tighten the ground post locking nut.
5	Ensure the pin 4 selector in the 600SSD is set to the factory default of isolated, not grounded.
6	If not using an existing approved grounding system, install a grounding system (Protective Earth) according to applicable regulations or codes.
7	Connect the ground wire from the CSM and the 600SS to Earth Ground.

Connecting the power supply and the Ethernet cable to the computer

Perform the following procedure to connect the power supply and the Ethernet cables.

Procedure 5-11 Connecting the power supply



1	Plug the category 5e cord from the CSM/surge suppressor into the jack labeled AC Power on the CSM Power Injector (if this connection is not already made).
2	Connect the protected side of the 600SSD surge suppressor cable to the Data & Power Out port of the CSM power injector.
3	Use a standard category 5e Ethernet cable to connect the computer to the jack labeled computer on the power supply. <div style="margin-top: 10px;">  NOTE The cable to the CSM provides both power and Ethernet connection. It is not pin or voltage compatible with IEE std.802.3af-2003 power over Ethernet. </div>
4	The power cord uses standard household power. Plug the power cord in the AC power source. <div style="margin-top: 10px;">  NOTE The AC line cord is not provided with the hardware. Acquire the appropriate power line cord for the country where the unit is installed. </div>

Figure 6-8 illustrates the cable connection through the data line protector and into the power supply cord.

Connectorized CSM Hardware Installation

This chapter provides the instructions and procedures used to:

- connect the Connectorized CSM device to a pole or wall
- pre-power up alignment for level of service connection
- cable the unit
- connect the antenna cables to the unit
- ground the unit
- add surge suppression
- post power up connection
- IP connectivity alignment correction

CAUTION

The orientation of the CSM when installed is important. The face of the CSM with the Motorola logo must be pointing in the direction of the antenna facing outwards from the building. The Ethernet connector must be oriented so it is on the bottom right corner of the Connectorized CSM.

Figure 6-1 Connectorized CSM (CPE) 320 Identification



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Figure 6-2 Connectorized CSM (CPE) 320 Rear View Connectors



G1_CCISM_rearviewconn.ext

Before you begin



This section describes items that the installer or subscriber must purchase before installing the CSM. This section also describes items that must be available and points to consider before beginning the CSM installation.

Additional material required for installation

The additional materials required for installation are as follows:

- The computer of the subscriber must be equipped with an Ethernet network interface card (NIC).

NOTE

The NIC is not provided with the CSM, but subscribers can purchase a NIC at most computer and electronics stores.

- An RJ-45 Ethernet cable to connect the CSM plug-in power supply to the computer.
- Ground wire of sufficient length to run between the CSM and the home ground point.

NOTE

- It is recommended that the ground wire be a 6 AWG, solid copper wire.
 - It is recommended that if a ground rod is used it should be an 8 ft (2.5m) copper rod.
 - Most buildings have an existing ground rod outside, at the main power connection site. If desired, a rod can be installed into the ground outside the building after consulting the local electrical codes.
 - The AC line cord is not provided with the hardware. Acquire the appropriate power line cord for the country where the unit is installed.
- Lead screw anchors if the CSM is mounted on a brick or masonry surface.
 - Outdoor-rated category 5e Ethernet cable to connect the CSM plug-in power supply through the building wall to the CSM.
 - RJ-45 plug connectors and the tools required for field termination of the category 5e cable
 - Grommet to cover a 3/4 inch. (18 mm) hole
 - Silicone or acrylic caulking

Pre-installation planning

While on the ground, find an appropriate location outside the building to mount the CSM.

NOTE

To provide Internet service, the CSM communicates with a base station on the communications tower of the service provider. Information about the nearest communications tower is provided by the service provider. For example, if the tower nearest to the building is towards the north of the building, install the CSM on the north side of the building.

After determining the optimal side of the building, select an CSM mounting point at a high location on the building such as under the eaves.

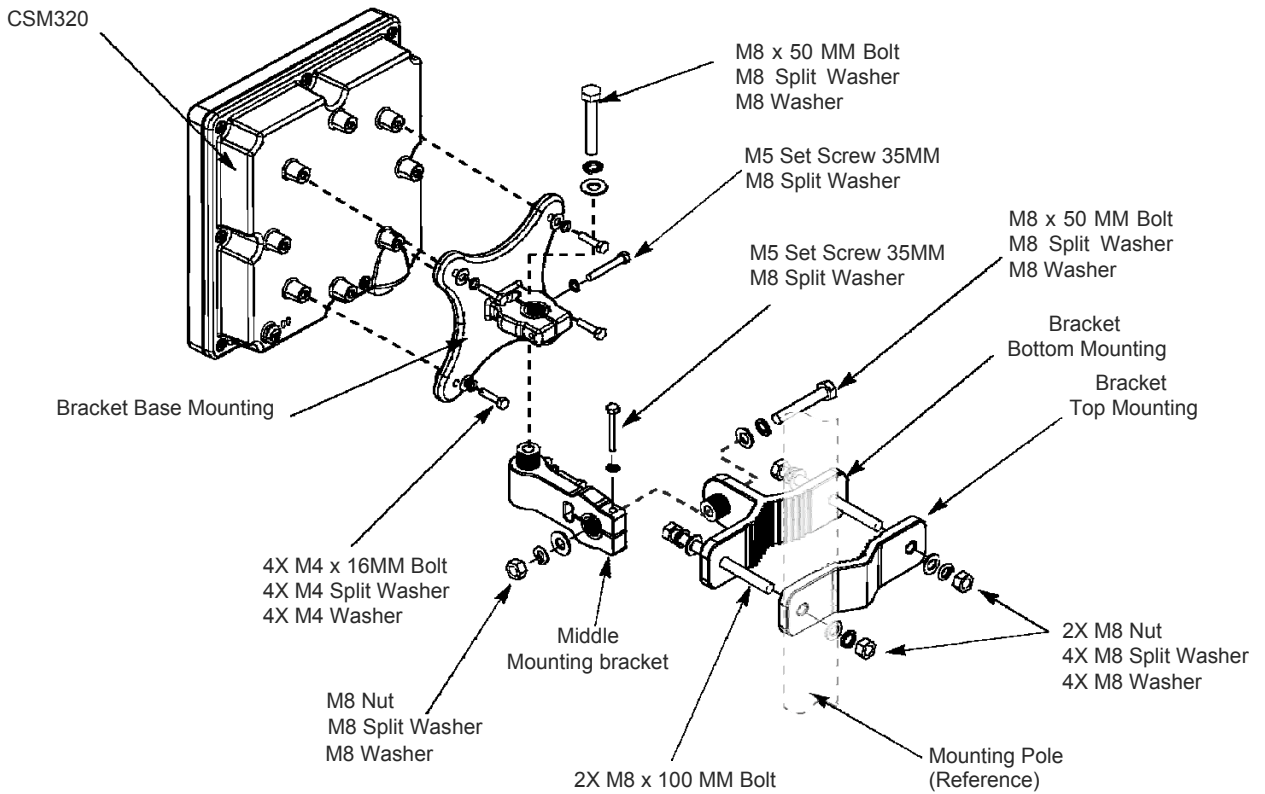
Components shipped with the CSM

Locate the components shipped with the CSM device. The parts list for the CSM installation consists of the following items:

Table 6-1 CSM parts list

Component	Quantity
CSM 320 device	1
Bracket base mounting	1
Bracket Bottom Mounting	1
Bracket Top Mounting	1
Middle mounting bracket	1
M8 (50 mm) hex head bolt	2
M8 (100 mm) bolt	2
M8 split washer	13
M8 washer	11
M8 nut	3
M5 (35 mm) set screw	2
M4 (16 mm) bolt	4
M4 split washer	4
M4 washer	4
Dsign power supply	1
ENET cable	1

Figure 6-3 CSM components



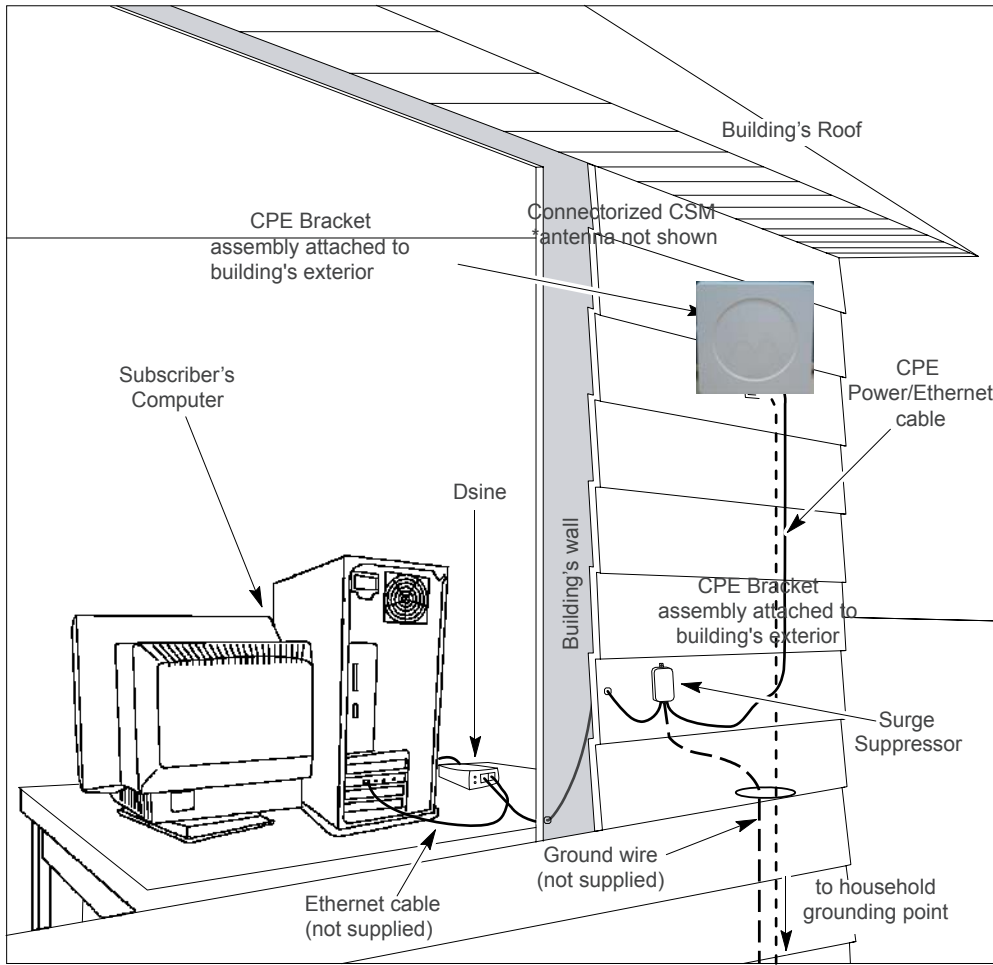
Cabling Overview

The following items are not supplied with the system:

- Ground wire
- Grounding rod
- Outdoor power/Ethernet cable
- Ethernet cable
- Computer NIC

Figure 6-4 illustrates the routing of the ground wire, the category 5e Ethernet cable, and the CSM power/Ethernet cable.

Figure 6-4 CSM mounted to a wall



Installing the CSM




This section describes how to find an appropriate installation location for the CSM, and how to install the CSM on the building.

Selecting a location for the CSM

Determine the optimum installation location for the CSM before physically mounting the CSM to the building.

Most often, if the CSM is mounted on the side of the building facing the base station of the service provider, the CSM can detect adequate signal to provide high-speed Internet access. However, unless there is an obvious line of sight to the correct base station, the correct orientation of the CSM is often not apparent. There may also be practical reasons why the CSM cannot be mounted on the side of the building that faces the base station.

Procedure 6-1 Selecting an installation location for the CSM

1	Using a laptop and a temporary power source connected to the CSM locate the optimal site for the CSM to be installed. Refer to the PMP 320 Administration and Configuration Guide for additional information on accessing the CSM GUI and status settings.	=8
2	Start by pointing the front of the CSM in the direction that is most likely to be optimal.	
3	Try pointing the CSM in different directions. If required, perform this task while standing in the upper stories or on the roof of the building. At each elevation and in each direction the CSM is pointed.	
4	After determining the place where the best signal can be detected using the CSM GUI screen information, choose a corresponding CSM installation location on the building.	
 NOTE <p>The CSM can be mounted either directly on the building or on a pole.</p>		

Installation Overview

After finding the best installation location on the building, perform the following procedure to install the CSM.

Procedure 6-2 Installing the Connectorized CSM

1	<p>Complete the mounting bracket assembly; leave the screws on the bracket arm slightly loose. If the screws are too tight, the vertical and horizontal tilt of the CSM cannot be adjusted later.</p> <p>NOTE</p> <p>If fastening the CSM to a pole, add the pole clamp to the assembly. Otherwise, set the pole clamp aside.</p>
2	<p>Perform one of the following:</p> <ol style="list-style-type: none"> 1. If attaching the CSM to the side of a building, attach the CSM to the building using the wall bracket of the bracket assembly. 2. Mount the CSM to a pole using the wall bracket and pole clamp of the bracket assembly.
3	Adjust the vertical and horizontal tilt of the CSM so that it can obtain the best signal.
4	Fully tighten the bracket assembly into the desired position.

Completing the mounting bracket assembly


Perform the following procedure to complete the mounting bracket assembly. Refer to [Figure 6-3](#) to reference the brackets and the assembly of the brackets.

Procedure 6-3 Mounting bracket assembly

1	Attach one end of the bracket arm to the arch on this wall bracket.
2	Insert a 5/16×1½ hex bolt into the arch of the wall bracket that was attached to the CSM in step 1 . Ensure that the head of the medium hex bolt rests inside the bolt jam of the arch.
3	Guide the rest of the bolt through the arch of the wall bracket.
4	Slide a tooth lock washer on the end of the hex bolt.
5	Align the hole on one tab of the bracket arm with the end of the bolt.

Continued

Procedure 6-3 Mounting bracket assembly (Continued)

6	Slide the bracket arm tab onto the bolt, and then place a flat washer over the end of the bolt.
7	Tighten the end of the bolt with a hex nut. Leave the hex nut loose enough so that the vertical tilt of the CSM can be adjusted later.
8	Attach the other end of the bracket arm to the second wall bracket.
9	Insert a 5/16×1½ hex bolt into the arch of the second wall bracket. This bracket is attached to the wall or clamped to a pole.  NOTE Ensure that the head of the hex bolt rests inside the bolt jam found on the arch. When the assembly is complete, ensure that the bolt jam is facing the ground.
10	Guide the rest of the bolt through the arch of the wall bracket.
11	Slide a tooth lock washer at the end of the hex bolt.
12	Align the hole on the tab of the bracket arm with the end of the bolt.
13	Slide the tab of the bracket arm onto the bolt, and then place a flat washer over the end of the bolt.
14	Tighten the end of the bolt with a hex nut. Leave the hex nut loose enough so that the horizontal tilt of the CSM can be adjusted later.
15	If fastening the CSM to a pole, loosely attach the clamp to wall bracket 2. Perform the steps listed in the section Fastening the CSM and mounting the bracket assembly to a pole.


Attaching the CSM and mounting the bracket assembly outside the building

WARNING

Maintain a safe distance from RF exposure at least 120 cm when installing the CSM to the subscriber building. Maintain safe distances from power lines.

Perform the following procedure to attach the CSM to the outside of the building.

Procedure 6-4 Attaching the CSM and mounting the bracket assembly outside the building

1	Where possible, install the CSM on the side of the building that has the greatest exposure to the communications tower of the service provider. The service provider can provide information about tower locations that can provide the CSM with the greatest signal exposure.
2	<p>Drill holes into the exterior wall of the building where the CSM must be hung.</p> <ul style="list-style-type: none"> • Drill the two top holes 2.5 inches apart. Drill the bottom holes 2.5 inches below the top holes. • If possible, drill one upper hole and its corresponding lower hole into a stud. Do not allow the CSM to be supported by the siding of the building. • If installing the CSM on a brick or masonry surface, use appropriate anchors. <div style="background-color: #ffff00; padding: 2px; display: inline-block;"> CAUTION</div> <p style="margin-left: 40px;">Observe caution when drilling through the wall of the building. Ensure that there are no power lines, gas lines, water lines, or data lines in the wall at the desired location where the drilling takes place.</p>
3	After the holes are drilled into the building, drive the screws through the holes on the wall bracket and into the building. While attaching the bracket assembly to the wall, ensure that the bottom of the CSM is pointing towards the ground. The bottom of the CSM is the side with the five lights and the grounding lug. The CSM must be installed vertically.

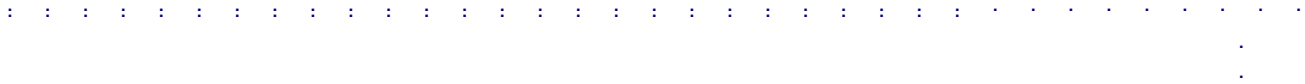
Fastening the CSM and mounting the bracket assembly to a pole

If fastening the CSM to a pole, add the pole clamp to the assembly. Perform the following procedure to fasten the CSM to a pole.

Procedure 6-5 Fastening the CSM and mounting the bracket assembly to a pole

1	<p>Insert the following through the holes on the clamp:</p> <ul style="list-style-type: none"> • Large hex bolt • Large split washer • Large washer
2	Place the clamp around the pole.
3	Align the screw assembly with the center holes on the wall bracket.
4	Tighten the clamp so that the bracket assembly and the attached CSM are tight on the pole.

Connecting the Antenna Cables to the Unit



Use the following procedure to connect the antenna cables to the unit. Depending upon the type of antenna used, either two omni antennas, or one diagonal polarized antenna, the connectors from the installed antennas must be connected to the Connectorized CSM unit N-type connectors.

Ensure that the cable length between the CSM and the antenna connectors is 18 inches (1 ft and 6 in).

Refer to the Chapter titled Installing Antennas for additional information regarding antenna installation procedures.

Figure 6-5 Connectorized CSM antenna cable connector location



G1_Ccsmantennaconnid.eps

Procedure 6-6 Connecting the Antenna Cables to the Connectorized CSM when using an Omni Antenna

1	Verify that the length between the CSM and the Omni antennas is 18 inches apart (1 ft and 6 in). Refer to Figure 6-5 for cable connection location on the CSM.
2	Using a 50 ohm low loss cable with an N-type connector, connect the end of the cable from the Omni antenna connector to the CSM N-type connector.
3	Repeat step 1 for the second Omni antenna.

Procedure 6-7 Connecting the Antenna Cables to the Connectorized CSM when using an Diagonal Polarized Antenna

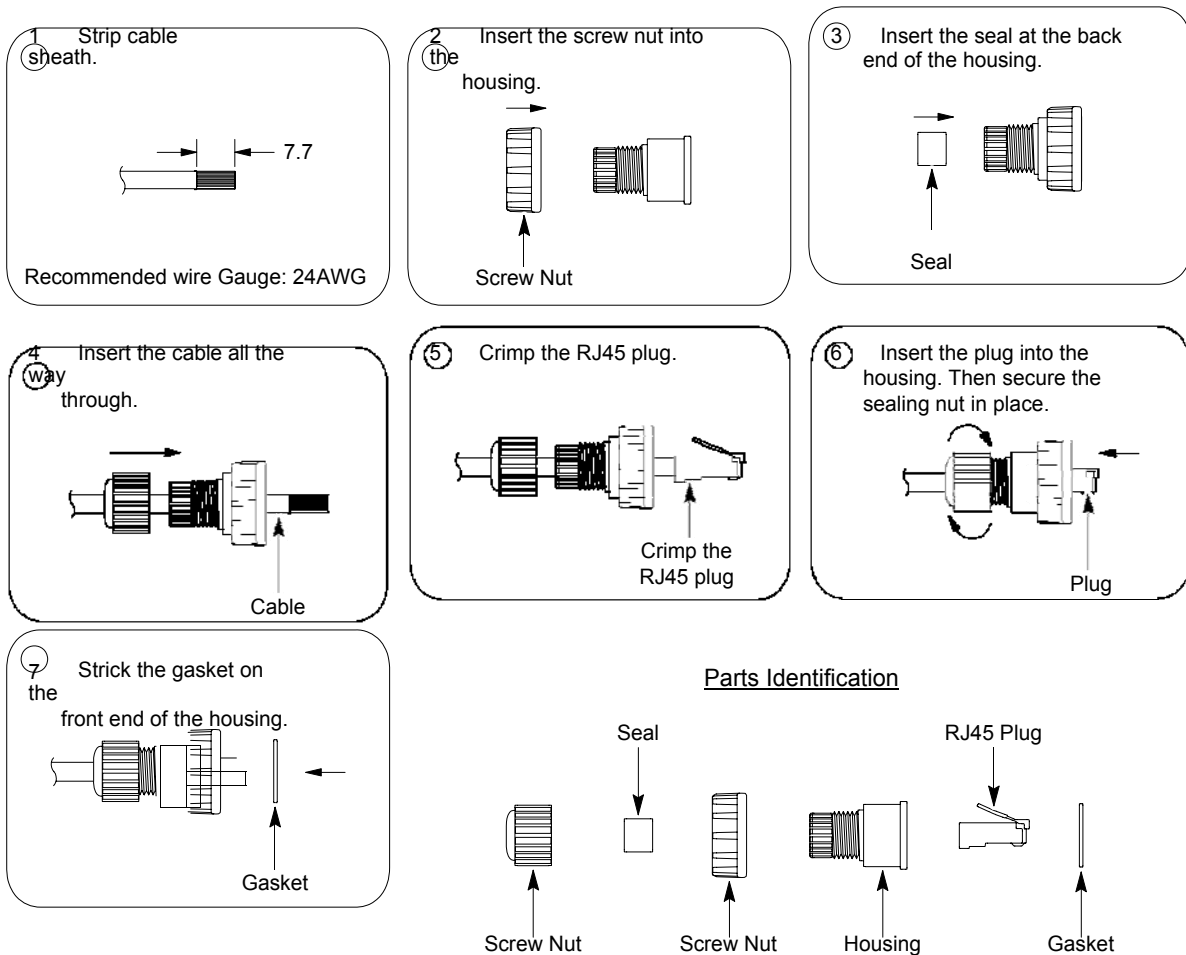
1	Using a 50 ohm low loss cable with an N-type connector, connect the N-type connector to the V-polarity connector of the antenna to the CSM N-type connector. Refer to Figure 6-5 for cable connection location on the CSM.
2	Using the other 50 ohm cable, connect the N-type connector to the H-polarity connector of the antenna to the CSM N-type connector.

Connecting the CSM to the Ethernet cable, Earth Ground, the Surge Suppressor

Ethernet Cable Assembly


Before installing the CSM Ethernet cable, ensure that the Ethernet cable is constructed with the weather protection kit that is contained with the CSM device. Use Figure 6-6 to construct the weather protection housing around the Ethernet cable and RJ-45 plug. This weatherized cable connects to the ENET connector of the CSM.

Figure 6-6 Ethernet cable weather protection assembly



Perform the following procedure to connect the Ethernet/power cable to the CSM.

Procedure 6-8 Connecting the Ethernet cable to the CSM

1	<p>Cut the required length of the outdoor-rated Category-5 Ethernet cable for the chosen installation site. The maximum cable length is 100 m (~330 ft).</p>
2	<p>Terminate the cable using standard RJ-45 connectors using the procedure as shown in Figure 6-6.</p> <p>Use dielectric grease (which is uniformly non-conducting) on all connections and in all RJ-45 Ethernet connectors. The best practice is to use enough grease to fill the RJ-45 female connector, and then insert the RJ-45 male connector and push the grease further into the unit and around the RJ-45 connector. Excess grease can be wiped over the connector area to provide some resistance to water ingress around the connector.</p>
3	<p>Wrap a drip-loop in the cable at any point where the cable changes direction.</p>
4	<p>Measure the cable so it will span from the CSM to the surge suppressor box.</p>
5	<p>Fasten the cable to the building according to local building codes.</p> <p> NOTE</p> <p>Cables that move in the wind can be damaged, impart vibrations to the connected device, or both. At installation time, prevent these problems by securing all cables with cable ties, cleats, or weather resistant tape. The cable can be a path for water to follow to enter the cable connector or even the module. Prevent this problem by including and securing a drip loop where the cable enters the building.</p>

Running cables through the wall of the building




The power/Ethernet cable runs from inside the building to the CSM. The following procedure describes how to run the cables through the wall of the building.

 **CAUTION**

Observe caution when drilling through the wall of the building. Ensure that there are no power lines, gas lines, water lines, or data lines in the wall at the desired location where the drilling takes place.

Procedure 6-9 Running cables through the wall of the building

1	<p> CAUTION</p> <p>Follow local building codes for penetrating buildings. Observe caution when drilling through the wall of the building. Ensure that there are no power lines, gas lines, water lines, or data lines in the wall at the desired location.</p> <p>Drill a 3/4 inch. (18 mm) hole through the wall at the desired location.</p>
2	Draw one end of the category 5e cable through the hole.
3	Route the category 5e power/Ethernet cable from the surge suppressor to the location where the power supply is to be plugged in.
4	After completing the installation, use a grommet for the hole and seal the hole with a silicone or acrylic caulking material.

Installing the 600SSD Surge Suppressor

Use the following procedure to install the 600SSD Surge suppressor.

⚠ CAUTION

Observe caution when drilling through the wall of the building. Ensure that there are no power lines, gas lines, water lines, or data lines in the wall at the desired location where the drilling takes place.

Procedure 6-10 Installing the 600SSD Surge Suppressor

1	With the cable openings facing downward, install the 600SSD surge suppressor above the site where the hole in the residence has been drilled. Use two screws to attach the unit following regulatory building guidelines.
2	Connect the surge suppressor to Earth Ground. Refer to Connecting the CSM to the Ethernet cable, Earth Ground, the Surge Suppressor on page 6-13 . Refer to Figure 6-7 .
3	Pack both of the 600SSD surge suppressor Ethernet jacks with dielectric grease.
4	Include a splicing loop in the Ethernet cable from the CSM (extra cable to allow future repositioning or reconnectorization) and position and secure the Ethernet cable with UV-resistant wire ties or other locally-approved fasteners so it forms a drip loop (so water drips off the cable instead of following the cable into the 600SSD surge suppressor).
5	Connect the Ethernet connection from the CSM to the surge suppressor.
6	Build another Ethernet cable to span from the surge suppressor through the residence wall to the area where the power injector will be placed in the subscriber's residence.
7	Guide the Ethernet cable through the grommet where the drilled hole was made into the residence.
8	Seal the cable entry point into the building using accepted industry or local practices.
9	Connect the Ethernet cable to the Data In port of the CSM power injector. Refer to Figure 6-8 .

Figure 6-7 Cable connections from the surge suppressor to the CSM power injector and the CSM

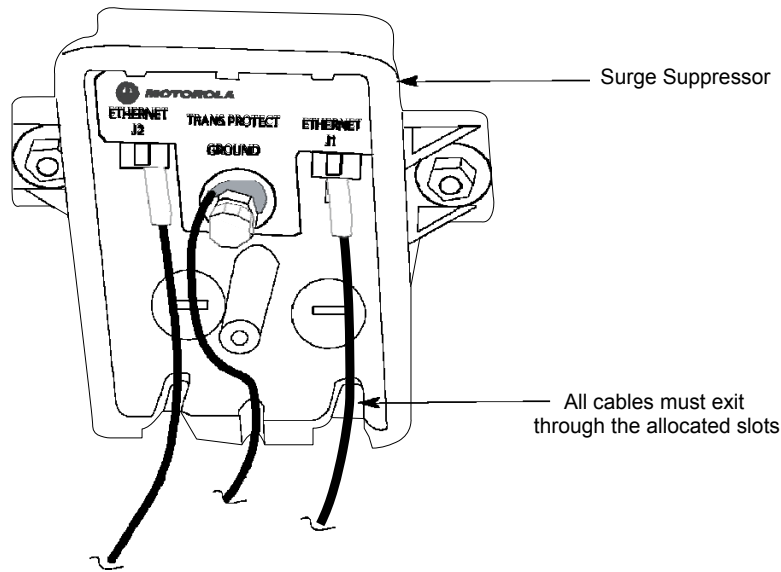
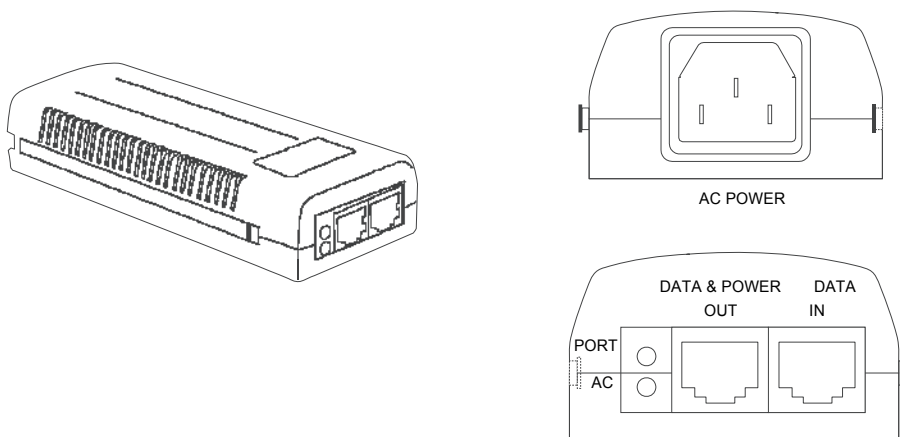


Figure 6-8 CSM 320 power injector



Connecting the ground wire

The CSM must be grounded to a household ground point or to a grounding rod according to the applicable electrical code. Equipment grounding practices vary with local building codes and established practices of the service provider. Following is the CSM grounding procedure as recommended by Motorola. The ground wire must be a minimum of 18 AWG, with 14 AWG recommended for runs up to 45 m (~150 ft) and 10 AWG recommended for runs over 45 m (~150 ft) .

 **NOTE**

If not using an existing approved grounding system, install a grounding system (Protective Earth) according to applicable regulations or codes.

Ground the CSM using one of the following methods:

- If grounding a CSM installed below the roof line, connect the CSM to the ground point of the building and then attach all wires to the building using electrical staples. Use drip loops as required.
- If grounding an CSM that is installed above the roof line, then perform the following:
 - Connect the ground wire from the CSM/surge suppressor to the ground rod in the ground next to the building.
 - Connect the ground rod to the household ground point according to the applicable electrical code.
 - Attach all wires to the building using electrical staples. Use drip loops as required.

Use the following procedure to ground the CSM at the residence premises.

Procedure 6-11 Grounding the CSM

1	Wrap the AWG 10 (6mm ²) copper ground wire around the ground post of the CSM.
2	Remove the cover of the 600SSD surge suppressor.
3	Wrap the AWG 10 (6mm ²) copper ground wire around the ground post of the 600SSD.
4	Tighten the ground post locking nut.
5	Ensure the pin 4 selector in the 600SSD is set to the factory default of isolated, not grounded.
6	If not using an existing approved grounding system, install a grounding system (Protective Earth) according to applicable regulations or codes.
7	Connect the ground wire from the CSM and the 600SS to Earth Ground.

Connecting the power supply and the Ethernet cable to the computer

Perform the following procedure to connect the power supply and the Ethernet cables.

Procedure 6-12 Connecting the power supply



1	Plug the category 5e cord from the CSM/surge suppressor into the jack labeled AC Power on the CSM Power Injector (if this connection is not already made).
2	Connect the protected side of the 600SSD surge suppressor cable to the Data & Power Out port of the CSM power injector.
3	Use a standard category 5e Ethernet cable to connect the computer to the jack labeled computer on the power supply.  NOTE The cable to the CSM provides both power and Ethernet connection. It is not pin or voltage compatible with IEE std.802.3af-2003 power over Ethernet.
4	The power cord uses standard household power. Plug the power cord in the AC power source.  NOTE The AC line cord is not provided with the hardware. Acquire the appropriate power line cord for the country where the unit is installed.

Figure 6-8 illustrates the cable connection through the data line protector and into the power supply cord.

Connectorized CSM Antenna Installation Instructions



Antenna Types used with the Connectorized CSM

There are two antenna types that have been tested with the Connectorized CSM PMP 320 product. The antennas that have been tested are as follows:

- 3.3-3.8 GHz Dual Polarization/ Dual Slant Subscriber Antenna
- 3.3-3.8 GHz Omni Directional Base Station Antenna

This section provides installation procedures for both types of antennas.

Dual Polarization/Dual Slant Subscriber Antenna

The Dual Polarization Dual Slant antenna features dual slant when it is mounted diagonally. It also offers:

- stable performance with 22 dBi of gain
- compact size allowing easy blending in any environment
- mount hardware that allows for quick and easy 45 degree turn installation
- UV protected radome suitable for harsh environments

Figure 7-1 Dual Polarization/Dual Slant Subscriber Antenna



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Specifications

The Dual Polarized / Dual Slant Subscriber Antenna is produced with the following specifications:

Table 7-1 Dual Polarized / Dual Slant Subscriber Antenna Electrical Specifications

Specification	Value
Frequency range	3.3 – 3.8 GHz
GAIN: H-Port & V-Port	22dBi
VSWR, max.	1.7 : 1
Polarization Dual Pole	Linear, Vertical & Horizontal
Dual Slant (optional)	± 45°
3 dB Beam-Width, H-Plane, typ.	12°
3 dB Beam-Width, E-Plane, typ.	12°
Cross Polarization, max	ETSI TS3
Front to Back Ratio, max.	ETSI TS3
Port to Port Isolation, typ.	-35 dB
Input power, max	10 Watt
Input Impedance	50 Ohm
Lightning Protection	DC Grounded

Table 7-2 Dual Polarized / Dual Slant Subscriber Antenna Mechanical Specifications

Specification	Value
Dimensions (HxWxD)	370 x 370 x 40 mm (14.5" x14.5" x1.6")
Weight	2.1 kg
Connector	2x SMA, Female or 2x N-Type, Female
Back Plane	Aluminum; protected through chemical passivation
Radome	Plastic UV Protected
Mount	MNT-22

Table 7-3 Dual Polarized / Dual Slant Subscriber Antenna Environmental Specifications

Specification	Value
Operating Temperature Range	- 55°C to + 65°C
Vibration	According to IEC 60721-3-4
Wind Load	200 km/h (survival)
Flammability	UL94

Continued

Table 7-3 Dual Polarized / Dual Slant Subscriber Antenna Environmental Specifications (Continued)

Specification	Value
Water Proofing	IP-67
Humidity	ETS 300 019-1-4, EN 302 085 (annex A.1.1)
Salt Fog	According to IEC 68-2-11
Ice and Snow	25mm radial (survival)
Service Life	>10 years

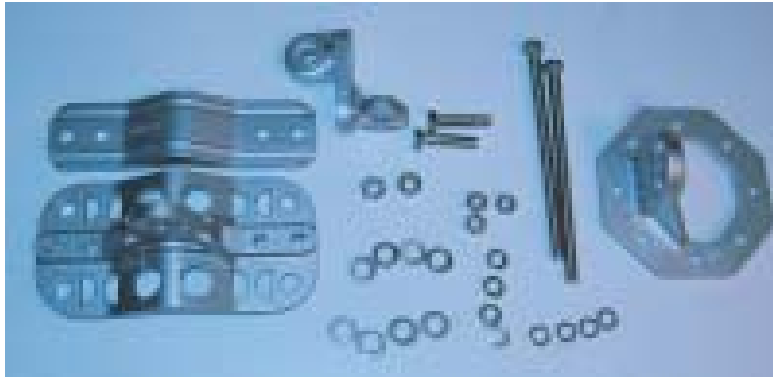
The Standard Compliance of the Dual Polarized / Dual Slant Subscriber Antenna is ETSI TS3.

Parts List

Table 7-4 Dual Polarized / Dual Slant Subscriber Antenna Parts List

Quantity	Description
1	Pole 1 inch to 4 inches (not supplied)
1	MNT-22-1
1	MNT-22-2
1	MNT-22-4
1	MNT-22-3
4	5/16 Helical spring lock washers
4	5/16 plain washer
2	5/16-18 x 1.25 inch Hex cap screws
2	5/16-18 x 5 inch hex cap screws
4	1/4 plain washer
4	1/4 helical spring lock washer
4	1/4-20 hex nut
2	5/16-18 hex nut

Figure 7-2 Mounting Bracket Parts Identification



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Tools

The following tools are needed for the antenna mounting bracket assembly:

- Torque driver – 30 in-lbs

Antenna Mounting Instructions

Use the following procedure to mount the Dual Polarized / Dual Slant Subscriber Antenna.

Figure 7-3 Dual Polarized / Dual Slant Subscriber Antenna Rear View for Mounting Assembly



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Procedure 7-1 Mounting the Dual Polarized / Dual Slant Subscriber Antenna to a pole

1	Place part number MNT-22-1 (antenna mounting plate) on the antenna and align with the screw holes.
2	Connect part number MNT-22-1 (middle mounting bracket) to the antenna mounting plate with four 1/4 inch spring washers, four 1/4 inch flat washers, and four 1/4-20 hex nuts. Tighten the hex nuts with a torque driver to 30 in-lbs.
3	Attach part number MNT-22-2 to the antenna mounting plate assembly using a 5/16 inch helical spring lock washer, a 5/16 inch plain washer, a 5/16-18 x 1.25 inch hex cap screw, and a 5/16-18 hex nut. Leave the assembly loosely tightened. Do not torque the nuts at this step.
4	Attach part number MNT-22-3 (bottom pole mounting bracket) to the assembly from step 3. Use a 5/16 inch helical spring lock washer, a 5/16 inch plain washer, a 5/16-18 x 1.25 inch hex cap screw, and a 5/16-18 hex nut. Leave the assembly loosely tightened. Do not torque the nuts at this step.
5	Locate the area of the pole to mount the antenna, and place the bottom pole mounting bracket with the rest of the assembly on the pole.
6	Attach the top pole bracket part number MNT-22-4 to the bottom pole mounting bracket and assembly using two 5/16 helical spring lock washers, two plain washers, and two 5/16-18 x 5 inch hex cap screws.
7	Adjust the antenna ensuring that the antenna is set at a diagonal position.
8	Tighten all nuts at a torque of 30 in-lbs.
9	Connect the antenna to the connectorized CSM using the instructions in the Connectorized CSM Installation chapter.

Omni Directional Base Station Antenna

The Omni Directional Base Station Antenna features dual slant when it is mounted diagonally. It also offers:

- stable performance with 9.5 dBi of gain
- compact size allowing easy blending in any environment
- UV protected radome suitable for harsh environments

Figure 7-4 Omni Directional Base Station Antenna Identification



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Specifications

Table 7-5 Omni Directional Base Station Antenna Electrical Specification

Specification	Value
Frequency range	3.3- 3.8 GHz
GAIN, typ.	9.5 dBi@3.4-3.8 9 dBi@3.3-3.4
VSWR, max.	2 : 1
Polarization	Linear, Vertical
3 dB Beam-Width, H-Plane, typ.	Omni Directional
3 dB Beam-Width, E-Plane, typ.	10°
Input power, max	50 Watt
Input Impedance	50 Ohm

Table 7-6 Omni Directional Base Station Antenna Mechanical Specification

Specification	Value
Dimensions (HxDia.)	470 x 66 mm (18.5" x 2. 5")
Weight	350 gr.
Connector	N-Type, Female
Radome	UV Protected , Plastic
Mount	2.5" PM (End) Attachment

Table 7-7 Omni Directional Base Station Antenna Environmental Specification

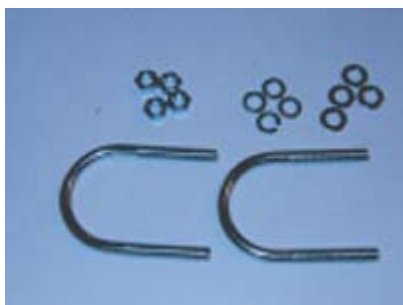
Specification	Value
Operating Temperature Range	- 40°C to + 65°C
Vibration	According to IEC 60721-3-4
Wind Load	200 km/h (survival)
Flammability	UL94
Water Proofing	IP-65
Humidity	ETS 300 019-1-4, EN 302 085 (annex A.1.1)
Salt Fog	According to IEC 68-2-11
Ice and Snow	25mm radial (survival)
Service Life	>10 years

Parts List

Table 7-8 Omni Directional Base Station Antenna Pole Mounting Parts List

Quantity	Description
2	U-brackets
4	Plain washers
4	Helical spring lock washers
4	Hex nuts

Figure 7-5 Omni Directional Base Station Antenna Parts Identification



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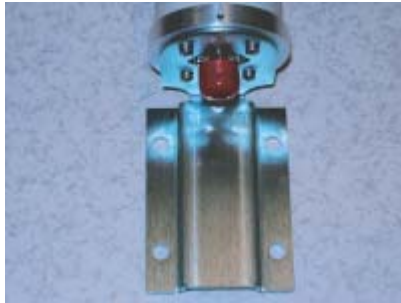
Tools

Hex wrench

Antenna Mounting Instructions

Use the following procedure to mount the Omni Directional Base Station Antenna to a pole. Note that two Omni Directional Base Station Antennas are needed to support the Connectorized PMP 320 CSM.

Figure 7-6 Omni Directional Base Station Antenna Bracket Identification



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Procedure 7-2 Procedure to mount an Omni Directional Base Station Antenna to a pole

1	Locate the area of the pole where the Omni Directional Base Station Antenna will be mounted to the pole.
2	Slide the U-bracket around the pole.
3	Align the Omni Directional Base Station antenna bracket and pass the U-bracket through the bracket of the antenna.
4	Slide the plain washers on the U-bracket.
5	Slide the helical locking washers on the U-bracket
6	Use the nuts to securely fasten the antenna bracket to the U-bracket
7	Repeat step 2 through step 6 for the second bracket. Repeat these steps for the second antenna.
8	Connect the antenna to the connectorized CSM using the instructions in the Connectorized CSM Installation chapter.

Regulatory, Legal, and Safety Notices

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IMPORTANT NOTE ON MODIFICATIONS

Intentional or unintentional changes or modifications to the equipment must not be made unless under the express consent of the party responsible for compliance. Any such modifications could void the user's authority to operate the equipment and will void the manufacturer's warranty.

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT NOTE:

FCC Radiation Exposure Statement:

3630SMC complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance **20** cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination. The firmware setting is not accessible by the end user.

Industry Canada statement:

This device complies with RSS-192 of the Industry Canada Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT NOTE:

Radiation Exposure Statement:

This equipment complies with Canada radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance **81** cm between the radiator & your body.

This device has been designed to operate with an antenna having a maximum gain of 22 dBi. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.

NATIONAL AND REGIONAL REGULATORY NOTICES

U.S. Federal Communication Commission (FCC) Notification

This device complies with Part 15 of the US FCC Rules and Regulations. Operation is subject to the following two conditions:

1. This device may not cause harmful interference and
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the US FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used in accordance with these instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to correct the interference by one or more of the following measures:

- Increase the separation between the affected equipment and the unit;
- Connect the affected equipment to a power outlet on a different circuit from that which the receiver is connected to;
- Consult the dealer and/or experienced radio/TV technician for help.

Table 8-1 FCC IDs and the specific configurations

FCC ID	Operating Frequency	Model Number	Antenna Gain	Channel Size	Maximum Transmitter Output Power	Maximum allowed EIRP
ABZ89FT7632	3.650 to 3.675 GHz	3630APC	16.5 dBi	10 MHz	22.91 dBm	NA
				7 MHz	21.35 dBm	NA
				5 MHz	19.81 dBm	NA
				3.5 MHz	18.33 dBm	NA
ABZ89FT7633	3.650 GHz to 3.675 GHz	3630SM	14.5 dBi	10 MHz	10 MHz	10 W (40 dBm)
				7 MHz	24 dBm	7 W (38.5 dBm)
				5 MHz	22.5 dBm	5 W (37 dBm)
				3.5 MHz	20.9 dBm	3.5 W (35.4 dBm)

**n
tinued**

Table 8-1 FCC IDs and the specific configurations (Continued)

FCC ID	Operating Frequency	Model Number	Antenna Gain	Channel Size	Maximum Transmitter Output Power	Maximum allowed EIRP
ABZ89FT7636	3.650 GHz to 3.675 GHz	3630SMC	9.5	10MHz	26.5	36
				7MHz	25	34.5
				5MHz	24	33.5
				3.5MHz	23	32.5
ABZ89FT7636	3.650 GHz to 3.675 GHz	3630SMC	22	10MHz	14	36
				7MHz	13	35
				5MHz	12	34
				3.5MHz	11.5	33.5

Industry Canada Notification

This device is approved for use in Canada in the licensed frequencies from 3.450 GHz to **3.700** GHz. It is undergoing Industry Canada approval for use in the 3.65 GHz band, and may not be used in that band until Industry Canada approval is granted.

Operation is subject to the following two conditions:

- This device may not cause harmful interference and
- This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio-frequency energy and if not installed and used in accordance with these instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to correct the interference by one or more of the following measures:

- Increase the separation between the affected equipment and the unit;
- Connect the affected equipment to a power outlet on a different circuit from that which the receiver is connected to;
- Consult the dealer and/or experienced radio/TV technician for help.

To reduce potential radio interference to other users, the antenna type and its gain should be chosen so its Equivalent Isotropic Radiated Power (EIRP) is not more than that permitted for successful communication.

For 3630APC (3600~3650 MHz)

This device has been designed to operate with an antenna having a maximum gain of 17 dBi. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.

For 3630APC (3650~3700MHz)

This device has been designed to operate with an antenna having a maximum gain of 16.5 dBi. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.

For 3530SMC/3630SMC

This device has been designed to operate with an antenna having a maximum gain of 22 dBi. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.

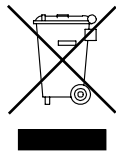
Table 8-2 Industry Canada Certification Numbers and the specific configuration

IC ID	Operating Frequency	Model number	Antenna Gain	Channel Size	Maximum Allowed EIRP	Maximum Transmitter Output power
109 W-3530APC	3450~3600MHz	3530 APC	16.5 dBi connectorized	any	NA	27dBm (500mW)
109W-3630APC	3600~3650MHz	3636APC	17 dBi	any	NA	27dBm (500mW)
109W-3630APC	3650~3700MHz	3636APC	16.5 dBi	any	NA	25dBm (316mW)
109W-3530SM	3450~3600MHz	3530SM	14.5 dBi	NA	NA	27dBm (500mW)
109W-3630SM	3600~3700MHz	3630SM	14.5 dBi	NA	NA	27dBm (500mW)
109W-3530SMC	3450~3600MHz	3530SMC	22 dBi	NA	NA	27 dBm (500mW)
109W-3630SMC	3600~3700MHz	3639SMC	NA	NA	NA	TBD

European Union Notification

The relevant Declaration of Conformity can be found at
<http://motorola.wirelessbroadbandsupport.com/doc.php>

Equipment Disposal



Please do not dispose of Electronic and Electric Equipment or Electronic and Electric Accessories with your household waste. In some countries or regions, collection systems have been set up to handle waste of electrical and electronic equipment. In European Union countries, please contact your local equipment supplier representative or service center for information about the waste collection system in your country.

EU Declaration of Conformity for RoHS Compliance

Motorola hereby, declares that these Motorola products are in compliance with the essential requirements and other relevant provisions of Directive 2002/95/EC, Restriction of the use of certain Hazardous Substances (RoHS) in electrical and electronic equipment.

The relevant Declaration of Conformity can be found at <http://motorola.wirelessbroadband-support.com/doc.php>.

Labeling and Disclosure Table for China

The People’s Republic of China requires that Motorola’s products comply with China Management Methods (CMM) environmental regulations. (China Management Methods refers to the regulation Management Methods for Controlling Pollution by Electronic Information Products.) Two items are used to demonstrate compliance - the label, and the disclosure table Table 6 3 Disclosure table.

The label is placed in a customer visible position on the product.

- Logo 1 means that the product contains no substances in excess of the maximum concentration value for materials identified in the China Management Methods regulation.
- Logo 2 means that the product may contain substances in excess of the maximum concentration value for materials identified in the China Management Methods regulation, and has an Environmental Friendly Use Period (EFUP) in years, fifty years in the example shown.



The Environmental Friendly Use Period (EFUP) is the period (in years) during which the Toxic and Hazardous Substances (T&HS) contained in the Electronic Information Product (EIP) will not leak or mutate causing environmental pollution or bodily injury from the use of the EIP. The EFUP indicated by the Logo 2 label applies to a product and all its parts. Certain field-replaceable parts, such as battery modules, can have a different EFUP and are marked separately.

The Disclosure table is intended to communicate compliance with only China requirements; it is not intended to communicate compliance with EU RoHS or any other environmental requirements.

Figure 8-1 Disclosure Table

部件名称						多溴二苯醚 (PBDE)
		汞 (Hg)				
金属部件						
电路模块						
电容及电感元件						
塑料和聚合物部件						
<p>表示该有害物质在该部件所含金属材料中的含量均在 GB/T11363 2006 标准规定的限值要求以下</p> <p>表示该有害物或至少在该部件的某一组成部分中的含量超出GB/T11363 2006 标准规定的限值要求</p>						

RF EXPOSURE SEPARATION DISTANCES



To protect from overexposure to RF energy, an AP must be installed to provide a separation distance of at least 50 cm (~20 in) from all persons In addition, do not collocate within 20 cm (4 in) of any other antenna or transmitter.

To protect from overexposure to RF energy, an SM must be installed to provide a separation distance of at least 50 cm (~20 in) from all persons and must not be collocated or operating with any other antenna or transmitter.

The following section and table provide details and discussion on the separate distance calculations.

To protect from overexposure to EU RF energy, An 3530SMC must be installed to provide a separation distance of at least **82** cm from all persons and must be not collocated or operating with any other antenna or transmitter.

To protect from overexposure to EU RF energy, An 3630SMC must be installed to provide a separation distance of at least **120** cm from all persons and must be not collocated or operating with any other antenna or transmitter.

Details of Exposure Separation Distances Calculations and Power Compliance Margins

Limits and guidelines for RF exposure come from:

- US FCC limits for the general population. See the FCC web site at <http://www.fcc.gov>, and the policies, guidelines, and requirements in Part 1 of Title 47 of the Code of Federal Regulations, as well as the guidelines and suggestions for evaluating compliance in FCC OET Bulletin 65.
- Health Canada limits for the general population. See the Health Canada web site at <http://www.hc-sc.gc.ca/rpb> and Safety Code 6.
- ICNIRP (International Commission on Non-Ionizing Radiation Protection) guidelines for the general public. See the ICNIRP web site at <http://www.icnirp.de/> and Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields.

The applicable power density exposure limits from the documents referenced above is 10 W/m2.

Peak power density in the far field of a radio frequency point source is calculated as:

Figure 8-2 Peak power density calculation

$$S = \frac{P \cdot G}{4 \pi d^2}$$

where
 S = power density in W/m²
 P = RMS transmit power capability of the radio, in W
 G = total Tx gain as a factor, converted from dB
 d = distance from point source, in m

Rearranging terms to solve for distance yields
$$d = \sqrt{\frac{P \cdot G}{4 \pi S}}$$

Table 8-3 shows calculated minimum separation distances d, recommended distances and resulting power compliance margins for each frequency band and antenna combination.

Details of Exposure Separation Distances Calculations and Power Compliance Margins
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Table 8-3 Calculated exposure distances and power compliance margins

	P(dBm)	P(W)	G	S	Distance (cm , Calculated)
3630APC	25.1	0.324	16.5	10	33.92
3630SM	27.06	0.508	14.5	10	33.76

These are conservative distances:

- They are along the beam direction (the direction of greatest energy). Exposure to the sides and back of the module is significantly less.
- In the case of collocated APs, they assume all APs are oriented in the same direction, which is a worst-case calculation.
- They meet or exceed sustained exposure limits for the general population (not just short-term occupational exposure limits).
- The calculated compliance distance d is overestimated because the far-field equation models the antenna(s) as a point source and neglects the physical dimension of the antenna(s).

Table 8-4 Exposure separation distances

Module Type	Separation Distance from Persons
Radio Module with integrated antenna	At least 20 cm (approximately 8 inches)
Module with Reflector Dish	At least 1.5 m (approximately 60 inches or 5 feet)
Module with LENS	At least 0.5 m (approximately 20 inches)
Antenna of connectorized 5.7 GHz AP	At least 30 cm (approximately 12 inches)
Antenna of connectorized or integrated 900 MHz module	At least 60 cm (approximately 24 inches)
Indoor 900 MHz SM	At least 10 cm (approximately 4

PMP 320 AP

inches)

At least 50 cm (approximately 20 inches)

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