

CommScope Era™

High Power Carrier Access Point

Installation Guide • M0201AKB_uc • January 2019

PRELIMINARY DRAFT



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Andrew Wireless Systems GmbH, 30-January-2019

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DOCUMENT OVERVIEW

This installation guide provides a product overview and installation instructions for the High Power Carrier Access Point (CAP H), which allows transmission between CommScope Era™ equipment, antennas, and Ethernet devices (such as WiFi and IP cameras). [Table 1](#) lists the CAP H models that this installation guide supports.

Table 1. Supported CAP H Models

Part Number ¹	Model Name	Designed for use in...
7772983-xxxx	CAP H 8/9/18/21	EMEA
7821740-xxxx	CAP H 9/18/21/26	EMEA
7825719-xxxx	CAP H 7E/80-85/17E/19	North America
7825730-xxxx	CAP H 17E/17E/19/19	North America
¹ The “-xxxx” suffix provides information as to whether the CAP H is AC or DC. Contact your local sales representative for further information. See also "CommScope Part Numbers" on page 3 .		



For information on how to find the minimum software requirements for Era hardware, refer to ["Hardware to Software Mapping Information" on page 54](#).

Document Revision History

This is the second release of the *CommScope Era™ High Power Carrier Access Point Installation Guide*, which

- adds support for the CAP H 7E/80-85/17E/19 and the CAP H 17E/17E/19/19
- updates
 - ["CAP H Connectors and Status LED" on page 6](#)
 - ["CAP H Installation and Cascade Rules" on page 20](#)
 - ["Ground the CAP H" on page 32](#)
 - ["Connect the Antenna Cable" on page 34](#)
 - ["Connect the MAINS Power and Power on an AC CAP H" on page 42](#)

Document Cautions and Notes

This document may contain any of the following notes, cautions and warning icons.



The icon to the left is used to indicate a caution or warning. Cautions and warnings indicate operations or steps that could cause personal injury, induce a safety problem in a managed device, destroy or corrupt information, or interrupt or stop services.



The icon to the left indicates a caution or warning that pertains to laser equipment.



The icon to the left indicates a caution or warning that pertains to Radio Frequency (RF).



The icon to the left indicates that the hardware is susceptible to Electro-Static Discharge (ESD) damage.



The icon to the left indicates a caution or warning that pertains to an electrical hazard.



The icon to the left indicates a caution or warning that pertains to a fire hazard.



The icon to the left indicates a Note. Notes provide information about special circumstances.

Abbreviations Used in this Guide

AC	Alternating Current	ISDE	Innovation, Sciences et Développement économique Canada
AUX	Auxiliary	ISED	Innovation, Science and Economic Development Canada
C	Celsius	kg	Kilogram
CAN	Central Area Node	LED	Light Emitting Diode
CAP H	Carrier Access Point, High Power	MHz	Megahertz
CAP L	Carrier Access Point, Low Power	MIMO	Multiple Input Multiple Output
CAP M	Carrier Access Point, Medium Power	mm	Millimeter
Cat	Category	MMF	Multi-Mode Fiber
CAT	Copper Transport	OD	Optical Density
CMS	CommScope Mobility Solutions	OPT	Optical Transport
dB	Decibel	PA	Power Amplifier
dBm	Decibel-milliwatts	PN	Part Number
DC	Direct Current	RAN	Regional-Area Network
EFTA	European Free Trade Association	RF	Radio Frequency
EMC	Electromagnetic Compatibility	RU	Rack Unit
EMEA	Europe, Middle East, Africa	SFP	Small Form-Factor Pluggable
EU	European Union	SISO	Single Input Single Output
F	Fahrenheit	SMF	Single-Mode Fiber
FCC	Federal Communications Commission	TEN	Transport Expansion Node
Gbps	Gigabyte per second	UAP	Universal Access Point
GHz	Gigahertz	Vdc	Volts, direct current
GUI	Graphical User Interface	W	Watts
ION	Intelligent Optical Network		

CommScope Part Numbers

The CommScope Era part numbers in this installation guide are in the format of *nnnnnnnn-xx*, where the “-xx” suffix indicates the latest release. Contact your local CommScope sales representative for the current release part number.

ERA SYSTEM OVERVIEW

CommScope Era™ coordinates wireless capacity throughout the entire coverage area via a single centralized head-end location or from an operator's existing C-RAN hub. Based on ION-E®, Era operates on the same cost-efficient standard IT cabling as ION-E and is compatible with ION-E deployments. Era systems bring together licensed wireless and power, plus Gigabit Ethernet for WiFi into one wireless system that can scale to building size and is technology and spectrum agnostic and adaptive. An Era system comprises the components listed below.

- **Central Area Node (CAN)**—provides server-level control and primary signal distribution. It combines the signals from multiple operators and distributes those signals within a venue or multiple venues. There are two configuration modes available for the CAN: **Classic** and **Switching**.
 - The **Classic CAN** configuration is appropriate for when all the BTS and Baseband sources are located in a centralized space in the same venue as the Classic CAN. You install RF Donor (RFD) Cards and CPRI Digital Donor (CDD) Cards in a Classic CAN, which digitizes the analog BTS signals from the RFD Cards and combines those with the BBU CPRI digital signals from the CDD Cards, and then distributes the RF signals to the TENS. The TENS then provide the RF signals to the Access Points (APs). The Classic CAN also supports APs that are directly connected to CAT or OPT Cards installed in the Classic CAN chassis. Wide-area Integration Nodes (WINs) are not supported by a Classic CAN. Users have full and flexible control of all signal routing via the Era GUI.
 - The **Switching CAN** configuration is appropriate for when WINs are required to allow operators to bring in baseband signals from multiple remote locations to fully leverage the C-RAN architecture in their hubs. All operator Baseband signals (analog BTS and BBU CPRI) are supplied to the Switching CAN by the WINs, so no RFD or CDD Cards can be installed in the Switching CAN. The Switching CAN then combines the signals from all WINs and distributes those signals to the TENS, and the TENS provide the signals to the APs. APs are not directly connected to a Switching CAN. Users have full and flexible control of all signal routing via the Era GUI.



This guide uses “CAN” to collectively refer to Central Area Nodes. When information pertains to a specific CAN mode, “Classic CAN” and “Switching CAN” will be used.

- **Wide-Area Integration Node (WIN)**—interfaces between a Switching CAN and RF sources, which makes C-RAN possible in Era by allowing operators to bring in signals from multiple remote locations kilometers away. You install RFD and CDD Cards in the WIN, which takes the analog BTS signals from the RFD Cards and combines those with the BBU CPRI digital signals from the CDD Cards, and distributes the RF sources to a Switching CAN.
- **Transport Expansion Node (TEN)**—is an expansion node connected to the CAN via fiber and can be located throughout the venue coverage area. A single TEN can support, dependent on the AP type and powering method, 12 to 32 Access Points (APs), which greatly reduces the number of fiber runs between the head-end and each AP.
- **Access Point (AP)**—connects a Classic CAN or TEN to antennas or other wireless devices. On the downlink, an AP converts data arriving at the AP to analog signals and sends them to an antenna. On the uplink, received signals are digitized and serialized into data streams which are sent back to the Classic CAN or TEN. APs provide pass-through support for WiFi, IP cameras, or other devices over a common cable. An AP can be any of the Universal Access Points or Carrier Access Points.



This guide uses “Access Point (AP)” to collectively refer to all versions of the Universal Access Point (UAP) and the Carrier Access Point (CAP). “Fiber APs” collectively refers to the CAP H, CAP M, and the Fiber CAP L. When information pertains to a specific AP type, that AP will be identified.

CAP H OVERVIEW

This installation guide describes the High Power Carrier Access Point (CAP H), which interfaces with a Classic CAN or TEN via an optical link. This allows the CAP H to provide data over Single-Mode Fiber (SMF), or Multi-Mode Fiber (MMF). Power for a CAP H is provided over internal AC/DC (AC version) or DC (DC version).

On the downlink, the CAP H converts data arriving at the CAP H to analog signals and sends them to the Antenna port. On the uplink, received signals are digitized and serialized into data streams, which are sent back to the Classic CAN or TEN.

Figure 1 on page 5 shows how a CAP H can be deployed in an Era system.

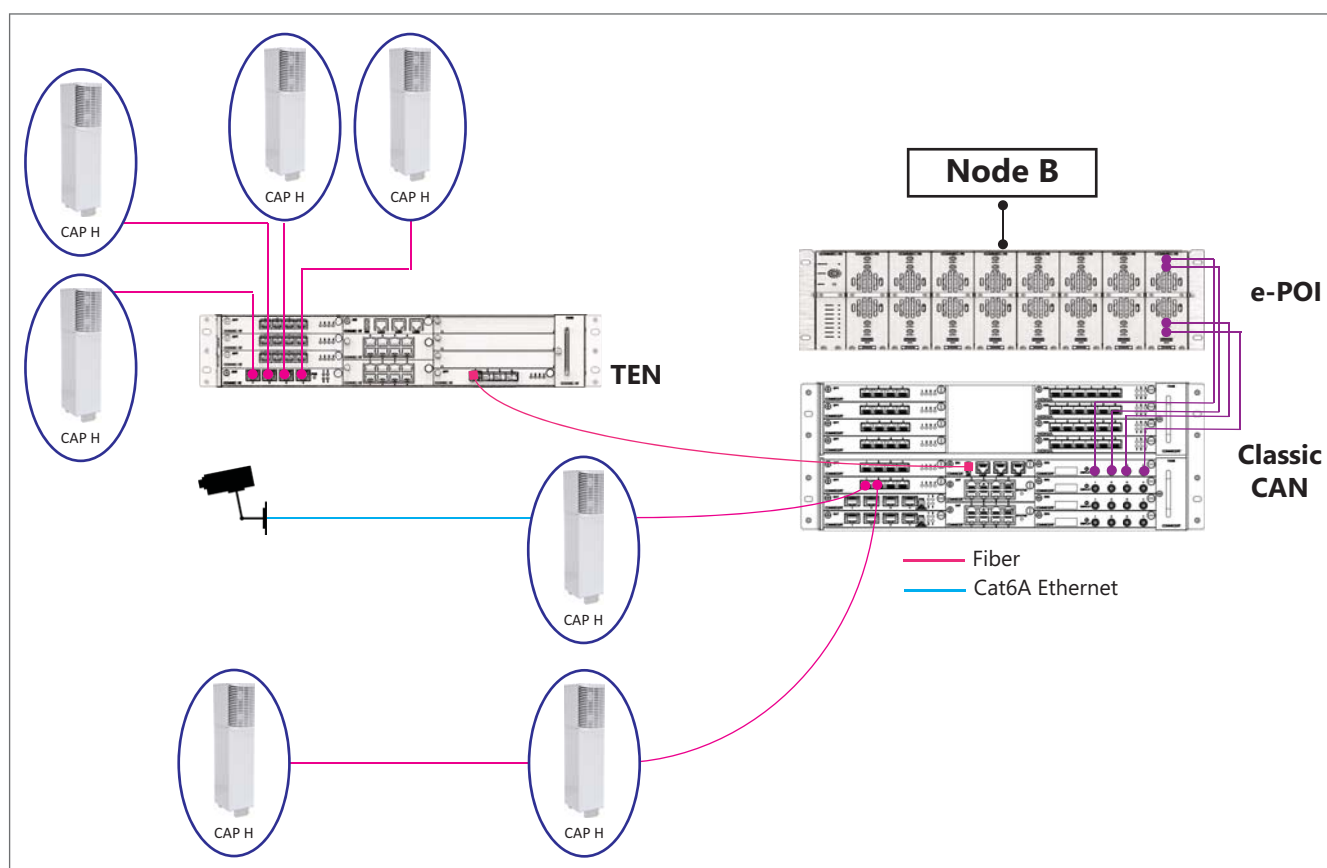


Figure 1. CAP H in an Era System

The CAP H

- is actively cooled and operates within the range of:
 - -33 °C to +50 °C
 - -27 °F to +122 °F
- is rated for indoor and outdoor installations (IP66 and IP67)
- Typical power consumption (4 band Units, exemplary):
 - 450 W (room temperature, idle)
 - 990 W (maximum temperature, fully loaded).

CAP H Connectors and Status LED

The CAP H connectors and Status LED are described in the following sections:

- "Connectors and Status LED on Models with One Antenna" on page 6
- "Connectors and Status LED on Models with Two Antenna Connectors" on page 9.

Connectors and Status LED on Models with One Antenna

- Figure 2 shows the connectors on an AC version of the CAP H that has one antenna connector.
- Table 2 on page 7 maps the callouts in Figure 2 and Figure 3 on page 8 and describes the connectors and STATUS LED.
- Figure 3 on page 8 shows the connectors on a DC version of the CAP H that has one antenna connector.



Do not remove caps from any of the connectors until instructed to do so.

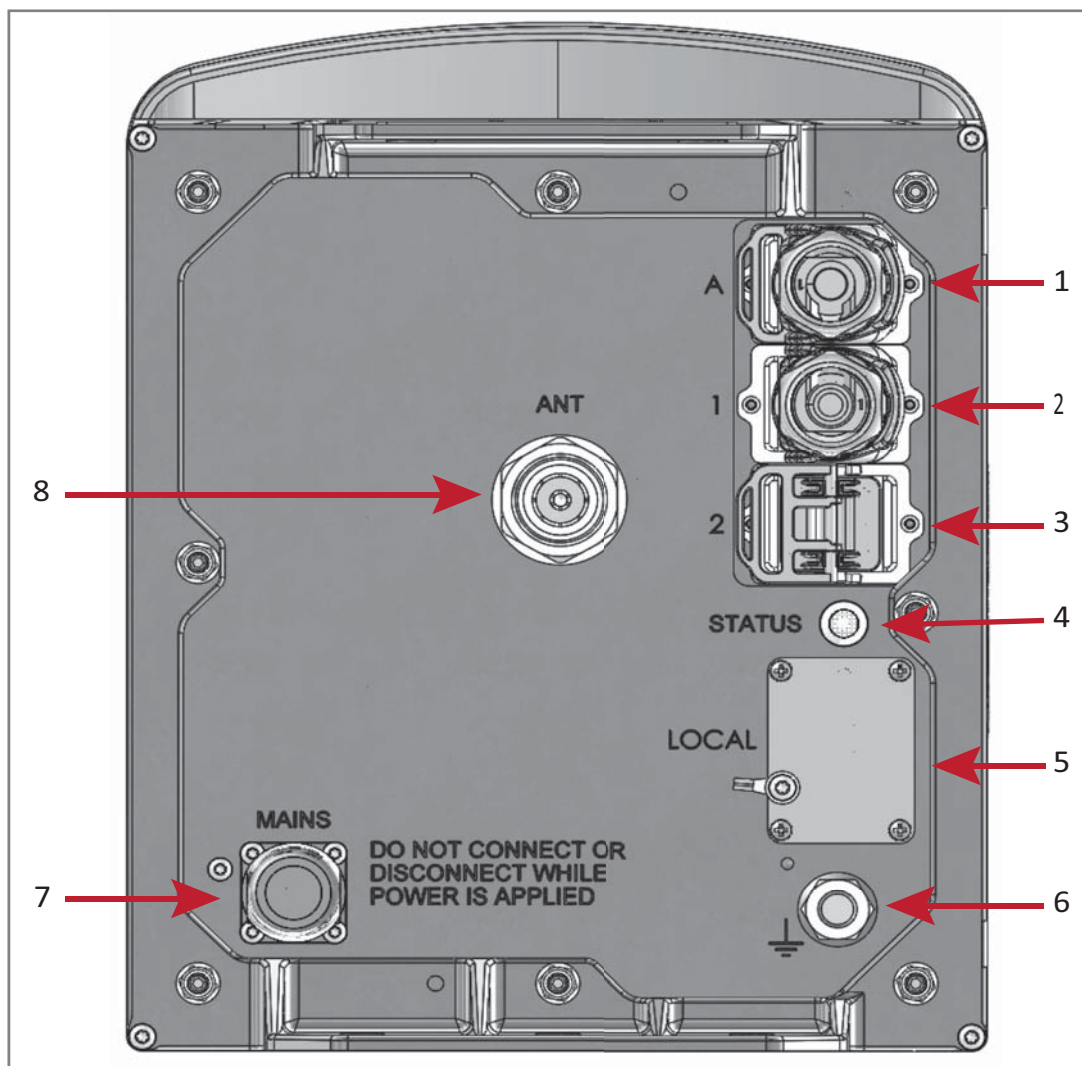


Figure 2. Location of Connectors and LED on AC Version with One Antenna Connector

The “REF #” column in [Table 2](#) refers to the callouts in [Figure 2 on page 6](#) and [Figure 3 on page 8](#).

Table 2. Function of Connectors and Status LED Models with One Antenna Connector

REF #	Label	Description	Function
1	A	RJ45 Auxiliary port	Connects to external Ethernet devices such as WiFi and IP cameras. Cabling is via the appropriate CAT cable for the protocol; this model supports a 1000 BASE-T and 802.3at Class 4 Power over Cat6A Ethernet connection. Maximum attached cable length is 3 meters (9.8 feet), per 802.3ATclass4 standards. For information on the Auxiliary port in cascades, see "CAP H Installation and Cascade Rules" on page 20 . The Auxiliary port ships with factory-installed EMI/weatherproof plug and must remain plugged if not in use; graphic shows an OCTIS connector (PN 7760652) in black.
2	1	Optical Port 1	Can be one of the following: - Connects to a Primary CAP H to a Classic CAN or TEN to provide the main signal interface. Optical transport occurs over Single Mode Fiber (SMF) or Multi Mode Fiber (MMF). Requires Optical OCTIS Kit (PN 7770612); Optical Port 1 ships with a dust cap that can be discarded upon unit installation. - Connects a Secondary CAP H to Optical Port 2 of the Primary CAP H.
3	2	Optical Port 2	Connects to an optional cascaded secondary CAP H via an Optical OCTIS Kit (PN 7770612). Optical transport occurs over Single Mode Fiber (SMF) or Multi Mode Fiber (MMF). Optical Port 2 ships with factory-installed EMI/weatherproof plug, and must remain plugged if not in use.
4	STATUS	Status LED	Provides a visual indication of the status of the CAP H; see "Using the Status LED to Determine State of the CAP H" on page 47 .
5	LOCAL	Mini USB network port	Provides a local connection to a laptop. This port is not required for normal operation of the unit and should only be used when requested by CommScope Technical Support.
6		- AC version—One M8 bolt, hex nut, and washers - DC version—Two M6 bolt, hex nut, and washers	Provides earth ground for the CAP H chassis.
7	MAINS	Power connector	- AC version—Provides the power to CAP H models that use standard AC (100 to 240 Vac) power. - DC version—Provides the power to CAP H models that use DC (-60 to -48 Vdc) power.
8	ANT	4.3-10 RF connector	Transmits and receives signals to and from distributed antennas. This RF port can be connected directly to an antenna (using RF jumper cables) or through splitters, allowing additional antennas to be fed by the CAP H.

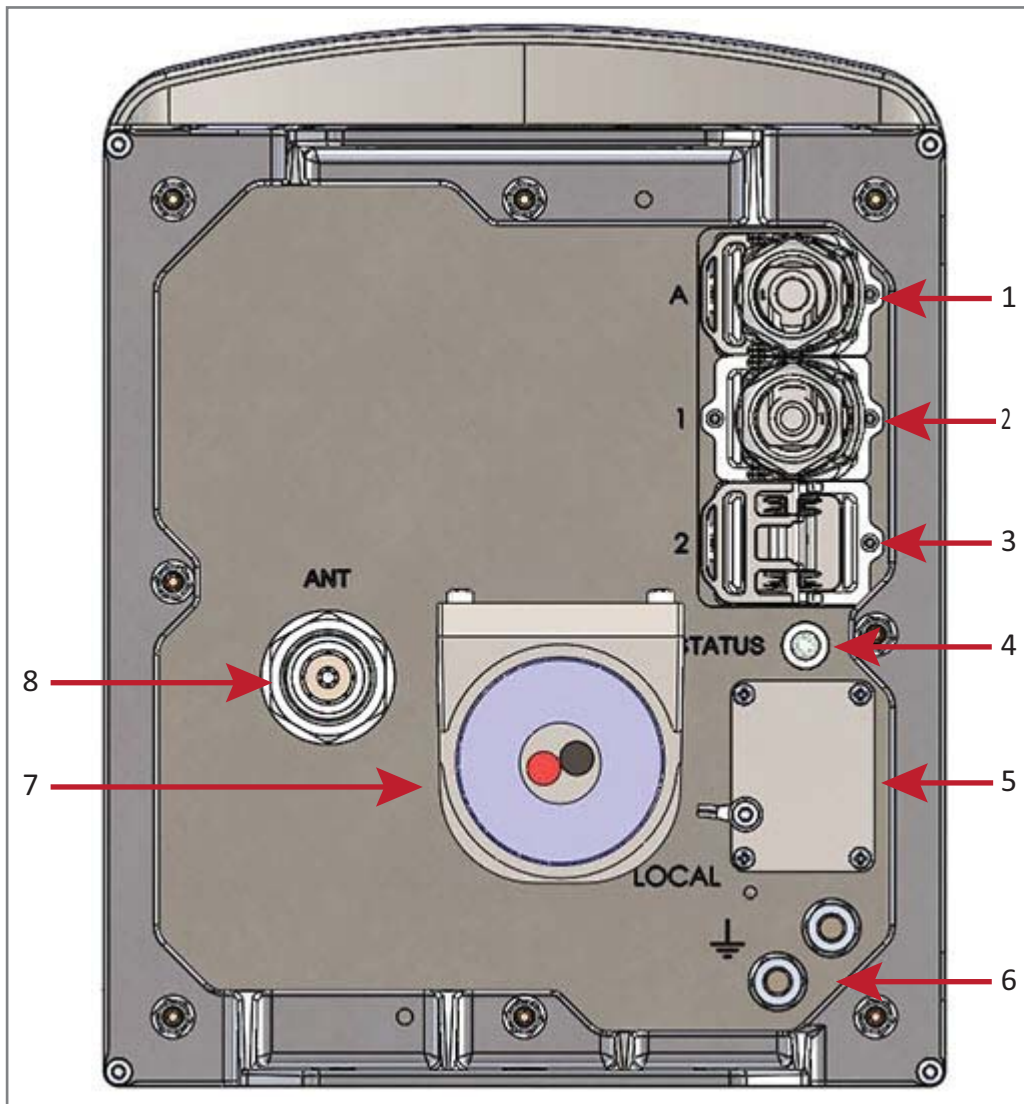


Figure 3. Location of Connectors and Status LED on DC Version with One Antenna Connector

Connectors and Status LED on Models with Two Antenna Connectors

- [Figure 4](#) shows the connectors on an AC version with two antenna connectors.
- [Table 3 on page 10](#) maps the callouts in [Figure 4](#) and [Figure 5 on page 11](#) and describes the connectors and STATUS LED.
- [Figure 5 on page 11](#) shows the connectors on a DC version with two antenna connectors.



Do not remove caps from any of the connectors until instructed to do so.

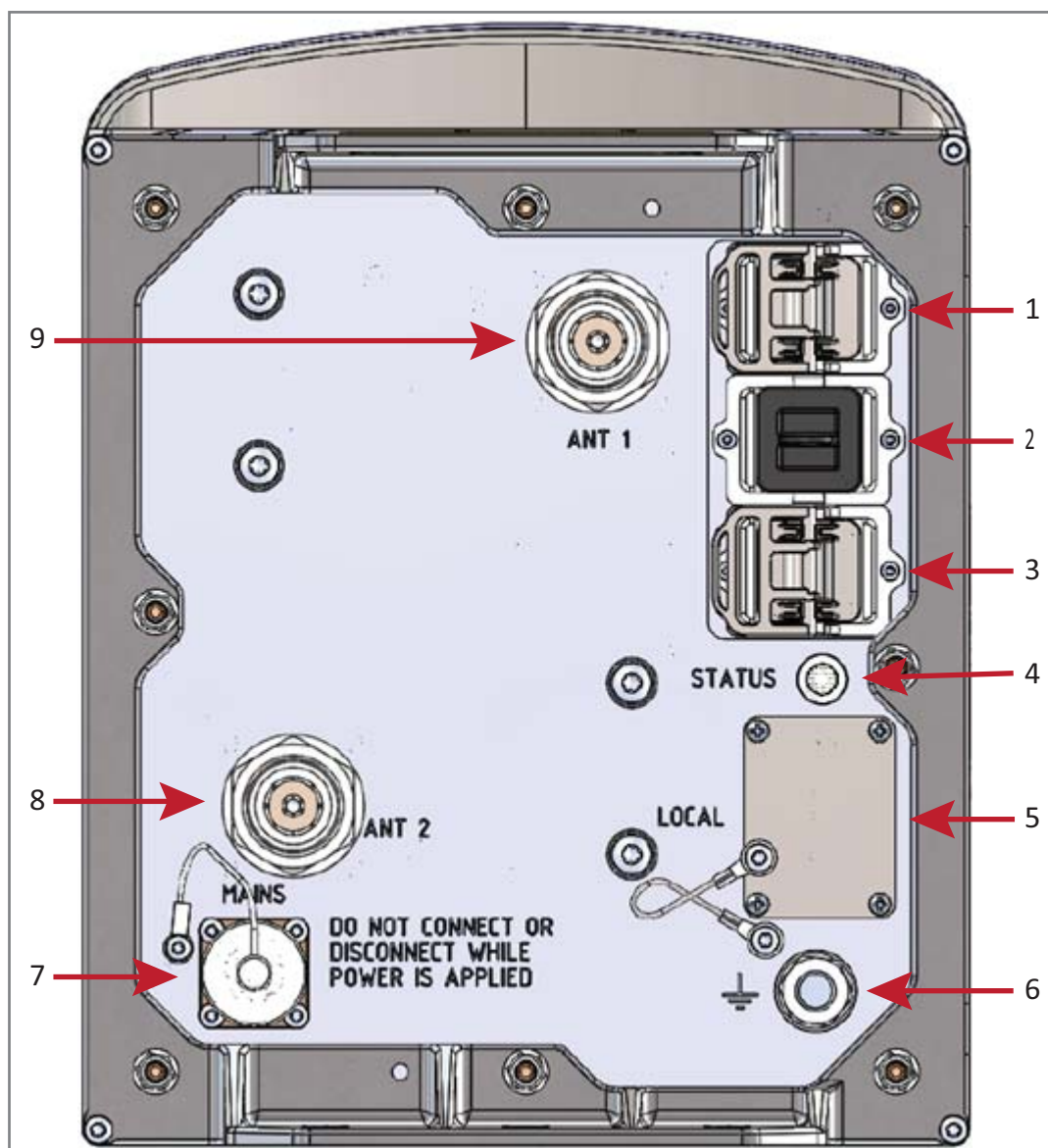


Figure 4. Location of Connectors and Status LED on AC Version with Two Antenna Connectors

The “REF #” column in [Table 2](#) refers to the callouts in [Figure 2 on page 6](#) and [Figure 5 on page 11](#).

Table 3. Function of the Connectors and Status LED Models with Two Antenna Connectors

REF #	Label	Description	Function
1	A	RJ45 Auxiliary port	Connects to external Ethernet devices such as WiFi and IP cameras. Cabling is via the appropriate CAT cable for the protocol; this model supports a 1000 BASE-T and 802.3at Class 4 Power over Cat6A Ethernet connection. Maximum attached cable length is 3 meters (9.8 feet), per 802.3ATclass4 standards. For information on the Auxiliary port in cascades, see "CAP H Installation and Cascade Rules" on page 20 . The Auxiliary port ships with factory-installed EMI/weatherproof plug, and must remain plugged if not in use; graphic shows an OCTIS connector (PN 7760652) in black.
2	1	Optical Port 1	Can be one of the following: - Connects to a Primary CAP H to a Classic CAN or TEN to provide the main signal interface. Optical transport occurs over Single Mode Fiber (SMF) or Multi Mode Fiber (MMF). Requires Optical OCTIS Kit (PN 7770612); Optical Port 1 ships with a dust cap that can be discarded upon unit installation. - Connects a Secondary CAP H to Optical Port 2 of the Primary CAP H.
3	2	Optical Port 2	Connects to an optional cascaded secondary CAP H via an Optical OCTIS Kit (PN 7770612). Optical transport occurs over Single Mode Fiber (SMF) or Multi Mode Fiber (MMF). Optical Port 2 ships with factory-installed EMI/weatherproof plug, and must remain plugged if not in use.
4	STATUS	Status LED	Provides a visual indication of the status of the CAP H; see "Using the Status LED to Determine State of the CAP H" on page 47 .
5	LOCAL	Mini USB network port	Provides a local connection to a laptop. This port is not required for normal operation of the unit, and should only be used when requested by CommScope Technical Support.
6		- AC version—One M8 bolt, hex nut, and washers - DC version—Two M6 bolt, hex nut, and washers	Provides earth ground for the CAP H chassis.
7	MAINS	Power connector	- AC version—Provides the power to CAP H models that use standard AC (100 to 240 Vac) power. - DC version—Provides the power to CAP H models that use DC (-60 to -48 Vdc) power.
8	ANT2	4.3-10 RF connector	Connect to two separate external antennas or to two ports on a cross-polarized dual antenna via 50Ω coaxial cable. Each connector supports two RF bands; see "Connect the Antenna Cable" on page 34 . These RF ports can be connected directly to an antenna (using RF jumper cables) or through splitters, allowing additional antennas to be fed by the CAP H.
9	ANT1		

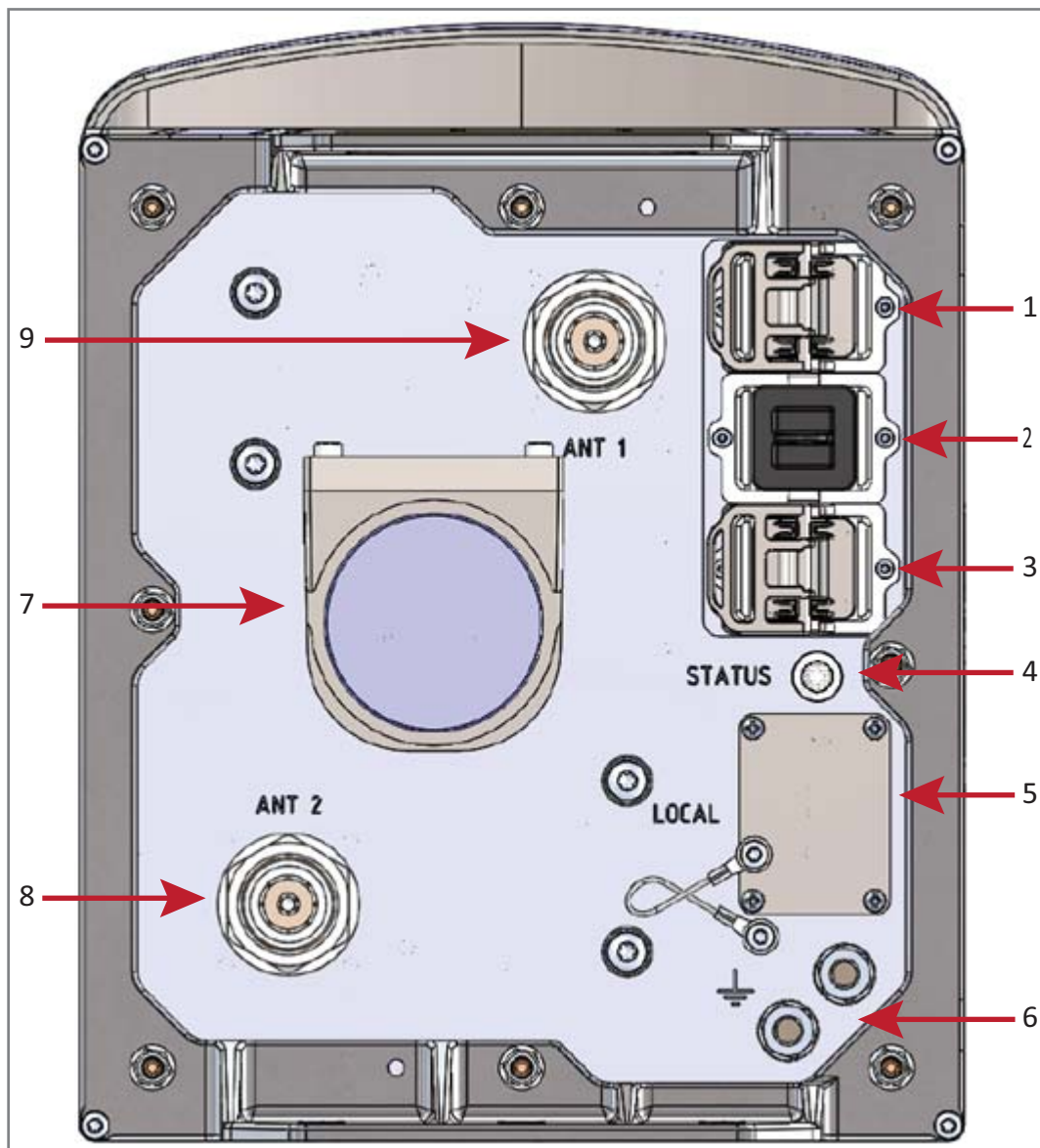


Figure 5. Location of Connectors and Status LED on DC Version with Two Antenna Connectors

CAP H Accessory Options

The following sections describe hardware options for the CAP H.

Mounting Kits

You must order one of following mounting kits, as appropriate for this installation. The mounting kit must be ordered separately; it is not contained with the standard equipment.

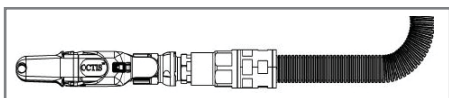
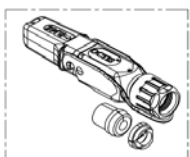
- Wall Mounting Kit (CommScope Part Number 7661581), includes the following:
 - One Top Mounting Bracket
 - One Bottom Mounting Bracket
 - Four M8x25 screws
 - Four split-lock washers
 - Four 8.4 mm flat washers.
- Pole Mounting Kit (CommScope Part Number 7661538), includes the following:
 - One Top Mounting Bracket with Screw Band
 - One Bottom Mounting Bracket with Screw Band
 - Two Worm-gear clamps
 - Four M8x25 screws
 - Four split-lock washers
 - Four 8.4 mm flat washers.

OCTIS Kits

All CAP H units include one OCTIS¹ Kit for the primary interface to a Classic CAN or TEN that CAP H plugs into the CAP H Optical Port 1. You can order an additional OCTIS Kit, which would allow you to cascade two CAP Hs via Optical Port 2, or to attach an auxiliary Ethernet device via the AUX Port. [Table 4](#) identifies the OCTIS Kit options.

Table 4. CAP H OCTIS Kits

Kit Name	CommScope PN	Description
Optical OCTIS Kit	7770612	Use as follows: - Optical Port 1—to connect the CAP H to a Classic CAN or TEN. - Optical Port 2—to cascade a second CAP H. - Ships with the following grommets: 6mm nominal diameter for use with cables with OD range from 4.8-5.8 7mm nominal diameter for use with cables with OD range from 5.8-6.8 8mm nominal diameter for use with cables with OD range from 6.8-7.8
Ethernet OCTIS Kit	7760652	Use to attach an auxiliary Ethernet device.
Fiber/Cable Protective Kit f. OCTIS	7823597	Use to protect fibers or cables; is 2m (78.7") long.



¹ OCTIS is a trademark of RADIALL.

SAFELY WORKING WITH A CAP H

The following sections provide important information that you should read and know before working with the CAP H. Observe all cautions and warnings listed in this section and elsewhere in this installation guide.

RF Safety Cautions



This system is a RF Transmitter and continuously emits RF energy. Maintain a minimum clearance from the antenna as specified in [Table 6](#) while the system is operating. Whenever possible, power down the CAP H before servicing the antenna.



Only license holders for the respective frequency range are allowed to operate this unit.



Do not operate the CAP H without terminating the antenna connectors. The antenna connectors may be terminated by connecting them to their respective antennas or to a dummy load.

Health and Safety Precautions



Electrical hazard. Danger of death or fatal injury from electrical current. Obey all general and regional installation and safety regulations relating to work on high voltage installations, as well as regulations covering correct use of tools and personal protective equipment.



Laser radiation. Risk of eye injury in operation. Do not stare into the laser beam; do not view the laser beam directly or with optical instruments.



High frequency radiation in operation. Risk of health hazards associated with radiation from the antenna(s) connected to the unit. Implement prevention measures to avoid the possibility of close proximity to the antenna(s) while in operation.



Risk of injury by the considerable weight of the unit falling. Ensure there is adequate manpower to handle the weight of the system.



Risk of serious personal injury by equipment falling due to improper installation. The installer must verify the following.

- There is adequate manpower to handle the weight of the system during installation.
- That the supporting surface will safely support the combined load of the electronic equipment and all attached hardware and components.
- When wall mounting a CAP H, the wall anchors (screws and dowels) used to mount the CAP H should be appropriate for the wall structure/material.

Property Damage Warnings



Only suitably qualified personnel are allowed to work on this unit and only after becoming familiar with all safety notices, installation, operation and maintenance procedures contained in this installation guide.



Keep operating instructions within easy reach and make them available to all users.



Only license holders for the respective frequency range are allowed to operate this unit.



When opening the CAP H, do not damage the warranty labels on the internal devices. The warranty is void if the seals are broken.



Make sure the repeater settings are correct for the intended use (refer to the manufacturer product information) and regulatory requirements are met. Do not carry out any modifications or fit any spare parts, which are not sold or recommended by the manufacturer.



Due to power dissipation, the CAP H may reach a very high temperature. Ensure sufficient airflow for ventilation. Do not operate this equipment on or close to flammable materials. Use caution when servicing the CAP H.



Although the CAP H is internally protected against overvoltage, it is strongly recommended to ground (earth) the antenna cables close to the antenna connectors of the unit for protection against atmospheric discharge. In areas with strong lightning, it is strongly recommended to install additional lightning protection.

Guard Against Damage from Electro-Static Discharge



Electro-Static Discharge (ESD) can damage electronic components. To prevent ESD damage, always wear an ESD wrist strap when working with Era hardware components. Not all Era hardware requires grounding. For those hardware components for which grounding is required, connect the ground wire on the ESD wrist strap to an earth ground source before touching the component. Wear the wrist strap the entire time that you work with the hardware.

General Installation Safety Requirements



Wet conditions increase the potential for receiving an electrical shock when installing or using electrically powered equipment. To prevent electrical shock, never install or use electrical equipment in a wet location or during a lightning storm.



Do not remove caps from any of the connectors until instructed to do so.



Read and observe all the warning labels attached to the unit. Make sure that all warning labels are kept in a legible condition. Replace any missing or damaged labels.

Compliance

- Notice:** For installations, which have to comply with FCC RF exposure requirements, the antenna selection and installation must be completed in a way to ensure compliance with those FCC requirements. Depending on the RF frequency, rated output power, antenna gain, and the loss between the repeater and antenna, the minimum distance D to be maintained between the antenna location and human beings is calculated according to this formula:

$$D_{[cm]} = \sqrt{\frac{P_{[mW]}}{4 * \pi * PD_{[mW/cm^2]}}}$$

where

- P (mW) is the radiated power at the antenna, i.e. the max. rated repeater output power in addition to the antenna gain minus the loss between the repeater and the antenna.
- PD (mW/cm²) is the allowed Power Density limit acc. to 47 CFR 1.1310 (B) for general population / uncontrolled exposures which is
 - f (MHz) / 1500 for frequencies from 300MHz to 1500MHz
 - 1 for frequencies from 1500MHz to 100,000MHz

RF exposure compliance may need to be addressed at the time of licensing, as required by the responsible FCC Bureau(s), including antenna co-location requirements of 1.1307(b)(3).

- Notice:** For installations which have to comply with European EN50385 exposure compliance requirements, the following Power Density limits/guidelines (mW/cm²) according to ICNIRP are valid:
 - 0.2 for frequencies from 10 MHz to 400 MHz
 - F (MHz) / 2000 for frequencies from 400 MHz to 2 GHz
 - 1 for frequencies from 2 GHz to 300 GHz
- Notice:** Installation of this equipment is in full responsibility of the installer, who has also the responsibility, that cables and couplers are calculated into the maximum gain of the antennas, so that this value, which is filed in the FCC Grant and can be requested from the FCC data base, is not exceeded. The industrial boosters are shipped only as a naked booster without any installation devices or antennas as it needs for professional installation.

- 4 Notice:** For installations which have to comply with FCC/ISED requirements:

English:

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

This device complies with Health Canada's Safety Code. The installer of this device should ensure that RF radiation is not emitted in excess of the Health Canada's requirement. Information can be obtained at http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio_guide-lignes_direct-eng.php.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Antenna Stmt for ISED:

This device has been designated to operate with the antennas having a maximum gain of 9 dBi. Antennas having a gain greater than 9 dBi are prohibited for use with this device without consent by ISED regulators. The required antenna impedance is 50 ohms.

The antenna(s) used for this transmitter must be installed to provide a minimum separation distance (as specified in [Table 6](#)) from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

French:

Cet appareil est conforme à FCC Partie 15. Son utilisation est soumise à Les deux conditions suivantes: (1) cet appareil ne peut pas provoquer d'interférences et (2) cet appareil doit accepter Toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement du dispositif.

Cet appareil est conforme avec Santé Canada Code de sécurité 6. Le programme d'installation de cet appareil doit s'assurer que les rayonnements RF n'est pas émis au-delà de l'exigence de Santé Canada. Les informations peuvent être obtenues:

http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio_guide-lignes_direct-eng.php

Les changements ou modifications non expressément approuvés par la partie responsable de la conformité pourraient annuler l'autorité de l'utilisateur à utiliser cet équipement.

Antenne Stmt pour ISDE:

Ce dispositif a été désigné pour fonctionner avec les antennes ayant un gain maximal de 9 dBi. Antennes ayant un gain plus grand que 9 dBi sont interdites pour une utilisation avec cet appareil sans le consentement des organismes de réglementation d'ISDE. L'impédance d'antenne requise est 50 ohms.

L'antenne (s) utilisé pour cet émetteur doit être installé pour fournir une distance de séparation minimale (comme indiqué dans le [Table 6](#)) par rapport à toute personnes et ne doit pas être co-localisées ou opérant en conjonction avec une autre antenne ou émetteur. Les utilisateurs et les installateurs doivent être fournis avec des instructions d'installation de l'antenne et des conditions de fonctionnement de l'émetteur pour satisfaire la conformité aux expositions RF.

- 5 Notice:** The unit complies with Overvoltage Category II. It also complies with the surge requirement according to EN 61000-4-5 (fine protection); however, installation of an additional medium (via local supply connection) and/or coarse protection (external surge protection) is recommended depending on the individual application in order to avoid damage caused by overcurrent.

For Canada and US, components used to reduce the Overvoltage Category shall comply with the requirements of IEC 61643-series. As an alternative, components used to reduce the Overvoltage Category may comply with ANSI/IEEE C62.11, CSA Certification Notice No. 516, CSA C22.2 No. 1, or UL 1449. Suitability of the component for the application shall be determined for the intended installation.

6 Notice: Corresponding local particularities and regulations must be observed. For national deviations, please refer to the respective documents included in the manual CD that is delivered with the unit.

7 Note: For a Class B digital device or peripheral:

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 or more 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 RF technician for help

8 Notice: For a Class A digital device or peripheral.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

9 Note: This unit complies with European standard EN60950-1 / EN62368-1.

Equipment Symbols Used / Compliance

Please observe the meanings of the following symbols used in our equipment and the compliance warnings listed in [Table 5](#).

Table 5. Compliance Labels

Symbol	Compliance	Meaning
—	FCC	For industrial (Part 20) signal booster: WARNING: This is NOT a CONSUMER device. It is designed for installation by FCC LICENSEES and QUALIFIED INSTALLERS. You MUST have an FCC LICENSE or express consent of an FCC Licensee to operate this device. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of \$100,000 for each continuing violation.
—	ISED	WARNING: This is NOT a CONSUMER device. It is designed for installation by an installer approved by an ISED licensee. You MUST have an ISED LICENSE or the express consent of an ISED licensee to operate this device. AVERTISSEMENT: Ce produit N'EST PAS un appareil de CONSOMMATION. Il est conçu pour être installé par un installateur approuvé par un titulaire de licence d'ISDE. Pour utiliser cet appareil, vous DEVEZ détenir une LICENCE d'ISDE ou avoir obtenu le consentement exprès d'un titulaire de licence autorisé par ISDE.
CE	CE	To be sold exclusively to mobile operators or authorized installers - no harmonized frequency bands, operation requires license. Intended use: EU and EFTA countries. Indicates conformity with the RED directive 2014/53/EU and/or RoHS directive 2011/65/EU.
CE 0700	CE	Indicates conformity with the RED directive 2014/53/EU and RoHS directive 2011/65/EU certified by the notified body no. 0700.

Required Antenna Distances

Table 6. Required Antenna Distances

CAP H Model	Antenna gain without cable loss [dBi]	Minimum Distance			
		FCC		ISED	
		m	inches	m	inches
CAP H 17E/17E/19/19	9	2.243	88.31	3.256	128.19
CAP H 7E/80-85/17E/19	9	2.705	106.5	3.923	154.45

INSTALLING A CAP H

The following sections guide you through the installation of a CAP H. Pay attention to all cautions and follow the steps in the order presented.

CAP H Installation and Cascade Rules

- When installing a CAP H, you must observe the following rules.
 - The CAP H connects via its Optical Port 1 to an OPT Card in a Classic CAN or TEN.
 - You can only install the OPT Card in Slots L1- L4.
 - You can connect up to 4 CAP Hs per OPT Card, for a total of 16 CAP Hs.
 - You can connect up to 4 Primary CAP Hs per OPT Card, and then connect one Secondary CAP H to each Primary CAP H, for a total of 32 CAP Hs.
- When cascading a Secondary CAP H or an external Ethernet device such as WiFi or an IP camera, you must observe the following rules.
 - In a cascade, the CAP H connected directly to a Classic CAN or TEN is the Primary CAP H, and the CAP H that connects to the Primary CAP H is the Secondary CAP H.
 - To cascade two CAP Hs, connect the fiber-optic cable from Optical Port 2 of the Primary CAP H to Optical Port 1 of the Secondary CAP H.
 - You connect CAP Hs to an OPT Card in a Classic CAN or TEN. Each OPT Card has four 10 Gbps ports (labeled 1 - 4) for fiber connections.
 - The OPT Card can only be installed in Slots L1 - L4 of a Classic CAN or TEN.
 - You can connect up to 4 CAP Hs per OPT Card for a total of 16.
 - The total 320 MHz RF bandwidth is shared between the two cascaded units, but can be shared unevenly; that is, with more bandwidth going to either the Primary or Secondary CAP H-either CAP H can transmit all the 320 MHz RF bandwidth or any subset of it.
 - The Primary and Secondary CAP Hs power up as soon as power is applied to them. In a cascade, the GUI discovers and readies the Primary CAP H for RF first, and then the Secondary CAP H will be discovered and readied for RF.

Prepare for Installation

Do the following before beginning installation.

- Review and know the cautions in ["Safely Working with a CAP H" on page 14](#).
- Review the system design plan.
- Identify and obtain all tools and materials required to complete the installation; see ["Recommended Tools and Material" on page 21](#)

Recommended Tools and Material

- Electrostatic Discharge (ESD) wrist strap
- Drill and bits that can penetrate the selected mounting surface
- 13mm wrench, used for wall or pole mounting the CAP H
- One of two mounting kits, which is ordered separately (see ["CAP H Accessory Options" on page 12](#))
- Earth-bonding cable to ground the CAP H chassis
- Fiber cleaning equipment: Isopropyl alcohol, compressed air, lint-free wipe, and cotton buds.

Unpack and Inspect the CAP H and Optional Accessories

- 1 Inspect the exterior of the shipping container(s) for evidence of rough handling that may have damaged the components in the container.
- 2 Unpack each container while carefully checking the contents for damage and verify with the packing slip.
- 3 If damage is found or parts are missing, file a claim with the commercial carrier and notify CommScope Technical Support (see ["CMS Global Technical Support" on page 53](#)). Save the damaged cartons for inspection by the carrier.
- 4 Save all shipping containers for use if the equipment requires shipment at a future date.

Installation Cautions



Read and observe all cautions listed in ["Safely Working with a CAP H" on page 14](#).



Do not install the unit in a way or at a place where the specifications outlined in the Environmental and Safety Specifications leaflet of the supplier are not met.



Due to power dissipation, the CAP H may reach a very high temperature. Ensure sufficient airflow for ventilation. Do not operate this equipment on or close to flammable materials. Use caution when servicing the CAP H.



Exceeding the specified load limits may cause the loss of warranty.



When connecting and mounting the CAP H cables, ensure that no water can penetrate the unit chassis through these cables.



Ensure that there is free access to the electrical connections as well as to the cabinet. The approved bending radius of the connected cables must not be exceeded. See ["Determine the Mounting Site" on page 23](#).



If any different or additional mounting material is used, ensure that the mounting remains as safe as the mounting designed by the manufacturer. The specifications for stationary use of the CAP H must not be exceeded. Ensure that the static and dynamic strengths are adequate for the environmental conditions of the site. The mounting itself must not vibrate, swing or move in any way that might cause damage to the CAP H.



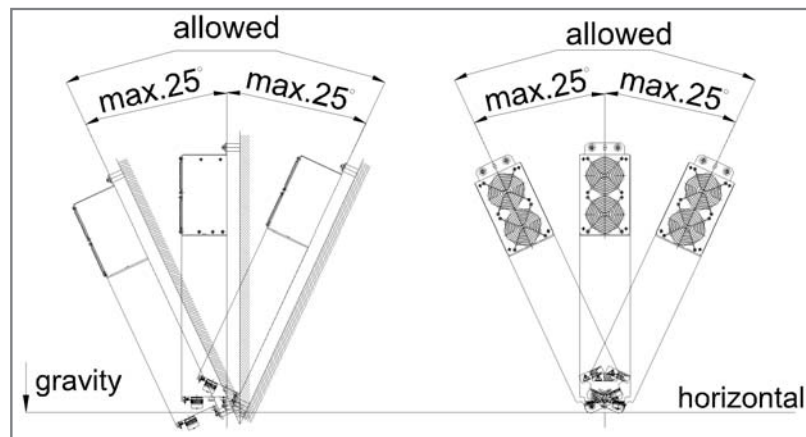
A spacing of 50 mm (1.97 inch) around the unit is required.



To ensure sufficient airflow when mounting the CAP H in enclosed spaces, two lid openings (one for the air inlet and the other for the air outlet) must be provided. Do not block these air inlets and outlets when mounting the CAP H. The size of each opening must equal at least 18 x 18 cm (> 300 cm²). Ensure that there is no thermal short circuit between the air inlet and air outlet. Make sure free airflow is not deflected or otherwise obstructed.



Observe all additional rules or restrictions regarding mounting that apply to specific CAP H types. For details refer to the mechanical specifications in the data sheet for the unit. Install the unit vertically with the Fan Unit at the top. A maximum tilt angle of 25° from a vertical position must be maintained, as shown in the following illustration.



Determine the Mounting Site

When deciding on a suitable mounting site, observe the following rules.

- The CAP H is suitable for installation indoors or outdoors.
- Use the weights listed in [Table 7](#) to determine a site that can bear the weight of the CAP H that is being installed, where:
 - The “Maximum Lift Weight” is the highest weight that must be lifted during installation. (An installer should lift the CAP H components one at a time, not a wholly configured CAP H.)
 - The “Total Hanging Weight” is the weight of the CAP H, including the weight of the Mounting Bracket, minus the weight of the external cables and connectors, that the mounting site must be able to support.

Table 7. Maximum CAP H Installation Weights

CAP H installed with this option ...		Maximum Lift Weight		Total Hanging Weight	
Mounting Kit	Part Number	kg	lbs.	kg	lbs.
Pole	7661538	29	63.93	31	68.3
Wall	7661581	29	63.93	31	68.3

- Use the dimensions shown in [Table 8](#) and [Figure 6 on page 24](#) to determine the mounting site.

Table 8. Key to [Figure 6 on page 24](#)

Key	Description
1	Minimum 198 mm (7.8")
2	Minimum 75 mm (2.95")
3	Ø 12.5 mm (.5")
4	Power IN cable
5	R45 min.
6	OCTIS Kit
7	Protective Tube Kit
8	Minimum R100mm (3.9")
9	21.5 mm (.85")
10	80 mm (3.15")
11	9 mm (.35")

Key	Description
12	Minimum free space is 100 mm (3.94") with OCTIS Kit
13	Minimum free space is 220 mm (8.66") with Protective Tube Kit
14	824 mm (32.44")
15	782 mm (30.79")
16	176 mm (6.93")
17	Free Area for Airflow IN: A AIR/IN .30000 mm ²
18	20.2 mm (.80")
19	12 mm (.47")
20	24 mm (.94")
21	125 mm (4.92")

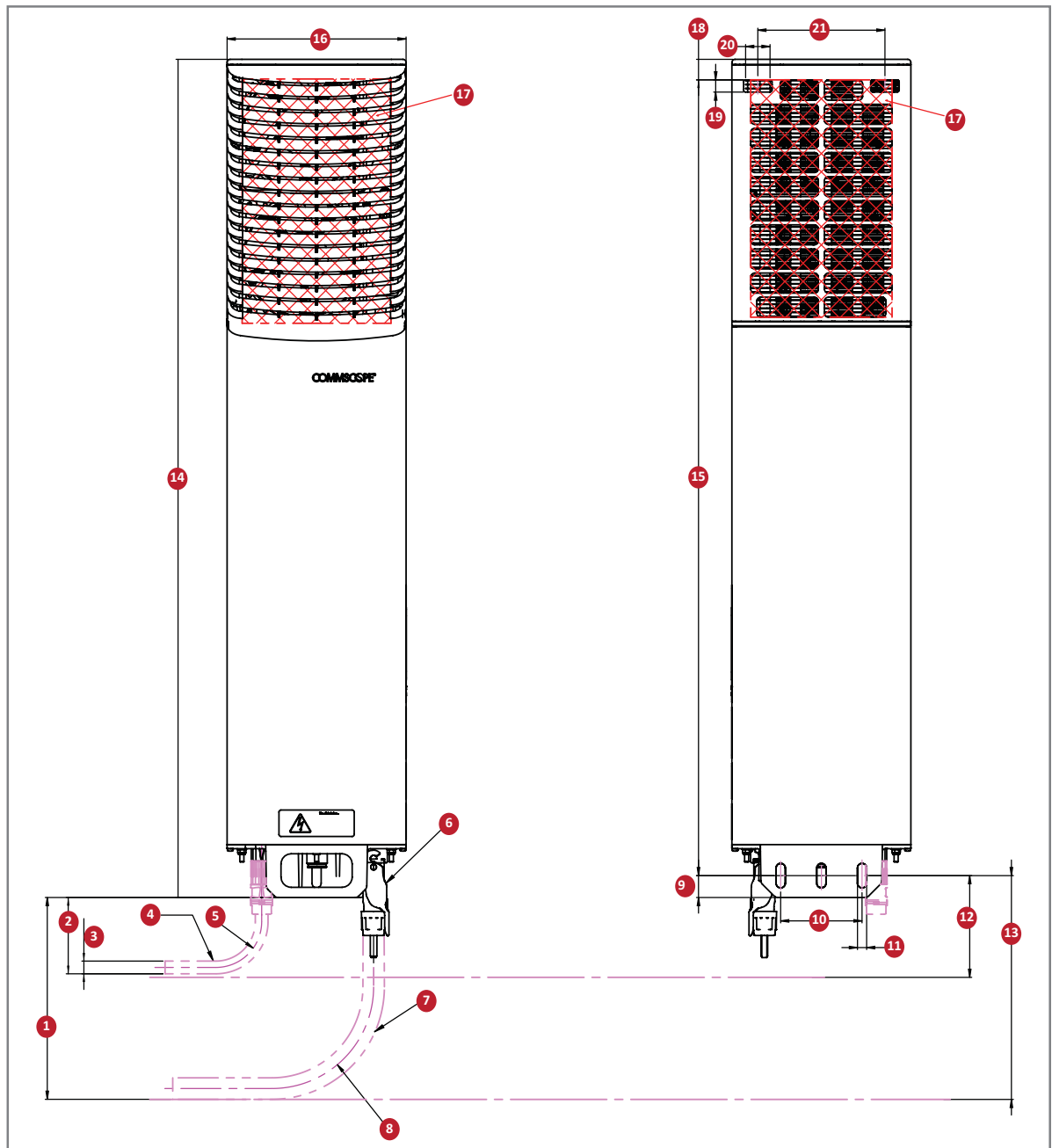


Figure 6. Required Space to Mount a CAP H

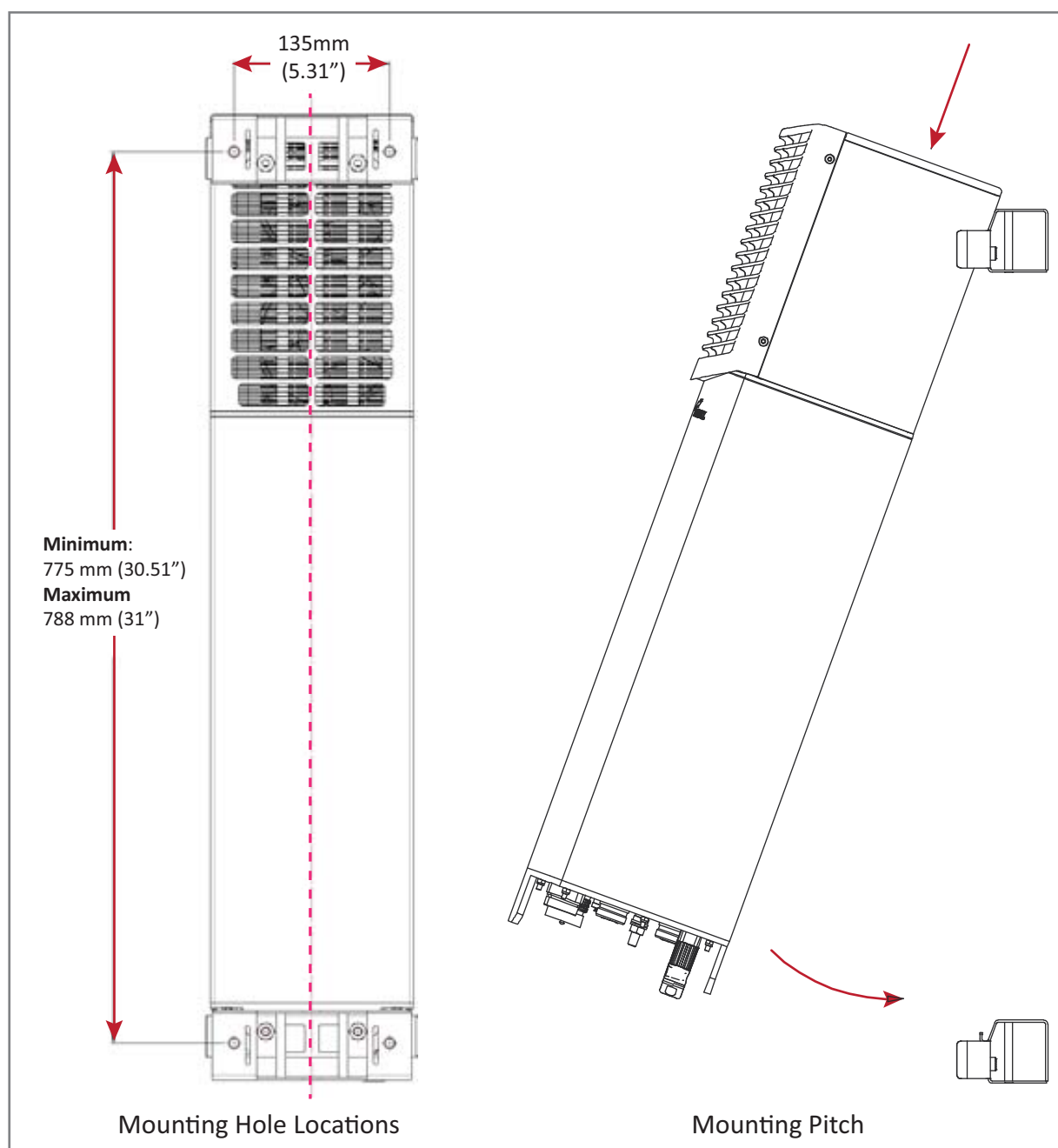
Wall Mounting a CAP H

This procedure tells you how to mount the CAP H to a wall using the Wall Mounting Kit (CommScope Part Number 7661581).



It is the responsibility of the installer to verify that the supporting surface will safely support the combined load of the electronic equipment and all attached hardware and components and to ensure that the CAP H is safely and securely mounted.

- 1 Mark the position of the drilling holes. The following graphic shows the location of the mounting holes and the pitch of the CAP H during the mounting procedure.

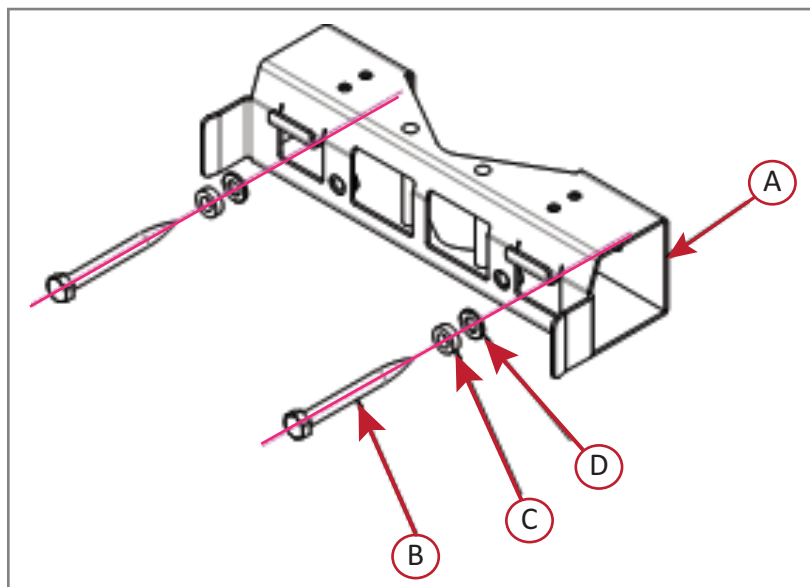


- 2 Drill four holes (two holes per bracket) at the positions marked in [Step 1](#).
- 3 Insert dowels in each of the holes drilled in [Step 2](#).

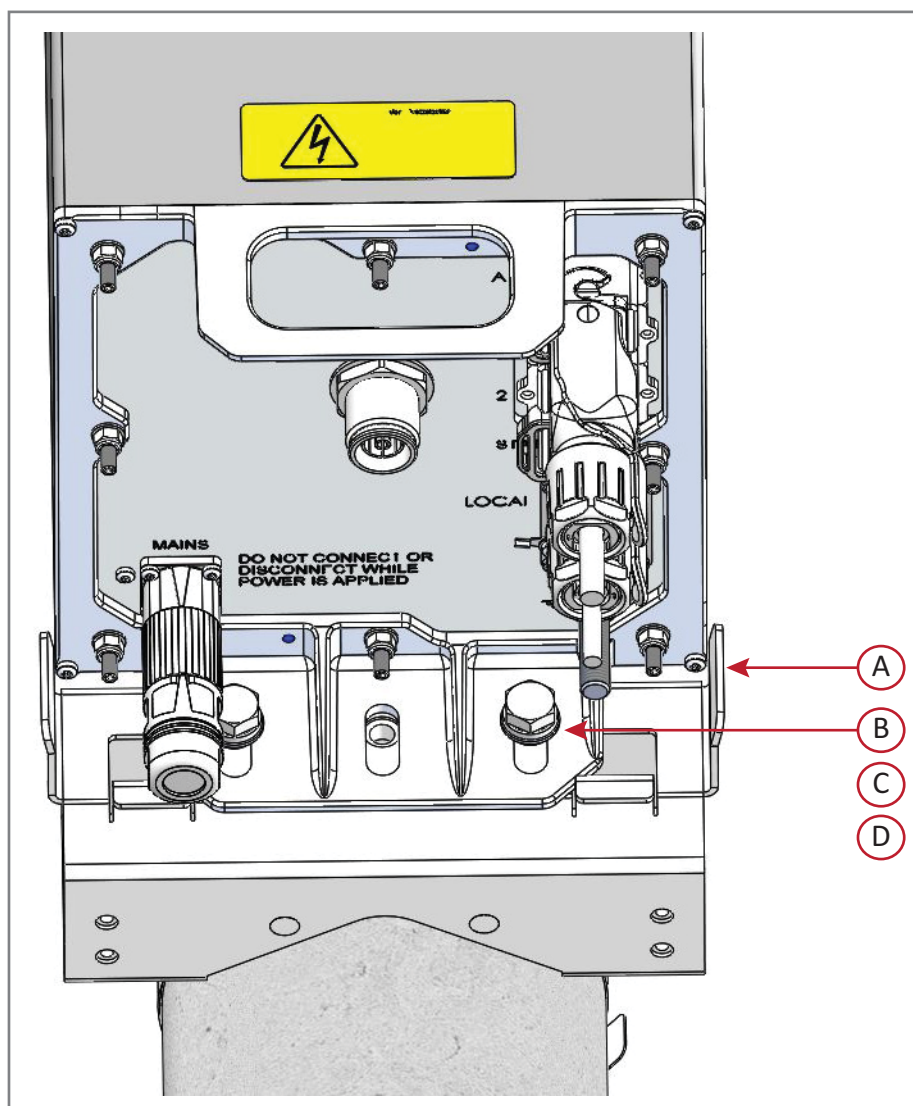


The dowels are not included with the CAP H shipment as the suitable type depends on the wall material). Dowels should be used for all wall mountings, except for when mounting to a wooden wall.

- 4 Mount the brackets (A) to the wall using the M8x20 screws (B), split-lock washers (C) and flat washers (D) so that the flat washers are against the mounting bracket:



- 5 Do the following to mount the CAP H in the Wall Mount Bracket.
 - a Hang the CAP H in the upper bracket.
 - b Push the CAP H into to the lower bracket (A), and then fasten it to the lower bracket using two M8x20 screws (B), split-lock washers (C) and flat washers (D) so that the flat washers are against the mounting bracket; torque to 27 N-m.



Pole Mounting a CAP H

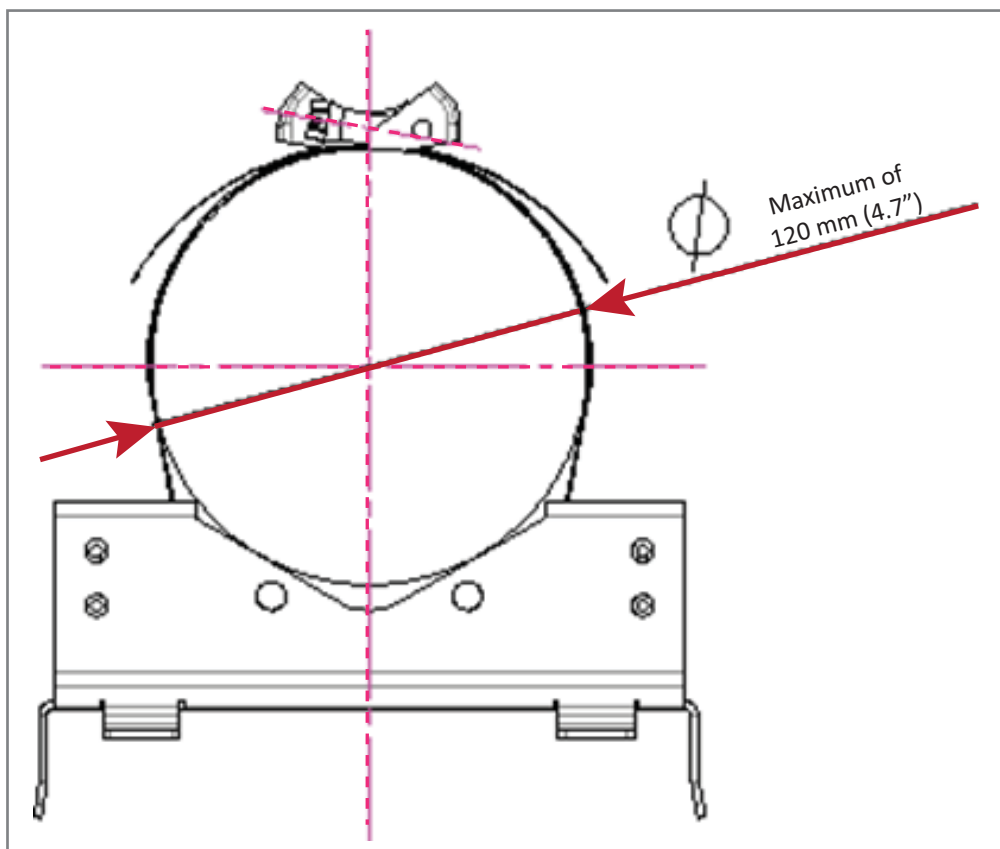
This procedure tells you how to mount the CAP H to a wall using the Pole Mounting Kit (CommScope Part Number 7661538).



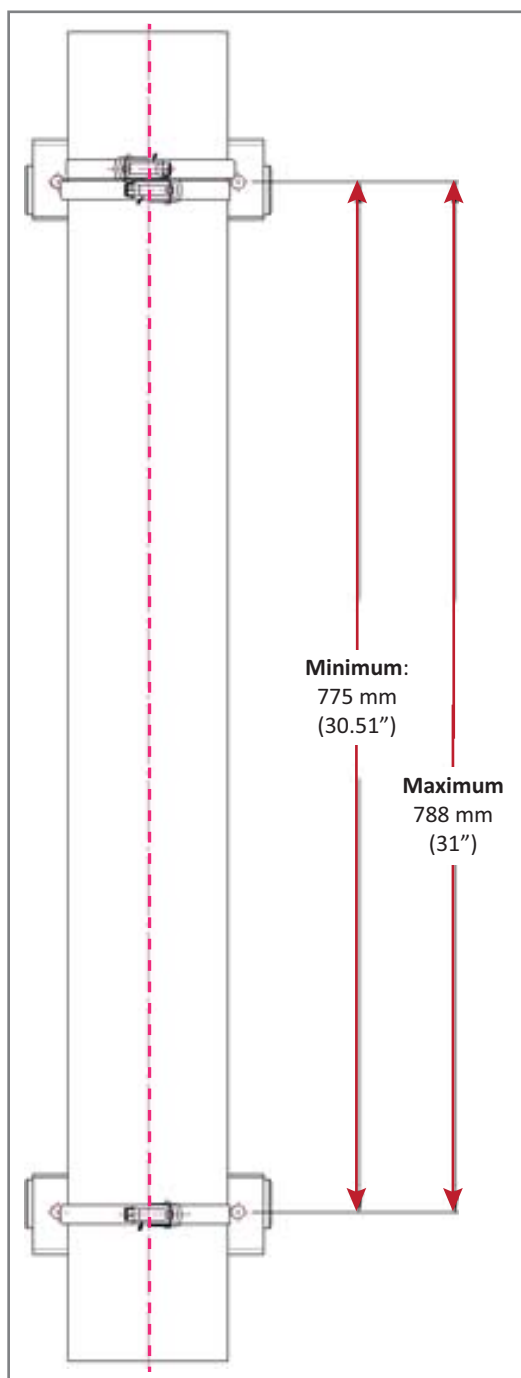
It is the responsibility of the installer to verify that the pole will safely support the combined load of the electronic equipment and all attached hardware and components and to ensure that the CAP H is safely and securely mounted.



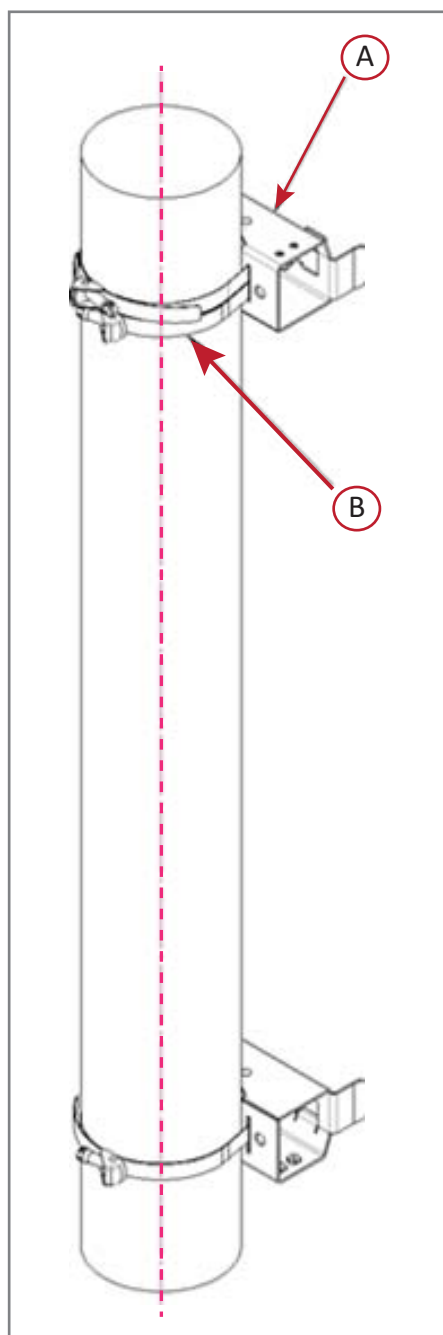
The maximum diameter of the pole or column cannot exceed 120 mm (4.7 inch).



- 1 Mark the position of where the screw bands should be attached to the pole, as shown in the following graphic, which also shows the pole-mounting pitches.



- 2 Use two screw bands (**B**) for the upper and one for the lower bracket to fasten the two brackets (**A**) to the pole, as shown below.

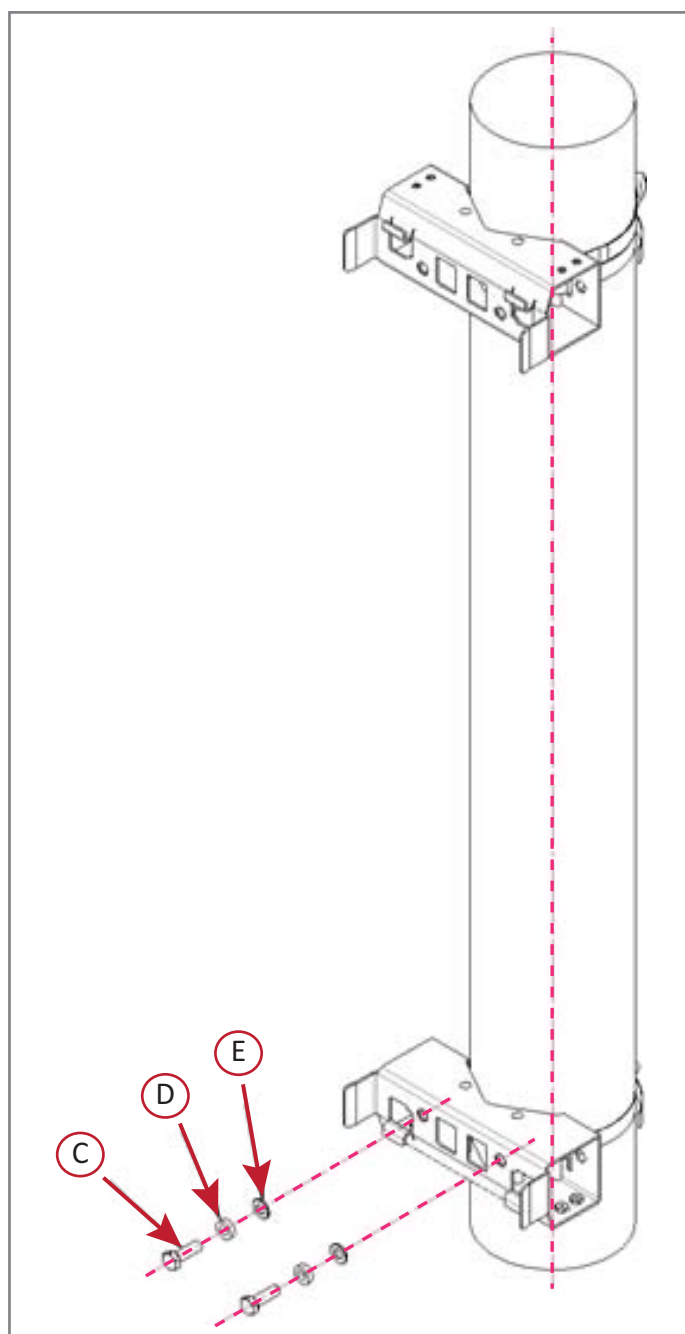


- 3 Place the bands around the pole or post and feed the loose end into the lock and tighten the slotted screw securely. When the screw is turned clockwise, it acts as a worm drive and pulls the threads of the band, causing the band to tighten around the pole.



When fastening the brackets, make sure that they are installed congruently and not at an angle to each other. To determine the distance between the clamps, refer to [Step 1 on page 29](#).

- 4 Do the following to mount the CAP H in the Pole Mount Bracket.
 - a Hang the CAP H in the upper bracket.
 - b Push the CAP H into to the lower bracket, and then fasten it to the lower bracket with two M8x25 screws (C), split-lock washers (D) and flat washers (E), as shown below; torque to 27 N-m.



Install the CAP H Cables

The following sections tell you how to cable the CAP H. Follow the procedures in the order in which they are given.

Ground the CAP H



The CAP H must be grounded.

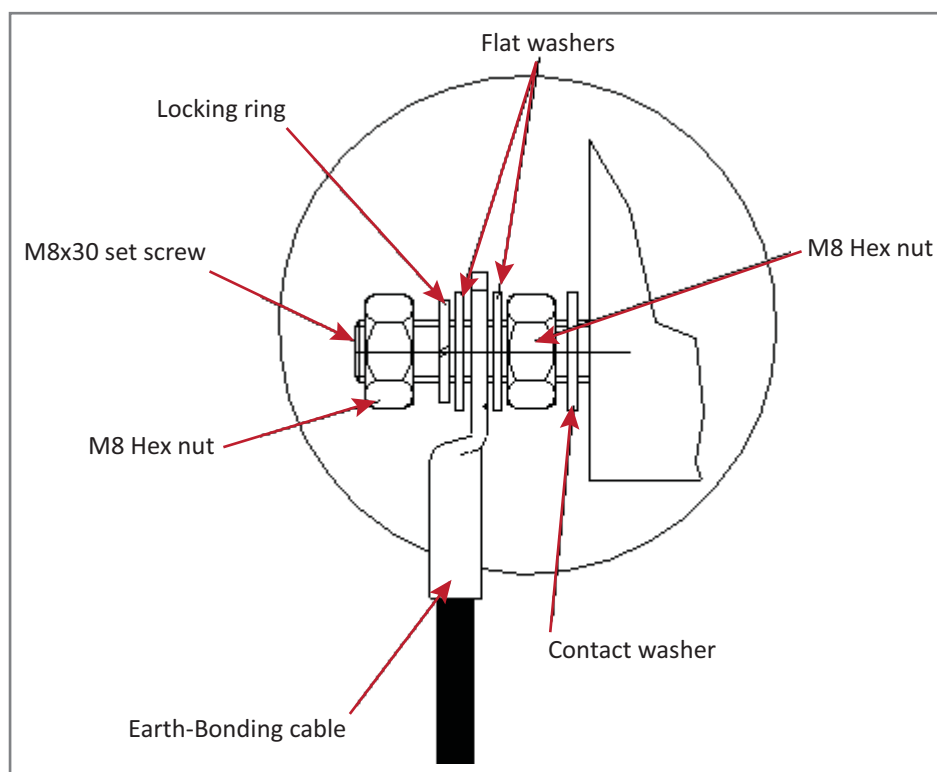


Do not use the grounding bolts to connect an external device.

- 1 Connect an earth-bonding cable to the grounding bolt connections on the outside of the CAP H chassis, as shown in the graphic to the right.
 - AC versions will have one M8 bolt; see [Figure 2 on page 6](#).
 - DC versions will have two M6 bolts; see [Figure 5 on page 11](#).



- 2 Connect the earth-bonding cable as shown in the graphic to the right.
 - a Loosen the hex nut, and then connect the earth-bonding cable between the two washers.
 - b Refasten all parts by tightening the hex nut.
 - c Connect the other end of the earth-bonding cable to a suitable permanent ground.



Ground of a second unit in a cascade must be connected to the same equipotential bonding terminal as the Primary CAP H. Use bonding cables of the same length, as short as possible, and with a large wire cross section. Follow local electrical code practices.

Connect the Antenna Cable

The following information regarding antenna mapping and is relevant to all CAP H variants.

- For Non-MIMO bands, there is no channel mapping option for the transceiver/antenna port. The transceiver/antenna port relationship is fixed in hardware.
- For MIMO bands, the Era GUI maps MIMO channels according to their AP designation:
 - AP0 to antenna port ANT1
 - AP1 to antenna port ANT2.
- When using SISO channels on a CAP H that supports MIMO, the system will automatically balance the number of channels between the two antenna ports, where the first SISO channel is mapped to ANT1, the second SISO channel is mapped to ANT2, and so on.
- Use [Table 9](#) to determine how to connect to the antenna correctly for each CAP H variation.

Table 9. Mapping CAP H Models to Antennas

Part Number	Model Name	ANT or ANT 1	ANT 2
7772983-xxxx	CAP H 8/9/18/21	8/9/18/21	Not Applicable
7821740-xxxx	CAP H 9/18/21/26	9/18/21/26	Not Applicable
7825719-xxxx	CAP H 7E/80-85/17E/19	7E/80-85/17E/19	Not Applicable
7825730-xxxx	CAP H 17E/17E/19/19	17E/19 (MAIN)	17E/19 (MIMO)

When attaching the antenna cable connector, refer to the corresponding documentation of the connector manufacturer. The bending radius of the antenna cable must remain within the given specifications. Observe all cautions listed below.



Make sure that the fiber cable used meets the RF and environmental requirements for this installation.



Use an appropriate torque wrench for the 4.3-10 type connectors (5 N-m, 44 in lb) with 22mm (7/8) in opening.

Do NOT use your hands or any other tool (such as a pair of pliers). This might cause damage to the connector and lead to a malfunction of the CAP H.



To minimize passive inter-modulation (PIM) distortion, pay attention to the physical condition of the connector junctions:

- Do not use connectors that show signs of corrosion on the metal surface.
- Prevent the ingress of water or dirt into the connector.
- Use protective caps for the connectors when not mounted.
- Before mounting follow the steps in ["Clean the RF Cable Connectors" on page 35](#).
- Attach and torque the connectors properly.
- Avoid metallic abrasion when mounting the connectors by only screwing the connecting nut, but not turning the whole connector.
- Use a torque wrench to fasten the connector, as described above.

Clean the RF Cable Connectors

This section tells you how to clean RF cable connectors. The graphics in this section illustrate the cleaning procedure and do not show the CAP H.



This procedure requires the use of compressed air. Wear protective clothing—especially protective glasses—to protect against injury from flying particles.



This procedure requires the use of flammable material. There is a risk of fire. Keep away from sources of ignition.



This procedure requires the use of eye irritant product. There is a risk of eye irritation. Avoid contact with eyes and skin. Wear protective clothing—especially protective glasses.

Do the following to clean the RF cable connectors.

1 Gather the following cleaning tools:

- Isopropyl alcohol
- Compressed air
- Lint-free wipe
- Cotton buds.



2 Remove the protective cap from the RF connector.



3 Use compressed air to remove metal chips and small particles from the mating and inner surfaces of the connector.



- 4 Use a lint-free wipe drenched with isopropyl alcohol to clean the connector winding.



- 5 Use a cotton bud drenched with isopropyl alcohol to clean the lip of the inner ring.



- 6 Use a cotton bud drenched with isopropyl alcohol to clean the inside surface of the inner ring.



- 7 Use a cotton bud drenched with isopropyl alcohol to clean the inside of the center conductor spring tines.



- 8 Remove the protective caps from the unit connector and then clean it the same way that you cleaned the cable connector.



- 9 Use compressed air to remove metal chips and small particles from the mating and inner surfaces of the connector.



- 10 Use a lint-free wipe drenched with isopropyl alcohol to clean the winding area.



- 11 Use a cotton bud drenched with isopropyl alcohol to clean the inside mating surface of the inner ring.



- 12 Use a cotton bud drenched with isopropyl alcohol to clean the outside surface of the center pin.



Assemble the Antenna Cable Connector

The graphics in this section illustrate how to assemble the antenna cable connector and do not show the CAP H.

- 1 Gather the following tools:
- Torque wrench
 - Adjustable counter wrench.



- 2 Join the connectors and turn the coupling nut until the thread grips.



- 3 Push in the connector until it clicks.

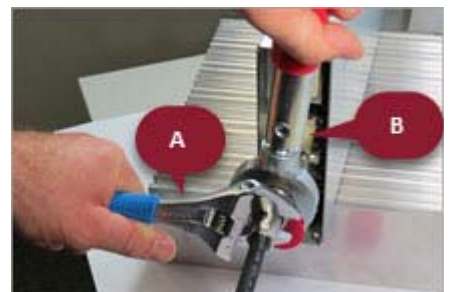


- 4 Fasten the coupling nut hand-tight. Do not turn the connector but the coupling nut only.



- 5 Retain the cable connector with the counter wrench (A) and fasten the coupling nut with the torque wrench (B) until the torque is applied (torque wrench clicks).

Note that for angled antenna connectors you should use your hand to retain the cable connector and fasten the coupling nut with the torque wrench. Make sure only the coupling nut is turned, not the cable connector.



Connect the Optical Fiber

- 1 Contact your local CommScope sales representative to obtain the following components, as required, for this installation.
 - Per the installation plan, obtain either Single Mode Fiber (SMF) or Multi Mode Fiber (MMF) that is of sufficient length to reach from the CAP H to a Classic CAN or TEN.
 - All CAP Hs ship with the required Optical OCTIS Kit (PN 7770612). If cascading a Secondary CAP H, a second Optical OCTIS Kit is required.
 - Obtain SFP+ Module pairs (one placed in the TEN and paired with another in the Classic CAN) that are appropriate for this installation. [Table 10](#) identifies the available SFP+ Modules and the maximum range for each.

Table 10. Supported SFP+ Modules

CommScope PN	Description	Maximum Range
7660511	SFP+, 10GBase-SRR, Multi Mode	OM3 300m OM4 400m
7680813	SFP+, 10GBase-LR, Single Mode	10km
7803247	SFP+, 10GBase CWDM-270	40km
7803249	SFP+, 10GBase CWDM-290	40km
7803291	SFP+, 10GBase CWDM-310	40km
7803293	SFP+, 10GBase CWDM-330	40km
7803295	SFP+, 10GBase CWDM-350	40km
7803298	SFP+, 10GBase CWDM-370	40km
7803900	SFP+, 10GBase CWDM-390	40km
7803902	SFP+, 10GBase CWDM-410	40km
7803904	SFP+, 10GBase CWDM-430	40km
7803906	SFP+, 10GBase CWDM-450	40km
7801330	SFP+, 10GBase CWDM-470	40km
7801340	SFP+, 10GBase CWDM-490	40km
7801342	SFP+, 10GBase CWDM-510	40km
7801344	SFP+, 10GBase CWDM-530	40km
7801360	SFP+, 10GBase CWDM-550	40km
7801363	SFP+, 10GBase CWDM-570	40km
7801365	SFP+, 10GBase CWDM-590	40km
7801367	SFP+, 10GBase CWDM-610	40km

- If connecting an external Ethernet device such as WiFi or IP camera, an Ethernet OCTIS Kit (PN 7760652 RJ-45) and appropriate CAT cable for the protocol to which the CAP H will connect. (This model supports a 1000 BASE-T and 802.3at Class 3 Power over Cat6A Ethernet connection.)
 - A single CAP H can support one auxiliary Ethernet device.
 - A cascaded CAP H pair can support one auxiliary device.

- 2 Connect the CAP H Optical Port 1 as appropriate for this installation. Note the maximum range listed in [Table 10](#). See "[CAP H Connectors and Status LED](#)" on page 6 for the location of Optical Port 1.
 - a Remove the dust cap from the CAP H Optical Port 1 connector and the connectors on the SMF or MMF.
 - b Follow the local cleaning technique to clean Optical Port 1.
 - c Clean the connectors on the SMF or MMF following the fiber supplier's recommendations.
 - d Install the SFP+ connector and Optical OCTIS Kit on the end of the SMF or MMF that will connect to the CAP H, and then connect that end of the fiber to the CAP H Optical Port 1 connector. (Refer to the technical data sheet that ships with the OCTIS Kit for further information.)
 - e Connect the other end of the SMF or MMF to an open port on the OPT Card.
- 3 Do the following only if cascading a Secondary CAP H, connect Optical Port 2 of the Primary CAP H to Optical Port 1 of the Secondary CAP H.
 - a Raise the lever on the EMI/IP67 cap on Optical Port 2 connector and remove the cap.
 - b Remove the caps from the connectors on the SMF or MMF.
 - c Follow the local cleaning technique to clean Optical Port 2.
 - d Clean the connectors on the SMF or MMF following the fiber supplier's recommendations.
 - e Install an SFP+ and Optical OCTIS Kit on the end of the fiber that will connect to the Primary CAP Hand connect that end of the SMF or MMF to the CAP H Optical Port 2 connector.
 - Note the maximum range listed in [Table 10](#). See "[CAP H Connectors and Status LED](#)" on page 6 for the location of Optical Port 2.
 - Refer to the technical data sheet that ships with the OCTIS Kit for further information.
 - f Install an SFP+ and Optical OCTIS Kit on the end of the fiber that will connect to the Secondary CAP Hand connect that end of the SMF or MMF to the CAP H Optical Port 1 connector on the cascaded Secondary CAP H.

(Optional) Connect an Auxiliary Device

Port A (Auxiliary port) provides a connection for external Ethernet devices such as WiFi and IP cameras.

If appropriate for this installation, do the following to connect an auxiliary device.



Port A must be plugged if not in use.

- 1 Raise the lever on the EMI/IP67 cap on Port A and remove the cap (for the location of Port A, see "[CAP H Connectors and Status LED](#)" on page 6).
- 2 Install the Ethernet OCTIS Kit on the end of the cable that will connect to the CAP H, and then connect that end of the cable to CAP H Port A. (Refer to the technical data sheet that ships with the OCTIS Kit for further information.)



This cable cannot exceed 3 meters (9.8 feet).

- 3 Connect the other end of the CAT cable to the Ethernet port of the auxiliary device.

Connect the MAINS Power

This section tells you how to connect the mains power to the CAP H. Read and observe all cautions and follow the steps in the order in which they are presented.

Working Safely with MAINS Power



Read and observe all cautions listed in ["Safely Working with a CAP H" on page 14](#).



Electrical hazard. Danger of death or fatal injury from electrical current. Obey all general and regional installation and safety regulations relating to work on high voltage installations, as well as regulations covering correct use of tools and personal protective equipment.



Ground (earth) the unit before connecting the power supply. Grounding bolts are provided on the CAP H connector panel to connect the ground-bonding cable. See ["Ground the CAP H" on page 32](#).



If the CAP H MAINS connector is not easily accessible, a disconnect device in the mains power circuit must be provided within easy reach.



A connection of the mains supply to a power socket requires the power socket to be near the CAP H.



Before connecting or disconnecting the CAP H MAINS connector, ensure that the mains power supply is disconnected.



Make sure that an appropriate circuit breaker is acting as a disconnect device (as required by IEC/EN62368-1 annex L) and an overcurrent limiting device are connected between mains power and the CAP H.



Incorrectly wired connections can destroy electrical and electronic components.



To avoid corrosion at the connectors caused by electrochemical processes, the material of the cable connectors must not cause a higher potential difference than 0.6 V (see electrochemical contact series).



For destabilized electric networks, which frequently generate spikes, the use of a voltage limiting device is advised.



Unused connectors must be closed with their protective covers to ensure water tightness.

Connect the MAINS Power and Power on an AC CAP H



This section provides information for powering an AC CAP H. If you are installing a DC CAP H, go to ["Connect the MAINS Power and Power on a DC CAP H" on page 44.](#)

A MAINS Power cable for AC ships with each CAP H; see [Figure 7](#). Note that there are two MAINS Power cables, make sure you are referring to the specifications for the cable with which you are working.

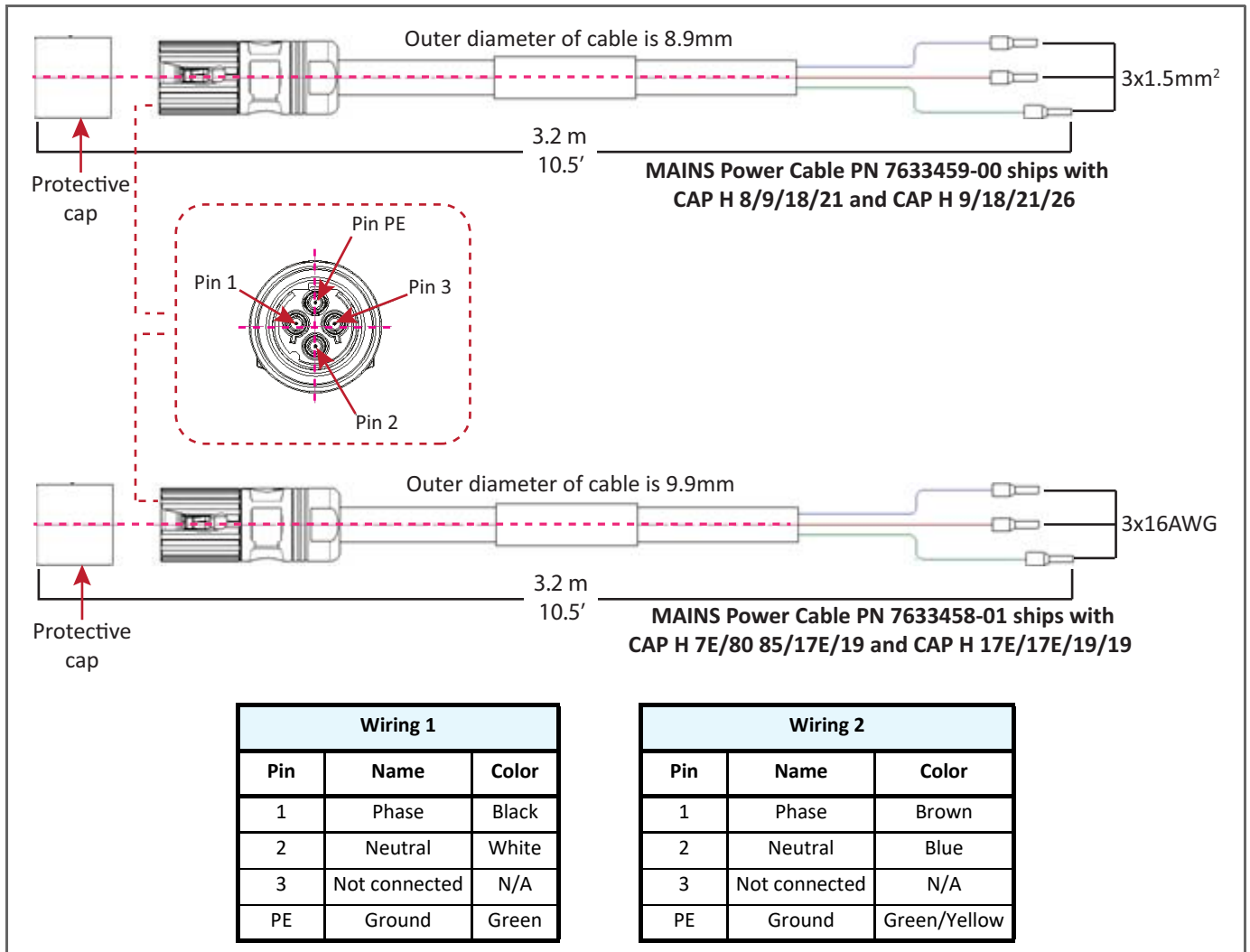


Figure 7. MAINS Power Cable



For the AC power supply connection, a minimum cross section of 1.5 mm² is required. Each wire must observe the applicable national regulations regarding loop impedance, voltage drop, and methods of installation. Make sure to connect the correct voltage to the CAP H.



MAINS power must be interruptible with an external delay-actions mains breaker. For the MAINS breaker, observe the following recommendation:

120 Volt / 20 Amp max. or 240 Volt / 16 Amp, single-phase, 50 / 60 Hz AC service is needed, i.e. the external AC breaker should be 20 Amps max. for 120-Volt service or 13 - 16 Amps for 240-Volt service.



Do not connect or disconnect the power cord at the mains connector while power is on. Turn off mains power before connecting the power cord at the CAP H, then, engage mains again.

Do the following to connect the MAINS power to the CAP H.

- 1 Follow the steps in ["Ground the CAP H" on page 32](#).
- 2 Locate the MAINS power cable that was delivered with the CAP H (shown in [Figure 7 on page 42](#)).
- 3 Locate or install a suitable power junction box or receptacle near the CAP H, and then route the power cable from the power source to the CAP H.



Do not connect the cable to the CAP H MAINS connector at this time. The power source must be interruptible.

- 4 Secure the MAINS cable per local regulations and electrical codes. Allow enough slack in the cable at the CAP H to plug or unplug the cable into the CAP H MAINS connector.
- 5 Wire the power cable to the junction box or receptacle. Refer to the color code and pin numbers shown in [Figure 7 on page 42](#).
- 6 With the cable's MAINS plug disconnected from the CAP H, turn the circuit breaker on, unscrew the plug's protective cover, and carefully test the plug with a voltmeter to ensure that the voltage and polarity are correct.
- 7 **Once the testing has been completed, turn off the circuit breaker.**
- 8 Unscrew the protective cover from the MAINS connector of the CAP H (see [Figure 7 on page 42](#)).
- 9 Insert the plug into the MAINS connector and tighten the clamping ring until it is hand tight. Do not over-tighten the clamping ring.
- 10 Turn on the circuit breaker.



The CAP H is powered on as soon as power is connected to it.

Connect the MAINS Power and Power on a DC CAP H



This section provides information for powering a DC CAP H. If you are installing an AC CAP H, go to ["Connect the MAINS Power and Power on an AC CAP H" on page 42.](#)



The MAINS cable must be properly secured observing local regulations and electrical codes. Be sure to allow enough slack in the cable at the CAP H to mount or dismount the cable into the DC MAINS connector of the CAP H.

A CAP H requires M6 double-lug DC cable connectors with stud-holding spacing of 15.88 mm (5/8"), as shown in [Figure 8.](#)

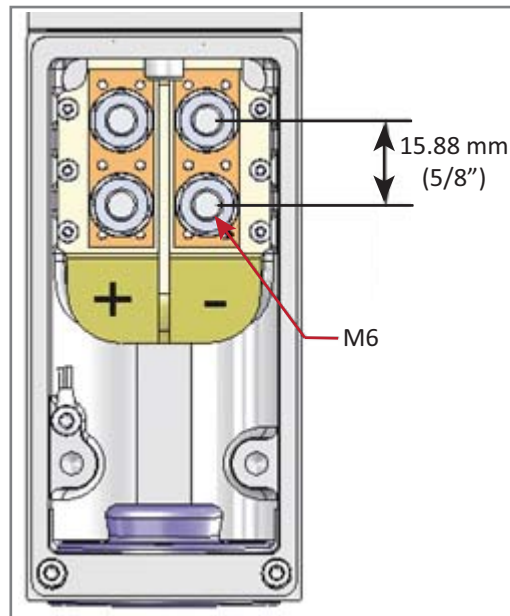


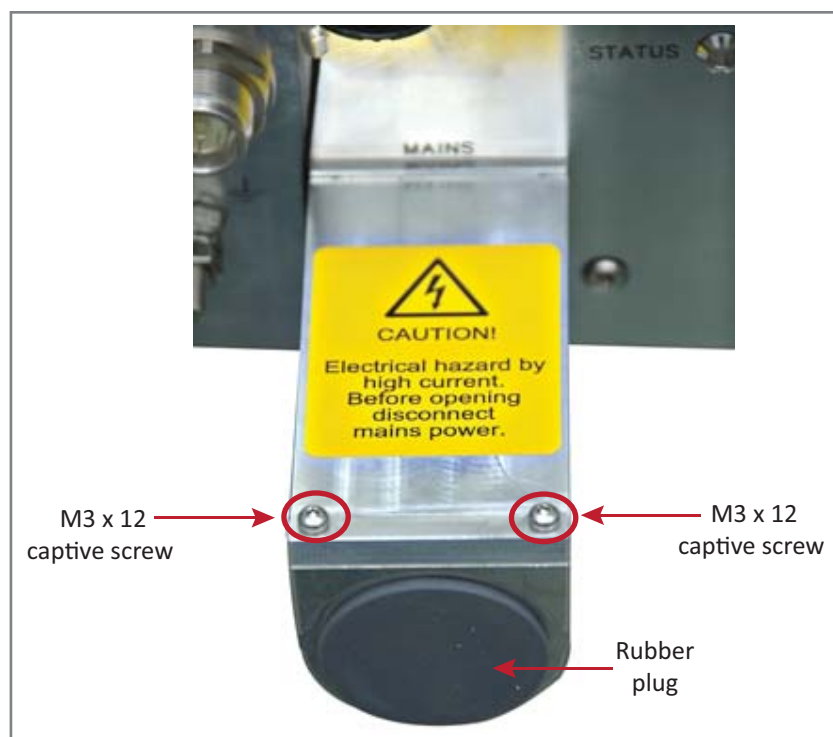
Figure 8. Required M6 Double-Lug DC Cable Connectors

Do the following to connect the CAP H MAINS power connector to DC power.



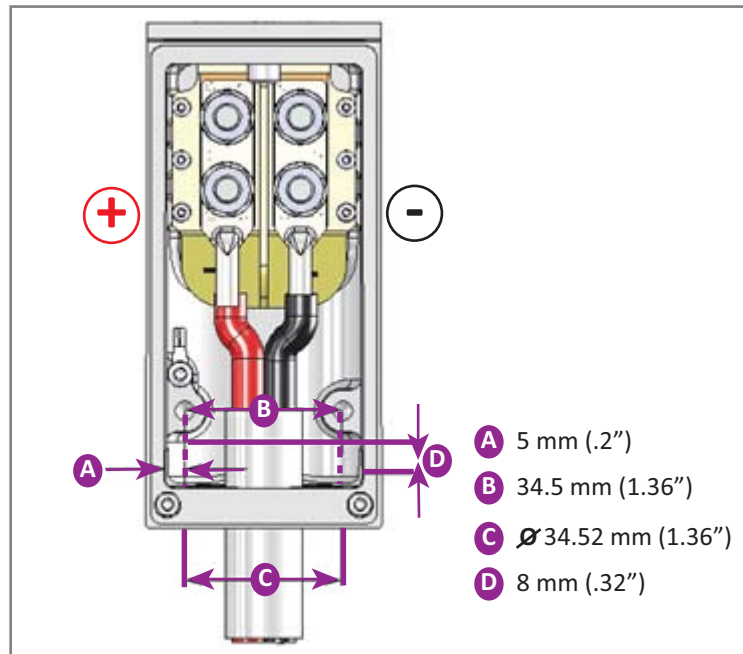
Danger of electrical hazard by high current. Disconnect MAINS power before opening the DC connector housing in [Step 1](#) below.

- 1 Unscrew the two M3 x 12 captive screws and take off the cover from the DC MAINS connector housing. At the CAP H housing, the cover is inserted into a recess, so first lift the cover at the front and carefully pull it out from the recess.
- 2 Remove the rubber plug.



- 3 Install a conduit fitting (not shipped with the CAP H) to the 34.52 mm hole. This must be a suitable fitting for a 1-inch conduit with lock nut. Inside, the clearance around the hole is 5 mm, the maximum space for the nut is 8 mm.

- 4 Insert the wiring through the opening and mount it to the M6 MAINS terminals, as shown in the following graphic.
 - Observe the correct polarity.
 - Close the conduit fitting to ensure water tightness.
 - For strain release, two M5 threaded holes are provided; the distance between the threaded holes is 34.5 mm (1.36").



- 5 Mount the housing cover by inserting it into the recess at the repeater cabinet and fastening the two M3 x 12 captive screws.



MAINS power must be interruptible with an external mains breaker (40 A). For the MAINS breaker, observe the local regulations of the DC provider.



Do not connect or disconnect the power cord at the MAINS connector while power is on. Turn off MAINS power before connecting the power cord at the CAP H, then, engage MAINS again.

USING THE STATUS LED TO DETERMINE STATE OF THE CAP H

You use the Status LED, which is on the bottom of the CAP H on its Connector panel (see ["CAP H Connectors and Status LED" on page 6](#)) to determine the current operational state of the CAP H. The color of the Status LED indicates the state of the CAP H, as described below.

- **Off**—The CAP H is not powered on, check for a MAINS power failure.
- **Steady Green**—The CAP H is powered ON and operational:
 - The unit has been detected by the system.
 - RF configuration has been successfully applied.
 - The unit is performing to specification.
- **Slow-Flashing Green**—A software update has been initiated via the Era software and is in process. The slow-flash starts as soon as the software update file has been transferred and the software update procedure has been triggered. This LED state cannot be interrupted by any alarms, except for a failure that prevents the software update to be completed, such as a software package integrity check failure (MD5 check). For information on software updates, refer to the Release Notes that are applicable to the Software Version running on this system.
- **Fast-Flashing Green**—the Era software has sent a **Flash LED** request so a technician can visually identify and locate this CAP H unit. The fast-flash starts as soon as the **Flash LED** request is initiated in the GUI and remains active until the duration set in the **Auto stop** parameter has expired. For further information, refer to the Era configuration guide that corresponds to this installation; see ["Accessing Era/ION-E Series User Documentation" on page 55](#).
- **Steady Orange**—The CAP H is not operational for one of the following reasons:
 - The CAP H is booting.
 - The CAP H has not been connected to the Era system; check for
 - Missing fiber link
 - Link failure
 - if the link is good, the CAP H has not been detected the Era GUI
 - The CAP H has not yet applied a valid signal set.
 - A major or minor alarm condition has been detected. The alarm can be recovered without having to replace a hardware component. The CAP H does not need to be replaced. For example, an ALC alarm or too low storage memory available alarm may be active.
- **Slow-Flashing Red**—The Era GUI is reporting a critical alarm for this unit; the CAP H can be recovered without replacing hardware. For information on the active alarm, view the **Active Alarms** page in the Era GUI (see the **Active Alarms** page description in the Era configuration guide that corresponds to this installation; see ["Accessing Era/ION-E Series User Documentation" on page 55](#)).
- **Steady Red**—The Era GUI is reporting a critical alarm for this unit that cannot be recovered. The CAP H or a CAP H component (such as an SFP+ Module) must be replaced. For information on the active alarm, view the **Active Alarms** page in the Era GUI (see the **Active Alarms** page description in the Era configuration guide that corresponds to this installation; see ["Accessing Era/ION-E Series User Documentation" on page 55](#)).

MAINTENANCE

Maintenance of the CAP H and replacement of components should only be performed as described in this section.

For most maintenance procedures, appropriate tools are required to ensure correct handling. All of these tools can be ordered from the supplier.

Unless otherwise agreed to in writing by CommScope, CommScope's general limited product warranty (<http://www.commscope.com/Resources/Warranties/>) shall be the warranty governing the CAP H, including its installation, maintenance, usage and operation.

Rules to Observe During Maintenance



Adhere to all cautions and warnings listed in the following sections:

- ["RF Safety Cautions" on page 14](#)
- ["Health and Safety Precautions" on page 14](#)
- ["Property Damage Warnings" on page 15](#)
- ["Guard Against Damage from Electro-Static Discharge" on page 15](#)
- ["General Installation Safety Requirements" on page 16](#)
- ["Installation Cautions" on page 21.](#)



The unit reaches high temperature in operation. Risk of burns by hot surface. Do not touch the unit before it has sufficiently cooled down.



Disconnect the CAP H from mains power before starting any maintenance.



To maintain the warranty, avoid unintentional damage to the seals on the modules.



If a CAP H must be returned to CommScope or your local sales office, use appropriate packaging. Use of the original packaging for shipping the unit is strongly recommended.



Defective parts should only be replaced by original parts from the supplier. All service work performed inside the housing is performed at the users own risk.



Due to the CAP H design, the Fan Unit is the only component that should be replaced in the field. Contact the supplier for replacement of any other components.

Routine Maintenance of the CAP H

Check the cleanliness of the CAP H—in particular its heat sink / fan(s)—at appropriate intervals depending on the degree of dust and dirt at the installation site. If necessary, any dusty or dirty areas / parts should be cleaned at regular intervals, which is also dependent on the degree of dust and dirt at the installation site.

Replacing the Fan Unit

Replacement of the Fan Unit is not required as a preventative measure. you should only replace the fan when an alarm indicates that the fan is malfunctioning or when directed to do so by CommScope.

Note, however, should the temperature of a CAP H amplifier reach a certain temperature threshold, it will reduce output power. If this doesn't help and the temperature continues to rise above 85°C (185°F), the Power Amplifier (PA) will shut down. Once temperature decreases, the PA will automatically turn back on.



Rotating fans. Risk of injury in operation. Wear tight-fitting clothes and disconnect mains before connecting or replacing or cleaning the Fan Unit.



The Fan Unit can only be replaced as a whole. Do not remove the fans separately.

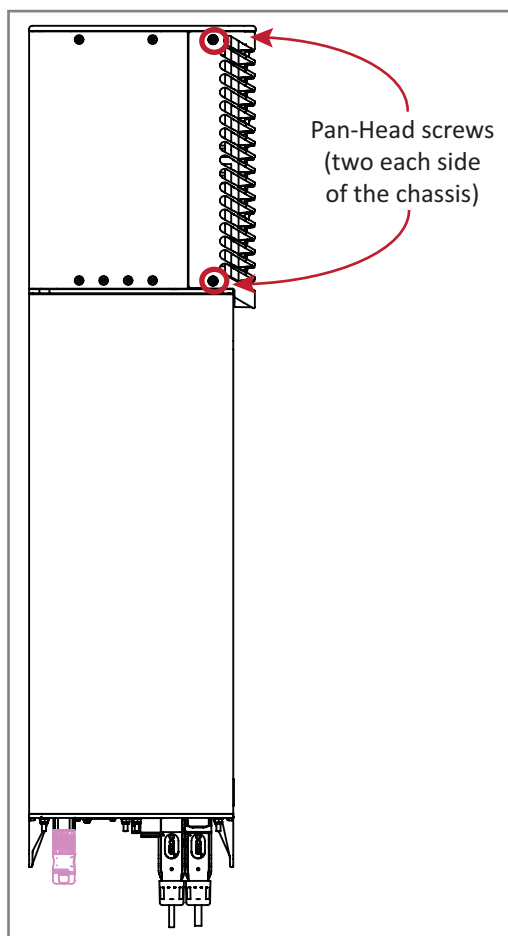


All CAP H screws have a right-hand thread. Use an appropriate tool to tighten or loosen them. Turn the screws clockwise to tighten them and turn them counter-clockwise to loosen them.

Do the following to replace the Fan Unit:

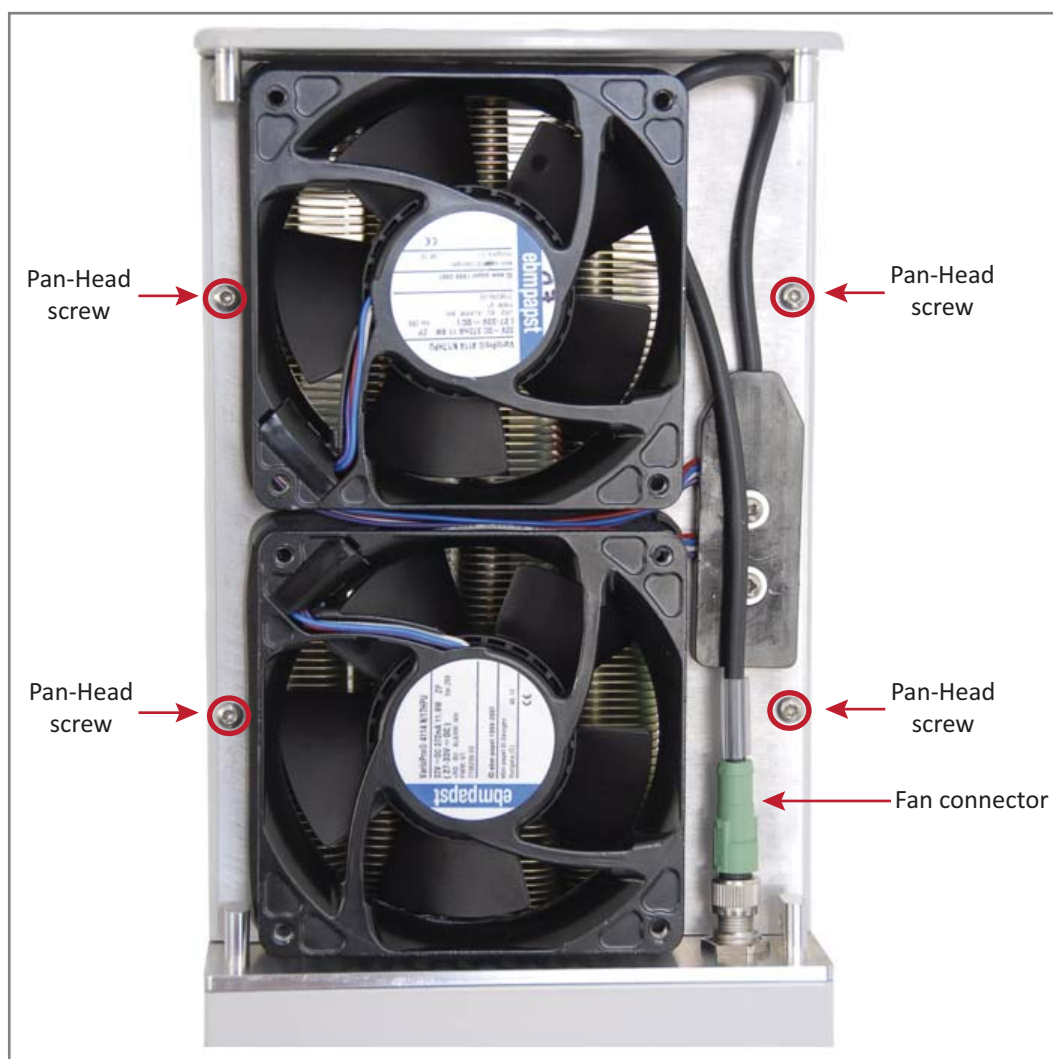
- 1 Adhere to all cautions and warnings listed in ["Rules to Observe During Maintenance" on page 48](#) and at the start of this section.
- 2 Label any unlabeled cables before disconnecting them to ensure correct reconnection.
- 3 Disconnect the CAP H from mains power and make sure it is powered down before proceeding.

- 4 Unscrew the four Pan-head screws (two at each side of the cabinet):



- 5 Remove the fan cover.

- 6 Do the following to remove the Fan Unit:
 - a Unscrew and disconnect the fan connector.
 - b Unscrew the four Pan-head screws that secure the fan plate to the CAP H chassis.
 - c Pull the Fan Unit from the CAP H chassis.



- 7 Do the following to install the new Fan Unit:
 - a Insert the new Fan Unit into the CAP H chassis.
 - b Use the four Pan-head screws that you removed in step [Step 6](#) to secure the new Fan Unit to the CAP H chassis.
 - c Connect the fan connector.
 - d Replace the Fan Unit cover that was removed in [Step 4](#) and [Step 5 on page 50](#).
- 8 Reconnect the CAP H to mains power and make sure it is powered on.

Cleaning the Heat Sink



This procedure requires the use of compressed air. Risk of injury by flying particles when compressed air is used. Wear protective clothing, especially protective glasses.



Rotating fans. Risk of injury in operation. Wear tight-fitting clothes and disconnect mains before connecting or replacing or cleaning the Fan Unit.



All CAP H screws have a right-hand thread. Use an appropriate tool to tighten or loosen them. Turn the screws clockwise to tighten them and turn them counter-clockwise to loosen them.

Do the following to clean the heat sink:

- 1 Adhere to all cautions and warnings listed in ["Rules to Observe During Maintenance" on page 48](#) and at the start of this section.
- 2 Label any unlabeled cables before disconnecting them to ensure correct reconnection.
- 3 Disconnect the CAP H from mains power and make sure it is powered down before proceeding.
- 4 Follow [Step 4 on page 50](#) through [Step 6 on page 51](#) to remove the Fan Unit from the CAP H chassis.
- 5 Use compressed air (max. 5 bar) to blow dust, dirt, or other debris out of the heat sink from back to front.

If the dirt cannot be blown out completely and parts of it stick to the ribs of the heat sink, clean the parts concerned carefully from the front using e.g. a brush. Take care that the heat sink material is not scratched or damaged.
- 6 Once the heat sink is clean, remount the Fan Unit as described in [Step 7 on page 51](#).
- 7 Reconnect the CAP H to mains power and make sure it is powered on.

CONTACTING COMMScope

The following sections tell you how to contact CommScope for additional information or for assistance.

CMS Global Technical Support

The following sections tell you how to contact the CommScope Mobility Solutions (CMS) Technical Support team. Support is available 7 days a week, 24 hours a day.

Telephone Helplines

Use the following Helpline telephone numbers to get live support, 24 hours a day:

- 24x7** +1 888-297-6433 (Toll free for U.S. and Canada)
- EMEA 8:00-17:00 (UTC +1)** + 800 73732837 (Toll free for parts of EMEA and Australia)
- + 49 909969333 (Toll charge incurred)

Calls to an EMEA Helpline outside of the 8:00 to 17:00 time frame will be forwarded to the 24x7 Helpline.

Online Support

To go to the CommScope Wireless Support Request web site from which you can initiate a Technical Support ticket, do one of the following:

- Scan the QR Code to the right.
- If viewing this document online as a PDF, click on the following URL link:
<http://www.commscope.com/wisupport>
- Enter the preceding URL into your web browser, and then press **ENTER** on your keyboard.



Waste Electrical and Electronic Equipment Recycling

Country specific information about collection and recycling arrangements per the Waste Electrical and Electronic Equipment (WEEE) Directive and implementing regulations is available on CommScope's website.

To access information on the CommScope recycling program, do any of the following:

- Scan the QR Code to the right.
- If viewing this document online as a PDF, click on the following URL link:
<http://www.commscope.com/About-Us/Corporate-Responsibility-and-Sustainability/Environment/Recycling/>
- Enter the preceding URL into your web browser, and then press **ENTER** on your keyboard.



Hardware to Software Mapping Information

- 1 Scan the QR Code to the right to view or download the minimum software requirements for each of the DCCS hardware modules. Alternatively, you can go to the following web address to access the portal:

http://www.commscope.com/collateral/DCCS_HW_SW_Mapping/



- 2 Click on a document link to open it, or right click on the link and select the **Save target as...** option from the contextual menu.

Mobility Solutions Technical Training

- 1 To access training on the online CommScope Mobility Solutions site, do one of the following:
 - Scan the QR Code to the right.
 - If viewing this document online as a PDF, click on the following URL link.
<https://commscope.netexam.com>
 - Enter the preceding URL into your web browser, and then press **ENTER** on your keyboard.
- 2 Review the courses listed in separate course panels; for further information on a course, click its **Full details** button. Instructor-led courses are conducted in North America and Europe. Before choosing a course, please verify the region.
- 3 To view the course schedule and register, click **Course Registration** at the top of the course page; this opens the **Partner Learning Center Login** page.
 - If you have an account, enter your **Username** and **Password**, and then click **Login**. (Click on the **Reset Password** link if you do not have your login information.)
 - If you don't have an account, click on the **Create New User Account** link under the **Login** button, and follow the prompts.



Once you have logged in, you will see a list of available class dates.

- 4 Click the date you prefer and select the **Enroll** or **Register Now** button to enroll. Follow the prompts through the payment process.
- 5 Click either the **Available Training** or **Calendar** tab to view other training courses.

For training related questions, please contact the CommScope DAS and Small Cell Institute at one of the following emails, as appropriate for your location:

Americas: DASTrainingUS@CommScope.com

EMEA: DASTrainingEMEA@CommScope.com

Accessing Era/ION-E Series User Documentation

- 1 Scan the QR Code to the right to go directly to the CommScope DCCS Customer Portal, where you can access the DCCS user documentation.



Alternatively, you can go to the following web address to access the portal:

<https://www.mycommscope.com>

- 2 Access to the Customer Portal requires a user account and password. On the Sign In page, do one of the following:
 - If you have an account, enter your Email address and Password, and then click Sign In.
 - If you don't have an account, click New user registration, and follow the prompts.
- 3 Click DCCS to open the site.
- 4 Select your site, and then click on a product link to open the product page.
- 5 Click on the title of any document to open it.

