



# COMMSCOPE CAPM8171926 Repeater for Cellular Systems Instruction Manual

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The Remote Unit, Extension Unit or Master Unit must be mounted by a professional / specially trained installer.

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## MECHANICAL INSTALLATION

### 1.1.1. Health and Safety for Mechanical Installation

Read and observe chapter 1.3 Health and Safety.

#### General Mounting Cautions

The following cautions apply to all CAP M installations; there may be other mounting cautions applicable to a specific mounting option, which will be defined in the applicable mounting procedure.



Attach all CAP Ms securely to a stationary object as described in this installation guide.



To maintain proper ventilation, keep at least 76 mm (3-inch) clearance around the CAP M.



The installation site must be able to bear the weight of the CAP M; see Table 7 on page 24.



Risk of injury by the 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. Installers must verify that the supporting surface will safely support the combined load of the electronic equipment and all attached hardware and components. For wall mounts, the screws and dowels (wall anchors) used should also be appropriate for the structure of the supporting wall.



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 M 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 M.



CAP Ms are passively cooled and must therefore always be mounted with their ANT port pointing down, as shown in Figure 19.

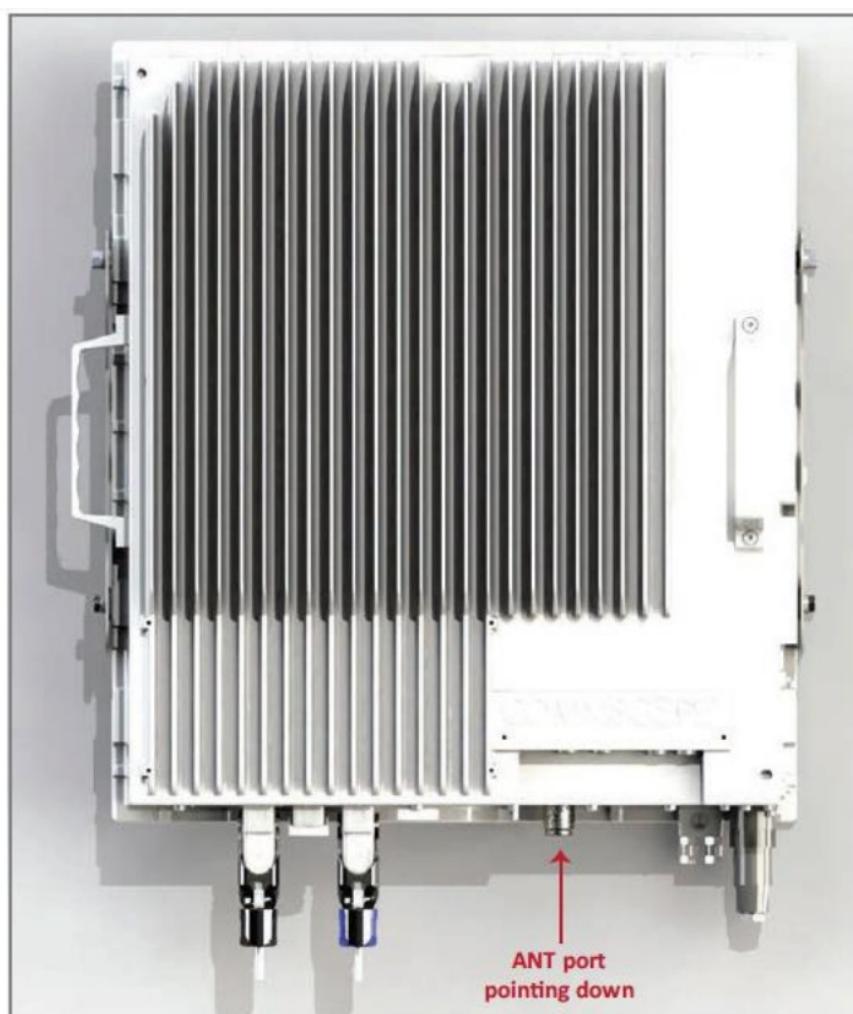


Figure 19. Mounting Orientation for a CAP M

## ELECTRICAL INSTALLATION

1.2.1. Health and Safety for Electrical Installation  
Read and observe chapter 1.3 Health and Safety.

### 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.



This system is an RF Transmitter and continuously emits RF energy. Maintain a minimum 8-inch (20 cm) clearance from the antenna while the system is operating. Whenever possible, shut down the RAN before servicing the antenna.



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



The CAP M is to be used only with CommScope (NEC Class 2) or Limited Power Source Era Subrack, or equivalent.



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.

### **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.

### **Power the CAP M**



The CAP M is powered on as soon as power is connected to it. The CAP M must therefore be grounded before you connect any electrical power to it. If you have not completed the steps in “Grounding the CAP M” on page 56, stop and do so before proceeding.



CAP M APs require a minimum 120 Volt /15 Amp or 240 Volt / 13 Amp, single-phase, 50 / 60 Hz AC service. MAINS power must be interruptible with an external delay-actions mains breaker. CommScope recommends external AC breakers capable of at least 15 Amps maximum for 120-Volt service or at least 13 Amps for 240-Volt service. One type B breaker can support up to two CAP M units, and a type C breaker can support up to four CAP M units.



For the AC power supply connection, a minimum cross-section of 1.5 mm<sup>2</sup> is required and for the DC power supply connection, a minimum cross-section of 2.5 mm<sup>2</sup> is required. Each wire must observe the applicable local regulations regarding loop impedance, voltage drop, and methods of installation. Make sure to connect the correct voltage to the CAP M.

## **HEALTH AND SAFETY**

### **Health and Safety Precautions**



A high leakage current ground (earth) connection to the Power Supply Unit (PSU) is essential before making any other connections to the PSU.



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.

### **RF Safety Cautions**



This system is an RF Transmitter and continuously emits RF energy. Maintain a minimum 43.3-inch (110 cm) clearance from the antenna while the system is operating. Whenever possible, shut down the RAN before servicing the antenna.



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



**Danger:** Electrical hazard. The danger of death or fatal injury from electrical current inside the unit in operation. Before opening the unit, disconnect the mains power.



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

## Property Damage Warnings



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.



Read and obey 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.



Make sure the unit's 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 MX may reach a very high temperature. Do not operate this equipment on or close to flammable materials. Use caution when servicing the CAP MX.



Only authorized and trained personnel are allowed to open the unit and get access to the inside.



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.



Although the unit 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.

## Compliance

1. **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 are calculated

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

according to this formula:

**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/cm<sup>2</sup>) 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).

2. **Notice:** For installations that have to comply with European EN50385 exposure compliance requirements, the following Power Density limits/guidelines (mW/cm<sup>2</sup>) according to ICNIRP are valid:

- 0.2 for frequencies from 10 MHz to 400 MHz
- $F \text{ (MHz)} / 2000$  for frequencies from 400 MHz to 2 GHz
- 1 for frequencies from 2 GHz to 300 GHz

3. **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 database, is not exceeded. The industrial boosters are shipped only as a naked boosters without any installation devices or antennas as it needs for professional installation.

4. **Notice:** For installations that have to comply with FCC/ISED requirements:

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 Health Canada's requirement. Information can be obtained at [http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio\\_guide-lignes\\_direct-eng.plip](http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio_guide-lignes_direct-eng.plip).

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

This device contains license-exempt transmitters)/receiver(s) that comply with Innovation, Science, and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

**Antenna Stmt for ISED:**

This device has been designated to operate with the antennas having a maximum gain of 7 dB. Antennas having a gain greater than 7 dBi are prohibited from 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 separation distance of at least 110 cm 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.

5. **Notice:** The maximum antenna gain allowed per band for a CAP M 6/6/7E/7E is listed in Table 4 below.

**Table 4. Maximum Antenna Gain CAP M 6/6/7E/7E**

FREQUENCY BAND (MHz)	POWER (dBm)	LINEAR ANTENNA GAIN (dB)	CROSS-POLARIZED ANTENNA GAIN (dB)
617.0 – 652.0	29	7'	10'
729.0 – 746.0	29	7*	10*
746.0 – 756.0	29	7'	10'
758.0 – 768.0	29	7'	10'
* The LINEAR ANTENNA GAIN and CROSS-POLARIZED ANTENNA GAIN including feeder loss must be selected so that the output power does not exceed 5 W ERP per channel according to FCC 490.219 (d)(3)(i).			

According to KDB 662911 “DO1 Multiple Transmitter Output vO2r01”:

- Pout = max RF output power settable each port = 29 dBm
- Nara = number of outputs = 2
- $10 \log(Nma)$  dB = RF output summed (in MIMO configuration) = 3 dB
- GA = antenna gain = 4 dBi (not cross-polarized)
- GD = directional gain (both transmit signals are correlated) = GA+  $10 \log(NANT)$  dBi (= GA when transmit signals are completely uncorrelated) = 7 dBi
- GL = insertion loss (TX-to-antenna attenuation) = 1.5 dB (note that this value is highly conservative, because is higher in real installations)

**Formula:**  $P_{out} + 10 \log(NAwr)$  dB + GD – < 5 Wow (39.14 dBm ERP)  $29\text{dBm} + 3 \text{ dB} + 7\text{dBi} - 1.5\text{dB} = 37.5 \text{ dBm ERP}$

cross-polarized antennas with Nara = 2: in the case of a transmitter with only two outputs driving a pair of antennas that are cross-polarized, the directional gain is the gain of an individual antenna. If the two antennas have different gains, the larger gain applies.

6. **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 the 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. The suitability of the component for the application shall be determined for the intended installation.

7. **Notice:** Corresponding local particularities and regulations must be observed. For national deviations, please refer to the respective documents, which are available from CommScope.
8. **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 radio/TV technician for help.

9. **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.

10. **Note:** This unit complies with European standard EN60950-i / 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.
		For (Part 90) 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. You MUST register Class B signal boosters (as defined in 47 CFR 90.219) online at <a href="http://www.fcc.gov/signal-boosters/registration">www.fcc.gov/signal-boosters/registration</a> . 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, the operation requires a license. Intended use: EU and EFTA countries.
		Indicates conformity with the RED directive 2014/53/EU and/or RoHS directive 2011/65/EU.
CE 07 00	CE	Indicates conformity with the RED directive 2014/53/EU and RoHS directive 2011/65/EU certified by the notified body no. 0700.

## 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/corporate-responsibility-and-sustainability/environment/weee-customer-recycling/>
- Enter the preceding URL into your web browser, and then press ENTER on your keyboard.





Documents / Resources

	<p><b>COMMSCOPE CAPM8171926 Repeater for Cellular Systems</b> [pdf] Instruction Manual CAPM8171926, XS5-CAPM8171926, XS5CAPM8171926, CAPM8171926 Repeater for Cellular Systems, Repeater for Cellular Systems</p>
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