ufiSpace

M3000-14XC

Fronthaul Multiplexer

Hardware Installation Guide

R1.4

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1 Overview

The UfiSpace M3000-14XC is a high-performance, versatile open networking fronthaul device that is designed to expand coverage and maximizes the DU resources with flexibility as service providers improve their services.

Implementing O-RAN's shared cell function, M3000-14XC enables telecoms and service providers to optimize private 5G network by utilizing DU resources efficiently and to streamline upgrading process when service providers are increasing its service capacity.

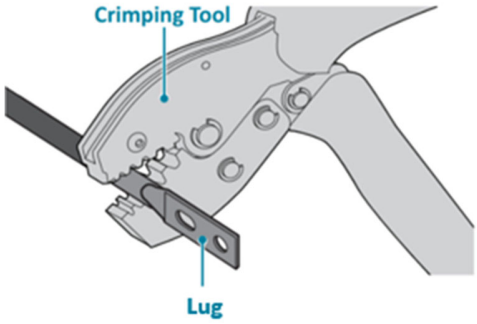
The M3000-14XC is future-proofed with a powerful 4-core processor, a programmable FPGA, 10GE interfaces, and full timing features supporting IEEE 1588v2 and SyncE. It is suitable for indoor and outdoor cabinet deployments with redundant, hot swappable components for convenience, increased availability, reliability and lower costs of maintenance.

This document describes the hardware installation process for M3000-14XC.

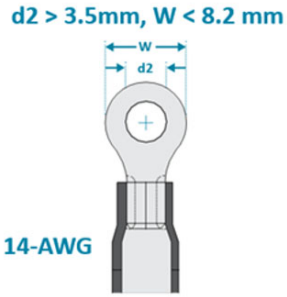
2 Preparation

2.1 Installation Tools

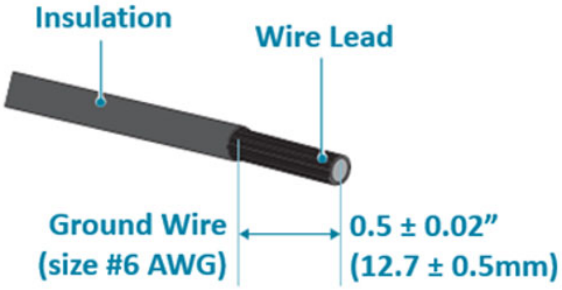
Phillips #2 Screw Driver



Crimping Tool



14-AWG wire with ring terminal for DC power supply



6-AWG green-and-yellow wire for grounding

Wire-stripping tools for stripping 6-AWG copper wire

- PC with terminal emulation software. Refer to the "Initial System Setup" section for details.
  - Baud rate: 115200 bps
  - Data bits: 8
  - Parity: None
  - Stop bits: 1
  - Flow control: None

2.2 Installation Environment Requirements

- Power Reserve: The M3000-14XC power supply is available with:
  1. **DC Version:** 1+1 active-active -36 to -75V DC power supply field replaceable unit or;
  2. **AC Version:** 1+1 active-active universal 100 to 240V AC power supply field replaceable unit.

  To ensure the active-active feed power design functions properly, a field with dual power circuit is recommend with a reserve of at least 200 watts on each power circuit.
- Space Clearance: The M3000-14XC width is 17.32 inches (44cm) and shipped with a rack mount brackets suitable for 19 inch (48.3cm) wide racks. The rack mount brackets can be installed at the front or in the center of the M3000-14XC. The depth of the M3000-14XC chassis is 9.84 inches (25cm) without the field replaceable units (FRUs). To accommodate the air inlet and front cabling, a recommended minimum space clearance of 6 inches (15.2cm) for the front of the unit. A total minimum reserve depth of 15.84 inches (40.23cm) is required.

Note	Illustrations are for reference purposes only. Actual scenario and equipment may differ.

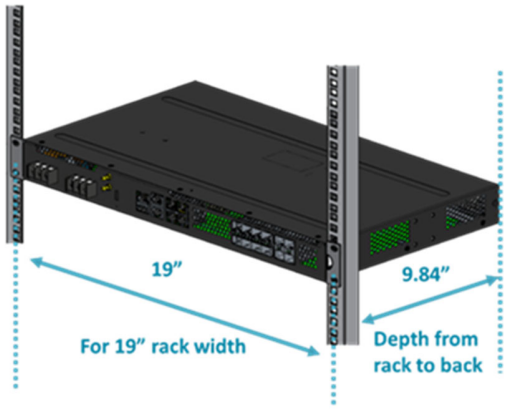


Figure 1.

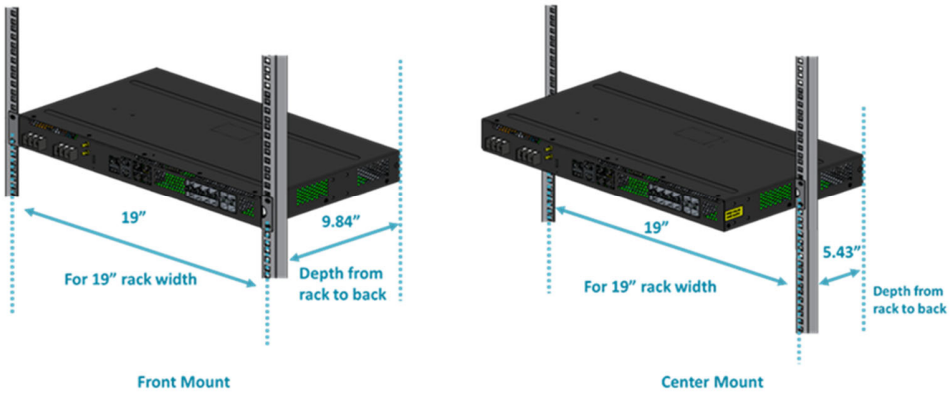


Figure 2.

- Cooling: The M3000-14XC airflow direction is front-to-back. Make sure the equipment on

the same rack have the same airflow direction.

Figure 3.

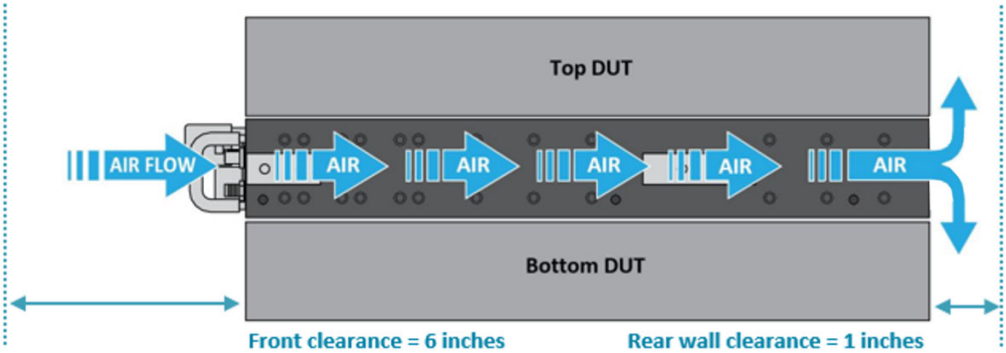


Figure 4.

2.3 Preparation Check List

Task	Check	Date
Power voltage and electric current requirement **DC version**: -36 to -75V DC, 8A maximum x2 or; **AC version:** 100 to 240V, 3A maximum x2		
Installation spacing requirement M3000-14XC spacing requires a height of 1RU (1.75”/4.5cm), a width of 19” (48.3cm) in width, and a depth of 15.84 inches (40.23cm)		
Thermal requirement M3000-14XC working temperature is -40 to 65°C (-40°F to 140°F), airflow direction is front-to-back		
Installation tools required #2 Philips Screwdriver, 6-AWG wire stripper, and crimping tool		
Accessories required PC with terminal emulation software, console cable, 14-AWG wire with ring terminal for power, 6-AWG wire for grounding		

3 Package Contents

3.1 Accessory List

Item	Description	Spec. & Dimensions	Qty.	Weight
1	Grounding Lug	1.97” x 0.44” x 0.3” (#6 AWG) (50 x 11.1 x 7.5mm)	1 pc	0.022lb (10.0g)/pcs
2	Screw Kit (for Grounding Lug)	2 x Screws M4*L8.0mm 4 x M4 Lock Washers	1 set	0.008lb (3.5g)/set
3	Rack Mount Bracket	1.98” x 1.69” x 0.79” (19” width rack) (50.4 x 43 x 20mm)	2 pcs	0.14lb (65.4g)/2pcs (0.07lb (32.7g)/pcs)
4	Screw Kit (for Rack Mount Bracket)	8 x Screws M4.0*L6.5mm	2 sets	0.04lb (14g)/2 sets 0.02lb (7g)/set
5	USB 2.0 Type A Cable	7.87” (200mm)	1 pc	0.023lb (10.5g)/pcs
6	AC Power Cord (AC version only)	72.05” (1830mm)	2 pcs	0.91lb (414g)/2 pcs (0.46lb (207g)/pcs)
7	RJ45 to DB9 Female Cable	95.98” (2438mm)	1 pc	0.23lb (105g)/pcs
8	Screw Kit	2 x Screw M4*L25mm 2 x D8*L25 Rubber Plug	2 sets	0.009lb (4.5g)/2sets 0.005lb (2.25g)/set

3.2 Component Physical Information

Specification	Item	Description
Weight	Total package contents	18.74lb (8.5kg)
	Chassis without FRU	9.22lb (4.18kg)
	Power Supply Unit (PSU)	DC PSU: 1.48lb (672.2g)
		AC PSU: 1.58lb (716g)
	Ground lug	0.022lb (10g)
	Rack mount bracket	0.07lb (32.7g)
	USB cable	0.04lb (17.2g)
	AC Power cord (AC version only)	0.46lb (207g)
	RJ45 to DB9 Female Cable	0.23lb (105g)
	Screw kit for ground lug	0.008lb (3.5g)
	Screw kit for rack mount bracket	0.02lb (7g)
	Screw kit	0.005lb (2.25g)
Dimension	M3000-14XC (W x D x H)	17.32” x 9.84” x 1.71” (440 x 250 x 43.5mm)
	PSU (W x D x H)	1.99” x 8.31” x 1.58” (50.5 x 211 x 40.2mm)

4 Identifying Your System

4.1 M3000-14XC Overview

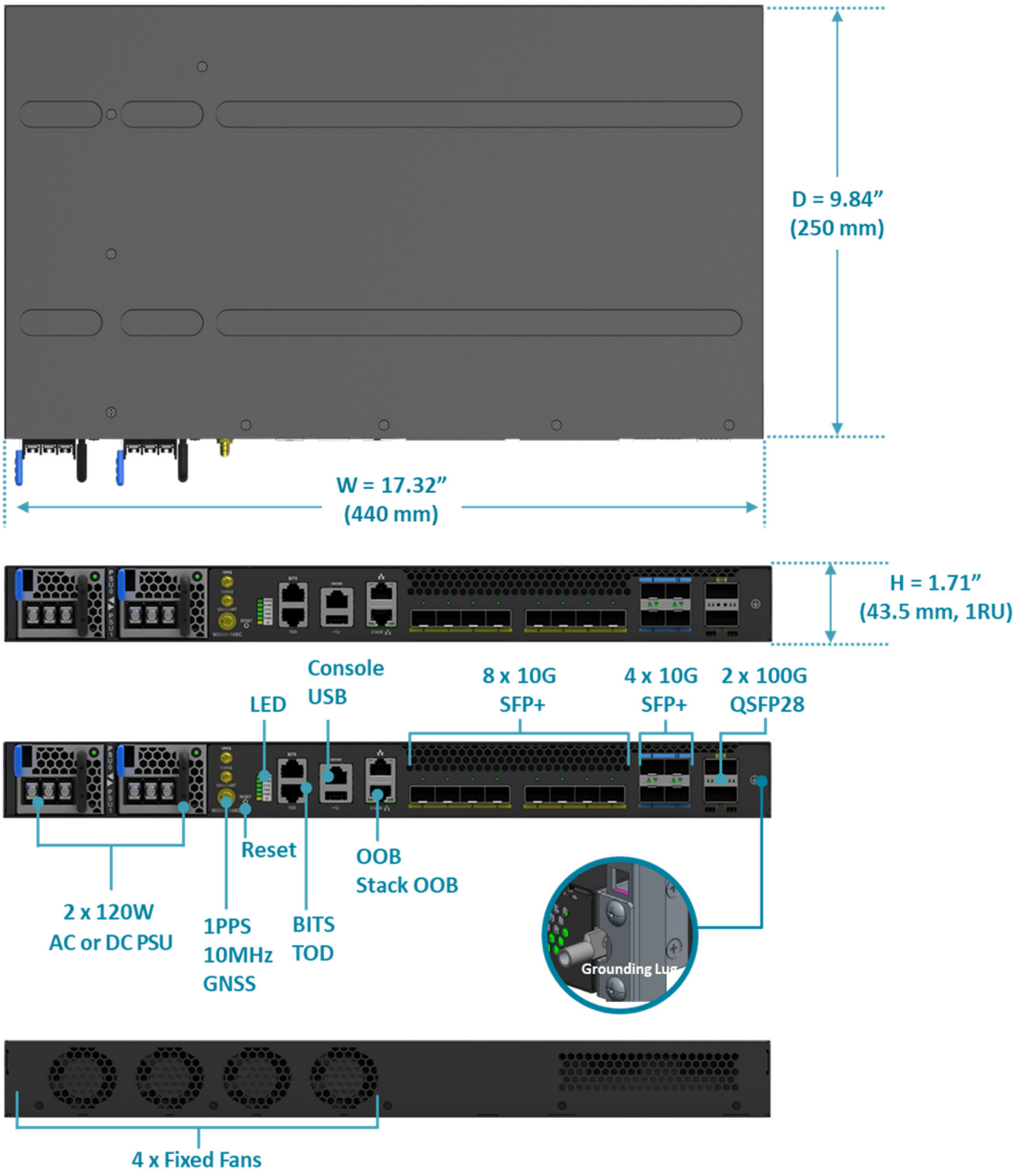


Figure 5.

4.2 DC Version PSU Overview

Power supply unit (PSU) with 1+1 redundancy. Hot swappable, field replaceable unit (FRU).

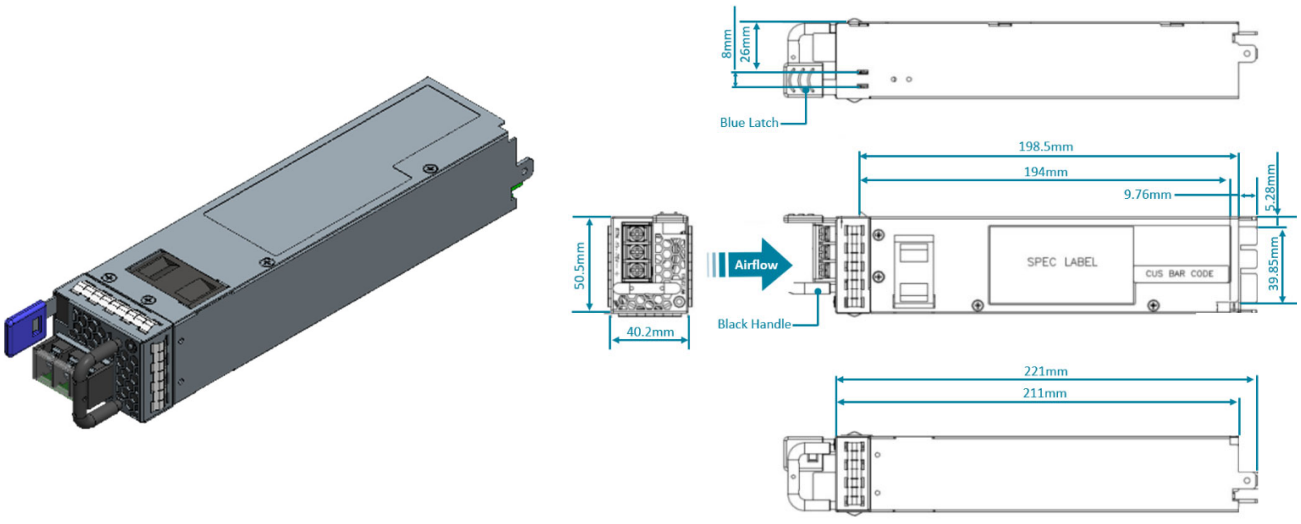


Figure 6.

4.3 AC Version PSU Overview

Power supply unit (PSU) with 1+1 redundancy. Hot swappable, field replaceable unit (FRU).

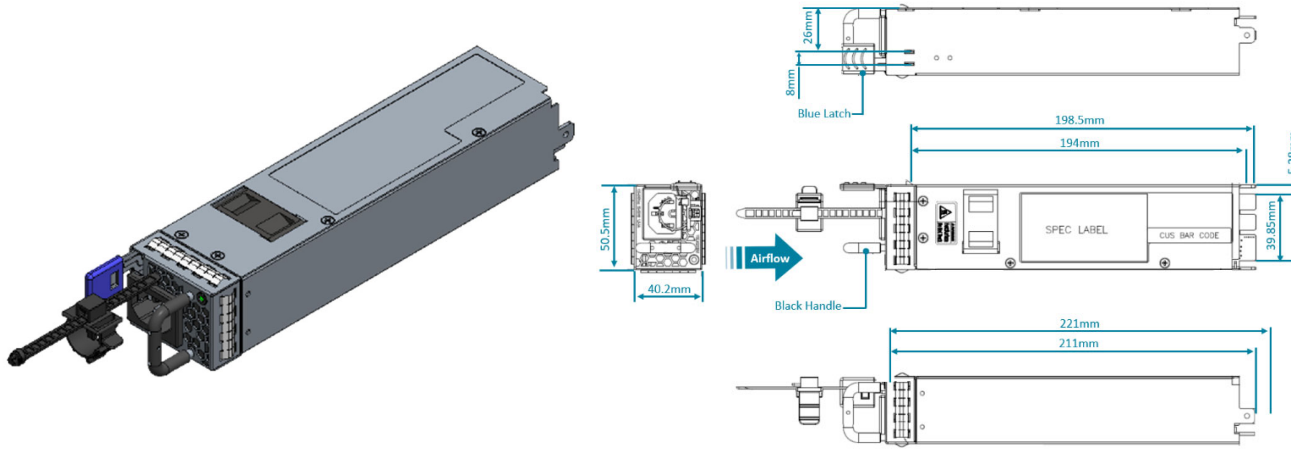


Figure 7.

4.4 Fan Overview

4 Fixed Fans.

Figure 8.

4.5 Port Overview

Port ID	Form Factor	Maximum Support Distance	Support Speed
0 ~ 7	SFP+	49.71mi (80km)	10G
8 ~ 11	SFP+	49.71mi (80km)	10G
12 ~ 13	QSFP28	6.21mi (10km)	40/100G

For now, only port 8 can be used as an interface connecting to DU.

Figure 9.

5 Rack Mounting

Caution	It is recommended that installation be done by two trained professionals. One individual should hold the equipment in position on the rack while the other secures it in place.

Note	Illustrations are for reference purposes only. Actual scenario and equipment may differ. Screws for rack posts not included

1. Secure the rack mount brackets onto the equipment.
   Align the rack mount brackets with the holes provided on the both sides of the case and secure the brackets using the 8 M4.0*L6.5mm screws provided with the package.

Figure 10.

2. Secure the equipment onto the rack posts.
   Mark the location on both posts to ensure it is leveled before securing the equipment onto the rack. (See Figure below).

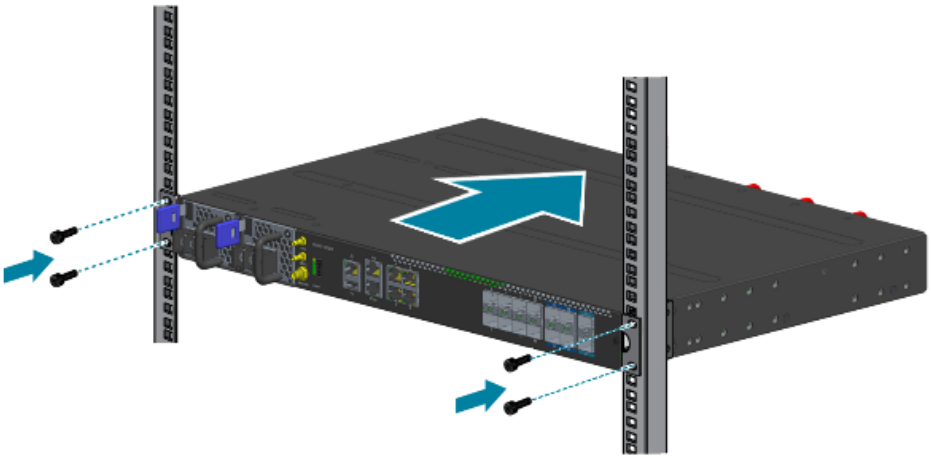


Figure 11.

For rack post widths wider than 19”, different brackets are available upon request (See Figure below).

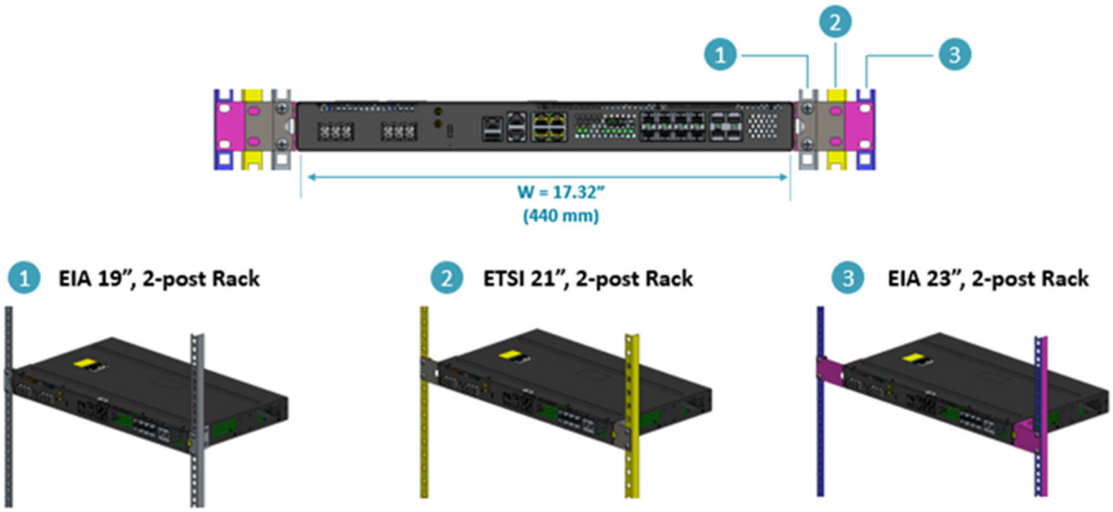


Figure 12.

6 Wall Mounting

Caution	It is recommended that installation be done by two trained professionals. One individual should hold the equipment in position on the wall while the other secures it in place.

The FHM can also be mounted on the wall. Please follow the instruction for installation.

1. Secure the rack mount brackets onto the equipment.
   Align the rack mount bracket with the holes provided on either side of the case, depending on which direction should the ports be facing (See Figure 15), and secure the brackets using the 4 M4.0*L6.5mm screws provided with the package. (See Figure 13)

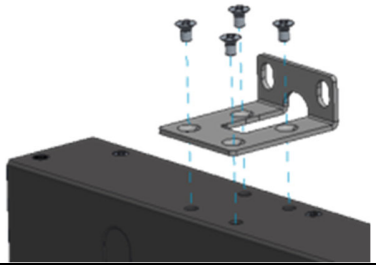


Figure 13.

2. Secure the equipment onto the wall.
   Mark the location on the wall. Drill two holes to insert 2 D8*L25 rubber plug into the wall. Secure the 2 M4*L25 Screw into the wall through the rack mount bracket. (See figure below)

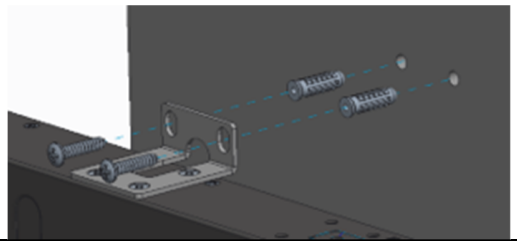


Figure 14.

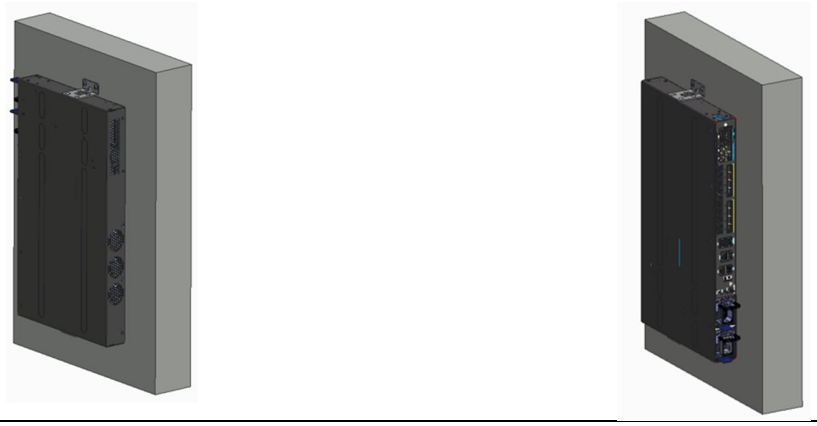
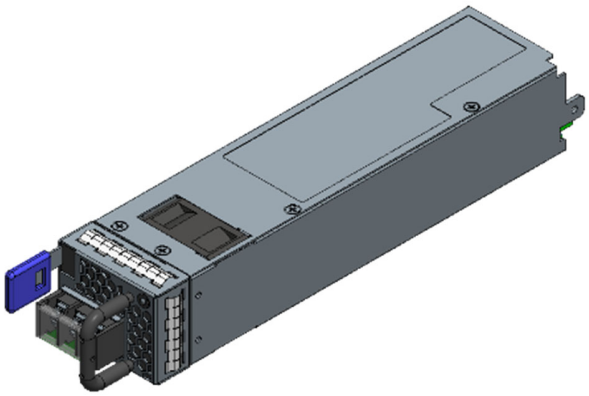


Figure 15.

7 Installing Power Supply Units

The power supply unit (PSU) is a hot swappable field replaceable unit (FRU) and can be replaced while the equipment is operating as long as the remaining (second) PSU is installed and in operation. The PSUs comes pre-installed and the following are instructions on how to install a new PSU.

DC Version:



AC Version:

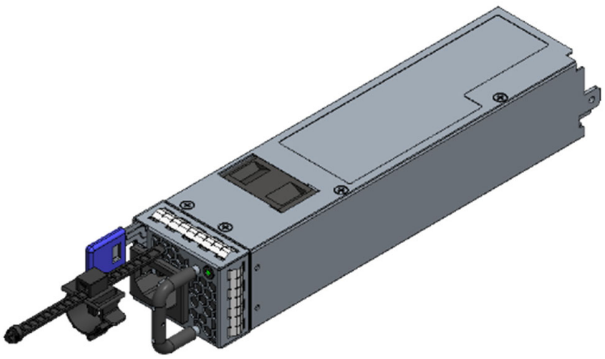
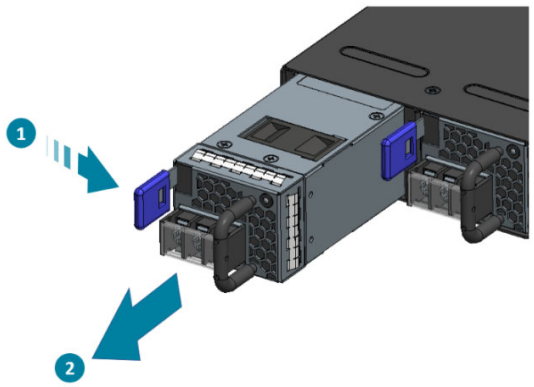


Figure 16.

Caution	Shock hazard! For safety, please disconnect all power inputs from the power supply unit before servicing the equipment.

1. Locate the release tab on the PSU. Then press and hold down the release tab to unlock the PSU from the power bay.
2. While holding down the release tab, grip the PSU's handle and firmly pull it out of the power bay.

DC Version:



AC Version:

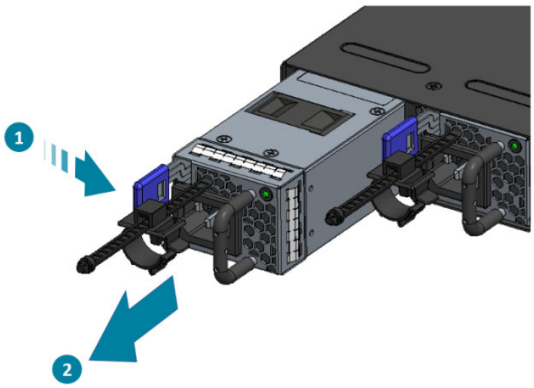
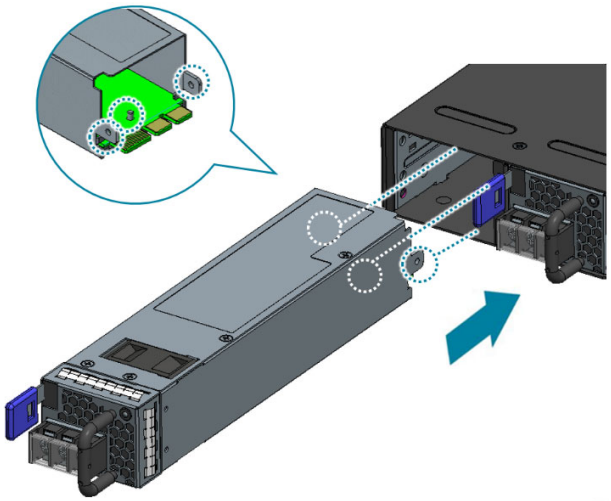


Figure 17.

3. Align the new PSU with the power bay, ensuring the PSU's power connector is in the correct position.
4. Carefully slide the new PSU into the power bay and gently push until it is flush with the case.
5. An audible click will be heard when the PSU is installed correctly. The PSU will not go in all the way if it is in the wrong direction.

Note	Illustrations are for reference purposes only. Actual scenario and equipment may differ.

DC Version:



AC Version:

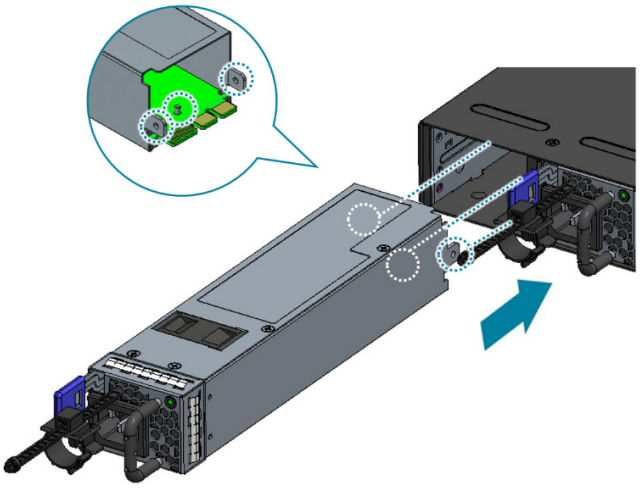


Figure 18.

8 Grounding the Equipment

It is recommended that equipment changes be done on a grounded rack system. This will reduce or prevent the risk of shock hazards, equipment damage, and potential of data corruption.

The equipment can be grounded from the equipment's case and/or the power supply units (PSUs). When grounding the PSUs, ensure that both PSUs are grounded at the same time in case one of them is removed. A grounding lug, M4 screws, and washers are provided with the package contents, however, the grounding wire is not included. For convenience, there are two locations on the case in which the grounding lug may be fixed.

The following instructions are for grounding the equipment.

Warning	This equipment must be grounded. Do not defeat the ground conductor or operate the equipment without correctly grounding the equipment. If there is any uncertainty about the integrity of the equipment's grounding, please contact the electrical inspection authority or a certified electrician.

1. Before grounding the equipment, ensure that the rack is properly grounded and in compliance with local regulatory guidelines. Ensure that there is nothing that can obstruct the connection for grounding and remove any paint or materials that may prevent good grounding contact.
2. Strip the insulation from a size #6 AWG grounding wire (not provided within the package contents), leaving 0.5” +/-0.02” (12.7mm +/-0.5mm) of exposed grounding wire.
3. Insert the exposed grounding wire all the way into the hole of the grounding lug (provided with package contents).
4. Using a crimping tool, firmly secure the grounding wire to the grounding lug.

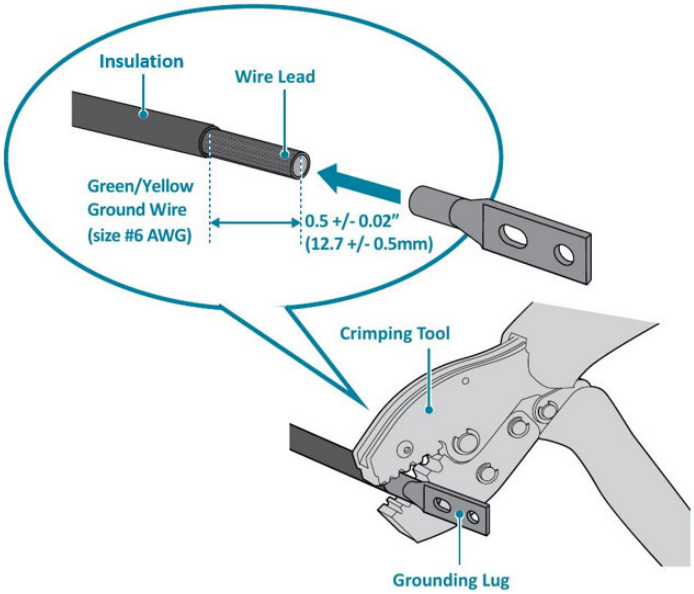


Figure 19.

5. Locate the designated location for securing the grounding lug, which is located on the side of the equipment.
6. Using 2 M4 screws and 4 washers (provided with the package contents), firmly lock the grounding lug to either of the designated grounding locations on the equipment.

Note	Illustrations are for reference purposes only. Actual scenario and equipment may differ.

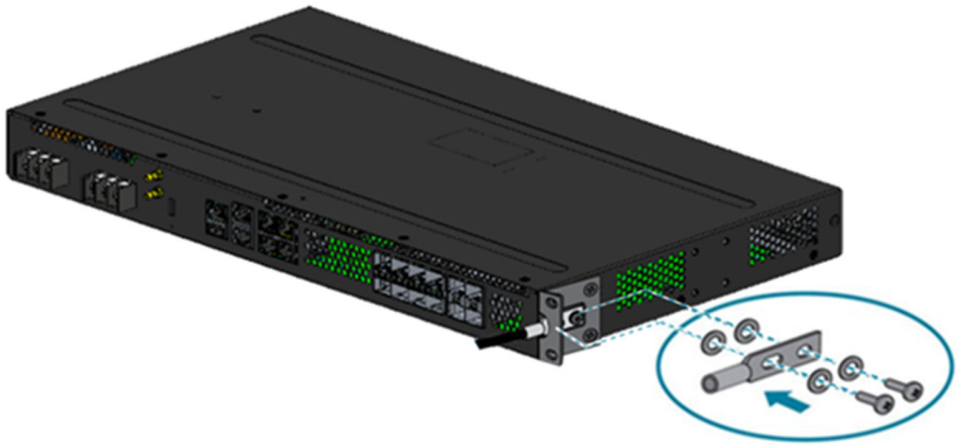


Figure 20.

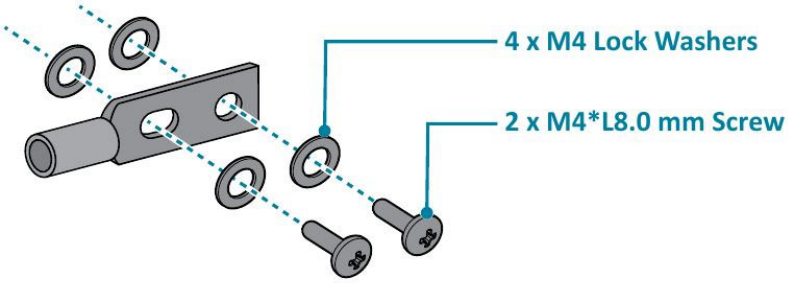


Figure 21.

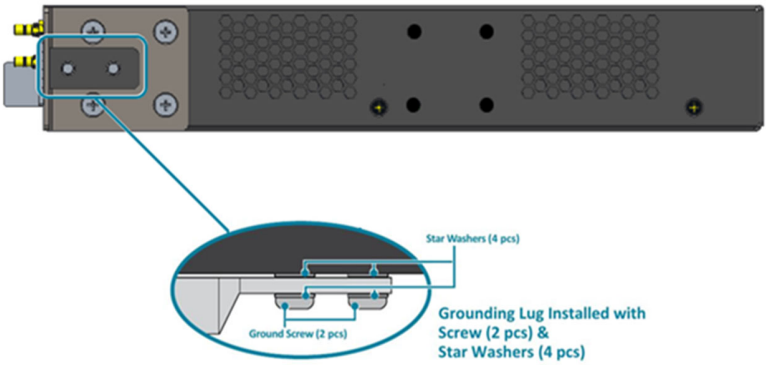


Figure 22.

9 Connecting Power

9.1 DC Version

1. Ensure there is enough power to supply the system.
   The maximum system power consumption is 197 watts. It is recommended to ensure that enough power is reserved from the power distribution system before installation. Also, please ensure that both PSUs have been properly installed before powering up the equipment, as the M3000-14XC is designed to support 1 + 1 power redundancy.
2. Attach the power cable.
   Locate the DC power screw-type terminal block on the DC PSU. Attach the UL 1015, 14 AWG DC power cable (not provided within the package contents) to the DC inlet connector on the PSU.

Warning	Dangerous voltage! • Must be powered off before removing! • Verify that all electrical connections are grounded before powering on • The DC power source must be reliably grounded

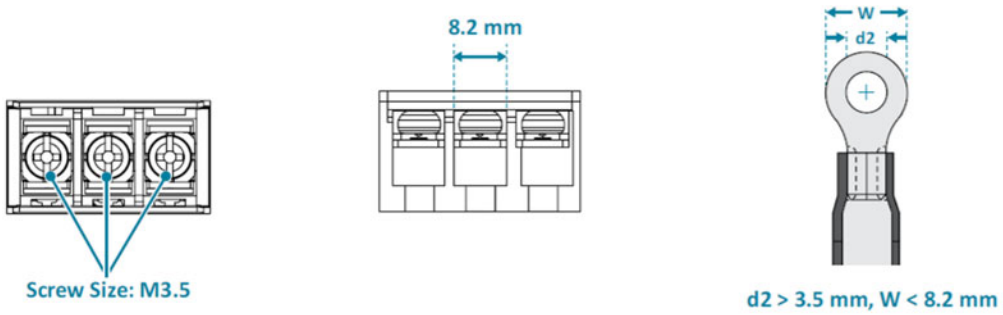


Figure 23.

3. Tighten the screws to the specified torque.
   Tighten the screws to a torque value of 7.0+/-0.5kgf.cm. If the torque is not enough, the lug will not be secure and may cause malfunctions. If the torque is too much, the terminal block or lug may be damaged.

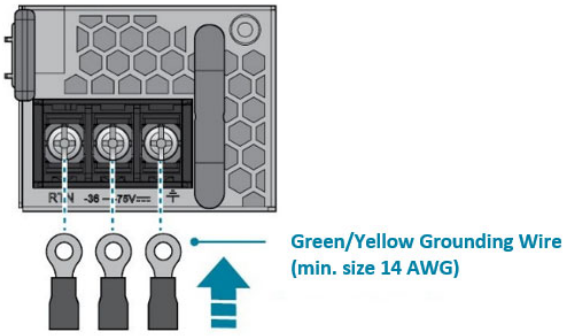


Figure 24.

4. Feed DC power into the system.
   The PSU will immediately output 12V and 5VSB to the system when a -36V to -75V DC power source is applied. The PSU has a built in 20 amperes, fast acting fuse based on the PSU maximum capacity, which will act as a second-tier system protection in case the power distribution unit's fuse is not functioning.
5. Verify that the power supply is operating.
   If connected correctly, when turned on, the LED on the PSU will light up with a Green color designating normal operation.

9.2 AC Version

1. Ensure there is enough power to supply the system.
   The maximum system power consumption is 197 watts with an input voltage of 100-240V AC. It is recommended to ensure that enough power is reserved from the power distribution system before installation. Also, please ensure that both PSUs have been properly installed before powering up the equipment, as the M3000-14XC is designed to support 1 + 1 power redundancy.
2. Attach the power cable.
   Plug the power cord into the AC PSU and secure it tightly.
3. Verify that the power supply is operating.
   If connected correctly, when turned on, the LED on the PSU will light up with a Green color designating normal operation.

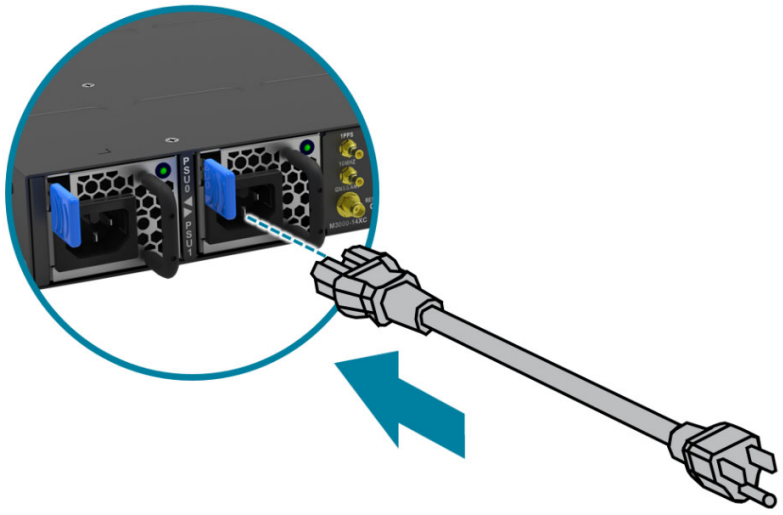


Figure 25.

10 Verifying System Operation

10.1 Front Panel LED

Verify basic operations by checking the system LEDs located on the front panel. When operating normally, the PWR, FAN, and SYS LEDs should all display green.

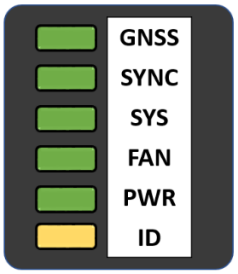


Figure 26.

LED Condition	Equipment Status
GNSS	
Off	GNSS is not configured. NOTE: Need NOS to activate this feature.
Solid Green	GNSS is in normal state. Self-survey is complete. NOTE: Need NOS to activate this feature.
Blinking Green	GNSS is in learning state. Self-survey is not completed. NOTE: Need NOS to activate this feature.
Solid Yellow	Power up. GNSS is not tracking any satellite. NOTE: Need NOS to activate this feature.
Blinking Yellow	GNSS antenna is short to ground. NOTE: Need NOS to activate this feature.
SYNC	
Off	System timing synchronization is disabled or in free-run mode. **Note: need NOS to activate this feature
Solid Green	System timing core (1588 and SyncE) is synchronized to external timing source (ex: GNSS, 1PPS, PTP, BITS, etc) **Note: need NOS to activate this feature
Blinking Green	System is synchronized in SyncE mode. **Note: need NOS to activate this feature
Solid Yellow	System timing core is in acquiring state or holdover mode.
Blinking Yellow	System timing synchronization fail. **Note: need NOS to activate this feature
SYS	
Off	Reserved
Solid Green	System boot complete
Blinking Green	Reserved
Solid Yellow	Reserved
Blinking Yellow	System boot not complete

LED Condition	Equipment Status
FAN	
Off	Reserved
Solid Green	All FAN modules work well
Blinking Green	Reserved
Solid Yellow	Reserved
Blinking Yellow	One or more FAN module(s) fail or no FAN module present
PWR	
Off	No power or in shutdown mode.
Solid Green	System power good & BMC is present & BMC power good
Solid Yellow	System power good & BMC is absent
ID	
Off	No Power
Blinking Blue	Beacon feature is enabled on the switch

10.2 **PSU FRU LED**

LED Condition	Equipment Status
Off	No DC power to all PSUs
Flashing Red	No DC power to this PSU
Flashing Green	DC present, only standby output on. Poor contact
Green	PSU DC output ON and OK
Red	PSU failure.
Flashing between Green and Red	Warning. Working condition not satisfied. Please check the voltage, electric current, and temperature.

10.3 **Management port LED**

LED Condition	Equipment Status
Left LED	
Off	1G no link
Solid Green	1G link-up
Blinking Green	1G TX/RX activity
Right LED	
Off	No activity
Solid Amber	10M/100M link-up
Blinking Amber	10M/100M TX/RX activity

11 Initial System Setup

Establishing a first-time serial connection.

To assign an IP address, you must have access to the command line interface (CLI). The CLI is a text-based interface that can be accessed through a direct serial connection to the device.

Access the CLI by connecting to the console port. After you assign an IP address, you can access the system through Telnet or SSH by Putty, TeraTerm or HyperTerminal.

Perform the following steps to access the device through a serial connection:

1. Connect the console cable.
    - The console can be connected using the RJ45 port labelled IOIO.
    - To connect to console, plug a RJ45 serial cable into the console port and connect the other end to the computer. Cable types may vary depending on the model.

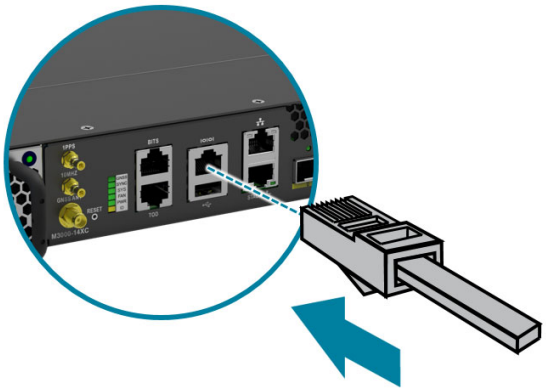


Figure 27.

2. Check for serial control availability.
   Disable any serial communication programs running on the computer such as synchronization programs to prevent interference.
3. Launch a terminal emulator.
   Open a terminal emulator application such as HyperTerminal (Windows PC), Putty or TeraTerm and configure the application. The following settings are for a Windows environment (other operating systems will vary):
    - Baud rate: 115200 bps
    - Data bits: 8
    - Parity: None
    - Stop bits: 1
    - Flow control: None
4. Login to the device.
   After the connection is established, a prompt for the username and password displays. Enter the username and password provided by our sales to access the CLI.

12 Cable Connections

12.1 Connecting the USB Extender Cable

Connect the USB 2.0 A Type plug (male connector) into the USB port (female connector) located on the front panel of the equipment. The USB port is a maintenance port.

Figure 28.

12.2 Connecting a Cable to the ToD Interface

Note	The maximum length of the straight-through Ethernet cable should not be more than 3 meters.

1. Connect one end of a straight-through Ethernet cable to the GNSS unit
2. Connect the other end of the straight-through Ethernet cable to the port marked “TOD” located on the front panel of the equipment.

Figure 29.

12.3 Connecting the GNSS Interface

Connect an external GNSS antenna with an impedance of 50 ohms to the port marked “GNSS ANT” located on the front panel of the equipment.

Figure 30.

12.4 Connecting the 1PPS Interface

Note	The maximum length of the 1PPS coaxial SMB/1PPS Ethernet cable should not be more than 3 meters.

Connect an external 1PPS cable with an impedance of 50 ohms to the port labelled “1PPS”.

Figure 31.

12.5 Connecting the 10MHz Interface

Note	The maximum length of the 10MHz coaxial SMB cable should not be more than 3 meters.

Connect an external 10MHz cable with an impedance of 50 ohms to the port labelled "10MHz”.

Figure 32.

12.6 Connecting a Cable to the BITS Interface

Note	The maximum length of the BITS cable should not be more than 3 meters.

1. Connect one end of a shielded RJ48 cable to the port labelled “BITS” located on the front panel of the equipment.
2. Connect the other end of the cable to the BITS patch or demarcation panel.

Figure 33.

3. Below is the pinout for BITS port

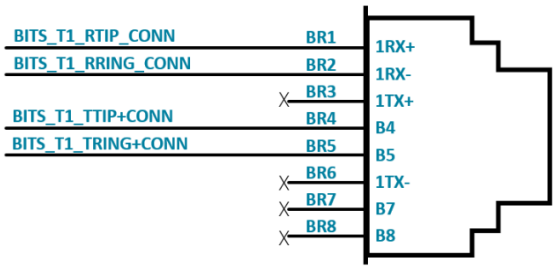


Figure 34.

12.7 Connecting the Transceiver

Note	To prevent over tightening and damaging the optic fibers, it is not recommended to use tie wraps with optical cables.

Read the following guidelines before connecting the transceiver:

- Before installing the equipment, take into consideration rack space requirements for cable management and plan accordingly.
- It is recommended to use hook-and-loop style straps to secure and organize the cables.
- For easier management, label each fiber-optic cable and record its respective connection.
- Maintain a clear line of sight to the port LEDs by routing the cables away from the LEDs.

Caution	Before connecting anything (cables, transceivers, etc.) to the equipment, please ensure to discharge any static electricity that may have built up during handling. It is also recommended the cabling be done by a professional who is grounded, such as by wearing an ESD wrist strap.

Please follow the steps below for connecting a transceiver.

1. Remove the new transceiver from its protective packaging.
2. Remove the protective plug from the transceiver port.
3. Place the bail (wire handle) in the unlocked position and align the transceiver with the port.
4. Slide the transceiver into the port and use gentle pressure to secure it in place. An audible click can be heard when the transceiver is secured in the port.

Caution	The difference between cables connecting Fronthaul Multiplexer to RUs should not exceed 800 meters to prevent additional latency. For example: If cable1 connecting to RU1 is 1500M, all other cables connecting Fronthaul Multiplexer to other RUs may not be longer than 2300M or shorter than 700M.

12.8 Installing an Antenna

Note	Make sure the satellite signal strength is greater than 30db, when using a GNSS simulator for testing.

Read the following guidelines before installing your antenna.

- The M3000-14XC supports various types of receiver frequency types, including GPS L1C/A, GLONASS L1OF, BeiDou B1, and Galileo E1B/C.
- The minimum sensitivity of the receiver frequency (RF) is -166dBm.
- The M3000-14XC supports both passive and active GNSS antennas, and will automatically detect which type of antenna is installed.
- If the received signal strength is lower than 30db, the GNSS receiver will fail to produce accurate location estimates.

To optimize antenna performance, it is highly recommended to choose a roof or top floor that is free from any signal blockage or obstruction.

Read the following guidelines before installing an active antenna:

- When an active antenna is installed, the M3000-14XC can supply up to 5V DC/150mA on the GNSS port.
- If any GNSS amplifier, DC-blocked or cascaded splitter is inserted, the GNSS detection function might be affected, resulting in GNSS satellite clock errors.
- We recommend that you use an active antenna equipped with 50 ohm impedance matching, 5V DC power supply capable, max. NF 1.5dB and 35~42dB internal LNA gain to get a strong enough signal strength in various weather conditions.
- To prevent damages caused by power surges or lightning strikes, ensure a surge protector is attached to the GNSS antenna.

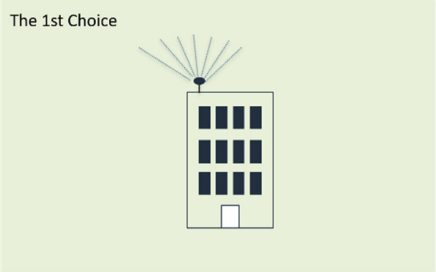


Figure 32.

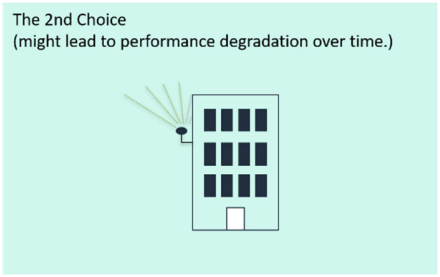

The 2nd Choice
(might lead to performance degradation over time.)

Figure 33.

13 Cautions and Regulatory Compliance Statements

Safety Notices
Caution! Shock hazard!
TO DISCONNECT POWER, REMOVE ALL POWER CORDS FROM UNIT.

Electrical Hazard: Only qualified personnel should perform installation procedures.
Risques d'électrocution: Seul un personnel qualifié doit effectuer les procedures d'installation.

Warning: Network Switch power supplies do not have switches for turning the unit on and off. Before servicing, disconnect all power cords to remove power from the device. Make sure that these connections are easily accessible.

Avertissement: Network Switch alimentations ne sont pas des interrupteurs pour allumer l'appareil et en dehors. Avant l'entretien, débranchez tous les cordons d'alimentation pour couper l'alimentation de l'appareil. Assurez-vous que ces connexions sont facilement accessibles.

Caution: Before mounting the device, ensure that the rack can support it without compromising stability. Otherwise, personal injury and/or equipment damage may result.

Caution: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Caution: Only Laser Class 1 optical transceivers shall be used.

Warning: Do not use optical instruments to view the laser output. The use of optical instruments to view laser output increases eye hazard. Use only UL/CSA, IEC/EN60825-1/-2 recognized pluggable modules.

Avertissement: Ne pas utiliser d'instruments optiques pour voir la sortie du laser. L'utilisation de instruments optiques pour afficher la sortie laser augmente les risques oculaires. Utilisez uniquement UL/CSA, IEC/EN60825-1 /-2 reconnu modules enfichables.

Warning:
The equipment should only be used within a restricted access area.
The equipment should only be operated by skilled or instructed persons.
The equipment and its modules should only be repaired, maintained or replaced by skilled personnel.
Instructed person is a term applied to persons who have been instructed and trained by a skilled person, or who is supervised by a skilled person.

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	この装置は、クラスA機器です。この装置を住宅環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

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