CommScope ERA®
WCS and e-POI Subracks and Power Supply Unit

Installation Guide • M0201ABK_uc • June 2021

COMMSCOPE®

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ERA® and ION-E®

ERA is an extension of the hardware and software architecture that CommScope originally introduced as ION-E. Going forward, all new systems are ERA. Since ION-E and ERA share the same hardware modules, system software and management systems, existing ION-E systems can be updated and expanded using ERA components.

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TRADEMARKS

Andrew Wireless Systems GmbH, June 17, 2021

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Document Overview

The information in this document guides you through the installation of CommScope ERA® components, which includes the ERA WCS-2, WCS-4, -48Vdc WCS-2, -48Vdc WCS-4, and e-POI Subracks and their cards or modules, and the Power Supply Subrack and its 12 Vdc and 57 Vdc Rectifier Modules. Table 1 identifies the ERA hardware that this installation guide supports.

Table 1. *ERA Hardware System Components Supported in this Manual*

Component		Description
WCS Subracks and Cards		
	WCS-4 Subrack	The WCS-4 Subrack is configured in the GUI as a Classic CAN, Switching CAN, WIN, or TEN. The WCS-4 (7635442-xx) is powered by the ERA AC to DC PSU subrack and power modules. The -48Vdc WCS-4 (7844068-xx) is powered by an external -48 Vdc power supply.
	WCS-2 Subrack	The WCS-2 Subrack is configured in the GUI as a Classic CAN, Switching CAN, WIN, or TEN. The WCS-2 (7635443-xx) is powered by the ERA AC to DC PSU subrack and power modules. The -48Vdc WCS-2 (7844067-xx) is powered by an external -48 Vdc power supply.
	Fan Module	The factory installed Fan Tray Modules cool a WCS Subrack and all of its cards.
See Figure 17 on page 79	Fan Filter	Air Filter Modules are installed in the left side of the WCS Subrack to prevent dust and other particulates from circulating into the WCS Subrack.
	System User Interface (SUI) Card	The SUI Card provides local and LAN Ethernet connections and a USB port.
	RF Donor (RFD) Card RF Donor (RFD) HB Card	The RFD Card is the interface for RF signals between the RF source (such as the BTS, eNodeB or e-POI) and a Classic CAN and WINs. RFD Card PN 7633229-0x is for frequencies between 380 MHz and 2700 MHz. RFD HB Card PN 7841277-00 is for frequencies between 2700 MHz and 4300 MHz (and can be used down to 1700 MHz). Note that CAP M and CAP H APs require the use of RFD Card PN 7633229-01 or higher, or an RFD HB or a CDD card. APs that support TETRA services require RFD Card PN 7633229-05 or higher or a CDD card.
	Optical Transport (OPT) Card	The OPT Card provides a 10 Gbps fiber connection between a Switching CAN, TENs, and WINs; and between a Classic CAN and TENs and Fiber APs. Each OPT Card supports up to four SFP+ transceivers for device connections. New OPT Card 7642123-01 requires ERA V2.8.0 or higher software.
	Copper Transport (CAT) Card	The CAT Card provides 10 Gbps Cat6A connections between a Classic CAN and TENs and UAPs or Copper CAT Ls. CAT Cards also supply the remote power over Cat6A to the UAPs or Copper CAT Ls. At least one 57 Vdc Module is required to use a CAT Card.
	Auxiliary Unit Transport (AUT) Card	The AUT Card provides a 1 Gbps pass-through connection between a Classic CAN and TENs and APs for WiFi, IP cameras, or other Ethernet devices.
	CPRI Digital Donor (CDD) Card	The CDD Card provides a digital CPRI interface between a Nokia BBU and a Classic CAN or WIN.
Power Supply Unit and Power Modules		
	Power Supply Unit (PSU)	The PSU can house up to two 12 Vdc Power Modules and two 57 Vdc Power Modules, which supply power to WCS Subracks, APs, and connected devices.
	12 Vdc Power Module	A 120/240 Vac to 12 Vdc module plugs into the Power Supply Subrack to provide 12 Vdc power to WCS Subracks and e-POI Subracks.
	57 Vdc Power Module	A 120/240 Vac to 57 Vdc Module plugs into the Power Supply Subrack to provide remote power over Cat6A to connected APs and devices connected to the APs.
e-POI Subrack and Cards		
	e-POI Subrack	The e-POI Subrack supports up to eight e-POI RF Modules (RFMs) and one Interface Card (IFC); ships with the IFC factory-installed.

Table 1. *ERA Hardware System Components Supported in this Manual (Continued)*

Component		Description
	Interface Card (IFC)	The IFC is used to set the Subrack number of the e-POI Subrack. It also provides a Status LED for each of the e-POI Modules in the Subrack. The IFC is factory installed in the e-POI Subrack.
	e-POI Module	The e-POI Modules are low PIM attenuators that reduce high power RF signals from their source by 30 dB to interface with the RFD Cards and works with duplexed input signals.
Access Points		
	• UAP • UAP-N25	A Universal Access Point (UAP) connects to the ERA system via Cat6A cabling, uses its internal antennas to transmit and receive over-the-air signals. It also supports Ethernet backhaul or a cascaded UAP through its AUX port. Similar in function to the UAP and UAP-X, the UAP-N25 and UAP-XN25 feature a 25 MHz filter on one path (instead of the 80 MHz filter on a UAP or UAP-X). This allows coexistence of specific bands, such as Australia 850 MHz and 900 MHz.
	• UAP-X • UAP-XN25	
	CAP L	The Low Power Carrier Access Point (CAP L) connects via Cat6A, Single-Mode Fiber (SMF), or Multi-Mode Fiber (MMF), uses external antennas to transmit and receive over-the-air signals, and supports Gigabit Ethernet pass-through for WiFi, IP cameras, or other devices. The CAP L can provide up to 21 dBm of RF output power per band. It also supports one cascaded CAP L.
	CAP M	The Medium Power Carrier Access Point (CAP M) connects via Single-Mode Fiber (SMF) or Multi-Mode Fiber (MMF), uses external antennas to transmit and receive over-the-air signals, and supports pass-through for Ethernet devices (such as WiFi and IP cameras). The CAP M, dependent on the frequency band, can provide up to 30 dBm of RF output. It also supports one cascaded CAP M.
	CAP MX	The CAP MX connects via Single-Mode Fiber (SMF) or Multi-Mode Fiber (MMF) and uses external antennas to transmit and receive over-the-air signals. It supports a large number of licensed bands. The CAP MX, dependent on the frequency band, can provide from 29 dBm to 33 dBm of RF output. It also supports one cascaded CAP M.
	CAP H	The High Power Carrier Access Point (CAP H) connects via Single-Mode Fiber (SMF) or Multi-Mode Fiber (MMF) and uses external antennas to transmit and receive over-the-air signals. The current ERA software does not support pass-through for Ethernet devices (such as WiFi and IP cameras) for CAP H, but this will be supported in a future software update. The CAP H can provide up to 43 dBm of RF output per band. It also supports one cascaded CAP H.

Document Revision History

This is the tenth release of the *WCS-2, WCS-4, and e-POI Subracks and Power Supply Unit Installation Guide*, CommScope Document Number M0201ABK. This release of the manual

- corrects the Summary Alarm voltage and current maximum values previously listed in the guide for the Alarm Connector. The correct maximum values supported are 0.8 A and 30 Vdc. The 125 Vac value previously listed is not supported. Also the image of the alarm connector was replaced to show the actual connector shipped with the unit; see "WCS Subrack Alarm Connector" on page 15.
- adds the minimum ERA software versions required to support new RFD Card PN 7633229-03, which has been updated with new subcomponents to prevent material delays or obsolescence.
- adds the minimum ERA software versions required to support new RFD Card PN 7633229-05 for APs that support TETRA services; see "RF Donor (RFD) Card and RF Donor (RFD) HB Card" on page 23.
- added the maximum wire size and minimum recommended wire size for the -48Vdc WCS subrack's DC power entry connector; see"Connect the -48Vdc WCS Rear-panel Cables" on page 54.
- removed note referring to a discontinued CDD Card configuration guide because the CDD information is contained in this guide.

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
AP	Access Point
AUT	Auxiliary Transport
AUX	Auxiliary
AXT	Alien Crosstalk
BDA	Bi-Directional Amplifier
BTS	Base Transceiver Station
C	Celsius
CAN	Central Area Node
CAP H	Carrier Access Point, High Power
CAP L	Carrier Access Point, Low Power
CAP M	Carrier Access Point, Medium Power
Cat	Category
CAT	Copper Transport
CMS	CommScope Mobility Solutions
dB	Decibel
dBc	Decibels (referenced to the carrier)
dBm	Decibel-milliwatts
DC	Direct Current
EFTA	European Free Trade Association
EMC	Electromagnetic Compatibility
EMEA	Europe, Middle East, Africa
EU	European Union
F	Fahrenheit
FCC	Federal Communications Commission
Gb	Gigabyte
Gbps	Gigabits per second (billions of bits per second)
GHz	Gigahertz
IFC	Interface Card
ISDE	Innovation, Sciences et Développement économique Canada
ISED	Innovation, Science and Economic Development Canada
kg	Kilogram
LCD	Liquid-Crystal Display
LED	Light Emitting Diode
Mbps	Megabits per second (millions of bits per second)
MHz	Megahertz
mm	Millimeter
MMF	Multi-Mode Fiber
OPT	Optical Transport
PN	Part Number
PoE	Power over Ethernet
POI	Point of Interface
PSU	Power Supply Unit
RAN	Regional-Area Network
RF	Radio Frequency
RFD	RF Donor
RTN	Return
RU	Rack Unit
SFP	Small Form-Factor Pluggable
SMF	Single-Mode Fiber
SNR	Signal-to-Noise Ratio
STP	Shielded -Twisted Pair
SUI	System User Inter-face
TEN	Transport Expansion Node
UAP	Universal Access Point
UTP	Unshielded Twisted Pair
V/m	Volt per meter
Vac	Voltage in Alternating Current
Vdc	Voltage in Direct Current
W	Watts

CommScope Part Numbers

The CommScope ERA part numbers listed in this installation guide are in the format of *nnnnnnn-**xx***, where the "***-xx***" suffix indicates the latest release. Contact your local CommScope sales representative for the current release part number.

Table 2. *CommScope Rack Part Numbers*

CommScope Part Number	Description
7844068-xx	-48Vdc WCS-4 subrack (external -48 Vdc power supply)
7635442-xx	WCS-4 subrack (powered by ERA AC to DC PSU subrack and power modules)
7844067-xx	-48Vdc WCS-2 subrack (external -48 Vdc power supply)
7635443-xx	WCS-2 subrack (powered by ERA AC to DC PSU subrack and power modules)
7676311-xx	e-POI subrack
7693531-xx	PSU subrack
7152435	Accessory kit, includes 4 M6 screws and 4 cage nuts

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. 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, CAP MX, and the Fiber CAP L. When information pertains to a specific AP type, that AP will be identified.

WCS-2 AND WCS-4 SUBRACK OVERVIEW

The following sections provide information on the WCS-4 and WCS-2 Subracks, their Cards, Fan Trays and Filter Modules.

For information on power consumption of ERA system components, refer to the *ERA Solution Ordering Guide*.

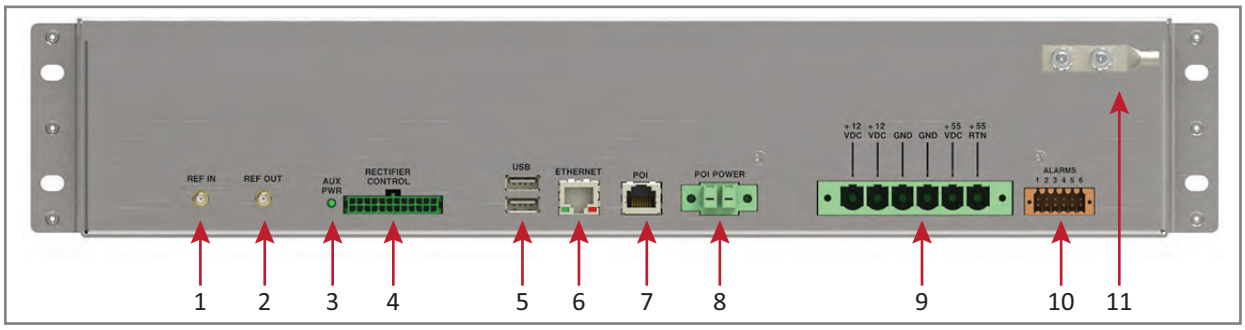
WCS-2 and WCS-4 Subracks

The following sections provide information on the WCS-4 and WCS-2 Subracks (Figure 1). How Cards are installed in the WCS-4 or WCS-2 Subrack, combined how the Subrack is configured in the ERA GUI determines whether the Subrack is a CAN, WIN, or TEN.

- The **WCS-4 (PN 7635442-xx)** is four Rack Units (RUs) high and is typically used as a CAN or a WIN but can also serve as a TEN. It is powered by the ERA AC to DC PSU subrack and power modules and can provide Power over CAT6A to UAPs and Copper CAP Ls.
- The **-48Vdc WCS-4 (7844068-xx)** is four Rack Units (RUs) high and is typically used as a CAN or a WIN but can also serve as a TEN. It is powered by an external -48 Vdc power supply. It is not capable of supplying Power over CAT6A to UAPs or Copper CAP Ls.
- The **WCS-2 (PN 7635443-xx)** is two RUs high, and is typically used as a TEN, but can also serve as a CAN or a WIN. It is powered by the ERA AC to DC PSU subrack and power modules and can provide Power over CAT6A to UAPs and Copper CAP Ls.
- The **-48Vdc WCS-2 (7844067-xx)** is two RUs high, and is typically used as a TEN, but can also serve as a CAN or a WIN. It is powered by an external -48 Vdc power supply. It is not capable of supplying Power over CAT6A to UAPs or Copper CAP Ls.
- The CAN is the server-level control and primary signal distribution within an ERA system.
- A TEN is a secondary distribution point that connects to a CAN using Multi-Mode or Single-Mode fiber.
- An ERA system supports one CAN, and the CAN can support up to 32 TENs in a one TEN to one CAN configuration. However, if you have two or more (up to four) fiber links between a particular TEN and its CAN, this reduces the number of TENs that can connect to a CAN. For example, if you have two fiber links for each TEN, then 16 TENs would be the maximum number of TENs that could be connected to the CAN.
- The WCS-4 and WCS-2 subracks and all subrack cards have an operating temperature range of +5 to +40 °C (+41 to +104 °F).

Figure 1. WCS-2 and WCS-4 Subracks

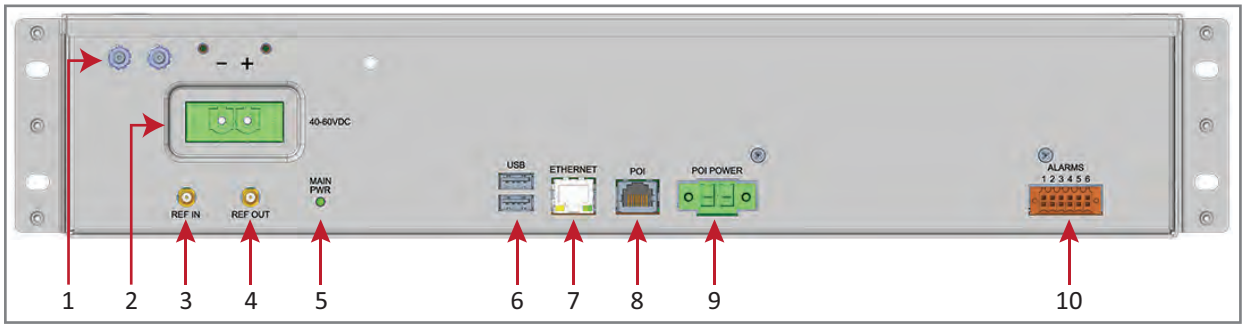
WCS Subrack Back Panel Connectors



WCS Subrack Back Panel Connectors		
Ref. #	**Component**	**Description**
1	REF IN connector	Reserved for use by CommScope.
2	REF OUT connector	Reserved for use by CommScope.
4	Rectifier Control connector	24-pin connector for PSU communication
5	USB connectors	Reserved for use by CommScope.
6	Ethernet connector	Connects to local laptop using http://192.168.1.1/
7	POI connector	Communications port that connects to the optional e-POI Subrack.
8	POI Power connector	12 Vdc to e-POI Subrack
9	Power connector	Inputs to the 12 Vdc Rectifier Module and the 57 Vdc Rectifier Module
10	Alarm connector	Dry contact input and output; see "-48Vdc WCS Subrack Back Panel Connectors" on page 14.
11	Ground stud	Ground (earth) connection to the Power Supply Subrack
WCS Subrack Back Panel LED		
Ref #	**LED**	**LED Color/Status**
3	AUX PWR	• On/Green when the Rectifier Control Cable is installed, and the PSU is powered on. • Off when either the PSU is off, or the PSU is on, but the control cable is unplugged.

To prevent SEVERE damage to the WCS Subrack, confirm that all AC power cables are unplugged from the rear of the PSU BEFORE plugging/unplugging the Rectifier Control cable into/from the WCS Subrack.

-48Vdc WCS Subrack Back Panel Connectors



-48Vdc WCS Subrack Back Panel Connectors		
Ref. #	**Component**	**Description**
1	Ground Studs	Ground (earth) connection to the Power Supply Subrack
2	DC Power Connector	-40 to -60 Vdc input connector for connection to -48 Vdc power supply
3	REF IN connector	Reserved for use by CommScope.
4	REF OUT connector	Reserved for use by CommScope.
5	Main Power LED	On/Green when -48 Vdc power supply is connected and powered on.
6	USB Connectors	Reserved for use by CommScope.
7	Ethernet connector	Connects to local laptop using http://192.168.1.1/
8	POI connector	Communications port that connects to the optional e-POI Subrack.
9	POI Power	Provides 12 Vdc to optional e-POI Subrack
10	Alarm connector	Dry contact input and output; see "-48Vdc WCS Subrack Back Panel Connectors" on page 14.

The -48Vdc DC power entry connector is hot plug/unplug tolerant and has reverse polarity protection.

WCS Subrack Alarm Connector

External alarms are connected to the WCS using a connector inserted into the alarms port located on the rear of the WCS.

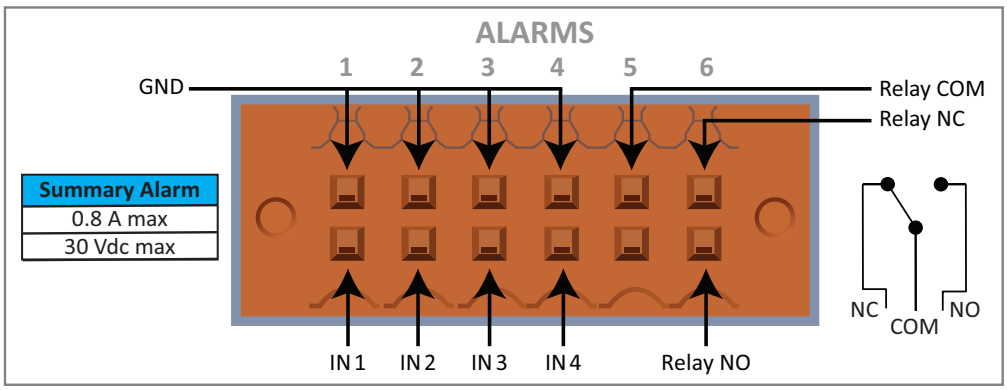
The alarm connector on the WCS-4 and WCS-2 Subracks has the following inputs:

- four opto-isolated (chassis-ground referenced) dry contact inputs to monitor external devices. The alarm state is activated when the alarm input is pulled to ground. The alarm input is referenced to chassis ground, and the alarm ground is tied to the chassis ground.
- a Summary Alarm Relay that energizes when specific alarms are triggered-the thresholds, shown in the following graphic. The Summary Alarm state changes whenever there is an alarm on the system and returns to its default state when there are no alarms. Depending on which contacts you use the default state is either Normally Closed or Normally Open.

The alarm connector on the WCS-4 and WCS-2 Subracks has the following output:

- The external alarm output is activated at the CAN whenever there is a critical or major alarm in the system. The alarm output is provided by a relay. Both normally open and normally closed terminals are available.

Included in the box, the mating connector for the Alarm connector (header) is Weidmuller part 1748040000.



The following table shows the alarm connector details for the system parameters.

Conductor connection system	Tension clamp connection
Outgoing direction of conductor	180°
Pitch	3.5 mm
Pitch in inch	0.138 inch
No. of poles	12
No. of rows	2
Stripping length	7 mm
L1 in mm	17.5 mm
L1 in inch	0.689 inch
Electric shock protection to DIN VDE 0470	IP 20
Electric shock protection to DIN VDE 0470	Safe from finger touch

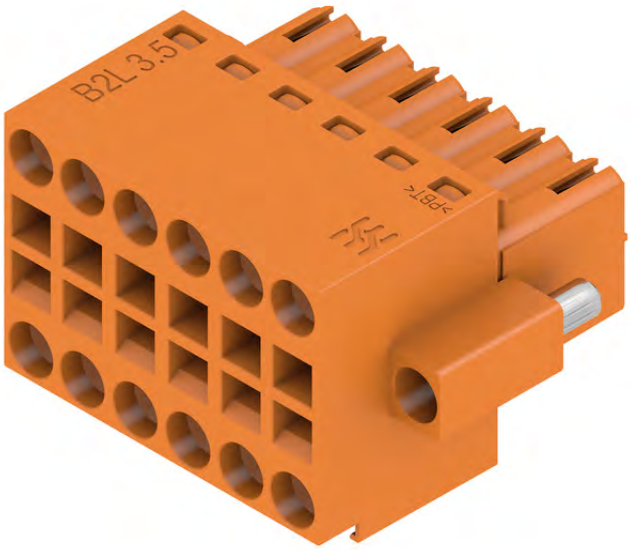
The following table shows the alarm connector details for the connectable conductors.

Connectable conductors	
Clamping range, max.	1 mm²
AWG, min.	28
AWG, max.	18
Solid, min. H05(07) V-U	0.2 mm²
Solid, max. H05(07) V-U	1 mm²
Flexible, min. H05(07) V-K	0.2 mm²
Flexible, max. H05(07) V-K	1 mm²
With wire end ferrule, acc. to DIN 46 228/1, min.	0.13 mm²
With wire end ferrule, acc. to DIN 46 228/1, max.	0.34 mm²
w. plastic collar ferrule, DIN 46228 pt 4, min.	0.13 mm²
w. plastic collar ferrule, DIN 46228 pt 4, max.	0.34 mm²

Before inserting the external alarms connector into the WCS alarms port, insert the conductors carrying the alarm signals into the alarm connector (circular holes). The alarm connector provides tension clamp connections in the mating connector. The wires carrying the alarm signals should be stripped back by 7mm and then inserted into the alarm connector. The alarm wires can range from sizes 18 AWG – 28 AWG, (0.2 mm² to 1 mm2).

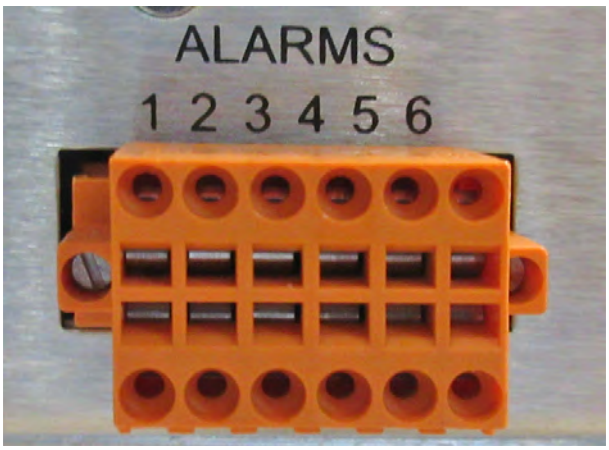
Typically, the alarm wires are connected to the mating connector first, then the mating connector is plugged into the alarm connector on the back panel of the WCS and screwed into place.

Mating alarm connector



Alarm port on WCS back panel

Mating connector inserted into WCS alarm port



This connector should have wires attached, so it matches the recommendation of inserting the wires into the connector first.

WCS Subrack Slot and Card Assignments

The following subsections detail which cards can be installed in which Subrack slots, dependent on the function assigned to the Subrack in the GUI.

If wrong type of card is plugged into a slot, the following will occur:

- The following alarm will be raised: **General Slot Alarm: Module plugged into wrong slot**. If you clear this alarm by clicking the **X** in the row that corresponds to it on the **Active Alarms** page without removing the card, the slot will remain disabled without an alarm, and the alarm will reappear after the next reboot.
- The Slot in which the incorrect card was installed will be disabled.

If you remove the wrong card from a slot, the following will occur:

- The Slot in which the incorrect card was removed will be enabled.
- The following alarm will be raised: **General Alarm: No card detected in slot**.

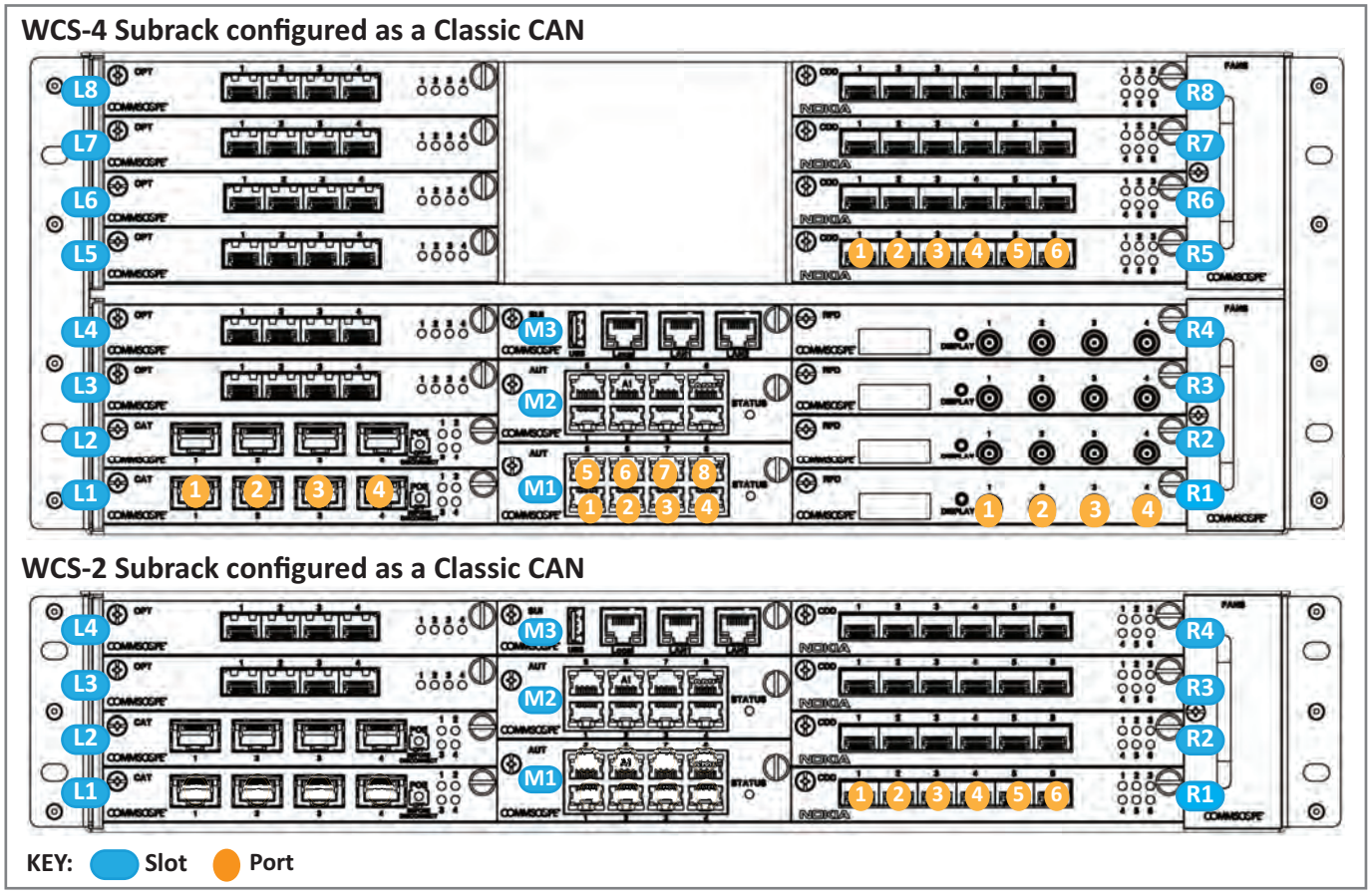
When an appropriate card is inserted into the slot from which the incorrect card was removed, the software will detect the card and clear the **General Slot Alarm**. If you don't insert a card into the slot, you must manually remove the alarm by clicking the **X** in the row that corresponds to that alarm on the **Active Alarms** page.

The following alarm will occur whenever a card is removed from its slot: General Alarm: No card detected in slot.

To maximize airflow through the PSU chassis, blank filler panels must be installed in all empty slots. If additional blank filler panels are required, order the ERA Power Supply Filler Panel (PN 7694140) from CommScope. For ordering information, contact your distributer, or customer service, or their sales account manager.

Slot and Card Assignment Rules for Classic CANs

Figure 2 lists the card installation rules for a WCS-4 or WCS-2 Subrack configured in the GUI to function as a Classic CAN, in which case the CAN will *not* be connected to a WIN.



Card Slot	Supported Card Type
L1 - L4 [1]	Install either a CAT Card or an OPT Card, as follows: • Install an OPT Card to connect to a TEN, CAP H, CAP M, or Fiber CAP L. [2] • Install a CAT Card to connect to a UAP or Copper CAP L.
L5 - L8 [1]	Install OPT Cards to connect additional TENs.
M1 - M2	Install AUT Card(s) as required for a 1 Gbps pass-through connection between the Classic CAN and the APs that are directly connected to the CAN.
M3	Install a SUI Card for network connectivity.
R1 - R8	Install either an RFD Card or a CDD Card, as follows: • Install an RFD Card to communicate with a BTS. • Install a CDD Card to communicate with a BBU.

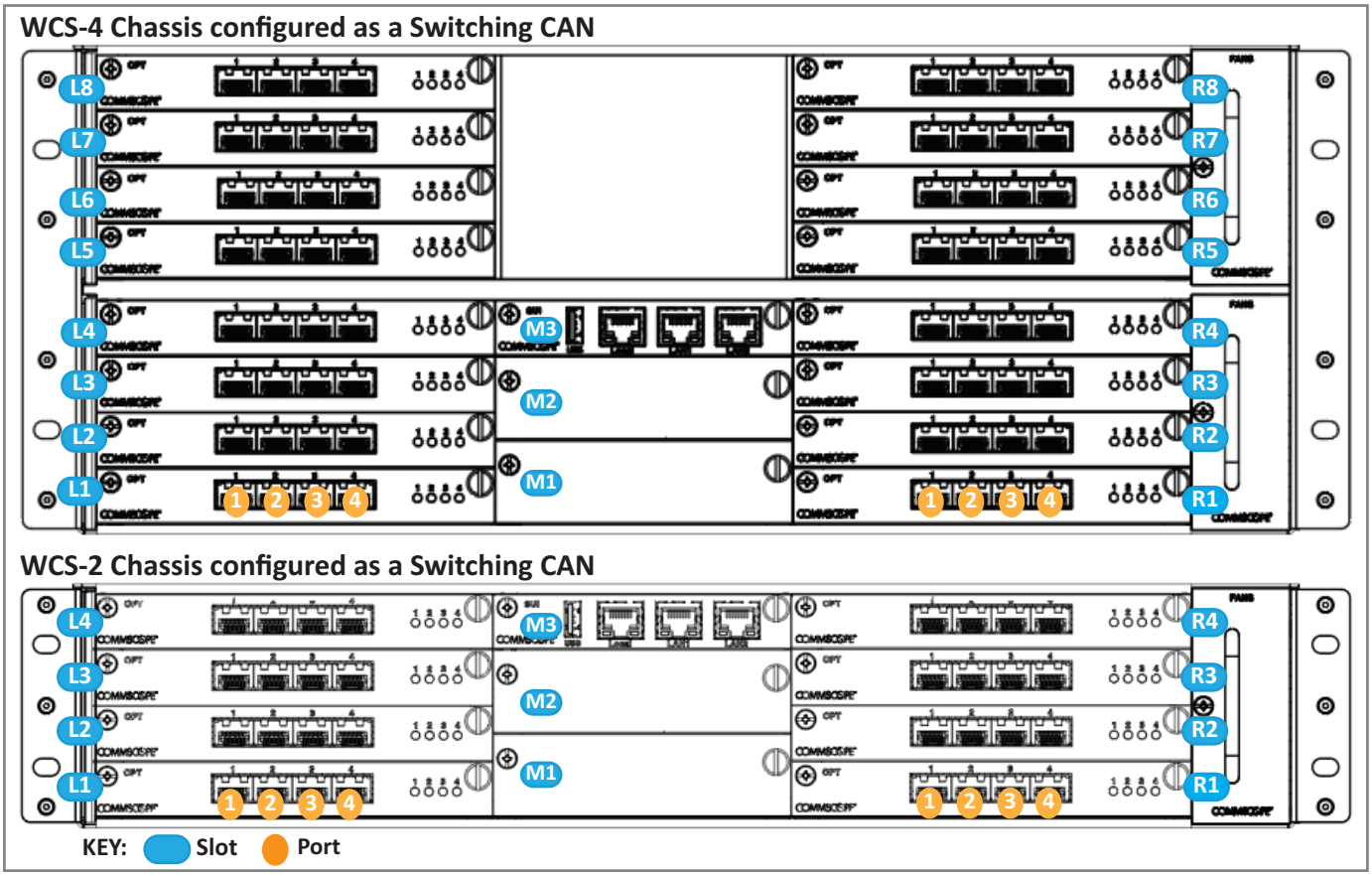
Figure 2. Supported Slot and Card Installations for Classic CANs

For information on how to configure the WCS Subrack as a Classic CAN in the ERA software, refer to the ERA configuration guide for Software Version 2.5 or later; see "Accessing ERA Series User Documentation" on page 83.

-48Vdc WCS configured as Classic CANs or TENs do not provide Power over CAT6A for Copper CAP Ls or UAPs. The standard WCS subracks using the 57V rectifier modules in the PSU subrack are required.

Slot and Card Assignment Rules for Switching CANs

Figure 3 lists the card installation rules for a WCS-4 or WCS-2 Subrack configured in the GUI to function as a Switching CAN, in which case the CAN *will* be connected to a WIN.



Card Slot	Supported Card Type
L1 - L8	Install an OPT Card to connect to a TEN.
M1 - M2	Not supported/used.
M3	Install a SUI Card for network connectivity.
R1 - R8	Install an OPT Card to connect to a WIN.

Figure 3. Supported Slot and Card Installations for Switching CANs

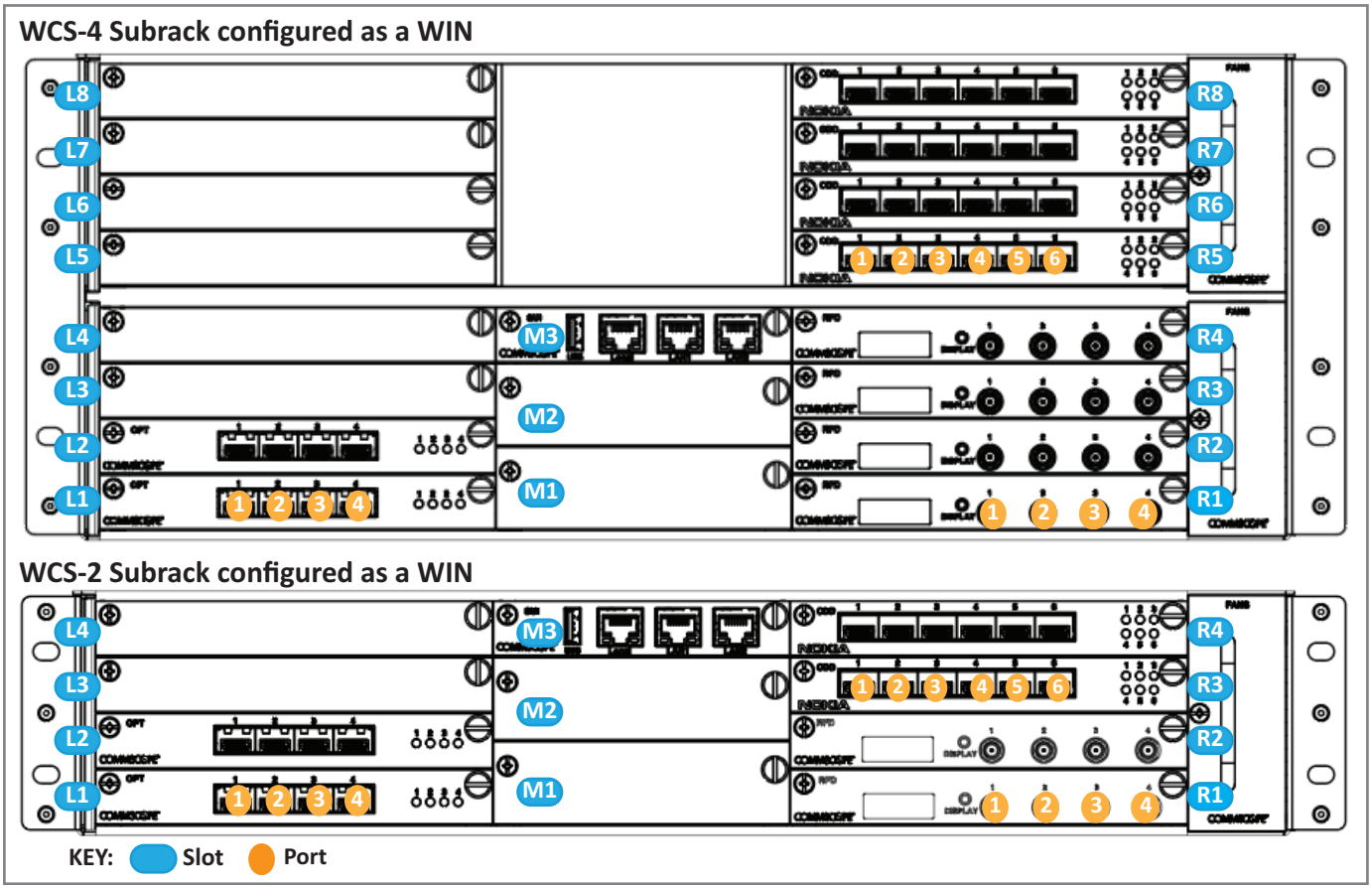
The following additional rules apply to a Switching CAN.

- You cannot directly connect APs to a Switching CAN; connect the APs to a TEN that then connects to the Switching CAN.
- You cannot install a CAT, AUT, RFD, or CDD Card in a Switching CAN.

For information on how to configure the WCS Subrack as a Switching CAN in the ERA software, refer to the ERA configuration guide for Software Version 2.5 or later; see "Accessing ERA Series User Documentation" on page 83.

Slot and Card Assignment Rules for WINs

Figure 4 lists the card installation rules for a WCS-4 or WCS-2 Subrack configured in the GUI to function as a WIN.



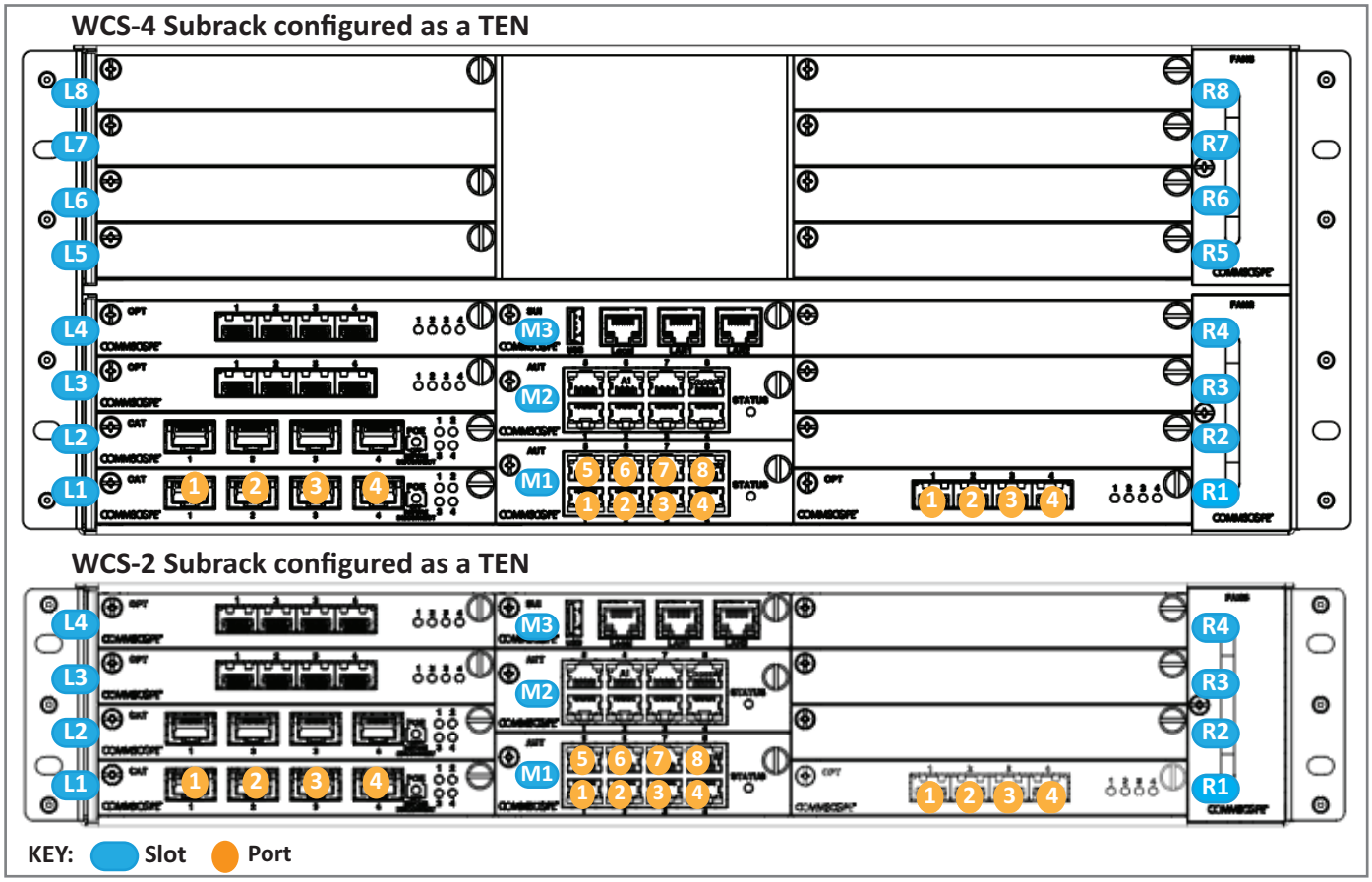
Card Slot	Supported Card Type
L1 - L2	Install an OPT Card, as described below. • Use Port L1.1 to connect to the Switching CAN. • Use Ports L1.2 through L2.4 for additional WIN-to-CAN links to increase the WIN bandwidth to support multiple operators and sectors.
L3 - L8	Not supported/used.
M1 - M2	Not supported/used.
M3	Install a SUI Card for Ethernet access to the WIN via the SUI Card's Local port if needed. It is not possible to assign a network IP address to a port when the SUI Card is installed in a WIN.
R1 - R8	Install either an RFD Card to communicate with a BTS, or a CDD Card to communicate with a BBU.

Figure 4. Supported Slot and Card Installations for WINs

For information on how to configure the WCS Subrack as a WIN in the ERA software, refer to the ERA configuration guide for Software Version 2.5 or later; see "Accessing ERA Series User Documentation" on page 83.

Slot and Card Assignment Rules for TENs

Figure 5 lists the card installation rules for a WCS-4 or WCS-2 Subrack configured in the GUI to function as a TEN.



Card Slot	Supported Card Type
L1 - L4	Install either a CAT Card or an OPT Card, as follows: • Install an OPT Card to connect to a CAP H, CAP M, or Fiber CAP L. • Install a CAT Card to connect to a UAP or Copper CAP L. **(Note: -48Vdc WCS subracks do not provide Power over CAT6A for UAPs or Copper CAP Ls. The standard WCS subracks using the 57V rectifier modules in the PSU subrack are required.)**
L5 - L8	Not supported/used.
M1 - M2	Install AUT Card(s) as required for a 1 Gbps pass-through connection between the TEN and the APs that are directly connected to the TEN.
M3	Install a SUI Card for Ethernet access to the TEN via the SUI Card's Local port if needed. It is not possible to assign a network IP address to a port when the SUI Card is installed in a TEN.
R1	Install an OPT Card and use • Port R1.1 to connect to the CAN • Ports R1.2 through R1.4 for additional TEN-to-CAN links.
R2 - R8	Not supported/used. (TENs do not support or use RFD or CDD Cards.)

Figure 5. Supported Slot and Card Installations for TENs

For information on how to configure the WCS Subrack as a TEN in the ERA software or allowing the CAN to configure the Subrack as a TEN, refer to the ERA configuration guide for Software Version 2.5 or later; see "Accessing ERA Series User Documentation" on page 83.

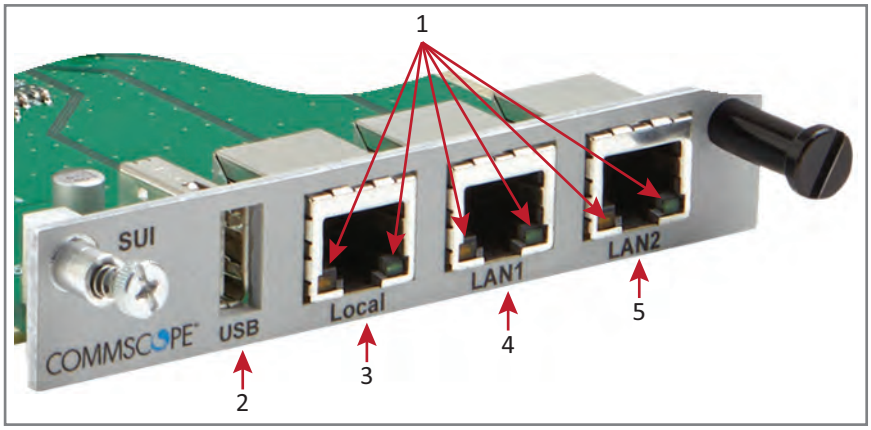
WCS Subrack Cards

The following sections describe the cards that can be installed in a WCS Subrack.

System User Interface (SUI) Card

The SUI Card (PN 7642125-xx) provides local and LAN Ethernet connections and a USB port. You install only one SUI Card in a Subrack, and it must always be installed in Slot M3.

The following graphic and table identify the SUI Card LEDs and connectors.



SIU Card LEDs			
Ref #	**LED**	**LED Color**	**Description**
1	Right	• Off	• No link.
		• Green	• Link established with device to which the port is connected.
		• Flashing green	• Activity is occurring on that port.
	Left	• Off	• 10 Mb connection established.
		• Yellow	• 100 Mb connection established.
SIU Card Connectors			
Ref #	**Component**	**Device**	**Function**
2	USB port	2.0 USB	Reserved for use by CommScope.
3	Local port	RJ-45 jack (female)	Connects to a local laptop; DHCP or specified fixed IP address.
4	LAN1 port	RJ-45 jack (female)	Reserved for future use.
5	LAN2 port	RJ-45 jack (female)	Connects to a LAN or modem; DHCP or specified fixed IP address.

RF Donor (RFD) Card and RF Donor (RFD) HB Card

The RFD Card (PN 7633229-xx) or RFD HB Card (PN 7841277-00) are the interfaces for RF signals between the CAN or WIN and the RF source, such as the BTS, eNodeB, BDA, or e-POI. (See table for Table 1 on page 5 for RFD Card and RFD HB Card deployment information.) You can only install RFD Cards and RFD HB Cards in a Subrack that is configured as a Classic CAN or WIN as follows:

- WCS-2: Slots R1 - R4; you can install up to four RFD Cards in a WCS-2.
- WCS-4: Slots R1 - R8; you can install up to eight RFD Cards in a WCS-4.

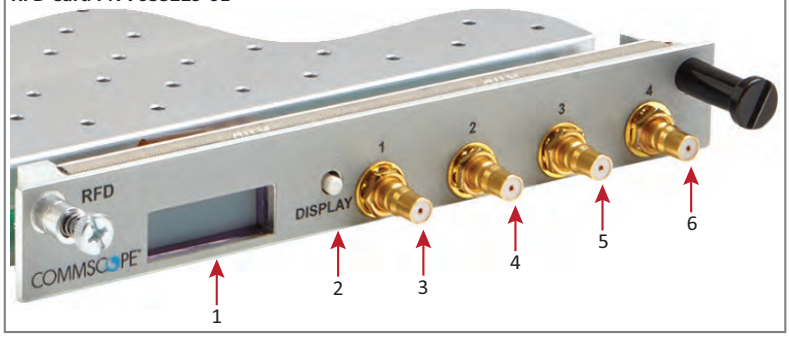
CAP M and CAP H APs require the use of RFD Card PN 7633229-01 or higher, or an RFD HB Card PN 7841277-00. RFD Card PN 7633229-03, which has been updated with new subcomponents to prevent material delays or obsolescence, requires ERA SW V2.8.0.400 or SW V2.8.2 or higher.

APs that support TETRA services require RFD Card PN 763229-05. SW V2.8.0.400 or V2.8.2 or higher is required to use the 7633229-05 card.

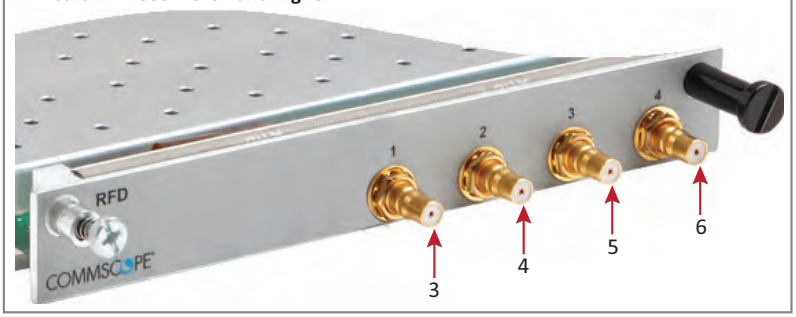
RFD Card PN 7841277-00 is required for operating at frequencies between 2700 MHz to 4300 MHz and operates as low as 1700 MHz. Requires ERA SW V3.0.0 or higher.

The following graphic and table identify the RFD Card components.

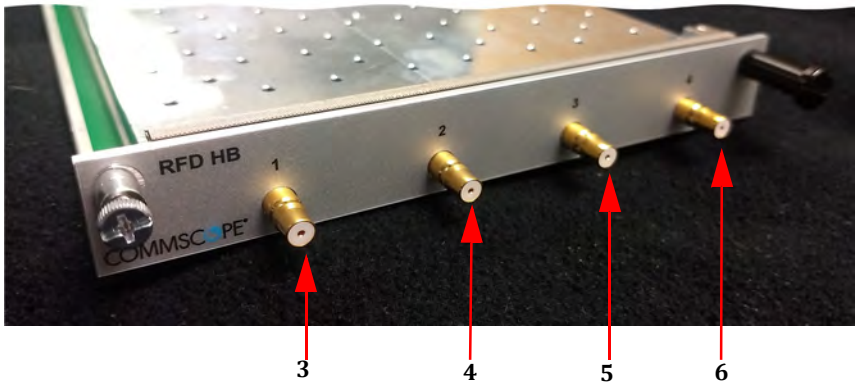
RFD Card PN 7633229-01



RFD Card PN 7633229-02 and higher



RFD HB Card PN 7841277-00



Ref #	Component	Device	Function
1	Display [1]	LCD	• The first line of the display shows the port number and band. • The second line of the display shows the service provider or **multiple** if multiple providers are connected to the port.
2	Display button [2]	Push button	Push once to turn on the display backlight, and then push four more times to cycle through the four ports.

3	Port 1 [3, 4, 5]	Female QMA connector	Connect to the UL/DL ports of the RF Source. If 30 dB of attenuation is required, can connect to UL/DL Ports 1 - 4 on an e-POI Module in an optional e-POI Subrack:
			• RF Paths: duplex and simplex supported
			• Frequency
			  • RFD Card PN 7633229-0x = 380 MHz - 2700 MHz
			  • RFD HB Card PN 7841277-00 = 2700 MHz - 4300 MHz
			  Note that this card will not operate below 1700 MHz.

4	Port 2 [3, 4, 5]		
5	Port 3 [3, 4, 5]		
6	Port 4 [3, 4, 5]		

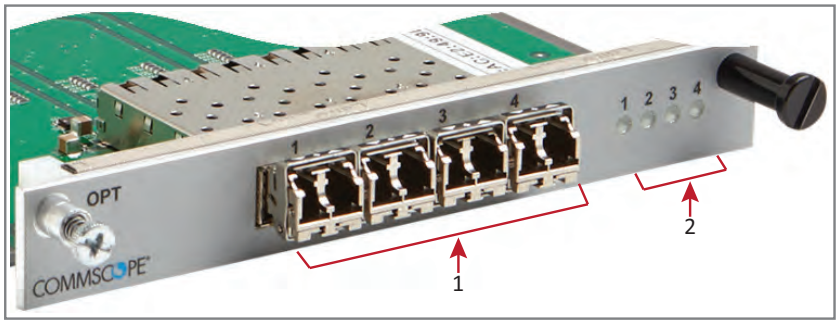
1 RFD Card PN 7633229-02 and higher, and RFD HB Card PN 7841277-00 do not include an LCD display.
2 RFD Card PN 7633229-02 and higher do not include a Display button.
3 Path 1 and Path 2 of an LTE MIMO 2x2 eNodeB must be connected to either Ports 1 and 2 of the RFD Card as a pair, or to Ports 3 and 4 as a pair.
4 All four paths (AP0, AP1, AP2, AP4) of an LTE MIMO 4x4 eNodeB must be connected to the duplex ports of a single RFD Card. Simplex is not supported for MIMO 4x4.
5 Simplex ports typically can be any two ports on the same RFD Card, except for simplex ports supporting LTE MIMO 2x2 must be configured as follows: pair Port 1 DL with Port 3 UL, and pair Port 2 DL with Port 4 UL.

Optical Transport (OPT) Card

The OPT Card (PN 7642123-xx) provides a 10 Gbps fiber connection between CANs, TENs, and WINs; and between CANs and TENs and Fiber APs. If a CAN requires that Slots L1 - L8 all have an OPT Card installed to support a full complement of TENs, you must use the TENs to connect the APs. CommScope R&D has updated the (7642123-00) OPT Card with new subcomponents to prevent material delays. The new (7642123-01) OPT Card has the same the form, fit, function, and performance as the previous card. Both versions of the card can work in the same system, but the 7642123-01 card requires ERA system software V2.8.0 or higher.

- For rules on where an OPT Card is installed in a WCS Subrack, see "WCS Subrack Slot and Card Assignments" on page 17.
- For rules that apply to OPT Cards and cascading Fiber CAP Ls, CAP Ms, or CAP Hs, refer to the Fiber CAP Ls, CAP M, and CAP H installation guides; see "Accessing ERA Series User Documentation" on page 83.

The following graphic and table identify the OPT Card connectors and LED.



OPT Card SFP Connectors			
Ref #	**Component**	**Device**	**Function**
1	1 - 4	10 Gbps SFP port for Multi- or Single-Mode fiber	Support for up to four SFP+ Modules; each SFP port provides high-speed fiber connections between a CAN and a TEN, a CAN and a WIN, a TEN and a Fiber AP, or a Classic CAN and a fiber AP.
OPT Card SFP Port LEDs [1]			
Ref #	**LED**	**LED Color**	**Description**
2	1 - 4	• Off	• The OPT Card has no power, or the OPT Card is plugged into the wrong Subrack slot (see "WCS Subrack Slot and Card Assignments" on page 17).
		• Green	• Optical link is established with device to which the port is connected.
		• Yellow	• The OPT Card is powered and initialized, but the link with the corresponding SFP port is not established. Problems that can activate the yellow LED include but are not limited to the following: an issue with the physical layer, dirty fiber, micro/macro bends, bad splice/terminations, excessive optical loss.
1 SFP Port LED numbers correspond with the SFP port numbers.			

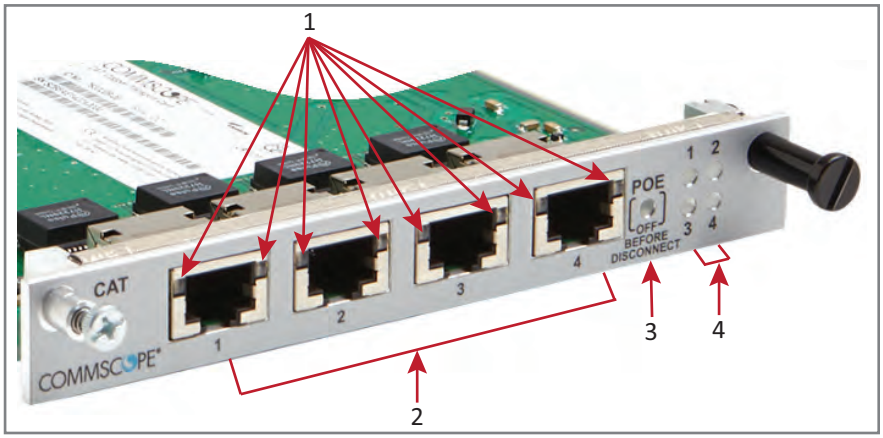
Copper Transport (CAT) Card

The CAT Card (PN 7633228-xx) provides power and 10 Gbps data over Cat6A cables to Access Points (APs).

- You install a CAT Card in Slots L1 - L4 of the Subrack.; see the rules listed in "WCS Subrack Slot and Card Assignments" on page 17.
- For rules that apply to CAT Cards and cascading UAPs or Copper CAP Ls, refer to the UAP and Copper CAP L installation guides; see "Accessing ERA Series User Documentation" on page 83.
- For rules that apply when there is a mixture of AP types in a system and all the APs are powered over Cat6A cabling, refer to the UAP and Copper CAP L installation guides; see "Accessing ERA Series User Documentation" on page 83.

At least one 57 Vdc Power Rectifier Module must be installed in the Power Supply Subrack to use a CAT Card; please see "57 Vdc Power Rectifier LEDS" on page 36. Note: -48 Vdc WCS subracks (PNs 7844067-xx, 7844068-xx) do not supply Power over CAT6A to UAPs or Copper CAP L APs.

The following graphic and table identify the CAT Card LEDs and connectors.

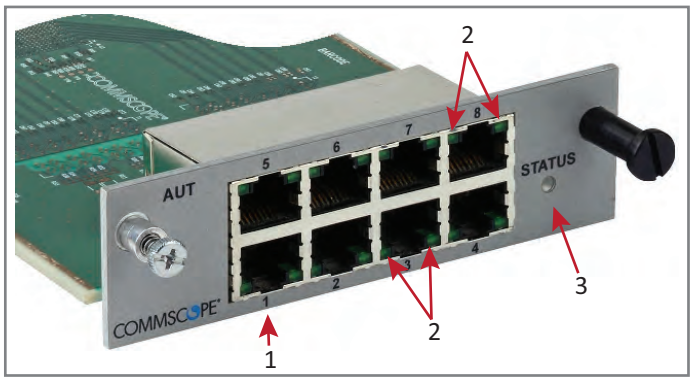


CAT Card LEDs			
Ref #	**LED**	**LED Color**	**Description**
1	RJ45 1 - 4	• Off	• No link between the CAT Card and the AP to which the port is connected. Loss of link may be caused by and is not limited to any of the following: cable length is >100m, bad terminations, interference, device not connected, bad coaxial cable, hardware problem.
		• Green	• Indicates that a 10G link is established.
		• Yellow	• An unsupported device is connected.
3	POE	• Off	• 57 Vdc power is not available.
		• Green	• CAT Card is installed in WCS Subrack Slot L1, L2, L3, or L4 and 57 Vdc power is available.
4	Port	• Off	• Always off, currently not used for any status.
CAT Card Connectors			
Ref #	**Component**	**Device**	**Function**
2	Port 1 - 4	RJ45, Cat6A	Connects to APs over Cat6A cables.

Auxiliary Unit Transport (AUT) Card

The AUT Card (PN 7642132-xx) provides a 1 Gbps pass-through connection between Classic CANs and TENs and APs for WiFi, IP cameras, or other gigabit Ethernet devices. Switching CANs do not support AUT Cards. (For information on the internal mapping between CAT Cards and AUT Cards, and for rules pertaining to connecting an AUT Card, see "Connect the AUT Cards" on page 73.)

The following graphic and table identify the AUT Card LEDs and connectors.



AUT Card LEDs			
Ref #	**LED**	**LED Color**	**Description**
2	Left LED on RJ45 Ports 1 - 8	• Off	• No activity on that port.
		• Flashing green	• Activity on that port.
	Right LED on RJ45 Ports 1 - 8	• Off	• Port is transmitting 1 Gbps.
		• Green	• Port is transmitting 100 Mbps or is not connected.
3	STATUS	• Off	• Error on the AUT Card, or AUT Card is not receiving power.
		• Green	• AUT Card functioning as expected.
		• Red	• AUT Card is experiencing an error.

AUT Card Connectors			
Ref #	**Component**	**Device**	**Function**
1	Ports 1 - 8	RJ45 ports	Provides a 1Gbs pass-through connection from a network connection on the AUT card to a WiFi, IP camera, or other 1Gbps Ethernet device connected to the AP paired with the AUT port.

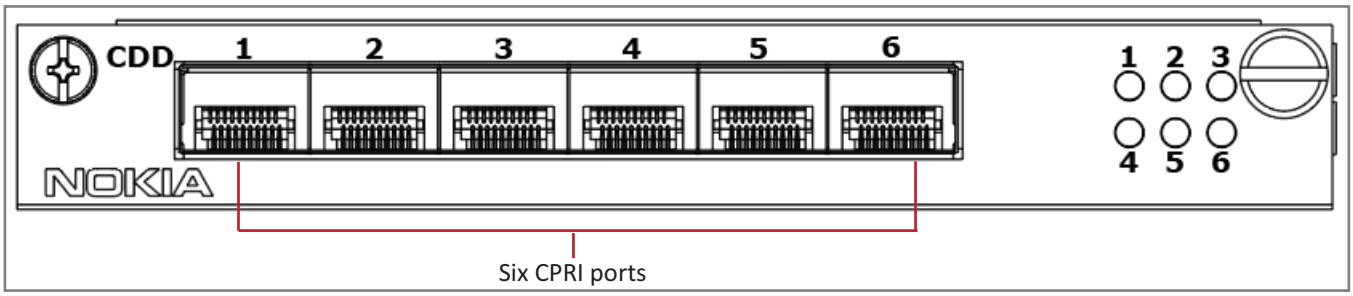
CPRI Digital Donor Card

A CPRI Digital Donor (CDD) Card installs into a Classic CAN or WIN to provide a digital CPRI interface between a Nokia BBU and the WCS Subrack, and to distribute CPRI signals to connected APs.

CDD Cards natively support LTE configurations. Please check the ERA version to determine if the software supports DSS and 5GNR configurations.

CDD Card CPRI Ports

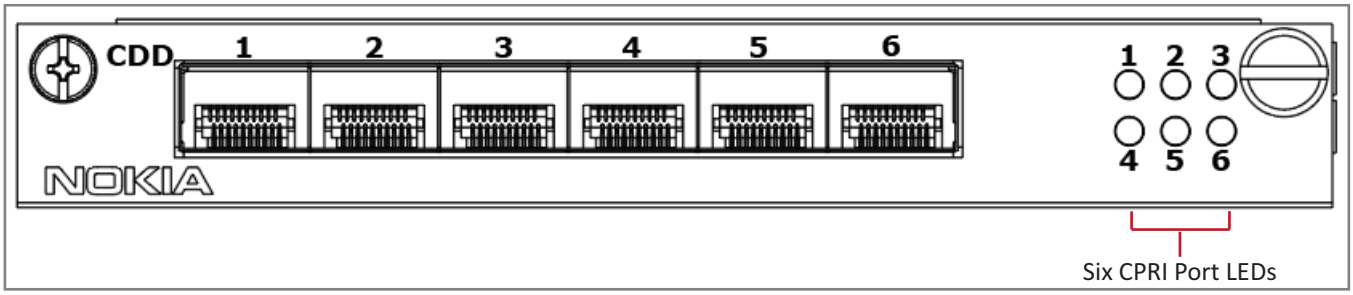
Each CDD Card has six SFP ports, as shown below. Each port provides one CPRI link between the BBU and the CDD Card. While MSA compliant, the CPRI ports are designed for a specific line rate offered by Nokia. Maximum transceiver power per CPRI Port is 2W.



Do not use CommScope ERA SFP+ Modules in the CDD Card. Contact your local Nokia sales representative to obtain the required number of SFP Modules for this installation.

CDD Card CPRI Port LEDs

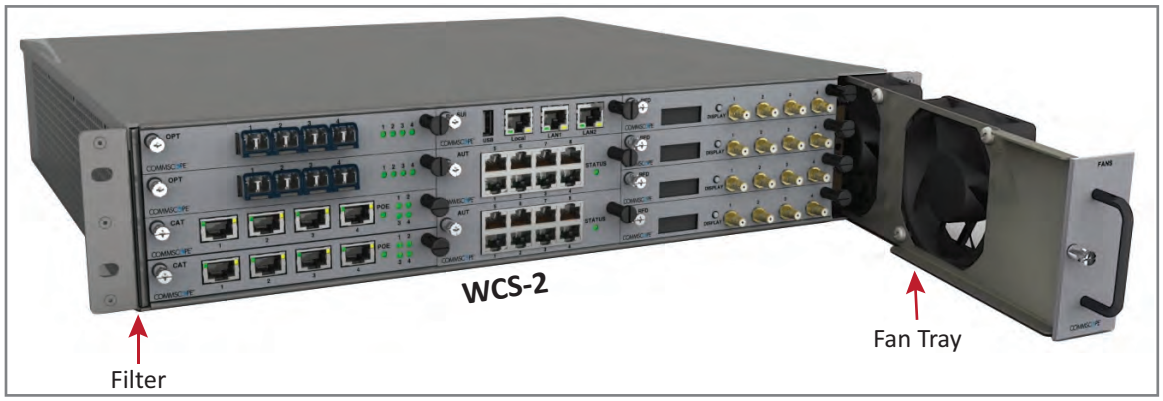
A CDD Card has six LEDs that correspond to its six CPRI ports, as shown in the following graphic and table.



LED Color	Affected LEDs	State
Off	All six	No power to the CDD Card. If this state is not expected, do the following in the order presented: 1 Verify that the CAN is powered on (the CAN powers the CDD). 2 Verify that the CDD Card is enabled; the default setting is **Off** (disabled) and must be manually set to **On** (enabled). 3 Reseat the CDD Card in its slot or move it to another slot to make sure there is firm connectivity with the WCS Subrack.
Flashing Red	All six	Can be any of the following: • External Power Supply Failure—board power failure. • There is a boot error.
	CPRI port specific	• CPRI port is not communicating with the WCS/CAN.
Solid Red	All six	Can be any of the following: • CDD Card is receiving power, but its FPGA has not loaded. • CDD Card is in Bootloader mode and its RAM test failed.
	CPRI port specific	• An SFP Module is not present in the CPRI port, but the CDD Card is configured via the ERA software. Verify that there is an SFP Module installed and is firmly seated in the CPRI port.
Flashing Amber	All six	Firmware download is in process. Note that this process includes matching the CDD Card firmware to the ERA Software Version running on the CAN in which the CDD Card is being installed. If the firmware on the CDD Card is different from the CAN, it will take slightly longer to download the firmware to the CDD Card. Wait until the LEDs are solid amber before configuring the CDD Card.
Solid Amber	All six	Can be any of the following: • All firmware updates have been pushed to each port and the CDD Card is ready to be configured. • The port has been configured from the DAS side, but the BBU has not provided a carrier yet.
Flashing Green	CPRI port specific	The BBU has provided a carrier, but the Signal Set has not yet been created and linked to an AP.
Solid Green	CPRI port specific	Port is configured for a Carrier and the Signal Set is being distributed to an AP.

WCS Subrack Fan Trays and Filter Modules

The Fan Tray and Filter Modules cool the WCS Subrack and all its cards. Fan Trays (PN 7635468-xx) and Filter Modules (PN 7700691-xx) are factory installed in the WCS Subrack.



The following rules apply to their use:

- Filters are on the left side of the WCS chassis and Fan Trays are on the right side of the WCS chassis.
  - A WCS-2 requires one Fan Tray and one Filter.
  - A WCS-4 requires two Fan Trays and two Filters.
- Fan Tray(s) and Filter Module(s) must be installed for WCS operation, but they can be replaced without system interruption.

For information on how to maintain the Filter Modules, refer to "WCS Subrack Filter Module Maintenance" on page 78.

Cat6A Cables and Connectors

The rules listed below must be observed for all ERA installations that utilize Cat6A cabling when connecting UAPs or Copper CAP Ls.

- Plenum rated cable must be used wherever it is required by local electrical codes.
- Cat6A shielded-twisted pair (STP) is not required unless operating in a high RFI/EMI environment.
- An ERA system requires a minimum Signal-to-Noise Ratio (SNR) of 25 dB, and Alien Crosstalk (AXT) must not degrade SNR on any cable by more than 0.5dB.
- Cat6A cable wire size requirements are as follows:
  - 23 AWG Cat6A cable (minimum EIA/TIA standards) must be used between RJ-45 connector points
  - 24 AWG is the minimum wire size allowed for a Cat6A Patch Cord.
- CommScope strongly recommends using factory terminated and tested Cat6A Patch Cord.
- There can never be more than two RJ-45 connections in a Cat6A cable run, as described below and as shown in Figure 6. Minimizing these connections improves the link margin.
  - In a non-cascade, between the CAT Card and the AP, there can be one Cat6A Patch Cord at the start of a Cat6A cable run and a second Cat6A Patch Cord at the end of a Cat6A cable run.
  - In a cascade, between the Primary AP and the Secondary AP, there can be one Cat6A Patch Cord at the start of a Cat6A cable run and a second Cat6A Patch Cord at the end of a Cat6A cable run.

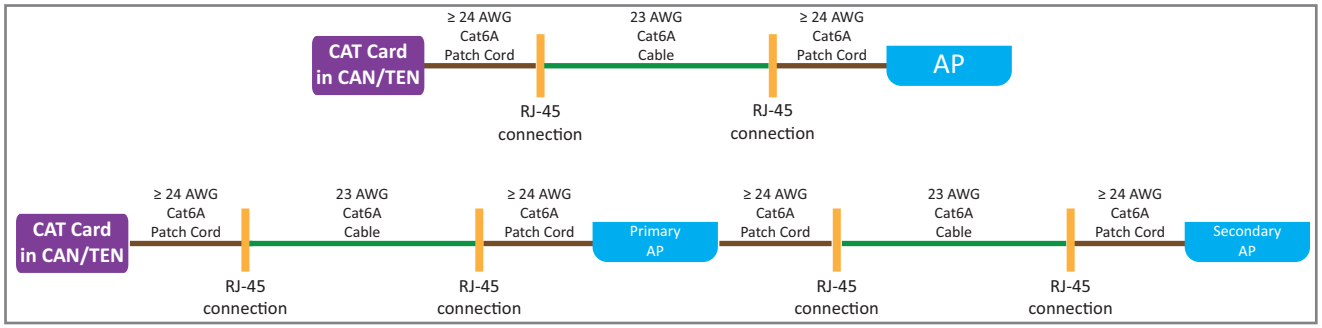


Figure 6. Maximum Number of RJ-45 Connections in Cable Runs

- Unshielded Cat6A (Category 6A U/UTP) twisted pair cable that meets ANSI/TIA-568-C.2, CENELEC EN 50173 series, and ISO/IEC 11801:2002 including its amendments 1 and 2, is suitable for use in an ERA system. The CommScope GigaSPEED X10D® 2091B ETL Verified Category 6A U/UTP Cable (760107201, 2091B BL 4/23 W1000) meets these requirements and is recommended.

  There are many parameters that impact the SNR of the 10GBase-T signal received by the CAT Card from the AP, or received by the AP from the CAT Card. For example, excessive insertion loss degrades the signal level, which results in a degraded SNR. An increase in the noise level will also result in degraded SNR. The most common sources of noise are NEXT (near end crosstalk, interference from pairs within a cable that couple from the TX to RX), and AXT (alien crosstalk, interference from adjacent cables). Additionally, there can be interference from outside sources such as lighting, switching power supplies, radio transmitters in the UHF and VHF bands, and similar sources of RFI/EMI. To guarantee acceptable SNR level, all cable key parameters must be measured as discussed in the next section.

- For information on how to test your Cat6A cables and connections, see "Cat6A Specifications and Testing Requirements" on page 81.

Power Supply Unit Subrack and Rectifier Modules

The following sections describe the ERA Power Supply Subrack and the 12 Vdc and 57 Vdc Rectifier Modules.

The Power Supply subrack and rectifier modules supply power to the WCS-2 (7635443-xx) and WCS-4 (7635442-xx) subracks. The power for the -48 Vdc WCS-2 (7844067-xx) and WCS-4 (7844068-xx) subracks is supplied by external -48 Vdc power supplies.

Power Supply Unit Subrack

The ERA Power Supply Unit (PSU) Subrack (PN 7693531-xx) can house two 12 Vdc Rectifier Modules and two 57 Vdc Rectifier Modules that provide power to the WCS Subracks, APs, and connected devices.

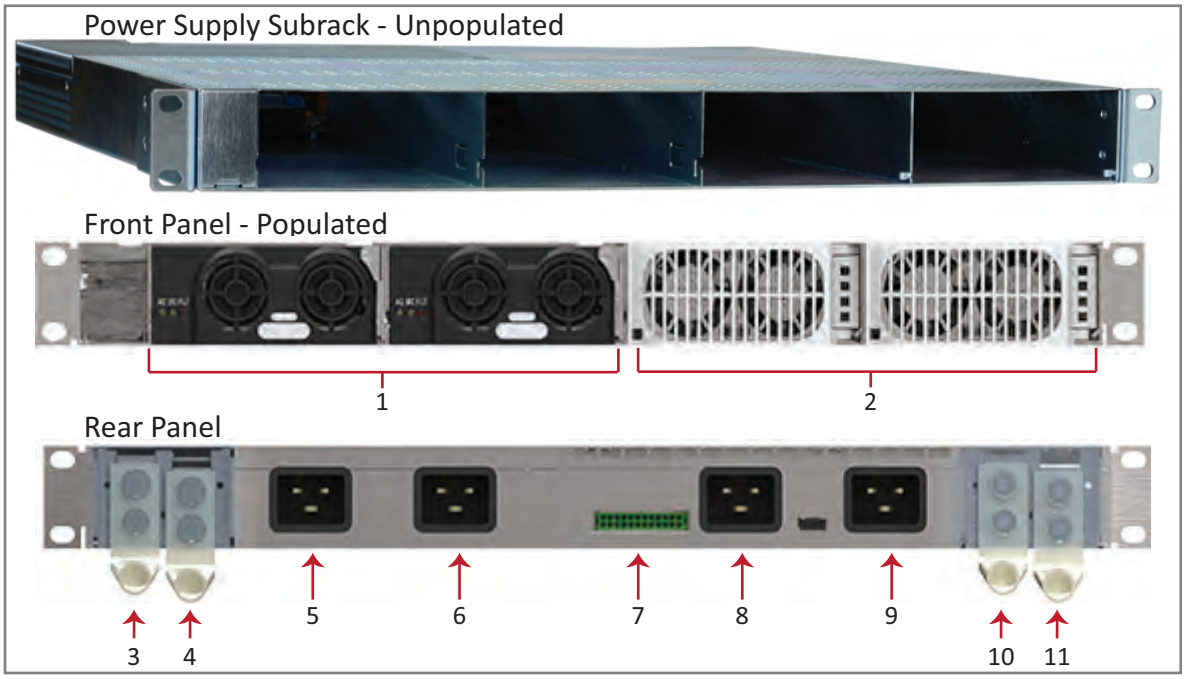
The PSU ships with the output DC cables already attached. The signal cable for connecting the PSU to the chassis is also provided and must be connected prior to powering on the unit. However, you can order input AC cables that are specific to the region in which the ERA system is installed, as shown in Table 3. Contact your local CommScope sales representative for assistance in ordering an AC Power Cable.

Table 3. *ERA AC Power Cable Assemblies*

CommScope PN	Power Cable Assembly Description
7680997-xx	UK Bs1362/ass145 to C19
7681032-xx	US NEMA L6-20p to C19
7681034-xx	US NEMA 5-15 to C19
7681049-xx	Italy Cei 23-50 to C19
7681038-xx	Is Si 32 to C19
7681036-xx	EU Cee (7) Vii to C19
7681030-xx	AUS As/nzs 3112 to C19

The 12 and 57 Vdc Rectifier Modules have an operating temperature range of -10 to +55 °C (+14 to +131 °F).

The following graphic and table identify the PSU modules and connectors.



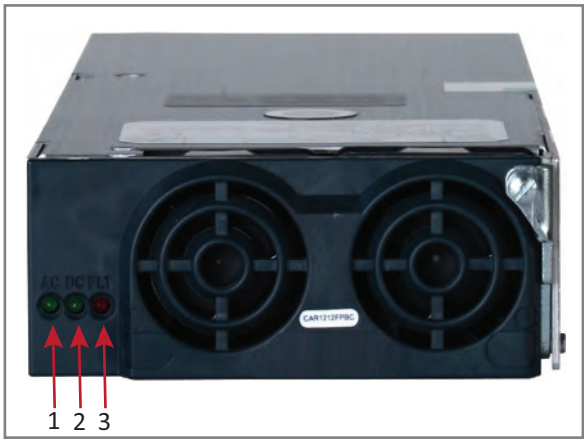
Ref #	Component	Device	Function
1	12 Vdc Rectifier Module	Power module	Provides 12 Vdc power to the WCS and e-POI Subracks.
2	57 Vdc Rectifier Module	Power module	Provides remote power over Cat6A for the AP and its connected devices.
3	57Vdc Output	Power terminal	Provides the connection point for the Positive (Red Wire).
4	GND Output	Power terminal	Provides the connection point for the RTN Negative (Black Wire).
5	AC Input (IEC 60320 C19)	Power connector	Provides the AC connection point for the for 57 Vdc Rectifier Module Slot 4.
6	AC Input (IEC 60320 C19)	Power connector	Provides the AC connection point for the for 57 Vdc Rectifier Module Slot 3.
7	Rectifier control connector	24 pin-terminal block	Provides the connection point for the WCS.
8	AC Input (IEC 60320 C19)	Power connector	Provides the AC connection point for the for 12 Vdc Rectifier Module Slot 2.
9	AC Input (IEC 60320 C19)	Power connector	Provides the AC connection point for the for 12 Vdc Rectifier Module Slot 1.
10	12Vdc Output	Power terminal	Provides the connection point for the Positive (Red Wire).
11	GND Output	Power terminal	Provides the connection point for the RTN Negative (Black Wire).

12 Vdc Rectifier Module

The 12 Vdc Rectifier Module (PN 7663610-xx) supplies power to the WCS and e-POI Subracks. The 12 Vdc Rectifier Module is fully redundant for ERA.

The PSU Rectifier Modules are hot swappable; you do not need to power down the PSU subrack to add or remove a module.

A second 12 Vdc Rectifier Module is to provide N+1 redundancy. The following graphic and table identify the 12 Vdc Rectifier Module LEDs and connectors.



Ref #	LED	LED Color	Description
1	AC	Green	AC input is within the specified range of 85 to 264 Vac.
		Off	AC input is not within the specified range.
2	DC	Green	DC output is within the specified range of 12V+/-2% (worst case) over line, load, and temperature.
		Off	DC output is not within the specified range.
3	FLT (Fault)	Red	There is no AC input or a failure has been detected in the 12 Vdc Rectifier Module. The Fault LED activates under the following conditions: • If two 12 Vdc Rectifier Modules are installed in the PSU, and the AC input is removed (cable unplugged) from one of the modules. • If only one 12 Vdc Rectifier Module is installed in the PSU, and AC power is removed. In this instance the FLT LED is only momentarily red. (The PSU has significant energy storage capacity and takes several seconds to fully discharge when AC input power is lost, which allows the FLT LED to remain on for a short period after input power is disconnected.)

For assistance in determining power consumption and heat produced for a specific equipment configuration contact CMS Global Technical Support as described on page 82.

The 12 Vdc Rectifier Module has an operating temperature range of -10 to +55 °C (+14 to +131 °F).

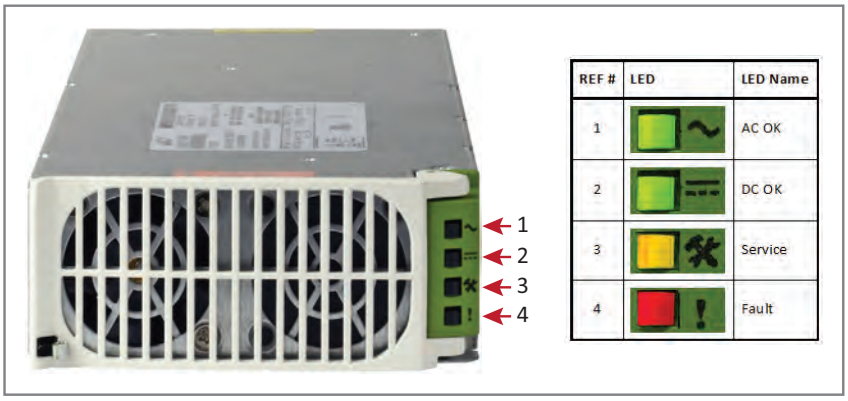
57 Vdc Power Rectifier Module

The 57 Vdc Rectifier Module (PN 7663468-xx) supplies Power over Cat6A to UAPs, Copper CAP Ls, and connected devices.

The PSU Rectifier Modules are hot swappable; you do not need to power down the PSU subrack to add or remove a module.

- Fiber APs and CAP Ls with local DC do not require 57 Vdc Rectifier Module support.
- A 57 Vdc Rectifier Module is not required
  - if the CAN/TEN will not be powering APs
  - for Switching CANs or WINs.
- The 57 Vdc Rectifier Module has an operating temperature range of -10 to +55 °C (+14 to +131 °F).

57 Vdc Power Rectifier LEDS



Condition	AC OK	DC OK	Service	Fault
Unit is functioning to specification.	On	On	Off	Off
Thermal shutdown; ambient temperatures over the operating range of 55°C (131°F) triggers the shutdown.	On	On	On	Off
Defective fan, blown AC fuse in Power Module, boost stage failure, over voltage latched shutdown.	On	Off	Off	On
No AC <15 ms (single unit)	Off	On	Off	Off
AC present but not within limits of 85 to 264 Vac.	Blinks	Off	Off	Off
AC not present	Off	Off	Off	Off
Over current	On	Blinks	Off	Off
Non-catastrophic internal failure (any detectable fault that does not shut down the unit)	On	On	Off	On
Internal communications to a specific PSU module is lost.	On	On	Off	Blinks

Maximum Number of APs that can be Powered by WCS Subrack

This section shows how to calculate the maximum number of UAPs or Copper CAP Ls that can be powered for specific WCS Subrack configurations. Note: -48Vdc WCS Subracks ID 7844067-xx, 7844068-xx do not provide Power over CAT6A to support UAPs or Copper CAP Ls.

The number of UAPs or Copper CAP Ls supported by a WCS Subrack is dependent on several factors:

- the WCS Subrack ID
  - original version
    - 7635442-00 (WCS-4)
    - 76355443-00 (WCS-2)
  - current version
    - 7635442-01 (WCS-4)
    - 7635443-01 (WCS-2).
- the number of 57V Rectifier Modules installed in the PSU—one or two
- the electrical service voltage that powers the rectifiers —220 Vac or 120 Vac.
- the CAT Card version —7633228-01 or 7633228-02

The following subsections provide the information you need to apply these factors against installation parameters.

ERA Software Power Estimates

The ERA software uses the power estimates shown in Table 4 to determine the number of UAPs or Copper CAP Ls that can be powered via Power over CAT6A for a specific configuration.

Table 4. *Software Assigned AP Power Consumption*

AP/Device	Software-Assigned Power Consumption (Watts)
UAP	85
CAP L	125
1 Gb Ethernet device	35

CAT Cards

Table 5 defines the number of UAPs and Copper CAP Ls that the original version CAT Card (7633228-01) and the current version CAT Card (7633228-02) can power.

Table 5. *Number of APs that can be powered per CAT Card by version*

CAT Card ID	UAPs	CAP Ls (Without 1G Devices)	CAP Ls [1] (Including Cascaded Secondary CAP Ls)	CAP Ls (With 1G Devices)
7633228-01	6	4	8	3
7633228-02	8	4	8	4
1 One locally powered secondary CAP L can be connected to each primary CAP L in cascade mode. Secondary CAP Ls in a cascade do not draw power from the WCS. Cascaded APs do not support 1G devices.				

WCS Subracks, 57 Vdc Rectifier Modules, and Service Voltage

Table 6 and Table 7 list the number of UAPs and Copper CAP Ls that can be powered via Power over CAT6A based on the number of 57 Vdc Rectifier Modules and the electrical service voltage. These number of APs supported as listed in these tables assumes that the power consumption of the UAPs is the maximum 85 Watts and the power consumption of the CAP Ls is the maximum 125 Watts. Typical configurations may require less power per AP.

- Table 6 lists the number of UAPs and Copper CAP Ls that the **original** version of WCS Subracks can power via Power over CAT6A:
  - 7635442-00 (WCS-4)
  - 76355443-00 (WCS-2).
- Table 7 lists the increased number of UAPs and Copper CAP Ls that the **current** version of WCS Subracks can power via Power over CAT6A:
  - 7635442-01 (WCS-4)
  - 7635443-01 (WCS-2).

Table 6. *Number of UAPs and Copper CAP Ls powered by the Original Version WCS Subracks (7635442-00/7635443-00)*

AP Type	1 x 120 Vac		2 x 120 Vac		1 x 220 Vac		2 x 220 Vac	
	# APs Powered	Maximum Watts	# APs Powered	Maximum Watts	# APs Powered	Maximum Watts	# APs Powered	Maximum Watts
UAPs [1]	14	1200	24	2400	23	2000	24	4000
CAP Ls [1]	9[2]	1200	16[2]	2400	16[2]	2000	16[2]	4000

1 The number for supported APs does not include any connected 1G devices, which are also powered by the Power over CAT6A circuits. If these devices are used, they must be accounted for in the total power consumption calculations. See Table 4 on page 37.

2 One locally powered secondary CAP L can be connected to each primary CAP L in cascade mode for a total of 18 CAP Ls with one 120 Vac/57Vdc rectifier or 32 CAP Ls for all other rectifier configurations shown. Cascaded APs do not support 1G devices.

Table 7. *Number of UAPs and Copper CAP Ls powered by the Current Version WCS Subracks (7635442-01/7635443-01)*

AP Type	1 x 120 Vac		2 x 120 Vac		1 x 220 Vac		2 x 220 Vac	
	# APs Powered	Maximum Watts	# APs Powered	Maximum Watts	# APs Powered	Maximum Watts	# APs Powered	Maximum Watts
UAPs [1]	14	1200	28	2400	23	2000	32	4000
CAP Ls [1]	9[2]	1200	16[2]	2400	16 [2]	2000	16 [2]	4000

1 The number for supported APs does not include any connected 1G devices, which are also powered by the Power over CAT6A circuits. If these devices are used, they must be accounted for in the total power consumption calculations. See Table 4 on page 37.

2 One locally powered secondary CAP L can be connected to each primary CAP L in cascade mode for a total of 18 CAP Ls with one 120 Vac/57Vdc rectifier or 32 CAP Ls for all other rectifier configurations shown. Cascaded APs do not support 1G devices.

APs in a Mixed Copper CAP L and UAP System

The following tables provide examples of the number of CAP Ls and UAPs that a system with two 57Vdc rectifiers can support with **original** WCS and CAT Card versions and a system with **current** WCS and CAT Card versions. Please see Table 6and Table 7 on page 38 for the number of APs supported with a single 57Vdc PSU rectifier module.

The original version WCS-4 (7635442-00) and WCS-2 (7635443-00) subracks with four original version CAT Cards (7633228-01) support the following

Table 8. *Original version WCS Subrack with Original Version CAT Cards (2x 57Vdc PSU)*

AP Type	CAP Ls (Without 1G Devices)	CAP Ls (Including Cascaded Secondary CAP Ls)	CAP Ls (With 1G Devices)	UAPs
4 CAT Cards for CAP Ls 0 CAT Cards for UAPs	16	32	12	0
3 CAT Cards for CAP Ls 1 CAT Card for UAPs	12	24	9	6
2 CAT Cards for CAP Ls 2 CAT Cards for UAPs	8	16	6	12
1 CAT Cards for CAP Ls 3 CAT Cards for UAPs	4	8	3	18
0 CAT Cards for CAP Ls 4 CAT Cards for UAPs	0	0	0	24
One locally powered secondary CAP L can be connected to each primary CAP L in cascade mode. Secondary CAP Ls in a cascade do not draw power from the WCS. Cascaded APs do not support 1G devices.				

The current version WCS-4 and WCS-2 subracks and current version CAT Cards have been optimized to support additional UAPs and CAP Ls. A WCS-4 (7635442-01) or WCS-2 (7635443-01) subrack with four (7633228-02) CAT Cards supports the following:

Table 9. *Current version WCS Subrack with Current Version CAT Cards (2x 57Vdc PSU)*

AP Type	CAP Ls (Without 1G Devices)	CAP Ls [1] (Including Cascaded Secondary CAP Ls)	CAP Ls (With 1G Devices)	UAPs
4 CAT Cards for CAP Ls 0 CAT Cards for UAPs	16	32	16 [2]	0
3 CAT Cards for CAP Ls 1 CAT Card for UAPs	12	24	12	8
2 CAT Cards for CAP Ls 2 CAT Cards for UAPs	8	16	8	16
1 CAT Cards for CAP Ls 3 CAT Cards for UAPs	4	8	4	24
0 CAT Cards for CAP Ls 4 CAT Cards for UAPs	0	0	0	32 [3]

1 One locally powered secondary CAP L can be connected to each primary CAP L in cascade mode. Secondary CAP Ls in a cascade do not draw power from the WCS. Cascaded APs do not support 1G devices.

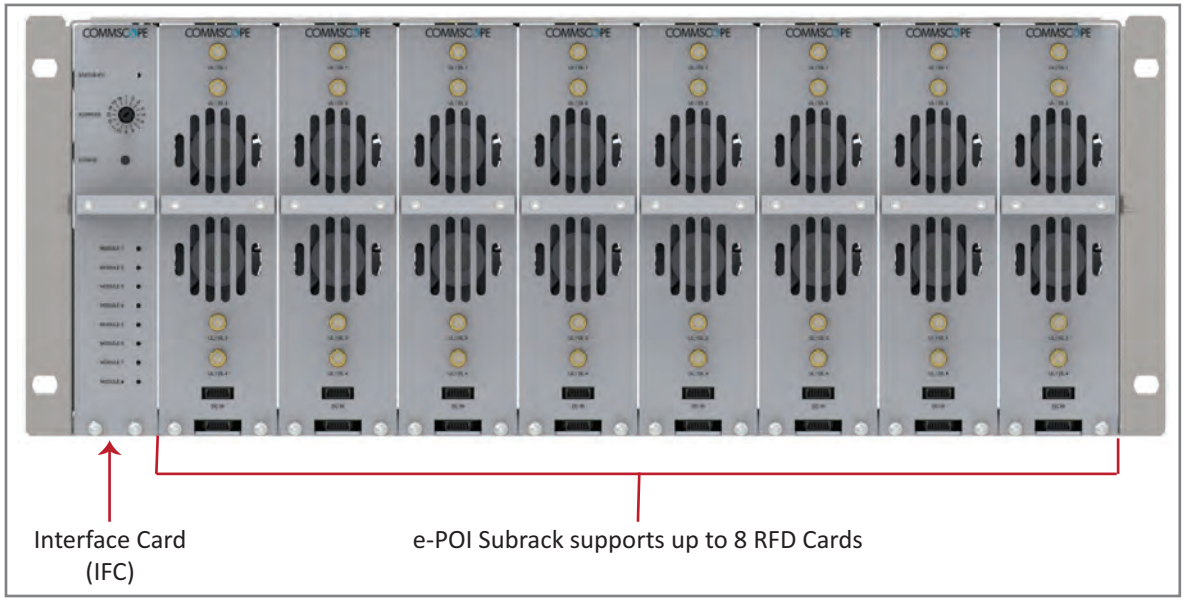
2 Maximum number of CAP Ls with 1G devices is limited to 15 with 2x 57Vdc/**120Vac** PSU. (Capable of 16 with 2x 57Vdc/**220Vac** PSU.)

3 Maximum number of UAPs is limited to 28 with 2x 57Vdc/**120Vac** PSU. (Capable of 32 with 2x 57Vdc/**220Vac** PSU.)

Optional e-POI Subracks

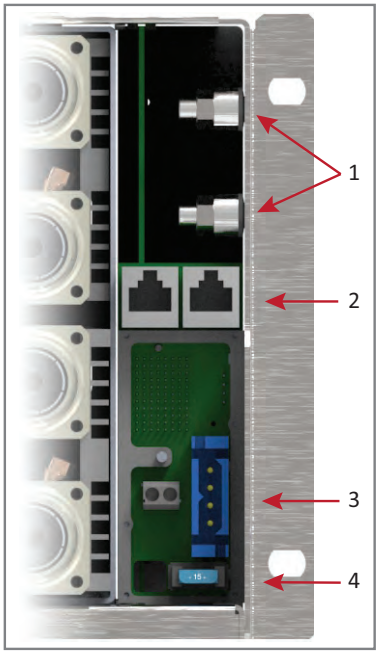
This section provides a product overview and installation instructions for the optional ERA Series Point of Interface (e-POI) Subrack (PN 7676311-xx). You use an e-POI Subrack to attenuate high-power RF signals from their source to the CAN, across all frequencies.

The universal e-POI Subrack provides power, housing, and communications for up to eight e-POI Modules. The e-POI Subrack ships with the Interface Card (IFC) factory installed. The e-POI Subrack and the Interface Card and e-POI Module have an operating temperature range of -5 to +50 °C (+23 to +122 °F).



To maximize airflow through the e-POI chassis, blank modules must be installed in all empty slots. If additional ERA e-POI Blank Modules (PN 7673474-xx) are required, contact your local CommScope sales representative.

The following graphic and table identify the e-POI Subrack back-panel connectors.

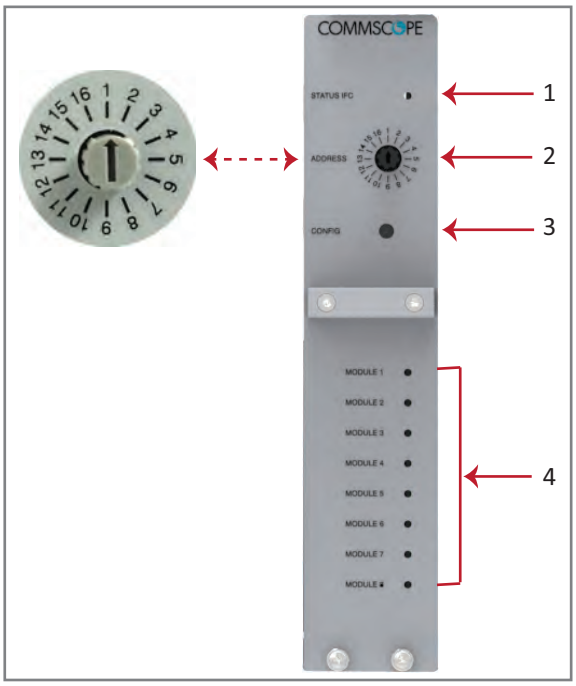


Ref #	Component	Device	Function
1	Ground studs	Ground studs	Provides grounding for the e-POI Subrack.
2	Communication ports	RJ-45 jack (female)	Communication ports that connect to the WCS-2 or WCS-4 Subrack.
3	12 Vdc Input connector	4-pin power terminal	Power terminal that connects to the WCS-2 or WCS-4 Subrack.
4	15A Blade Fuse		

Interface Card (IFC)

The IFC (PN 7676260-xx) is used to set the Subrack number of the e-POI Subrack. It also provides communications, status, and alarms for the e-POI Modules installed in the e-POI Subrack.

The following graphic and table identify the IFC Card LEDs and connectors.



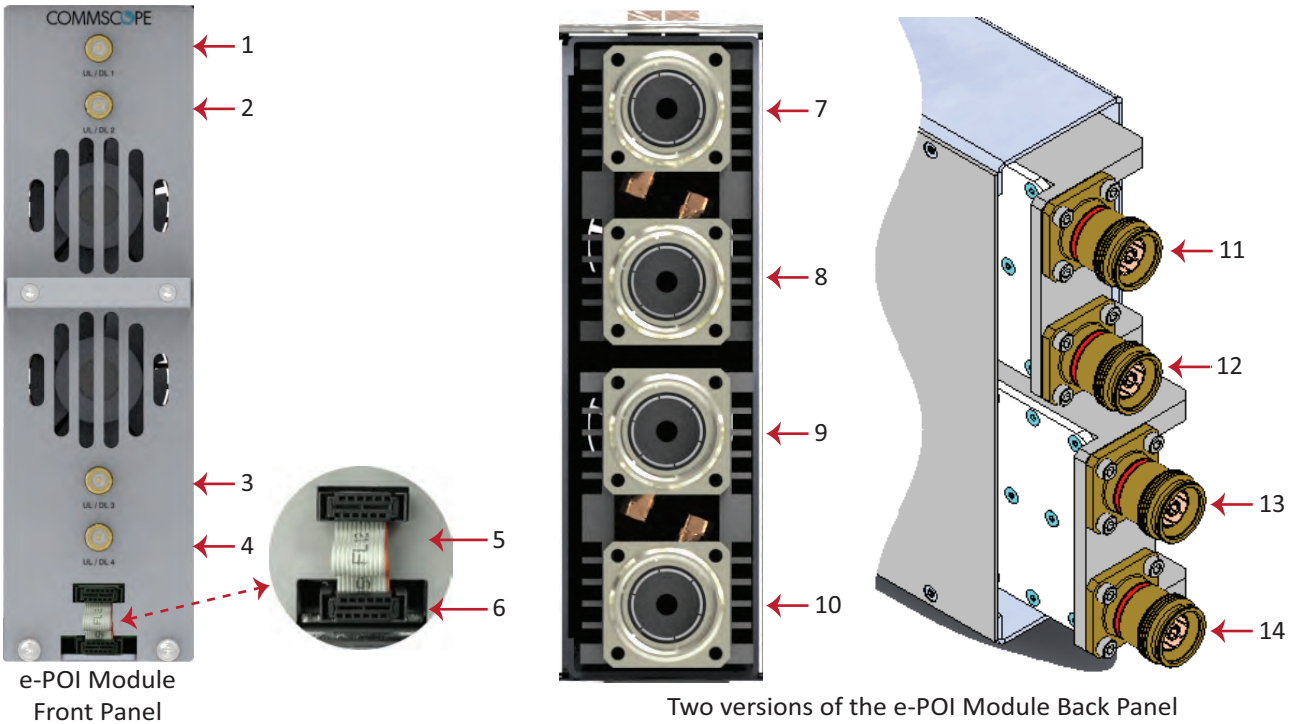
IFC LEDs			
Ref #	**LED**	**LED Color**	**Description**
1	Status	• Off	• The e-POI Subrack or the IFC is not fully seated or is not receiving power.
		• Green	• e-POI Subrack or IFC is functioning to specification.
		• Red	• Active alarm on e-POI Subrack or IFC.
4	e-POI Module Status 1 - 8	• Off	• e-POI Module in corresponding slot is not receiving power.
		• Green	• e-POI Module in corresponding slot is functioning to specification. e-POI Module Status LED must be green before connecting corresponding RF signals to input. **NOTE: If e-POI Module is not functioning, PIM or VSWR rating could be compromised, causing an alarm on the BTS.**
		• Red	• e-POI Module in corresponding slot has active temperature alarm.

IFC Connectors			
Ref #	**Component**	**Device**	**Function**
2	Address switch	Rotary dial	Must be set to **1**.
3	Config button	Pushbutton	Alerts ERA Software to scan for and remove references to removed RFD Cards; see "Removing an e-POI Module from an e-POI Subrack" on page 80.

e-POI Modules

The e-POI Modules provide a wide-band, high power, low-PIM, interface and attenuation for the ERA RFD Cards. Each e-POI Module can handle all frequency bands as well as multiple operators. Each e-POI Module has four duplexed ports that supply support for up to four interfaces. e-POI modules are hot swappable; you do not need to power down the e-POI subrack to add or remove them. However, there are steps you should take to avoid false alarms; please see "Removing an e-POI Module from an e-POI Subrack" on page 80.

The following graphic and table identify the e-POI Module connectors.



e-POI Module Front Panel

Two versions of the e-POI Module Back Panel

Ref #	Component	Device	Function
1	UL/DL Port 1	Female QMA connector	Connect to Ports 1 - 4 on an RFD Card in the CAN.
2	UL/DL Port 2		
3	UL/DL Port 3		
4	UL/DL Port 4		
5	Module Power/Com port	4-pin power connector	Use the Ribbon cable [1] (PN 7671957-xx) to connect the Module Power port to the Subrack Power/Com port.
6	e-POI Subrack Power/Com port	4-pin power connector	Connects to DC on a 12 Vdc Rectifier Module in the WCS Subrack.
7	UL/DL Port 1	7/16 DIN connectors (e-POI Module PN 7659180-00)[2]	Connect to the eNodeB.
8	UL/DL Port 2		
9	UL/DL Port 3		
10	UL/DL Port 4		
11	UL/DL Port 1	4.3-10 connectors (e-POI Module PN 7761433-00)	Connect to the eNodeB.
12	UL/DL Port 2		
13	UL/DL Port 3		
14	UL/DL Port 4		

1 The Ribbon cable is connected after the e-POI Module is installed in the e-POI Subrack.
2 The e-POI Module 7659180-00 is no longer being manufactured, it is included here for those ERA systems in which this version of the e-POI Module is installed and deployed at customer sites.

Safely Working with ERA Hardware

The following sections provide important information that you should read and know before working with any ERA hardware. Observe all cautions and warnings listed in this section.

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.

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. Keep all warning labels are kept in a legible condition. Replace 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.

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 protective caps from any of the connectors until instructed to do so.

Due to power dissipation, the Power Supply Units may reach a very high temperature if not properly ventilated. Do not operate this equipment on or close to flammable materials.

Never operate a WCS-2 or WCS-4 Subrack without a Fan Tray installed.

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

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 hardware components. Not all ERA hardware requires grounding. For those ERA 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 ERA hardware.

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 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/cm^2) 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 which have to comply with European EN50385 exposure compliance requirements, the following Power Density limits/guidelines (mW/cm^2) 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

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

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 separation distance of at least 100 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.

French:

Cet appareil est conforme à partie15 de FCC des règles Partie15. 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 I'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 d'au moins 100 cm de toutes les 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 For a Class B digital device or peripheral:

Note: 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.

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 10.

Table 10. *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 LICENCE 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.

INSTALL THE SUBRACKS AND PSU IN AN EQUIPMENT RACK

The following sections tell you how to install the following ERA components into an equipment rack:

- WCS-2 Subrack
- WCS-4 Subrack
- Power Supply Unit (PSU) and Rectifier Modules
- e-POI Subrack (optional)

WCS Subrack Type Considerations

With the introduction of the -48Vdc WCS-2 and -48Vdc WCS-4 subracks, two sets of installation instructions and requirements are now included in the guide to cover both types of WCS subracks. The -48Vdc powered WCS units are well suited for systems where Power over CAT6A is not required, such as WINs, Switching CANs, and TENs that only have Fiber CAPs connected to them. The standard WCS-2 and WCS-4 are still required when PoE is needed for UAPs and Copper CAP Ls.

Unpack and Inspect the Subracks and Components

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. Do the following if damage is found or parts are missing
   a. Save any damaged cartons for inspection by the carrier.
   b. File a claim with the commercial carrier.
   c. Notify the appropriate support team:
      - For all units except for CDD Cards, notify CommScope Technical Support (see "CMS Global Technical Support" on page 82).
      - For CDD Cards, contact **Nokia (ALU) support at 1-866-582-3688**.
4. Save all shipping containers for use if the equipment requires shipment at a future date.

Rack-Mount the Subracks and PSU (WCS-2, WCS-4)

When installing ERA Subracks and PSUs, adhere to the rules listed below and as shown in Figure 7 on page 50:

As with any piece of IT equipment, placing the ERA system connection behind a secure firewall is highly recommended.

There must be 1 RU of air space above the PSU.

Support rails are always required for WCS-2 and WCS-4 Subracks and e-POI Subracks. Support rails should never be used for PSU subracks to prevent contact with the DC power terminals on the rear of the units.

Support rails must not block airflow.

Disconnect all input to the PSU before adding it to or removing it from an equipment rack. If you are removing the PSU from an equipment rack, unlatch any installed 12 Vdc or 57 Vdc Rectifier Modules from the PSU chassis before you disconnect the DC Power and Rectifier Control cables on the rear of the chassis.

Connect the PSU to a high leakage current ground (earth) before making any other connections to the PSU.

To maximize airflow through the WCS and e-POI chassis, blank panels must be installed in all empty slots. If additional blank panels are required, contact your local CommScope sales representative to order the appropriate panel:

- **Blank Panel Universal (PN 7688866-xx)**
- **Blank Panel SUI (PN 7688868-xx)**
- **Blank Panel AUT (PN 7688867-xx)**
- **e-POI Blank Module (PN 7673474-xx)**
- **Power Supply Filler Panel (PN 7694140-xx).**

The PSU must be installed above the WCS Subrack to support its weight and to ensure that the DC terminals on the rear of the unit do not come into contact with another subrack or other metal surface. There must be 1 RU of air space above the subrack.

Figure 7 on page 50 shows two configurations for mounting Subracks and PSUs in an equipment rack.

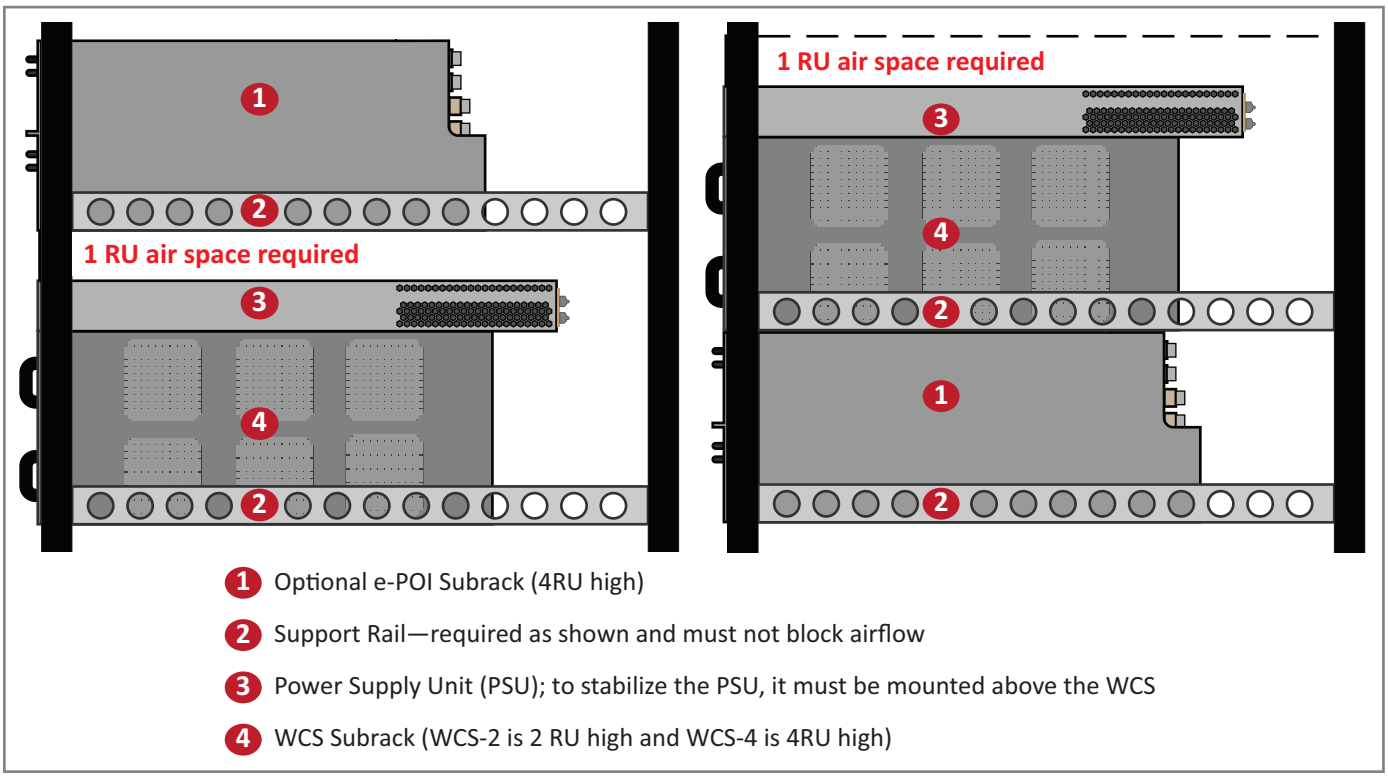


Figure 7. WCS Subrack Installation Requirements

Due to the bending radius requirements of the DC Output power cables, a minimum of 23 inches (584 millimeters) of space is required between the front of the PSU subrack and the rear door of the rack or any walls or other obstructions located behind the unit.

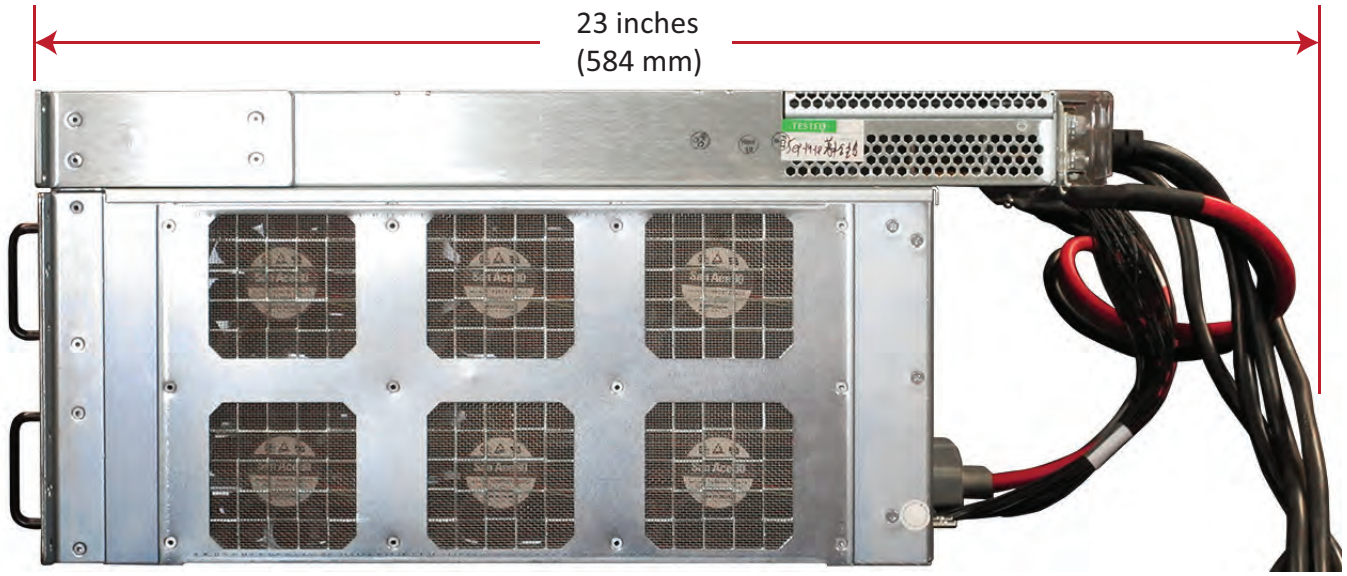


Figure 8. Minimum Space Required Behind PSU Subrack

The PSU subrack must be mounted above the WCS subrack to provide support and to prevent the possibility of short circuiting the DC Output terminals. Rack rails should never be used to support the PSU subrack to prevent contact with the DC Output terminals. Avoid contact with the exposed metal on the 12 Vdc and 57 Vdc terminal lugs

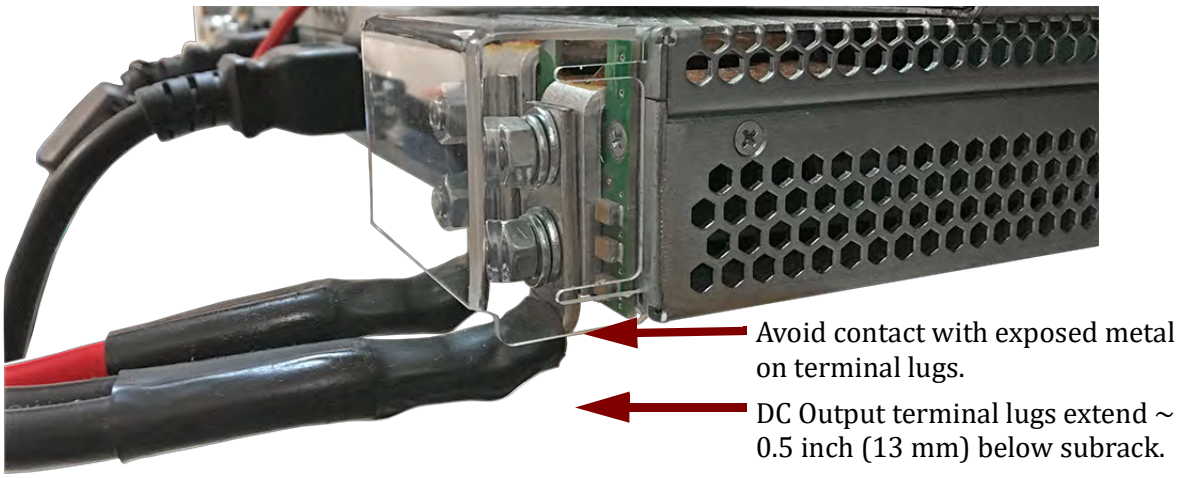


Figure 9. Power Supply Unit DC Output Terminal Lugs

Connect the WCS Rear-panel Cables

1 Connect the rear-panel power, communication, and control cables as shown in the following graphic.

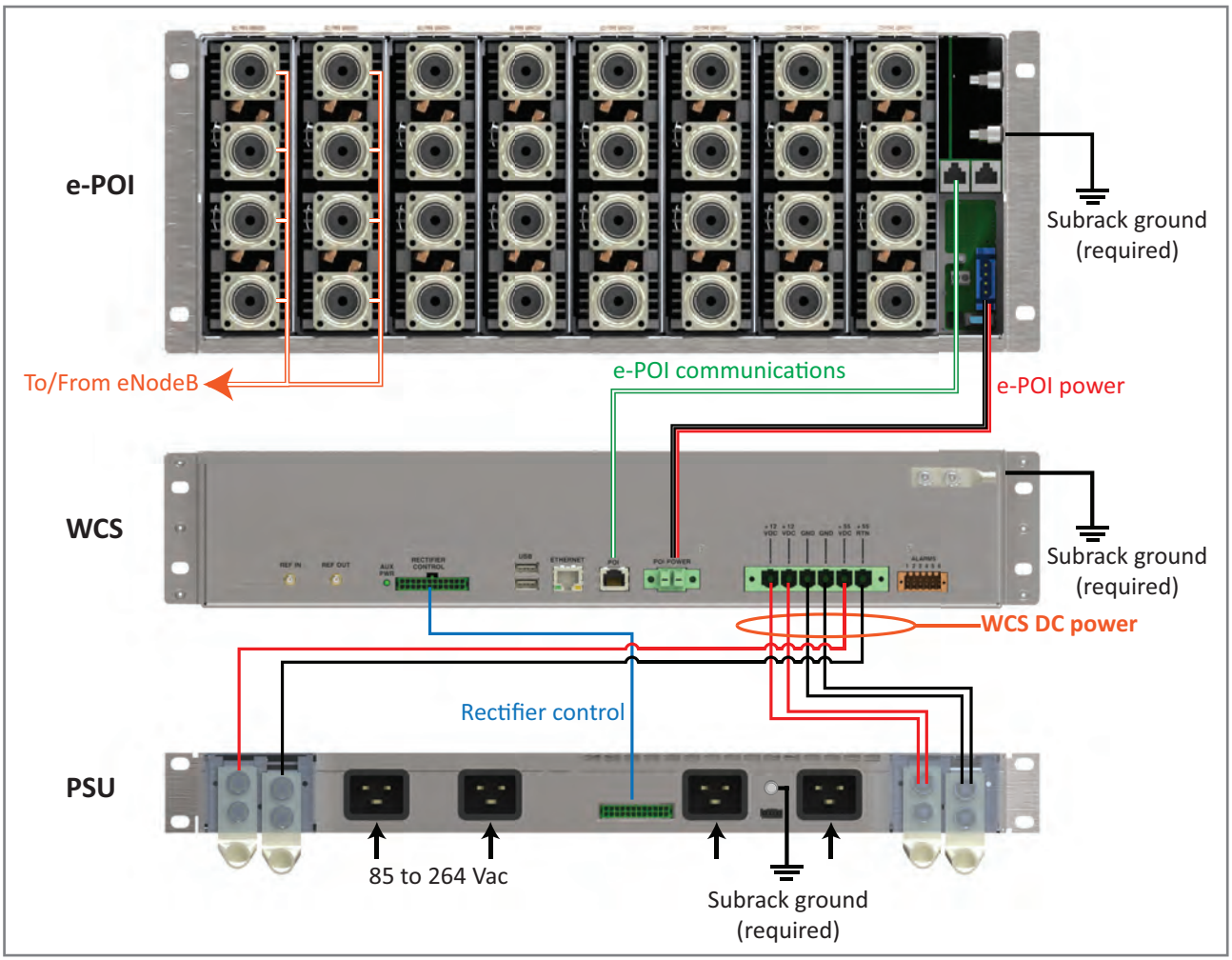
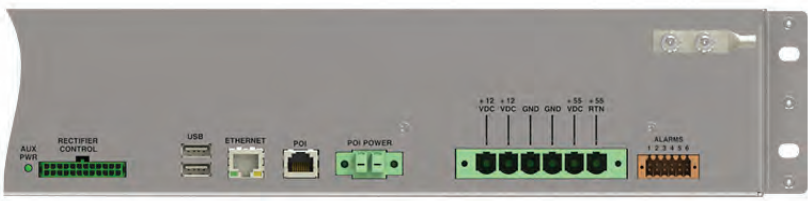
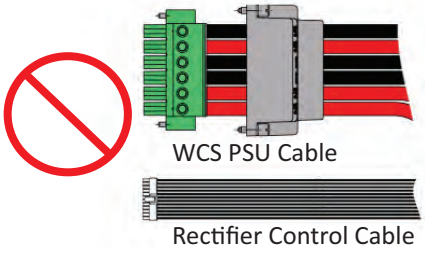


Figure 10. WCS Rear Panel Cabling

2 Connect the DC Power cable and the Rectifier Control cables that shipped with the PSU shelf assembly.

CAUTION! **To prevent SEVERE damage to the WCS Subrack, confirm that all AC power cables are unplugged from the rear of the PSU BEFORE plugging/unplugging the WCS Power or Rectifier Control cables into/from the WCS subrack.**





a Do the following before connecting the WCS PSU Cable or the Rectifier Control Cable:

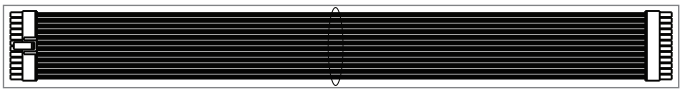
- Confirm that all AC power cables are unplugged from the rear of the PSU.
- Remove 12 Vdc Rectifier Modules and 57 Vdc Rectifier Modules from the PSU. Do not skip this step. Residual charge is still available in the Power Modules for a short period after AC input is lost and connecting the WCS PSU Cable or the Rectifier Control Cable with **any** power in the PSU can damage the WCS.

b Plug the DC Power Cable, which is attached to the rear of the PSU, into the WCS Subrack power connector, and then use a flat-blade screwdriver to tighten the two mounting screws.

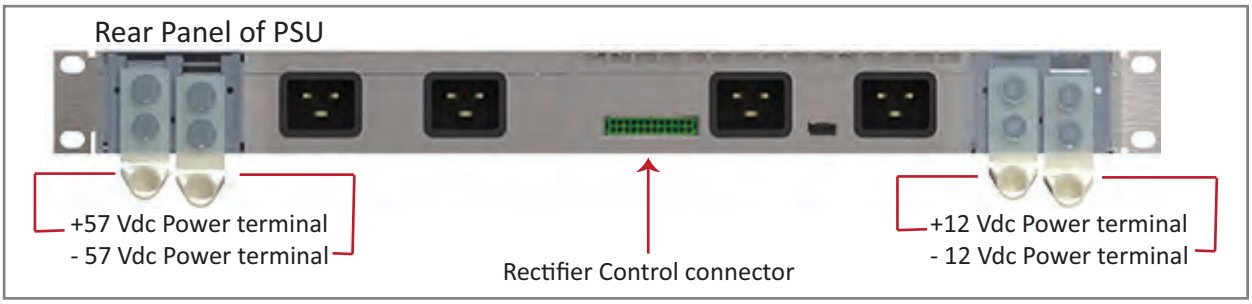
To prevent damage to the WCS, tighten the two DC Power Cable mounting screws to ensure that the DC Power Cable cannot be accidentally dislodged.

c Slide the Power Connector shell over the Subrack power connector and tighten the two thumbscrews to attach it to the WCS Subrack.

d Plug the Rectifier Control Cable (shown to the right) into the WCS Rectifier Control connector; press it in until you hear it click and lock into place.



e Plug the other end of the Rectifier Control Cable to the matching connector (unlabeled) on the rear of the PSU.



3 Connect the Ground stud on the WCS, PSU, and e-POI Subracks to a suitable earth ground, per local and national electrical codes.

4 Reseat the 12 Vdc Rectifier Modules and 57 Vdc Rectifier Modules in the PSU.

5 Plug AC power cables into the power connectors on the rear of the PSU.

Rack-Mount the Subracks (-48Vdc WCS-2, WCS-4)

When installing ERA Subracks adhere to the rules listed below:

As with any piece of IT equipment, placing the ERA system connection behind a secure firewall is highly recommended.

Support rails are always required for -48Vdc WCS-2 and WCS-4 Subracks and e-POI Subracks.

Support rails must not block airflow.

To maximize airflow through the WCS and e-POI chassis, blank panels must be installed in all empty slots. If additional blank panels are required, contact your local CommScope sales representative to order the appropriate panel:

- **Blank Panel Universal (PN 7688866-xx)**
- **Blank Panel SUI (PN 7688868-xx)**
- **Blank Panel AUT (PN 7688867-xx)**
- **e-POI Blank Module (PN 7673474-xx)**
- **Power Supply Filler Panel (PN 7694140-xx).**

Figure 11 on Page 53 shows two configurations for mounting -48Vdc WCS and e-POI Subracks in an equipment rack.

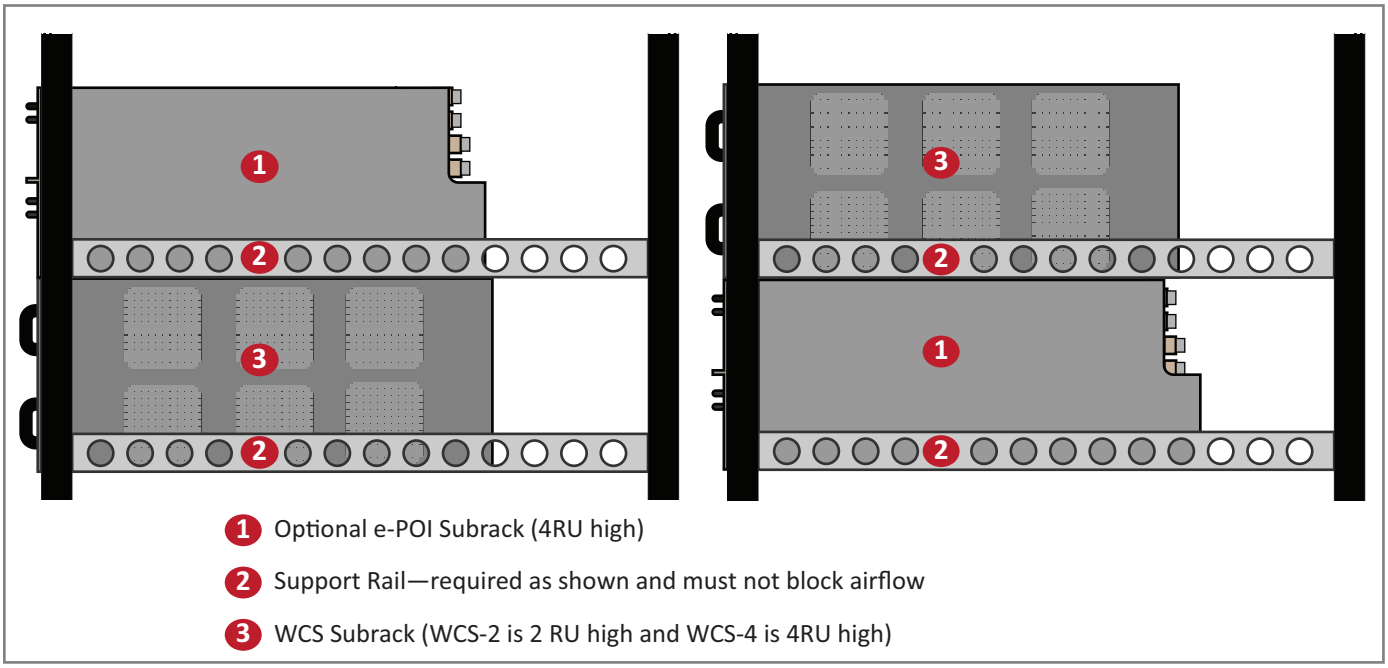


Figure 11. -48Vdc WCS Subrack Installation Requirements

Connect the -48Vdc WCS Rear-panel Cables

1 Connect a suitable ground cable from the grounding bolts (studs) to a suitable earth ground, per local and national electrical codes for each of the subracks. Subrack grounding is required.

2 Connect the rear-panel power, communication, and power cables as shown in the following graphic.

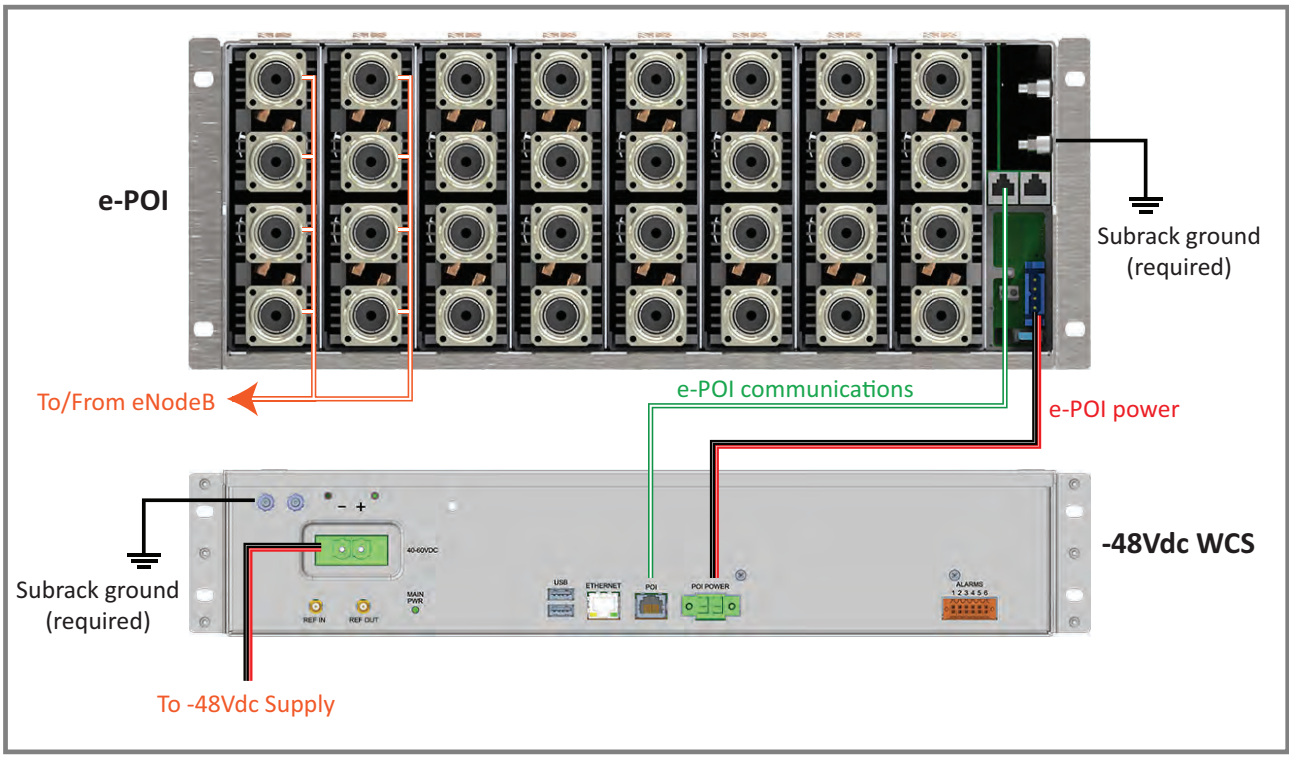
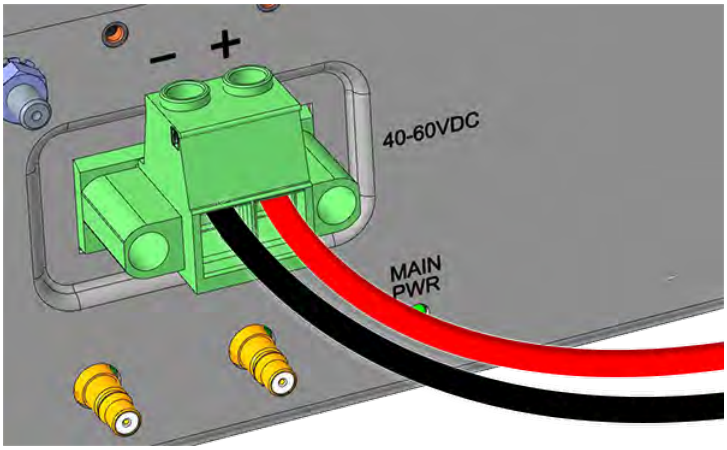


Figure 12. -48Vdc WCS Rear Panel Cabling

3 Connect the cables from the -48Vdc power supply to the two-conductor DC power entry connector that shipped with the -48Vdc WCS subrack (observing the correct polarity.) and plug it into the WCS subrack.

The DC power entry connector can accept up to 8 AWG (10 mm²) wire. The minimum recommended wire size for the -48Vdc WCS subrack DC power entry connector is 10 AWG (6 mm^2).

As in all standard -48Vdc power systems, the Red wire that is connected to the '+' terminal of the WCS DC power entry plug will also be connected to earth ground back at the -48Vdc power source. Please see the 48Vdc WCS DC Power Supply Requirements in Table 11 on the next page.



The -48Vdc DC power entry connector is hot plug/unplug tolerant and has reverse polarity protection.

4 Connect the e-POI communications and power cables from the WCS to the e-POI subrack (if used).

Table 11. *-48Vdc WCS DC Power Supply Requirements*

DC Power Supply Requirements	
Input Voltage Range	-40 Vdc to -60 Vdc
Current -48Vdc WCS-4	20A maximum
Current -48Vdc WCS-2	15A maximum
-48Vdc WCS-4 Max Load	691 Watts
-48Vdc WCS-2 Max Load	418 Watts
-48Vdc WCS-2 Max Load (TEN Configuration)	115 Watts

Install and Connect the Subrack Cards

The following sections tell you how to install a card into a WCS Subrack, add SPF+ transceivers to an OPT Card, and how to connect the Subrack cards to the ERA system.

Install a Subrack Card

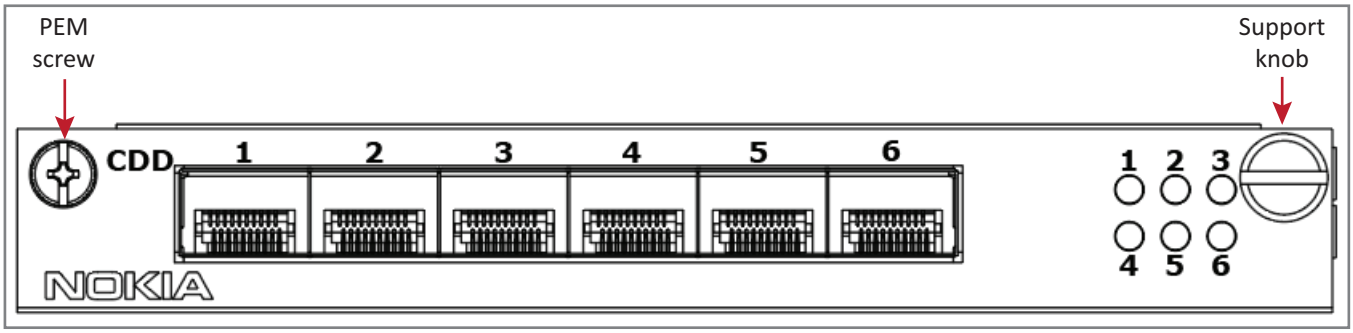
Do the following to install an ERA card into a WCS-2 or WCS-4 Subrack.

1. Observe all cautions in "Safely Working with ERA Hardware" on page 43.
2. Follow the rules listed in "WCS Subrack Slot and Card Assignments" on page 17 to identify in which slot(s) a card to install in a WCS-2 or WCS-4 Subrack to configure the Subrack as a Classic CAN, Switching CAN, WIN, or TEN.
3. CDD Cards and RFD Cards should be populated in the Subrack from bottom to top starting with the bottom slot of each section of the Subrack (Slot R1 or Slot R5) to ensure optimal cooling of the cards. For example, if you have only one CDD Card, it should be installed in Slot R1 and blank panels should be installed in R2-R4.
4. Remove the blank panel from the slot in which a card is to be installed.
   a. Loosen the silver PEM screw on the left that secures the blank panel to the Subrack.
   b. Reserve the blank panel for future use.
5. Install the card in the Subrack.
   a. Use the black Support knob on the right of the card's faceplate to slide the card into its slot, and then push the card into its slot back until the card's faceplate is flush against the Subrack chassis.

When installing a Card into or removing it from a Subrack, keep the Card level. Tipping the Card up or down during installation or extraction may cause it to strike another component in the Subrack, which can damage the Card and/or the component that was struck.

   b. Tighten the silver PEM screw on the left of the card's faceplate to secure the card to the Subrack chassis.

   The following graphic shows the PEM screw and support knob on a CDD Card. Although other cards will have different connectors and LEDs, the positioning of the PEM screw and Support knob will be the same.



   c. Do not leave any unoccupied slots open; replace blank panels, as necessary

To maximize airflow through the WCS and e-POI chassis, blank panels must be installed in all empty slots. If additional blank panels are required, contact your local CommScope sales representative to order the appropriate panel:

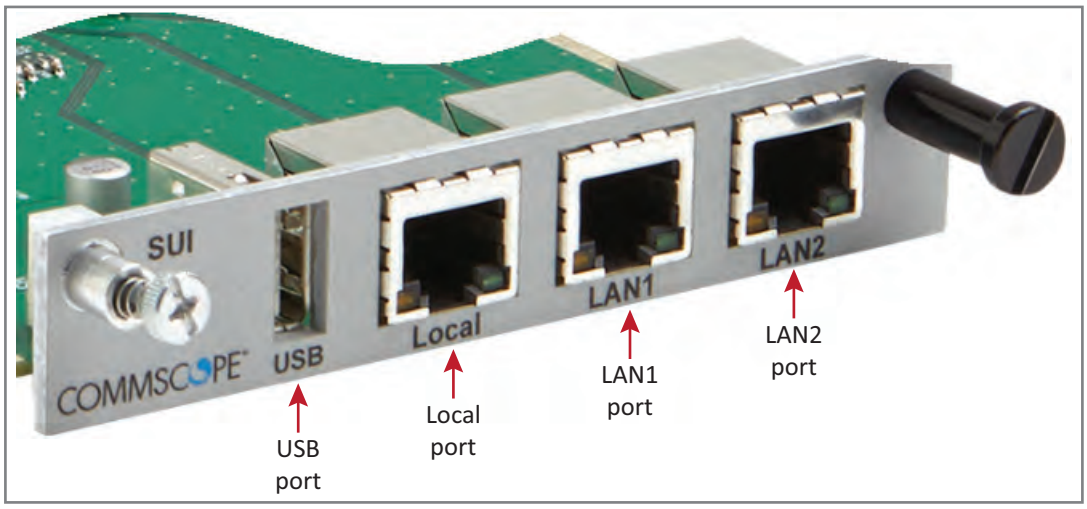
- **ERA Blank Panel Universal (PN 7688866-xx)**
- **ERA Blank Panel SUI (PN 7688868-xx)**
- **ERA Blank Panel AUT (PN 7688867-xx).**

CDD Cards and RFD Cards should be populated in the Subrack from bottom to top starting with the bottom slot of each section of the Subrack (Slot R1 or Slot R5) to ensure optimal airflow to the cards.

Connect the SUI Card

The SUI Card allows you to connect the WCS Subrack to a local laptop, LAN, or modem. Connect any of these devices as required for local practice.

- **Local:** Use Ethernet CAT 5 cable (straight or crossover) with RJ-45 connectors to connect a local laptop or PC to the Local port to allow for administration of the ERA system through the ERA software.
- **LAN2:** Use Ethernet CAT 5 cable (straight or crossover) with RJ-45 connectors to connect your LAN or a modem to the LAN2 port.



The LAN1 port is not currently used.

The USB port is reserved for use by CommScope.

SUI Cards are hot swappable; you do not need to power down the CAN, TEN, or WIN to install or remove an SUI Card.

Connect the RFD Cards

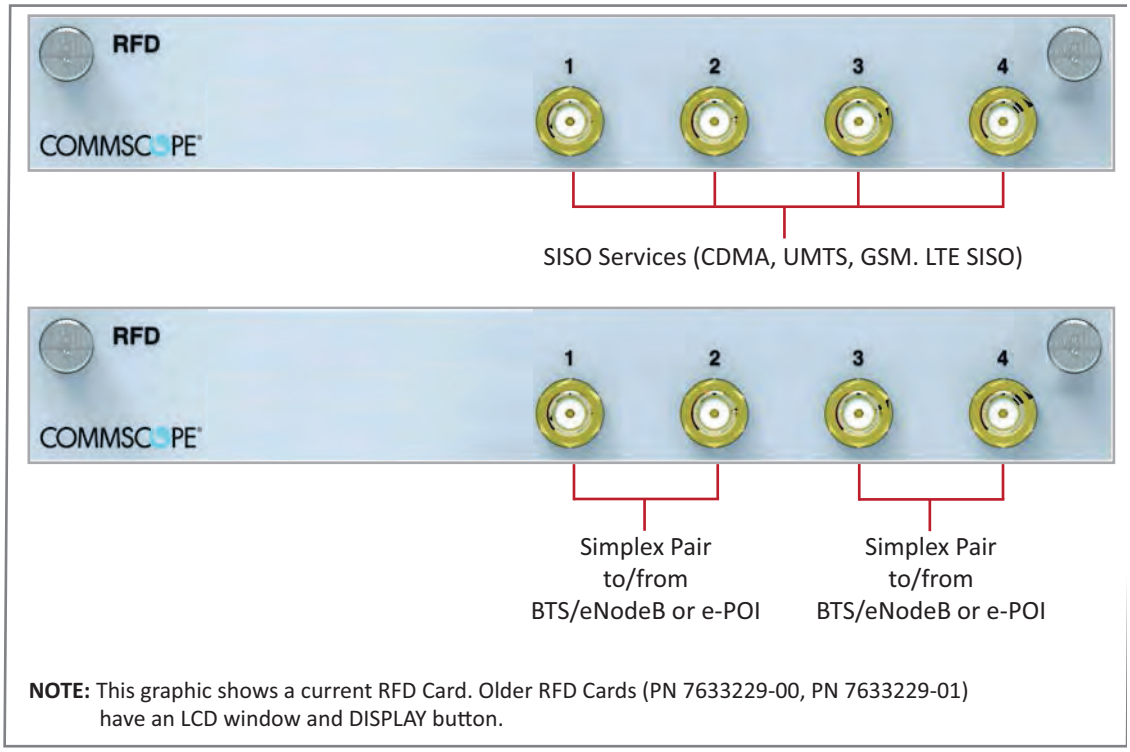
APs that support TETRA services require RFD Card PN 7633229-05. SW V2.8.0.400 or higher is required to use the 7633229-05 card.

CAP M and CAP H APs require the use of RFD Card PN 7633229-01, 7633229-02 or higher. RFD Card PN 7633229-03, which has been updated with new subcomponents to prevent material delays or obsolescence, requires ERA SW V2.8.0.400 or SW V2.8.2 or higher.

RFD Cards are hot swappable; you do not need to power down the CAN or WIN to install or remove an RFD Card.

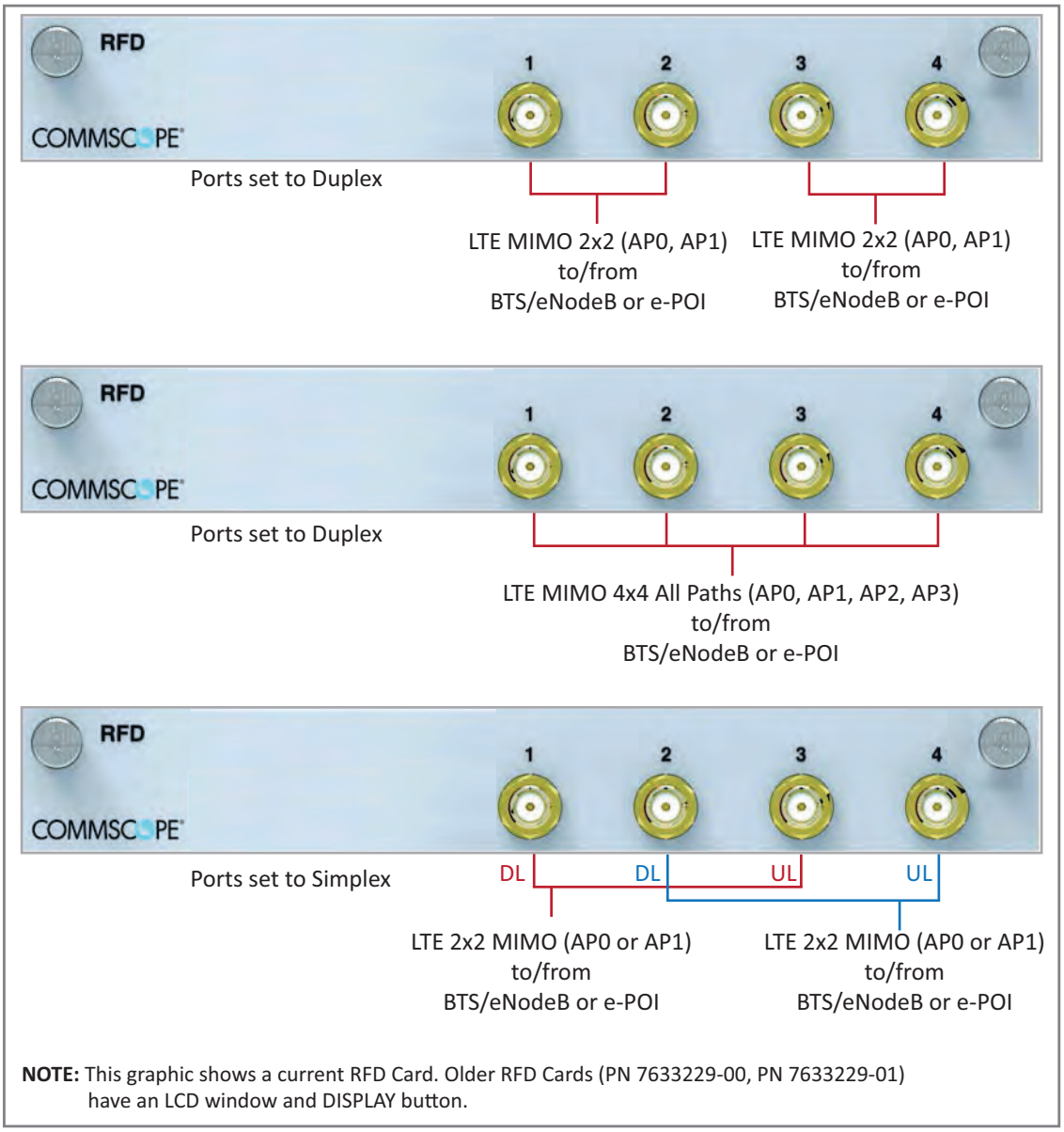
1 Connect RF cables from the BTS/eNodeB or e-POI to the QMA connectors of the RFD cards.

- SISO services such as CDMA, UMTS, GSM, and LTE SISO can be connected to any active port.
- Simplex port connections typically can use any two ports on the same RFD Card, except for LTE MIMO 2x2 pairs.



NOTE: This graphic shows a current RFD Card. Older RFD Cards (PN 7633229-00, PN 7633229-01) have an LCD window and DISPLAY button.

- Simplex ports supporting LTE MIMO 2x2 must be configured as follows: pair Port 1 DL with Port 3 UL, and pair Port 2 DL with Port 4 UL on the same RFD Card.
- Duplex ports supporting LTE MIMO 2x2 pairs must be connected to the same RFD Card, as a pair to: Port 1 and Port 2 or to Port 3 and Port 4.
- LTE MIMO 4x4 requires that all four paths (MIMO index AP0, AP1, AP2, and AP3) of an eNodeB be connected to duplex ports on the same RFD card. No duplicates of the MIMO index and no missing MIMO indexes are allowed. No specific MIMO index connection order is required. Simplex connections are not supported.



NOTE: This graphic shows a current RFD Card. Older RFD Cards (PN 7633229-00, PN 7633229-01) have an LCD window and DISPLAY button.

2 If the signal levels of the BTS exceed the maximum input level of + 16 dBm, an e-POI Module or other suitable attenuator must be used to attenuate the signal. For optimum PIM performance, the composite level into a Donor (RFD Card) port should be less than 16 dBm. If only one carrier is in a band, PIM is probably not a concern. For the case of two or more carriers in a band, spurious intermods due to PIM could land in the UL causing interference. Whether or not PIM will cause interference depends on the spacing between UL and DL and the frequencies of active carriers.

Connect the OPT Cards

OPT cards provide a 10 Gbps fiber connection between CANs, TENs, and WINs; and between CANs and TENs and Fiber APs. Each OPT Card supports up to four SFP+ transceivers for device connections.

OPT Cards are hot swappable; you do not need to power down the CAN, TEN, or WIN to install or remove an OPT.

Connecting OPT Cards is a two-phase process:

- In phase 1, you "Install SFP+ Modules in the OPT Cards" on page 62.
- In phase 2, you connect the OPT Card to another WCS Subrack or to a Fiber AP, as required for this installation:
  - "Cabling OPT Cards to Connect a WIN a Switching CAN" on page 64
  - "Cabling OPT Cards to Connect the TEN to a Classic CAN" on page 66
  - "Cabling OPT Cards to Connect a TEN to a Switching CAN" on page 68
  - "Cabling OPT Cards for Connecting to a Fiber AP" on page 70.

Fiber Optic Link Budget in the ERA System

When designing the fiber links for the CommScope ERA system, is important to consider all the factors that can affect link performance. These factors include TX optical power, RX sensitivity, the fiber length, the wavelength, the number of splices, and the number of connectors. This topic briefly describes the key factors that should be considered.

Minimum Optical Path Loss

The optical power applied to the RX input of the SFP+ module must be less than the Receiver Overload threshold. In some cases, the Receiver Overload is less than or equal to the maximum TX Optical Power, which allows a very short fiber jumper to be used to connect TX to RX power; however, in other cases the TX Power exceeds the Receiver Overload threshold, so a minimum amount of optical attenuation must be applied between the TX output and RX input to prevent overdriving the RX input. See Table 14 on page 62 for a list of SPF+ modules that are qualified for use with the ERA system.

```
Optical Fiber Path Loss >= TX Optical Power Max - Receiver Overload
```

If the path loss is below the amount of attenuation needed to prevent exceeding the Receiver Overload threshold, then additional attenuation must be added in the link to prevent overdrive. This can be done by adding additional fiber or by using an inline optical attenuator.

Maximum Optical Path Loss

The optical power received at the RX input must be greater than the RX Sensitivity. The RX power is equal to the minimum TX power reduced by any optical attenuation in the TX-RX path. It is good design practice to provide additional link margin when designing the fiber links.

```
Maximum Optical Path Loss <= TX Optical Power Min - RX Sensitivity - Link Margin
```

Optical Link Loss

Optical loss is calculated by adding the attenuation due to the length of the fiber optic cable, the number of connectors in the link, and the number of splices. If there are other optical devices in the link, then their attenuation needs to be included as well (mux, demux, add/drop, etc.).

```
Optical Link Loss = fiber length(km) * optical attenuation/km
                  + Splice Loss * Number of splices
                  + Connector Loss * Number of Connectors
```

Minimum Performance Levels

The values below are the minimum performance specifications for fiber optic components noted in ANSI/TIA/EIA-568-C.3 Optical Fiber Cabling Components, with key performance specifications shown in Table 12 and Table 13 below.

Table 12. *Minimum Performance of Optical Components*

Parameter	Minimum Performance [1]
Mated connector pair	0.75 dB
Splice	0.3 dB
1 Actual performance may be better than the minimum performance values noted.	

Table 13. *10 Gbps Ethernet Standards for Optical Link Budget*

SFP+ Module Type	10GBASE-SR		10GBASE-LR	10GBASE-ER
Fiber Class	OM3	OM4	G.652	G.652
Maximum Distance (m)	300	400	10,000 [1]	40,000 [1]
Wavelength of Operation (nm)	850	850	1310	1550
Loss per km @ wavelength (dB)	3.5	3.5	0.5	0.5
Allowed Measured Loss (dB)	2.6	2.9	6.0	11.0
Allowed Back Reflection (dB)	-20	-20	-26	-26
1 Maximum Distance may require < 0.5dB/km loss. Most high quality single mode cables are so rated.				

SFP+ Modules Tested for use with ERA

The following SFP+ modules are available from CommScope. These SFP+ modules have been tested by CommScope to ensure that they meet the requirements of an ERA system. This list was current at the time that this manual was published but is subject to change.

Table 14. *SFP+ Modules Tested for Use with ERA*

CommScope Part No.	Description	Minimum Path Loss	CommScope Part No.	Description	Minimum Path Loss
7660511	SFP+, 10GBase-SR, (MM)	0 dBm	**7803295**	IC SFP+ APSPC35B33CDL40 Transceiver	5 dBm
7680813	SPF+, LR (SM)	0 dBm	**7803298**	IC SFP+ APSPC37B33CDL40 Transceiver	5 dBm
7801330	SFP+ CWDM 1471 nm, 10G-BASE-ER/EW, 10GbE	5 dBm	**7803900**	IC SFP+ APSPC39B33CDL40 Transceiver	5 dBm
7801340	SFP+ CWDM 1491 nm, 10G-BASE-ER/EW, 10GbE	5 dBm	**7803902**	IC SFP+ APSPC41B33CDL40 Transceiver	5 dBm
7801342	SFP+ CWDM 1511 nm, 10G-BASE-ER/EW, 10GbE	5 dBm	**7803904**	IC SFP+ APSPC43B33CDL40 Transceiver	5 dBm
7801344	SFP+ CWDM 1531 nm, 10G-BASE-ER/EW, 10GbE	5 dBm	**7803906**	IC SFP+ APSPC45B33CDL40 Transceiver	5 dBm
7801360	SFP+ CWDM 1551 nm, 10G-BASE-ER/EW, 10GbE	5 dBm	**7832204**	10G BIDI SFP+ TX1270/RX1330 40km I-temp	5.5 dBm
7801363	SFP+ CWDM 1571 nm, 10G-BASE-ER/EW, 10GbE	5 dBm	**7832206**	10G BIDI SFP+ TX1330/RX1270 40km I-temp	5.5 dBm
7801365	SFP+ CWDM 1591 nm, 10G-BASE-ER/EW, 10GbE	5 dBm	**7843514**	SFP+, LC, 1310nm, max. 40Km	5.5 dBm
7801367	SFP+ CWDM 1611 nm, 10G-BASE-ER/EW, 10GbE	5 dBm	**7845626**	10G BIDI SFP+ TX1310/RX1270 20km I-temp	2.5 dBm
7803247	IC SFP+ APSPC27B33CDL40 Transceiver	5 dBm	**7845627**	10G BIDI SFP+ TX1270/RX1310 20km I-temp	2.5 dBm
7803249	IC SFP+ APSPC29B33CDL40 Transceiver	5 dBm	**7845628**	CSFP BIDI Transceiver Tx-1270 / Rx-1310 (20km)	2.5 dBm
7803291	IC SFP+ APSPC31B33CDL40 Transceiver	5 dBm	**7845629**	CSFP BIDI Transceiver Tx-1310 / Rx-1270 (20km)	2.5 dBm
7803293	IC SFP+ APSPC33B33CDL40 Transceiver	5 dBm			

Install SFP+ Modules in the OPT Cards

The following steps tell you how to install the appropriate 10 Gbps SFP+ Module into the ports on the OPT Card that will be used to provide a 10 Gbps fiber connection between a CAN and a TEN or a WIN, or between a CAN or TEN and a Fiber AP.

1. The SPF+ Module used must match the type of fiber used—Multi-Mode Fiber or Single-Mode Fiber (SMF or MMF). If necessary, contact your local CommScope sales representative to obtain the required number of SFP+ Modules for this installation.

   CommScope recommends testing with a device capable of certifying the end-to-end link (including the SFP+ Module) to ensure the installation meets the applicable 10Gbps Ethernet standard.

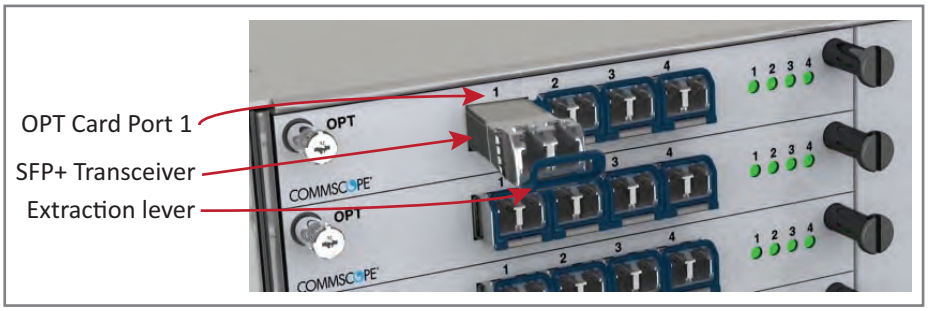
2. If the optical fiber path loss is below the minimum amount needed to prevent overdrive of the receiver, then insert an in-line optical attenuator to increase the loss above the minimum threshold.

3 Follow the steps in "Install and Connect the Subrack Cards" on page 56 to install the OPT Card into the WCS Subrack, as needed for this installation:

- For a Classic CAN, you use:
  - Slots L1 - L4 for an OPT Card connecting a Classic CAN to a TEN or a Fiber AP
  - Slots L1 - L8 for an OPT Card connecting the Classic CAN to a TEN.
- For a Switching CAN, you use:
  - Slots L1 - L8 for an OPT Card connecting a Switching CAN to a TEN
  - Slots R1 - R8 for an OPT Card connecting a Switching CAN to a WIN.
- For WINs, you use:
  - Use Port L1.1 to connect to the Switching CAN.
  - Use Ports L1.2 through L2.4 for additional WIN-to-CAN links to increase the WIN bandwidth to support multiple operators and sectors.
- For TENs, you use:
  - Slot R1, Port 1 (**R1.1**) to connect to a Classic or Switching CAN. **R1.1** is the primary control slot and is mandatory.
  - Slot R1, Ports 2 - 4 (**R1.2** - **R1.4**) for additional TEN-to-CAN links.
  - L1 - L4 to connect to a Fiber AP over an optical-fiber link.

4 Use the system design to identify which OPT Card ports will be used in this system.

5 Slide the SFP+ into the OPT Card port identified in Step 4, and push the SFP+ into the OPT Card until you hear it click into place.



Should you need to remove an SFP+ Module, do the following in the order presented to prevent damage to the SFP+ Module, the OPT Card, or the fiber.

1 **Disconnect the fiber cable.**

2 **Pull the extraction lever on the SFP+ Module towards you. Do not rotate the lever downward more than 90 degrees to avoid damage to the lever.**

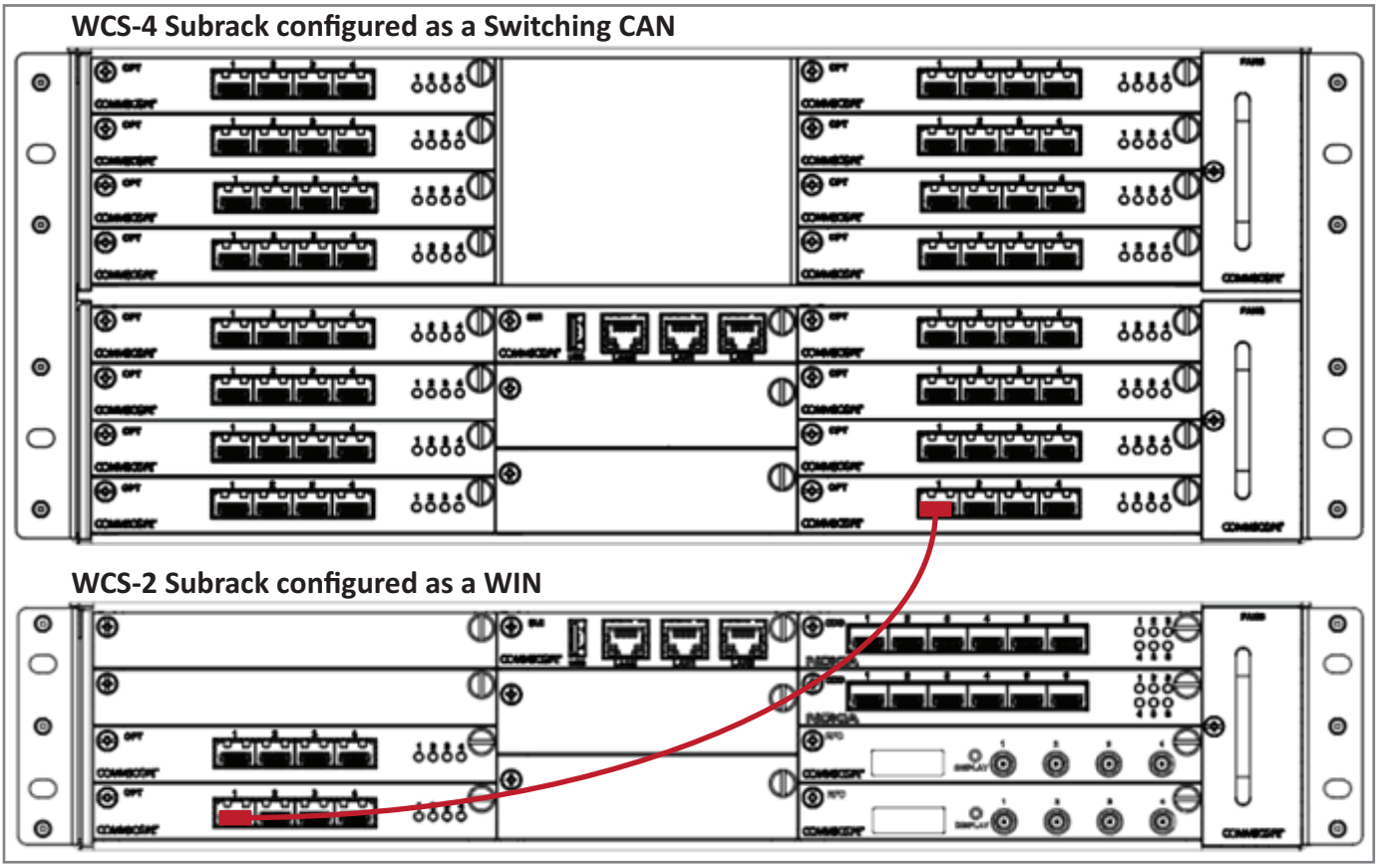
3 **Use the extraction lever to carefully pull the SFP+ module out of the OPT Card slot.**

Cabling OPT Cards to Connect a WIN a Switching CAN

In this process you will connect SFP+ Modules to the fiber cable and then use the cable to connect a WIN to a Switching CAN.

The graphics used in this process show a WCS-4 Subrack as a Switching CAN, and a WCS-2 Subrack as a WIN. The same rules for slots and port connections apply if the Switching CAN was a WCS-2 Subrack or the WIN was a WCS-4 Subrack.

1. Complete the steps in "SFP+ Modules Tested for use with ERA" on page 62.
2. Obtain a pair of SFP+ Modules that correspond to the length and type of fiber you will use to connect the CAN to the WIN. Note the maximum range listed inTable 13 on page 61.
3. Follow local practice or manufacturer recommendations to clean fiber connectors.
4. Connect one end of the cable with an SFP+ Module into one of the OPT Card ports (labeled **1** - **4**) installed in the Switching CAN—you can only use Slots **R1** - **R8** in the Switching CAN.
5. Connect the other end of the cable with an SFP+ Module into **Port 1** on the OPT Card installed in **Slot L1** (**L1.1**) of the WIN.



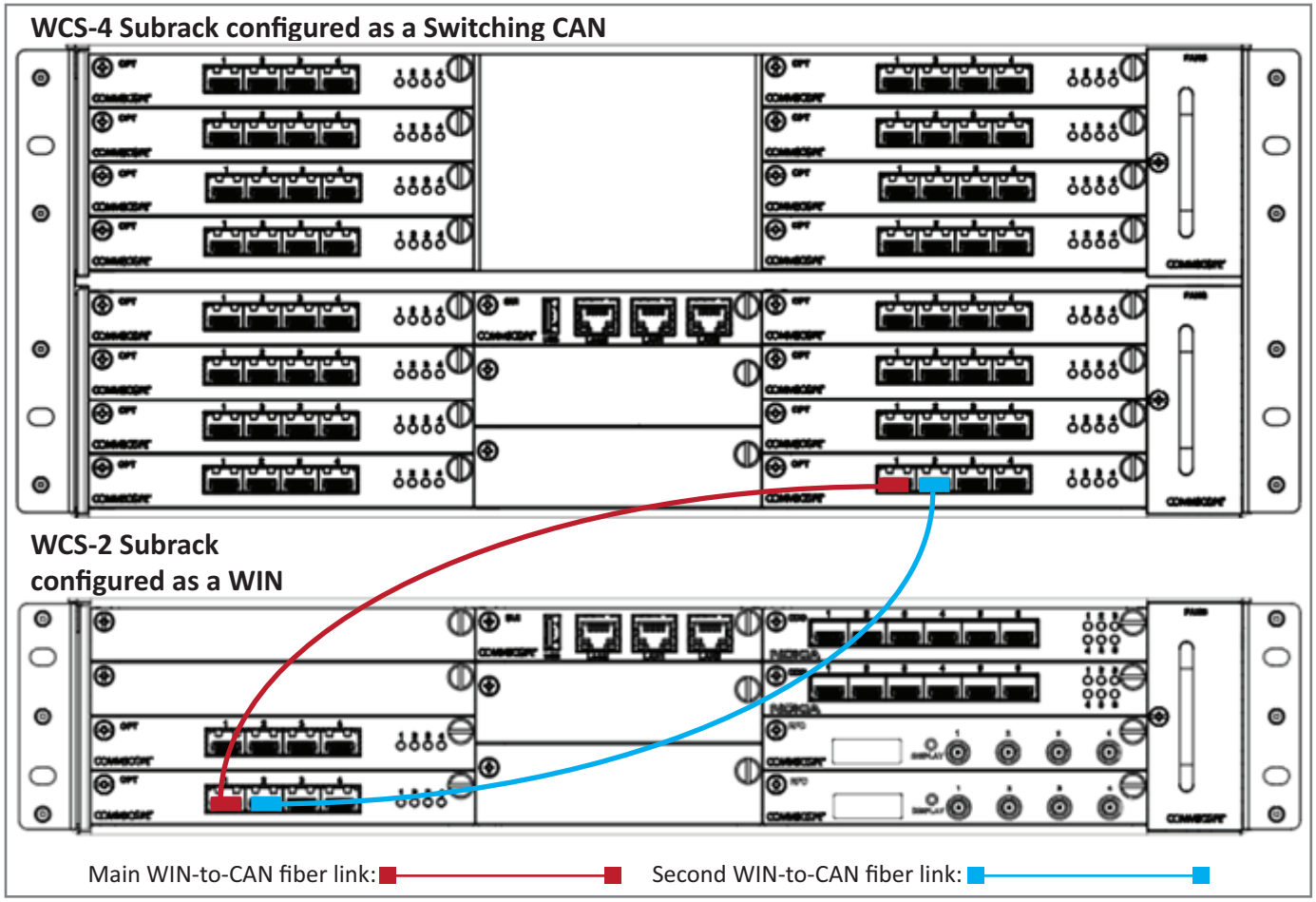
6 (Optional). Do the following to add an additional WIN-to-CAN link to increase the WIN bandwidth to support additional operators and sectors:

a Obtain a pair of SFP+ Modules that correspond to the length and type of fiber you will use to connect the Switching CAN to the WIN. Note the maximum range listed in Table 13 on page 61.

b Follow local practice or manufacturer recommendations to clean fiber connectors.

c Connect one end of the cable with an SFP+ Module into one of the four ports on the OPT Card (labeled **1** - **4**) installed in the Switching CAN.

d Connect the other end of the cable with an SFP+ Module into **Port 2** on the OPT Card installed in **Slot L1** of the WIN.



7 (Optional). To add additional WIN-to-CAN links to increase the WIN bandwidth to support additional operators and sectors, follow the process in Step 6, as needed for each additional link.

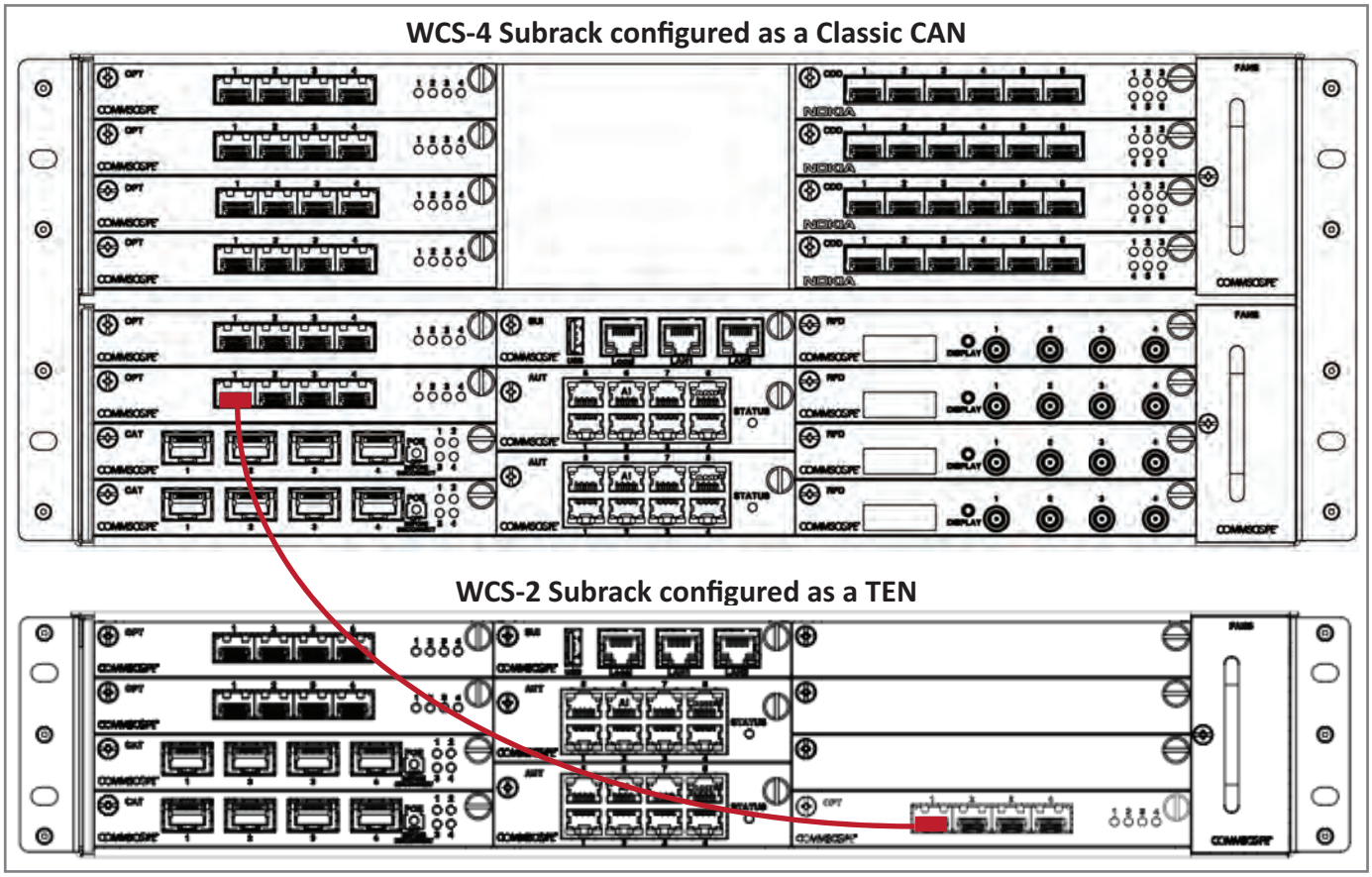
In addition to the card placement, you must also configure the function of the WCS Subracks in the ERA GUI. For further information, refer to the ERA configuration guide for Software Version 2.5 or later; see "Accessing ERA Series User Documentation" on page 83.

Cabling OPT Cards to Connect the TEN to a Classic CAN

In this process you will connect SFP+ Modules to the fiber cable and then use the cable to connect the TEN to a Classic CAN.

The graphics used in this process show a WCS-4 Subrack as a Classic CAN, and a WCS-2 Subrack as a TEN. The same rules for slots and port connections apply if the Classic CAN was a WCS-2 Subrack or the TEN was a WCS-4 Subrack.

1. Complete the steps in "SFP+ Modules Tested for use with ERA" on page 62.
2. Obtain a pair of SFP+ Modules that correspond to the length and type of fiber you will use to connect the CAN to the TEN. Note the maximum range listed in Table 13 on page 61.
3. Follow local practice or manufacturer recommendations to clean fiber connectors.
4. Connect one end of the cable with an SFP+ Module into one of the OPT Card ports (labeled **1** - **4**) installed in the CAN.
5. Connect the other end of the cable with an SFP+ Module into **Port 1** on the OPT Card installed in **Slot R1** of the TEN.



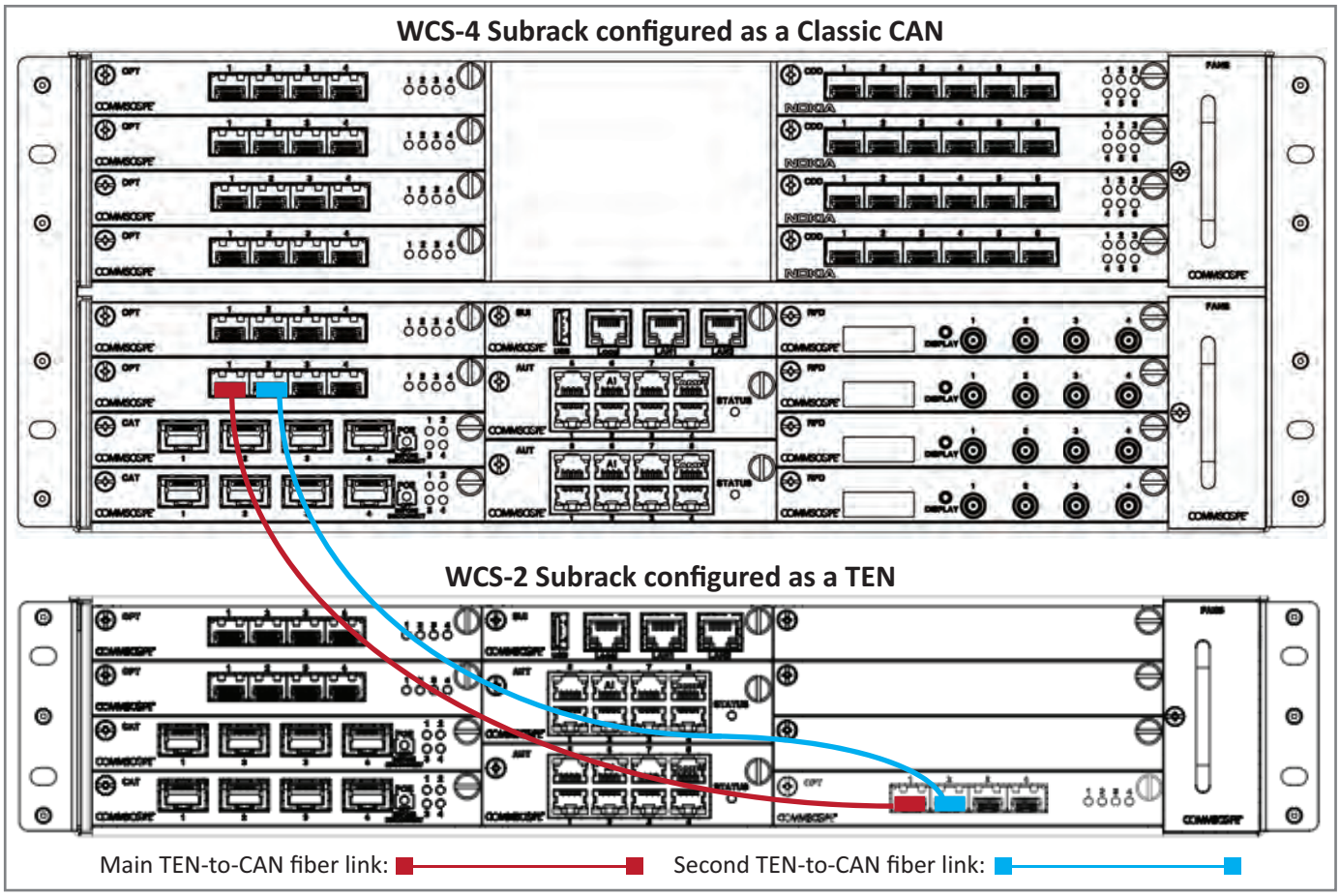
6 (Optional). To add an additional 320 MHz of RF between the TEN and CAN, do the following:

a Obtain a pair of SFP+ Modules that correspond to the length and type of fiber you will use to connect the CAN to the TEN. Note the maximum range listed in Table 13 on page 61.

b Follow local practice or manufacturer recommendations to clean fiber connectors.

c Connect one end of the cable with an SFP+ Module into one of the four ports on the OPT Card (labeled **1** - **4**) installed in the CAN.

d Connect the other end of the cable with an SFP+ Module into **Port 2** on the OPT Card installed in **Slot R1** of the TEN.



7 (Optional). To add additional TEN-to-CAN links, with each link adding an additional 320 MHz of RF capacity between the TEN and CAN, follow the process in Step 6, as needed for each additional link. However, you will now use Ports R1.2 through R1.4, which must be populated consecutively—there cannot be unused ports between used ports. That is, you cannot use Port R1.2 and R1.4 and leave R1.3 unused.

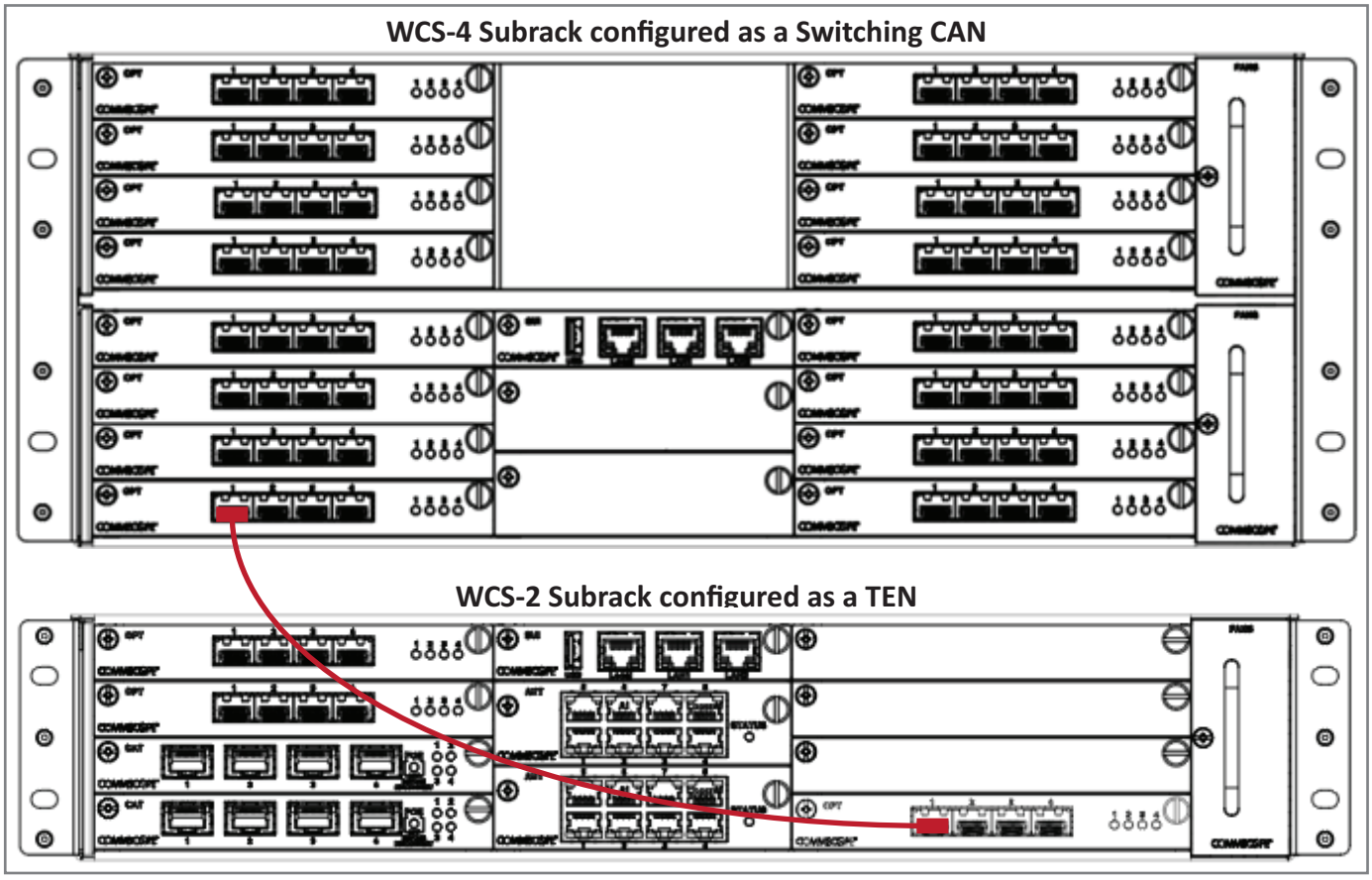
In addition to the card placement, you must also configure the function of the WCS Subracks in the ERA GUI. For further information, refer to the ERA configuration guide for Software Version 2.5 or later; see "Accessing ERA Series User Documentation" on page 83.

Cabling OPT Cards to Connect a TEN to a Switching CAN

In this process you will connect SFP+ Modules to the fiber cable and then use the cable to connect a TEN to a Switching CAN.

The graphics used in this process show a WCS-4 Subrack as a Switching CAN, and a WCS-2 Subrack as a TEN. The same rules for slots and port connections apply if the Switching CAN was a WCS-2 Subrack or the TEN was a WCS-4 Subrack.

1. Complete the steps in "SFP+ Modules Tested for use with ERA" on page 62.
2. Obtain a pair of SFP+ Modules that correspond to the length and type of fiber you will use to connect the CAN to the TEN or the WIN. Note the maximum range listed in Table 13 on page 61.
3. Follow local practice or manufacturer recommendations to clean fiber connectors.
4. Connect one end of the cable with an SFP+ Module into one of the OPT Card ports (labeled **1** - **4**) installed in the Switching CAN—you can only use Slots **L1** - **L8** in the Switching CAN.
5. Connect the other end of the cable with an SFP+ Module into an OPT Card in the TEN, as follows:
   - Use Port R1.1 to connect to the Switching CAN.
   - Use Ports R1.2 through R1.4 for additional TEN-to-CAN links.



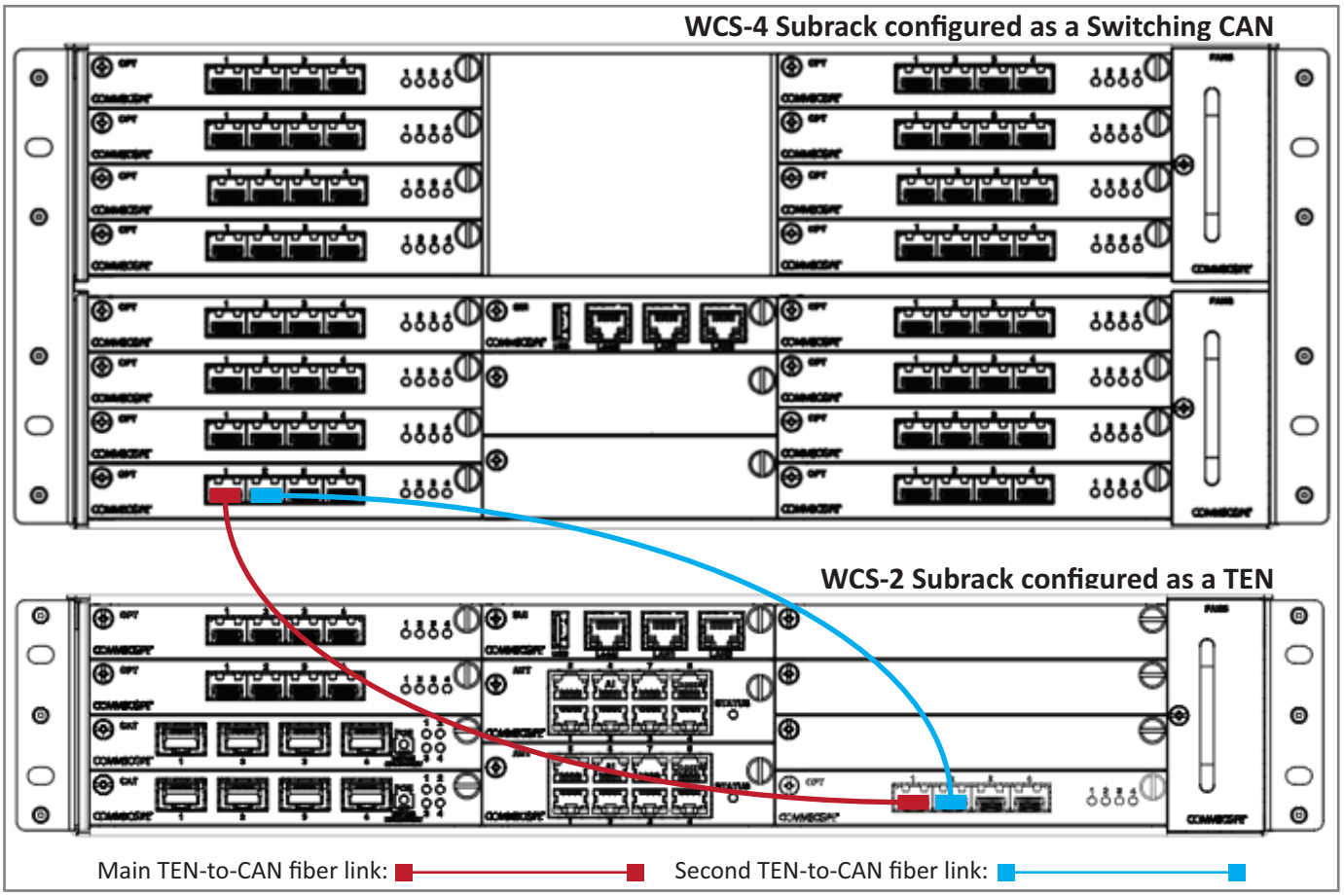
6 (Optional). To add an additional 320 MHz of RF between the TEN and the Switching CAN, do the following:

a Obtain a pair of SFP+ Modules that correspond to the length and type of fiber you will use to connect the CAN to the TEN. Note the maximum range listed in Table 13 on page 61.

b Follow local practice or manufacturer recommendations to clean fiber connectors.

c Connect one end of the cable with an SFP+ Module into one of the four ports on the OPT Card (labeled **1** - **4**) installed in the Switching CAN.

d Connect the other end of the cable with an SFP+ Module into **Port 2** on the OPT Card installed in **Slot R1** of the TEN.



7 (Optional). To add additional TEN-to-CAN links, with each link adding an additional 320 MHz of RF capacity between the TEN and Switching CAN, follow the process in Step 6, as needed for each additional link. However, you will now use Ports **R1.2** through **R1.4**, which must be populated consecutively—there cannot be unused ports between used ports. That is, you cannot use Port **R1.2** and **R1.4** and leave **R1.3** unused.

In addition to the card placement, you must also configure the function of the WCS Subracks in the ERA GUI. For further information, refer to the ERA configuration guide for Software Version 2.5 or later; see "Accessing ERA Series User Documentation" on page 83.

Cabling OPT Cards for Connecting to a Fiber AP

This procedure tells you how to connect an OPT Card in a CAN or a TEN to a Fiber AP. For full installation instructions, refer to the applicable Fiber AP installation guide. See "Accessing ERA Series User Documentation" on page 83.

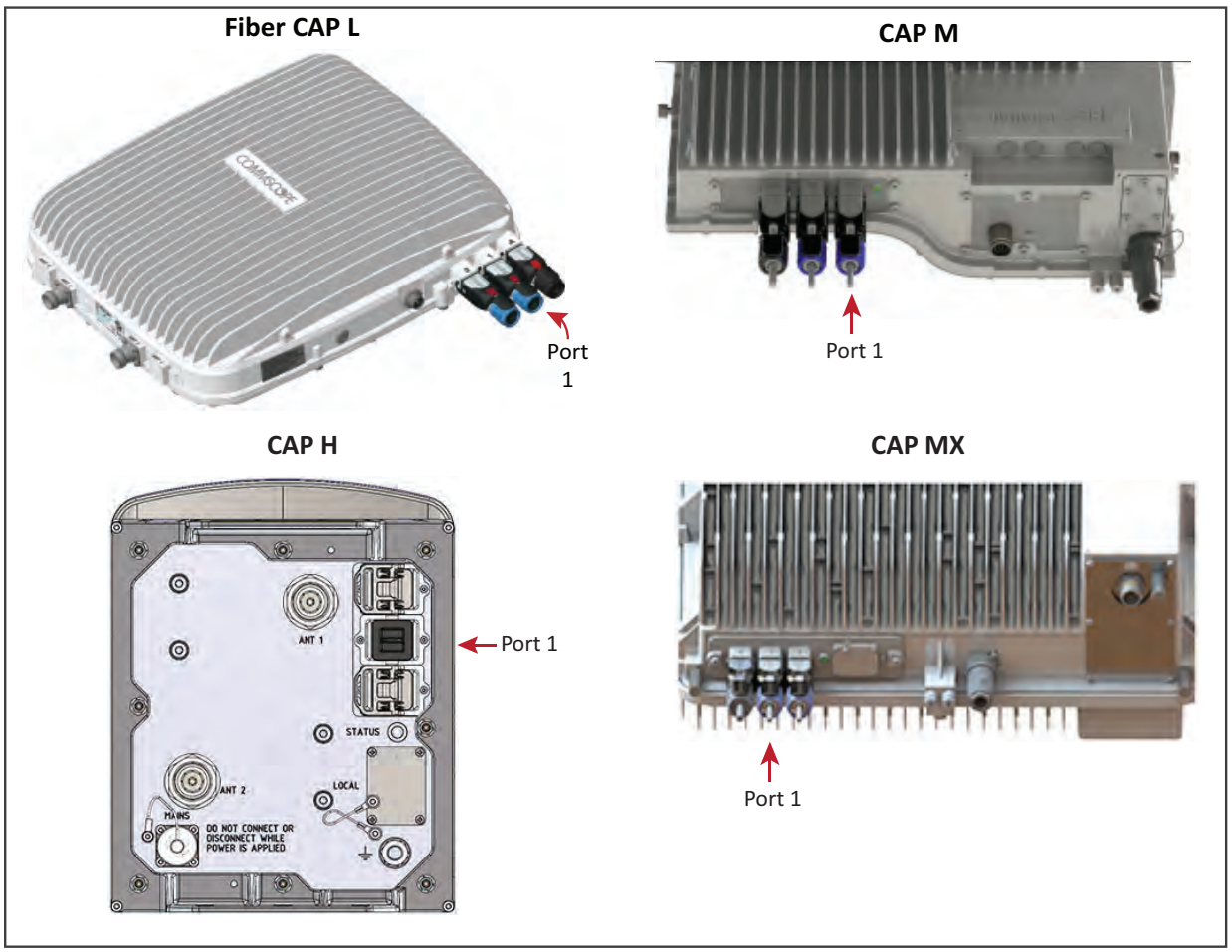
In this process you will connect SFP+ Modules to the fiber cable, and then use the cable to connect a CAN or a TEN to a Fiber AP.

1 Contact your local CommScope sales representative to obtain the following components, as required, for this installation.

- Per the installation plan, obtain either SMF or MMF that is of sufficient length to reach from the Fiber AP to the CAN or TEN.
- Obtain a pair of SFP+ Modules that is appropriate for this installation. Table 14 on page 62 identifies the available SFP+ Modules.
- The AP includes one Optical OCTIS Kit (PN 7770612). Obtain an additional kit to cascade APs.

2 Connect the Optical Port 1 on the Fiber AP, as appropriate for this installation.

a Remove the dust cap from Optical Port 1 on the Fiber AP, and from the connectors on the SMF or MMF (see graphic that follows).



b Follow the local cleaning technique to clean Optical Port 1 on the Fiber AP.

c Clean the connectors on the SMF or MMF following the fiber supplier's recommendations.

d Install the SFP+ Module and Optical OCTIS Kit on the end of the SMF or MMF that will connect to the Fiber AP, and then connect it to Optical Port 1 on the Fiber AP (see the preceding graphic). Refer to the technical data sheet that ships with the OCTIS Kit for further information.

e Connect the other end of the fiber and SFP+ module to an open port on an OPT Card. (The OPT Card should only be installed in L1, L2, L3, or L4.)

If installing a CAP L with the CAP L Hybrid Fiber Splice Box Kit (PN 7774354-xx), the optical fiber will be hanging from the Hybrid Fiber Splice Box.

3 Complete the steps in "SFP+ Modules Tested for use with ERA" on page 62.

Connect the CAT Cards

This procedure tells you how to connect an AP to a CAT Card installed in a Classic CAN or a TEN. Card Cards cannot be used in a Switching CAN or WIN. In a cascaded AP configuration, you connect the CAT Card to the Main AP.

CAT Cards are hot swappable; you do not need to power down the CAN or TEN to install or remove an CAT Card.

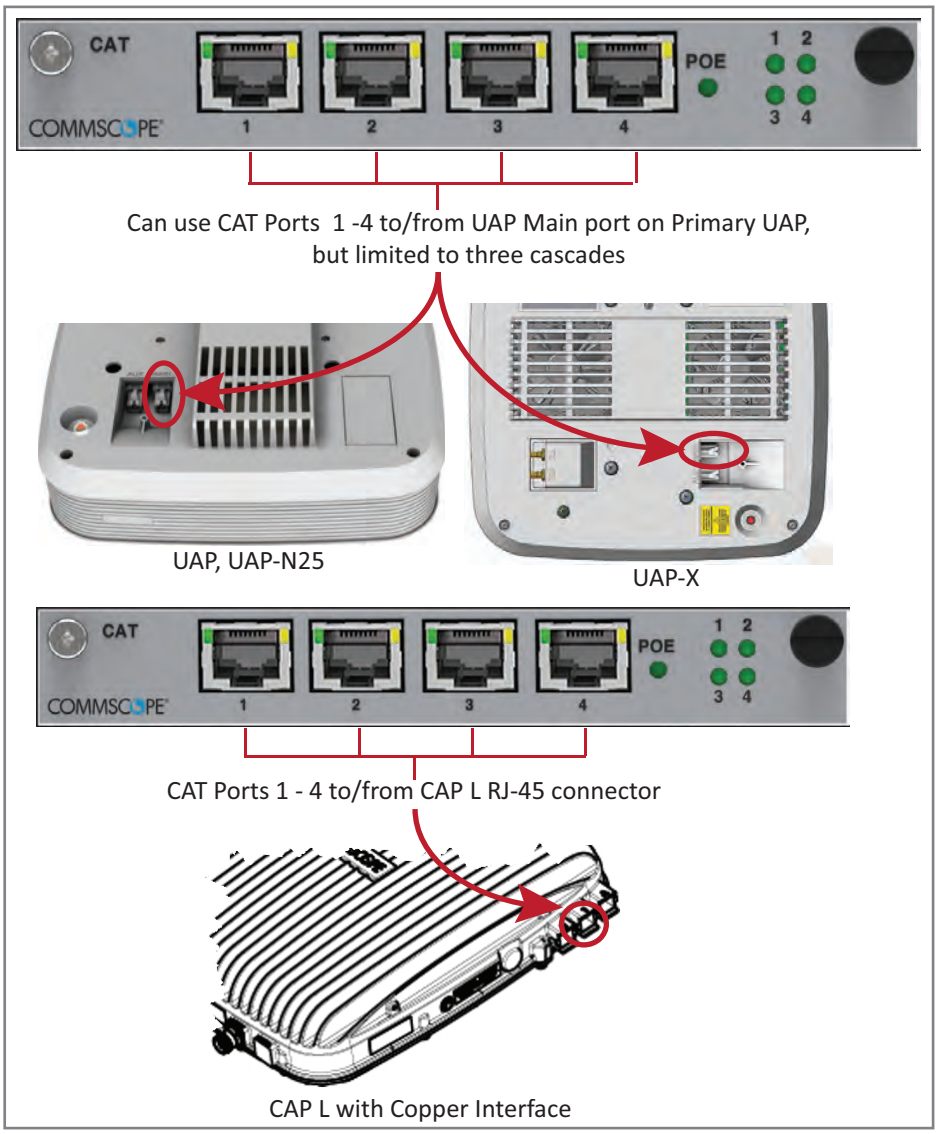
The -48 Vdc WCS subracks do not supply power over CAT6A to UAPs or Copper CAP L APs.

1 Follow the steps in one of the following sections to install the CAT Cards in Slots L1 - L4 of a Classic CAN or a TEN, as needed for this installation:

- "Slot and Card Assignment Rules for Classic CANs" on page 18
- "Slot and Card Assignment Rules for TENs" on page 21.

2 Use 23 AWG (minimum) Cat6A cables to connect up to four APs to the CAT Card as described below and as shown in the graphic below. When making this connection, observe the cabling rules identified in "Cat6A Cables and Connectors" on page 32.

- UAP, UAP-N25, UAP-X, and UAP-XN25—connect the CAT Card port to the UAP Main port.
- Copper CAP L—connect the CAT Card port to the CAP L RJ-45 port.



3 Use a testing device that provides an integrated test for Cat6A to make sure the Cat6A connections meet the requirements listed in "Cat6A Cables and Connectors" on page 32.

Connect the AUT Cards

The following rules apply to the AUT Card ports 1 - 8.

- The outside network that supports the Ethernet device connected to the AP must be connected to the corresponding AUT Card and port of the Subrack containing the CAT/OPT card to which the AP is connected.
- Because the path from the AP AUX port to an AUT port path is a pass-through connection, no extra network setup procedures for the Ethernet device are required.
- The AUT path is independent of the signal set assigned to an AP, however, the maximum transport bandwidth for the AP is reduced from 320 MHz to 285 MHz when an Ethernet device is connected to the AP.
- An Ethernet device such as a camera can be connected to the AUX port of an AP if AUT Cards are installed in the TEN or CAN.
- The AUX port of a cascaded (secondary) AP cannot be used to connect an Ethernet device.
- The AUT Card ports do not supply power, however, the AP does supply Remote Power over Cat6A to connected Ethernet devices.
- 1 Gbps and 100 Mbps Ethernet devices are supported, however, the type of device supported is dependent on the type of device connected to the AUT port.
  - If a 100 Mbit/s Ethernet device is connected to the AUT port, then the Ethernet device connected to the associated AP must also be a 100 Mbit/s device.
  - If a 1 Gbit/s Ethernet device is connected to the AUT port, then either a 100 Mbit/s device or a 1 Gbit/s device may be connected to the associated AP.

AUT Cards are hot swappable; you do not need to power down the CAN or TEN to install an AUT Card.

An AP will experience a Loss of Service that lasts approximately 1.5 minutes when a cascaded AP or an Ethernet device is connected to its AUX port. APs re-flash and reboot whenever an Ethernet device is initially added or when the type of device (AP or Ethernet device) connected to the AUX port is changed. The blue LED on the AP blinks while the AP is re-flashing without interrupting service, but during the reboot the AP experiences approximately 1.5 minutes of Loss of Service.

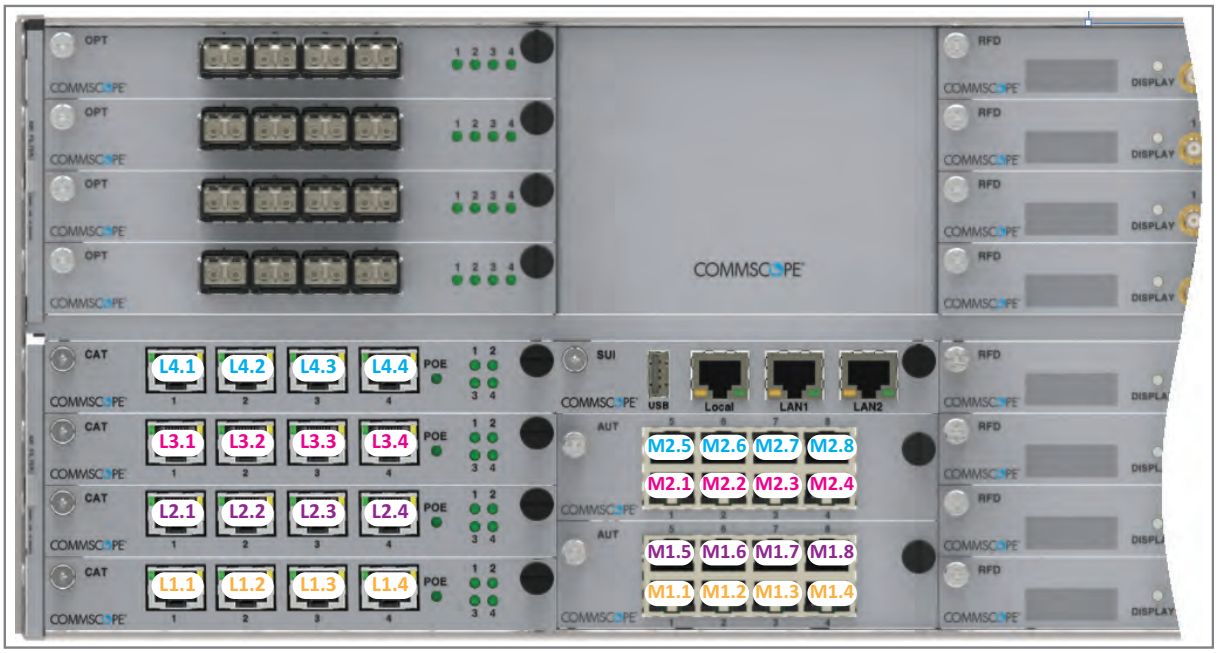
An AUT Card cannot be used in a Switching CAN or a WIN.

Figure 13 shows the internal mapping between WCS slots and CAT/OPT Card ports to AUT Card slots and ports. There is a specific relationship between the slot in which the CAT and AUT Cards are installed, and the CAT and AUT Card ports. For example:

- The CAT/OPT Card slot/port combination of **L1.1** always maps to AUT Card slot/port combination **M1.1**
- The CAT/OPT Card slot/port combination **L4.4** always maps to AUT Card slot/port combination **M2.8**.

This internal mapping provides the Ethernet backhaul for Ethernet devices connected to the Ethernet ports on the AUT Card.

Figure 13 shows the CAT Card installed in Slots L1 - L4. The mapping shown would be the same for an OPT Card installed in Slots L1 - L4.



WCS Slot (L1 - L4)	CAT/OPT Card Port	AUT Card Slot (M1 - M2)	AUT Card Port
L1	1	M1	1
L1	2	M1	2
L1	3	M1	3
L1	4	M1	4
L2	1	M1	5
L2	2	M1	6
L2	3	M1	7
L2	4	M1	8

WCS Slot (L1 - L4)	CAT/OPT Card Port	AUT Card Slot (M1 - M2)	AUT Card Port
L3	1	M2	1
L3	2	M2	2
L3	3	M2	3
L3	4	M2	4
L4	1	M2	5
L4	2	M2	6
L4	3	M2	7
L4	4	M2	8

Figure 13. Internal Mapping of CAT/OPT Card Slots and Ports to AUT Card Slots and Ports

Use the preceding information and the following steps to connect the AUT Card(s) to the ERA system.

1 Follow the steps in "Install and Connect the Subrack Cards" on page 56 to install the AUT Card(s) into the WCS Subrack Slots M1 - M2, as needed for this CAT/TEN installation.

2 Use to Figure 13 as a reference for port assignments of auxiliary devices subtended off an AP.

Connect the CDD Cards

The following sections guide you through the installation of a CDD Card. Adhere to all product safety and compliance cautions and follow the steps in the order presented.

Calculate the Power Draw

The maximum power draw for a CDD Card is 40 Watts. To determine the power draw of all CDD Cards installed in the CAN, multiply the number of CDD Cards installed by 40 Watts.

This calculation is for the CDD Card only.

Connect the CDD Card to the BBU

CDDs are hot swappable; you do not need to power down the CAN or WIN to install or remove a CDD.

1 If necessary, contact your local Nokia sales representative to obtain the required number of SFP Modules for this installation. The CPRI line rate is determined by each installation; care must be taken to order the proper speed grade SFP Module based on the installation requirements.

Do not use CommScope ERA SFP+ Modules in the CDD Card.

2 Slide an SFP Module into a CDD Card CPRI Port (labeled 1 - 6), and then push the SFP Module into the CDD Card until you hear it click into place.

Should you need to remove an SFP Module, do the following in the order presented to prevent damage to the SFP Module, the CDD Card, or the fiber.

1. Disconnect the fiber cable.

2. Pull down on the extraction lever on the SFP Module.

3. Use the extraction lever to carefully pull the SFP module out of the CDD Card slot.

3 Obtain the required length of Single-Mode Fiber cable (with loss of less than 13 dB) that has a dual-fiber LC jumper that can reach from a CDD Card CPRI port in the Classic CAN or WIN to a CPRI port on the Nokia AirScale FSM4 ABIA Module in the BBU.

4 Connect one end of the cable to an SFP Module installed in a CDD Card CPRI Port (labeled 1 - 6).

5 Connect the other end of the cable to a CPRI port on the Nokia AirScale ABIA Module, where the CPRI ports are labeled RF-*n* where *n* is the port number (1 - 6).

Refer to the following graphics for examples of BBU to CDD Card connectivity:

- For Classic CAN installations, see Figure 14 on page 76
- For WIN installations, see Figure 15 on page 77.

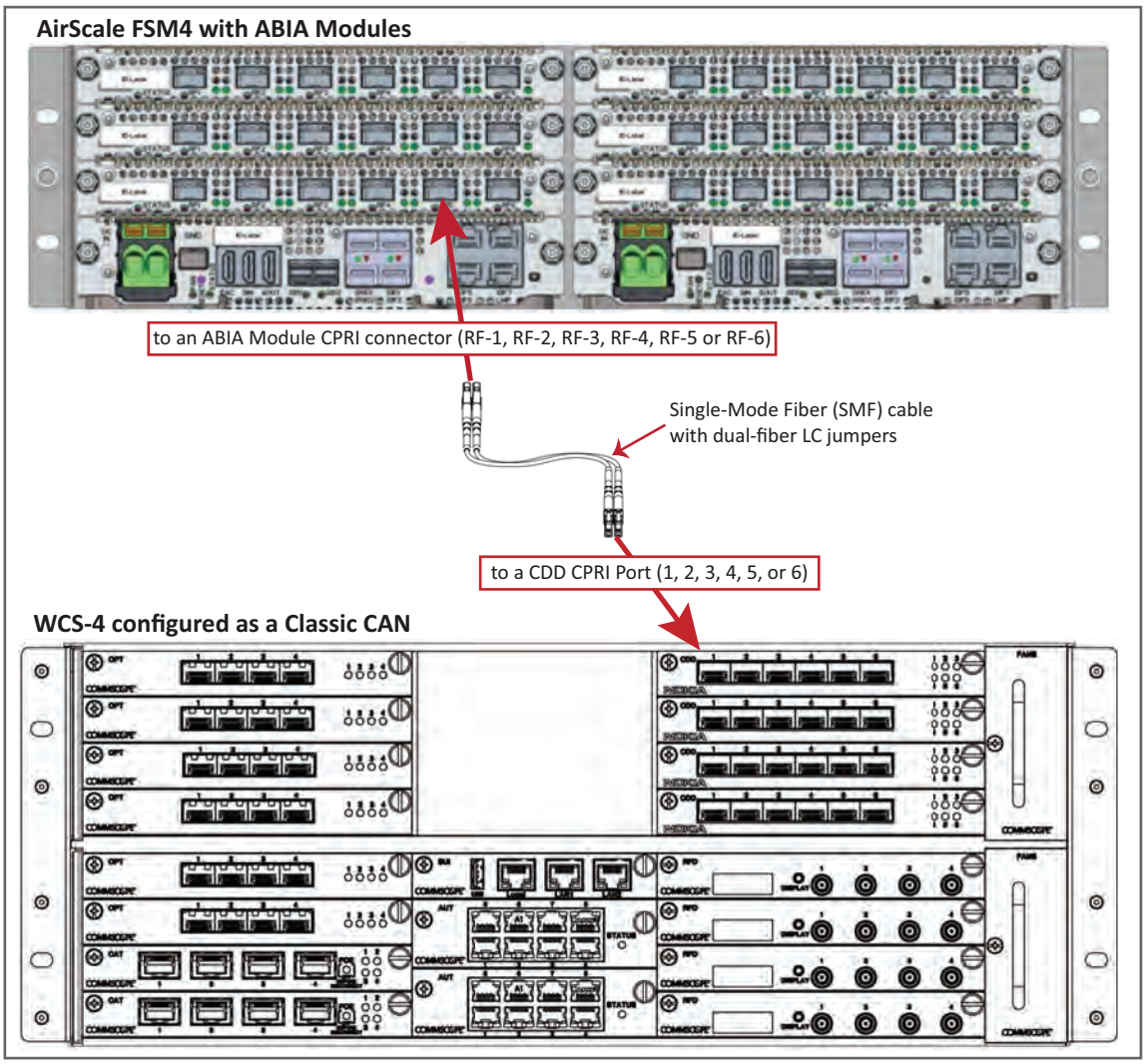


Figure 14. CDD Card in a Classic CAN Connecting to a BBU

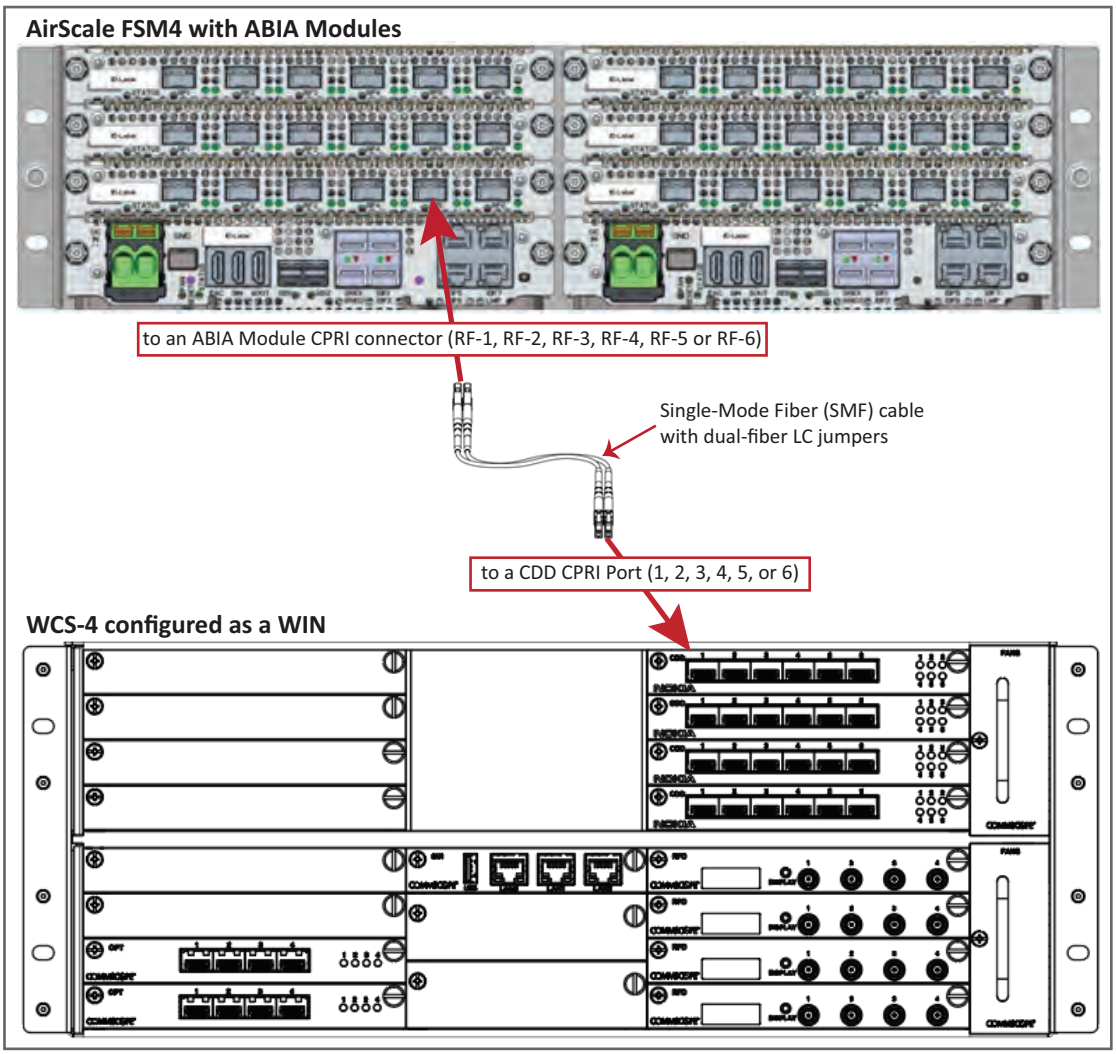


Figure 15. CDD Card in a WIN Connecting to a BBU

MAINTENANCE

The following sections provide maintenance information.

WCS Subrack Filter Module Maintenance

The WCS-2 Subrack has one Filter Module, and the WCS-4 Subrack has two Filter Modules on the left-hand side of the chassis (see "WCS Subrack Fan Trays and Filter Modules" on page 31). Air enters the Subrack on the left side of the chassis and exits on the right by the Fan Tray.

The Filter Modules should be checked every six months to make sure they are clear of dust and cleaned if necessary. A dirty Filter Module will inhibit fresh air flow and can cause temperature alarms. CommScope has found that CAT Cards are typically first to show temperature alarms if the Filter Module becomes clogged.

Removing a WCS Subrack Filter Module

WCS Subrack Filter Modules can be pulled out with your fingers, as there are no screws—Filter Modules are retained in the WCS Subrack chassis by friction. However, you may have to use a screwdriver or a flat blade under the lip of the Filter Module frame to help pry it out of its slot. Filter Modules can be pulled out while the system is running.

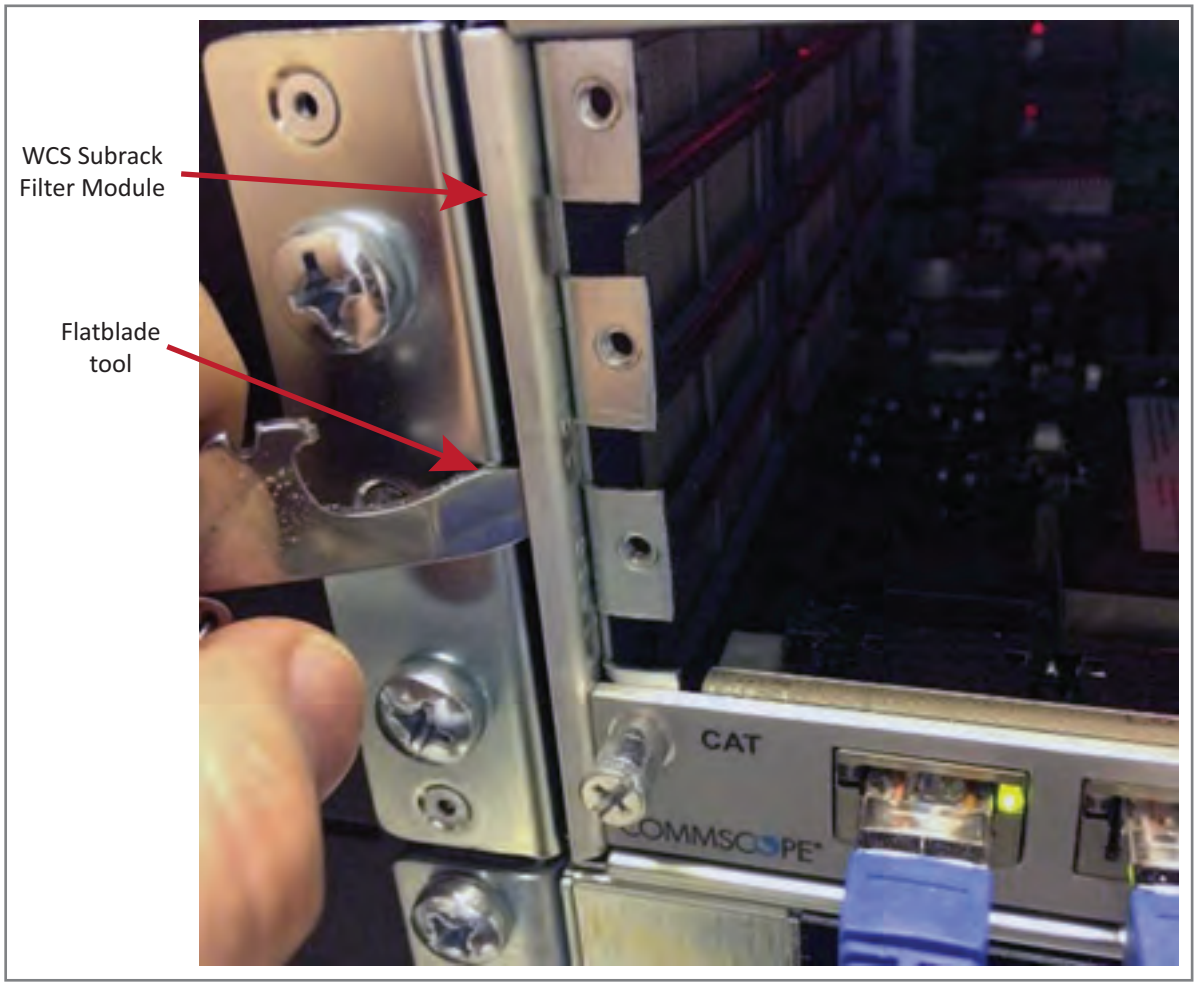


Figure 16. Removing a WCS Filter Module

Cleaning a WCS Subrack Filter Module

The Filter Modules are reusable, and can be cleaned with a brush, vacuum, or water. If water is used, as much dust as possible should be removed before getting the Filter Module wet. Figure 17 shows examples of a clean and a dirty Filter Module.

When cleaning a Filter Module, take care so you do not damage the EMI gasket at the front of the filter frame. If the Filter Module becomes damaged and cannot be reinstalled, contact your local CommScope sales representative to order a new Filter Module (PN 7700691-xx).

Do not clean the Filter Module with water in the same vicinity as the WCS Subrack or other electronics. Wet conditions increase the potential for receiving an electrical shock when installing or using electrically powered equipment. Make sure the Filter Module is completely dry before replacing it in the WCS Subrack chassis.

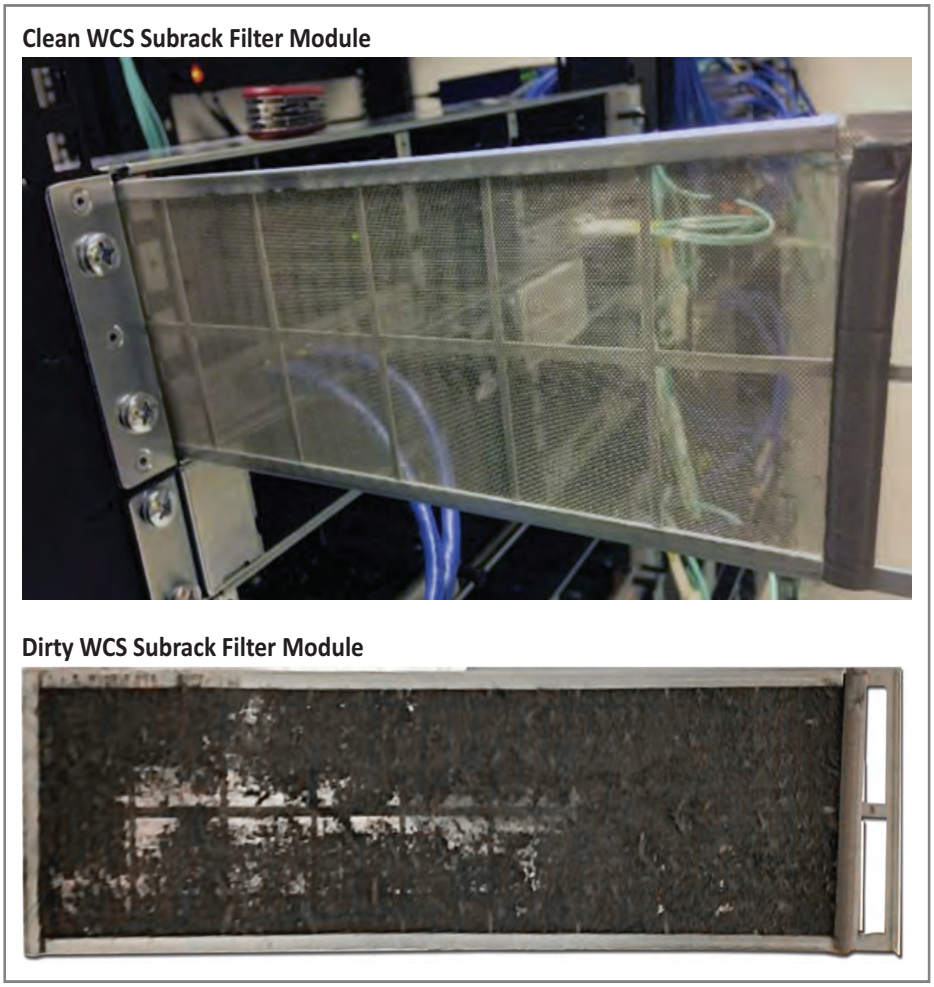


Figure 17. Examples of Clean and Dirty WCS Subrack Filter Modules

Installing a WCS Subrack Filter Module

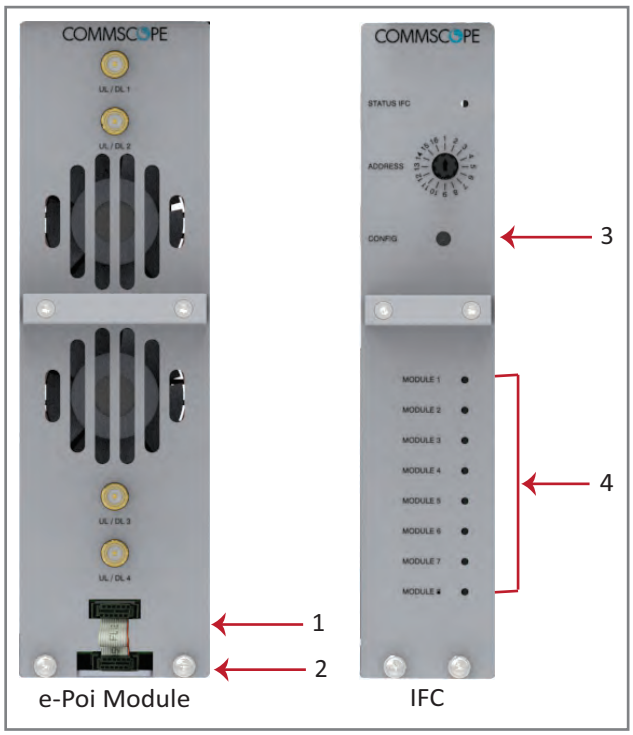
To install a cleaned or new Filter Module, slide the filter into its slot and press firmly until its edge is aligned with the front faceplate of the WCS Subrack chassis and cannot be pushed in any further.

Removing an e-POI Module from an e-POI Subrack

e-POI modules are hot swappable; you do not need to power down the e-POI subrack to add or remove an e-POI module, but you should follow the instructions below to ensure that false alarms are not generated due to a missing e-POI module.

The ERA Software automatically detects when an e-POI Module is added to an e-POI Subrack. Should you need to remove an e-POI Module, you must do the following:

1. Disconnect the Ribbon cable from the e-POI Module that you are removing from the e-POI Subrack.
2. Loosen the two thumbscrews on the bottom of the e-POI Module and pull it from the Subrack.
3. Press the Config button on the IFC for 5 seconds. This tells the ERA Software to scan and delete the removed e-POI Module from inventory and clear any alarms related to that e-POI Module.
4. Wait for the e-POI Module Status LEDS on the IFC to flash off and then on, which indicates that the IFC has been reconfigured.



Cat6A Specifications and Testing Requirements

Cat6A connections must be tested with a device that can measure the cable parameters against the thresholds defined in ANSI/TIA standards (such as the Fluke DTX-1800 and DSX-5000). Figure 18 shows the end-to-end channel from the CAN/TEN to the CAP L, which is inclusive of the Cat6A cable, the Cat6A Patch Cord, and the Panel and connection box. The end-to-end channel must meet the Cat6A U/UTP performance defined by the TIA/EIA 568 C.2 standard; see Table 15.

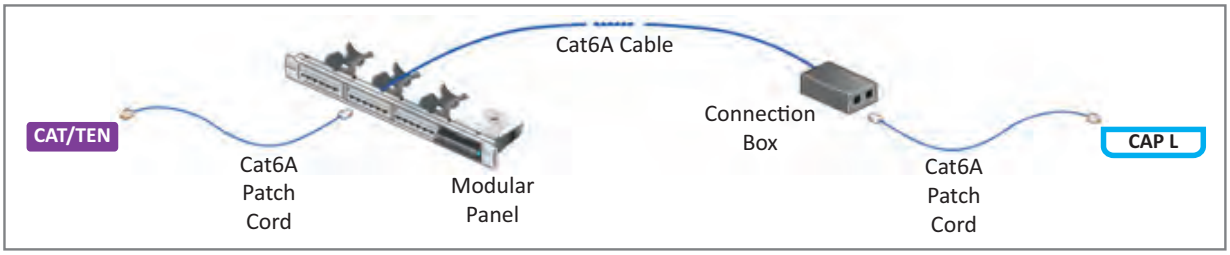


Figure 18. ERA End-to-End Channel

Some cables list their performance in "typical" performance values. However, sweep-testing is necessary to confirm actual performance. CommScope strongly recommends using Cat6A cable that has been tested to the listed frequency with test confirmation available for inspection.

Table 15. *Cat6A U/UTP Performance Standards (TIA/EIA 568 C.2)*

MHz	Insertion Loss (dB) Channel/Link	NEXT (dB) Channel/Link	PSum NEXT (dB) Channel/Link	ACRF (dB) Channel/Link	PSum ACRF (dB) Channel/Link	Return Loss (dB) Channel/Link
1	2.3/1.9	65.0/65.0	62.0/62.0	63.3/64.2	60.3/61.2	19.0/19.1
4	4.2/3.5	63.0/64.1	60.5/61.8	51.2/52.1	48.2/49.1	19.0/21.0
8	5.8/5.0	58.2/59.4	55.6/57.0	45.2/46.1	42.2/43.1	19.0/21.0
10	6.5/5.5	56.6/57.8	54.0/55.5	43.3/44.2	40.3/41.2	19.0/21.0
16	8.2/7.0	53.2/54.6	50.6/52.2	39.2/40.1	36.2/37.1	18.0/20.0
20	9.2/7.8	51.6/53.1	49.0/50.7	37.2/38.2	34.2/35.2	17.5/19.5
25	10.2/8.8	50.0/51.5	47.3/49.1	35.3/36.2	32.3/33.2	17.0/19.0
31.25	11.5/9.8	48.4/50.0	45.7/47.5	33.4/34.3	30.4/31.3	16.5/18.5
62.5	16.4/14.1	43.4/45.1	40.6/42.7	27.3/28.3	24.3/25.3	14.0/16.0
100	20.9/18.0	39.9/41.8	37.1/39.3	23.3/24.2	20.3/21.2	12.0/14.0
200	30.1/26.1	34.8/36.9	31.9/34.3	17.2/18.2	14.2/15.2	9.0/11.0
250	33.9/29.5	33.1/35.3	30.2/32.7	15.3/16.2	12.3/13.2	8.0/10.0
300	37.4/32.7	31.7/34.0	28.8/31.4	13.7/14.6	10.7/11.6	7.2/9.2
400	43.7/38.5	28.7/29.9	25.8/27.1	11.2/12.1	8.2/9.1	6.0/8.0
500	49.3/43.8	26.1/26.7	23.2/23.8	9.3/10.2	6.3/7.2	6.0/8.0

Propagation Delay is 555 nanoseconds for channel/498 nanoseconds for link tested at 10 MHz.

Delay Skew is 50 nanoseconds for channel/44 nanoseconds for link tested at 10 MHz.

For additional information, see also *CommScope Product Specifications for the GigaSPEED X10D® 2091B ETL Verified Category 6A U/UTP Cable* (760107201 | 2091B BL 4/23 W1000). (Click here access the document online.)

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

1 To go to the CommScope **Wireless Support Request** web page 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

2 Follow the online prompts to initiate a Technical Support ticket.

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.

Hardware to Software Mapping Information

1. To view or download a document that lists the minimum software requirements for ERA hardware, 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/resources/in-building-wireless
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.

Technical Training

1. To access the CommScope University Training site, please use the following web address or scan the QR code to the right:

   www.commscopeuniversity.com
2. Once you are logged in, you can search for training by typing search words in the search field or by going to the Course Catalog to view the available courses.
3. Instructor-led courses are conducted in North America and Europe. Before choosing a course, please verify the region.

For training related questions, please contact us:

Americas: DASTrainingUS@CommScope.com

EMEA: DASTrainingEMEA@CommScope.com

Accessing ERA Series User Documentation

1. To access ERA user documentation on the CommScope DCCS Customer Portal web page, do one of the following:
   - Scan the QR Code to the right to go directly to the CommScope DCCS Customer Portal, where you can access the ERA user documentation.
   - If viewing this document online as a PDF, click on the following URL link:

     https://www.commscope.com/membership
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** and **Password**, and then click **Sign In**.
   - If you don't have an account, in the **Register Today** panel, click **Register** and follow the prompts.
3. On the **My CommScope** page, click **DCCS**.
4. If prompted with **Please sign in to continue**, enter your **Email** and **Password**, and then click **Sign In**.
5. Under the **Site** list, select your site name.
6. In the **Welcome** page, click **ERA**.
7. Click on the title of any document to open it.

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