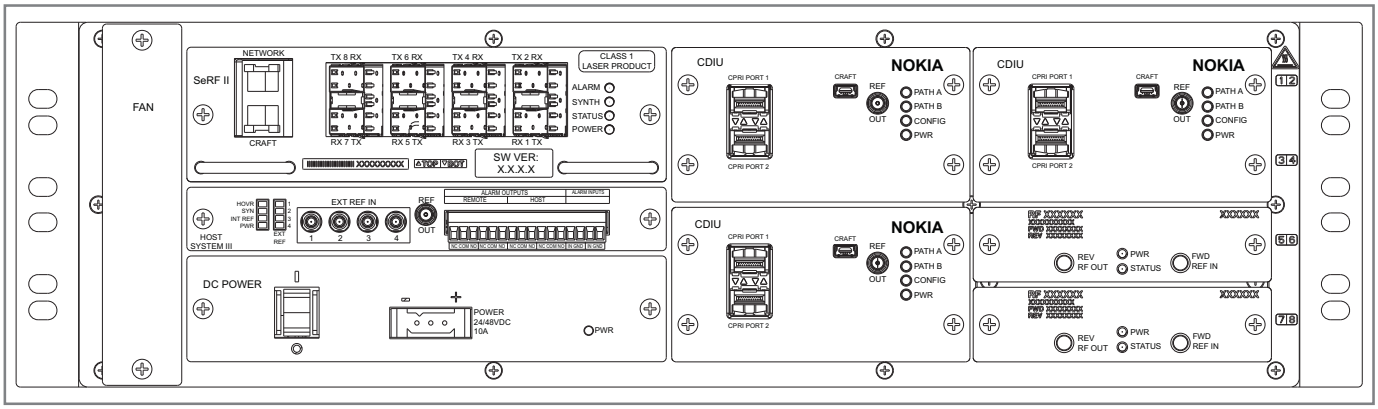
FlexWave® Host Unit II

Installation Guide • FWPP-502-01 • July 2016



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Revision History

Issue	Document Date	Technical Updates
1	July 2016	CommScope has acquired TE Connectivity's telecom, enterprise and wireless business, which includes the FlexWave product line; CommScope document FWPP-502-01 replaces TE document TECP-77-256. Updates Table 2 on page 2 with all Host Unit RF DARTs supported in FlexWave Software Release 9.0.2. Graphics of CDIUs are updated to show change from Alcatel-Lucent to Nokia. Changed the maximum composite forward path RF signal level at the Host Unit to between -25 and +6 dBm.

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DOCUMENT OVERVIEW

This installation guide provides the information you need to install a CommScope FlexWave Host Unit II.

NOTE: This installation guide does not describe the Host Expansion Unit (HEU); for information on HEUs, refer to the *FlexWave Host Expansion Unit and Amplifier Shelf Installation Guide* (FWPP-508).

The procedures in this installation guide are applicable to for use with Prism, Spectrum, and Common Host installations, unless noted otherwise. Basic Prism, Spectrum, and Common Host installations are described below. Note that for the balance of this install guide, the Host Unit II will be referred to as the "Host Unit."

- A Prism-only system comprises a FlexWave Host Unit that connects only to Prism Remote Units (PRUs).
- A Prism Fullband system comprises a FlexWave Host Unit that connects only to Prism Fullband Remote Units (FRUs).
- A Spectrum-only system comprises a FlexWave Host Unit that connects only to a Spectrum DART Remote Unit (DRU) within a Spectrum Expansion Module Group (EMG), and the EMG then connects to Spectrum Remote Access Units (RAUs).
- A Common Host system comprises a FlexWave Host Unit that connects to both PRUs and DRUs.

NOTE: This installation guide describes a Host Unit Chassis II that ships with the Host System III Module (CommScope Part Number FWP-000HUSYSIII).

SUPPORTED HOST UNIT CHASSIS, RF DARTS, AND CPRI DIGITAL INTERFACE UNITS

Tables 1 - 3 identify the Host Unit chassis, CPRI Digital Interface Unit (CDIUs), and Host Unit RF Digital/Analog Radio Transceivers (DARTs) that the information in this installation guide supports.

Table 1. *Supported FlexWave Prism and Spectrum Host Unit Chassis*

Catalog Number	Description
FWP-00000HUII	Host Unit Chassis II*
* The Host Unit Chassis II that this installation guide describes ships with the Host System III Module (FWP-000HUSYSIII) pre-installed at the factory.	

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Table 2. *Supported Host Unit RF DART Modules*

Catalog Number	Description	Can Use in a Prism, Prism Fullband, or Spectrum System		
		Prism	Prism Fullband	Spectrum
FWU-V6000HUDART	700 APT, Single SuperDART		X	
FWU-L6000HUDART	700 LTE Lower ABC DART, Single SuperDART	X		X
FWU-U6000HUDART	700 LTE UPPER C DART, Single SuperDART	X		X
FWU-20000HUDART	850 Cell, Classic DART	X		X
FWU-M6000HUDART	800 Digital Dividend (DD), Single SuperDART (International)		X	
FWU-40000HUDART	800 SMR, Classic DART	X		X
FWU-66000HUDART	900 E-GSM DART, Single SuperDART	X	X	
FWU-50000HUDART	900 ESMR, Classic DART	X		X
FWU-7S000HUDART	1800 GSM DART, Dual SuperDART	X	X	
FWU-76000HUDART	1800 GSM DART, Single SuperDART	X	X	
FWU-8S000HUDART	1900 PCS DART, Dual SuperDART	X		
FWU-86000HUDART	1900 PCS DART, Single SuperDART	X		X
FWU-80000HUDART	1900 PCS, Classic DART	X		
FWU-AS000HUDART	2100 AWS DART, Dual SuperDART	X		
FWU-A6000HUDART	2100 AWS DART, Single SuperDART	X		X
FWU-A0000HUDART	2100 AWS, Classic DART	X		
FWU-9S000HUDART	2100 UMTS DART, Dual SuperDART	X	X	
FWU-96000HUDART	2100 UMTS DART, Single SuperDART	X	X	
FWU-W6000HUDART	2300 WCS SGL SuperDART	X		X
FWU-T6000HUDART-L	2500 TDD DART, Single SuperDART, 2496.5-2571.5 MHz	X		
FWU-T6000HUDART-H	2500 TDD DART, Single SuperDART, 2615-2690 MHz	X		
FWU-TS000HUDART-H	2500 TDD DART, Double-High SuperDART, 2615-2690 MHz	X		
FWU-N6000HUDART	2600 Single SuperDART		X	X
FWU-NS000HUDART	2600 LTE Double-High SuperDART		X	X

Table 3. *Supported CPRI Digital Interface Unit (CDIUs)*

Catalog Number	Product
FWP-CDIU-01	CPRI Digital Interface Unit
* The CPRI Digital Interface Unit requires a Host System III Module (FWP-000HUSYSIII) in the Host Unit.	

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Document Cautions and Notes

Two types of messages, identified below, appear in the text:

CAUTION! Cautions 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.

NOTE: Notes contain information about special circumstances.

Abbreviations Used in this Guide

AC	Alternating Current
AWG	American Wire Gauge
BTS	Base Transceiver Station
C	Centigrade
CDIU	CPRI Digital Interface Unit
CDRH	Center for Diseases and Radiological Health
cm	Centimeter
COM	Communication or Common
CPRI	Common Public Radio Interface
DART	Digital/Analog Radio Transceiver
dB	Decibel
dBm	Decibel-milliwatt
DC	Direct Current
DCCS	Distributed Coverage and Capacity Solutions
DL	Downlink
DRU	DART Remote Unit
EMEA	Europe, Middle East, Africa
EMC	Electromagnetic Compatibility
EMG	Expansion Module Group
ESD	Electro-Static Discharge
EU	European Union
F	Fahrenheit
FCC	Federal Communications Commission
FDA	Food and Drug Administration
FWD	Forward
GND	Ground
HP	High Power
IC	Industry Canada
IF	Intermediate Frequency
IFEU	IF Expansion Unit
IR	Intermediate Reach
LED	Light-Emitting Diode
LR	Long Reach
MHz	Megahertz
MIMO	Multiple-Input Multiple-Output
mm	Millimeter
MRAU	Main Remote Access Unit
NC	Normally Closed
NO	Normally Open
OSP	Outside Plant
PLL	Phase-Locked Loop
PSU	Power Supply Unit
PWR	Power
RAU	Remote Access Unit
REV	Reverse
RF	Radio Frequency
Rx	Receive
SDART	Super Digital/Analog Radio Transceiver
SeRF	Serialized RF
SFP	Small Form-Factor Pluggable
SRAU	Secondary Remote Access Unit
TDD	Time Division Duplex
TS	Timeslot
Tx	Transmit
UL	Underwriters' Laboratories, Inc.
UL	Uplink
UPC	Usage Parameter Control
UPS	Uninterruptible Power Supply
Vac	Volts, alternating current
Vdc	Volts, direct current
W	Watt
WDM	Wavelength Division Multiplexing
TS	Timeslot

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HOST UNIT OVERVIEW

The Host Unit can be used in the following system configuration:

- The Host Unit can be located with an RF source, either a Base Station (BTS), Baseband Unit (BBU), or a repeater (BDA).
- The Host Unit can be used in a Host-to Host system in which you connect the Host Unit to a FlexWave Host Expansion Unit (HEU). However, you cannot use CDIUs in a Host-to-Host system.
- The Host Unit can be used in a Common-Host system in which the Host Unit connects to both Prism PRUs and Spectrum DRUs. If you cascade a Common-Host system, you can only connect a PRU to a PRU and a DRU to a DRU—you cannot connect a PRU to a DRU or vice versa. Also, HEUs cannot be used in a Common-Host system.

On the forward path, the Host Unit receives the RF signals from the BTS/BBU/BDA/HEU, digitizes the designated RF bands, and then transports them over single-mode fiber to one or more of the following:

- Prism Remote Unit (PRU)
- Prism Fullband Remote Unit (FRU)
- Prism Host Expansion Unit (HEU)
- Spectrum DART Remote Unit (DRU) within the Expansion Module Group (EMG).

NOTE: This installation guide uses the term "Remote Unit" to refer collectively to the PRU, FRU, HEU, and DRU. If the interaction between the Host Unit and a Remote Unit is specific to a Remote Unit type, the Remote Unit type (PRU, FRU, DRU, or HEU) is identified.

On the reverse path, the Host Unit receives the digitized RF or IF signals from the Remote Unit and converts them back to RF for the BTS/BBU/BDA/HEU.

The Host Unit supports up to eight RF Digital/Analog Radio Transceiver DART (DART) cards or up to four CPRI Digital Interface Units (CDIU), or a combination of both. DARTs are available in 35 MHz bandwidth (Classic DARTs) and 75 MHz full bandwidth (SuperDARTs); for further information see "DART Types" on page 14. The Host Unit also passes command and status information to the Remote Unit(s), and receives status information back from them.

You can sum Host Unit DARTs and/or CDIUs that link to a single Remote Unit DART to any of the following combinations:

- two different Host DARTs, with the exception of TDD DARTs, which cannot be used in summing configurations
- one Host DART and one CDIU path
- two paths from the same CDIU or different CDIUs.

For further information on how to sum DARTs and CDIUs, refer to the *FlexWave Software Release 9.0 System Setup and Provisioning Guide* (FWPP-505).

Both DARTs and CDIUs are hot swappable, which allows for easy upgrades to additional bands without service interruption.

NOTE: While it is recommended that a BBU Lock be performed before CDIU maintenance, it is not required. In general, the BBU will restore service after a CDIU hot swap. If the BBU does not bring back service after a CDIU hot swap, you may need to request BBU actions; refer to the *Guidance for "RRH Locking" of CDIUs Prior to DAS or BBU Maintenance Field Note* (FN15-009) for details.

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The Host Unit is designed for use within a non-condensing indoor environment, such as inside a wiring closet or a controlled-environment cabinet. The Host Unit is three Rack-Units (RUs) high and can be mounted in a 19- or 23-inch rack (for information on the Host Unit dimensions, see "Technical Specifications" on page 69). With the exception of the chassis-ground stud, all controls, connectors, and indicators are accessible via the front of the Host Unit; Figure 1 shows the main Host Unit components.

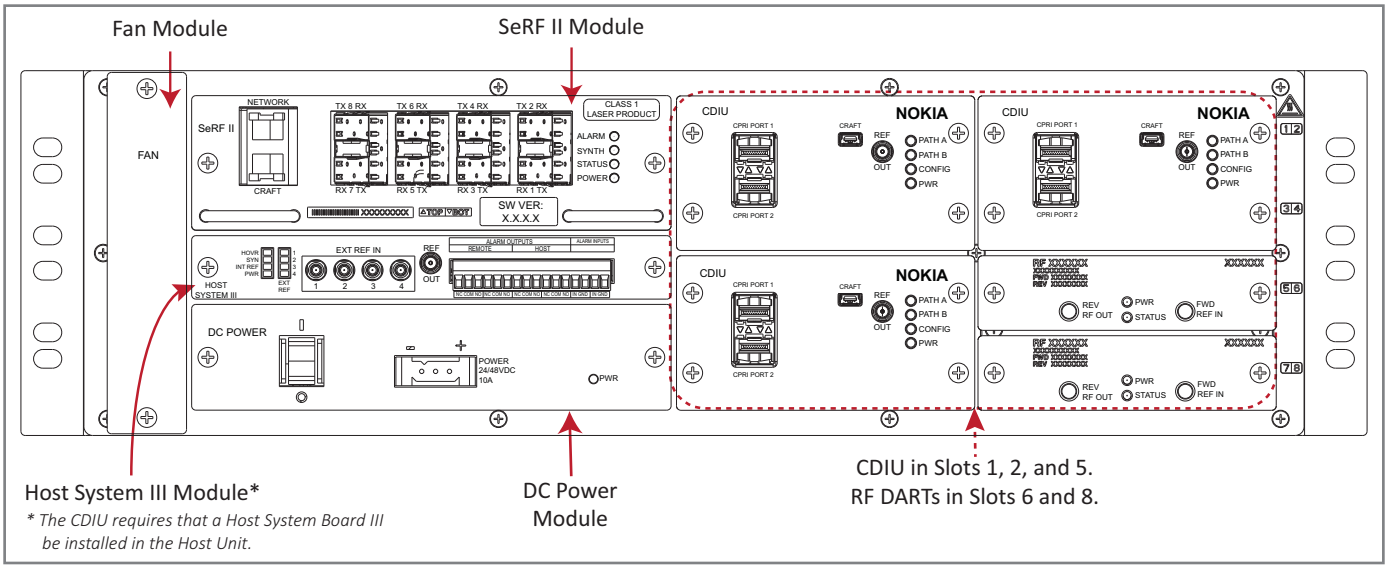

Figure 1. Host Unit Front Panel

Host Unit Modules

All Host Units ship with a Fan Module, a SeRF II Board Module, a Host System III Module, and a DC Power Module factory installed. All four modules are required for the Host Unit to operate. To introduce the functionality of the Host Unit components, this section breaks the Host Unit down by module.

NOTE: **To maintain correct airflow through the Host Unit chassis, unused DART/CDIU slots must be covered with a blank faceplate with divider bars in place. The Host Unit ships with four blank faceplates. If additional blank faceplates are required, you can order them from CommScope (see "Contacting DCCS Global Technical Support" on page 72).**

Fan Module

The Fan Module, mounted on the left side of the Host Unit, continuously blows cool air into the Host Unit enclosure, and vents hot air out of the chassis on the right. An alarm is generated if a high-temperature condition (>50ºC / 122ºF) occurs. The Fan Module is field replaceable and can be hot swapped. For further information, see "Fan Module Maintenance" on page 68.

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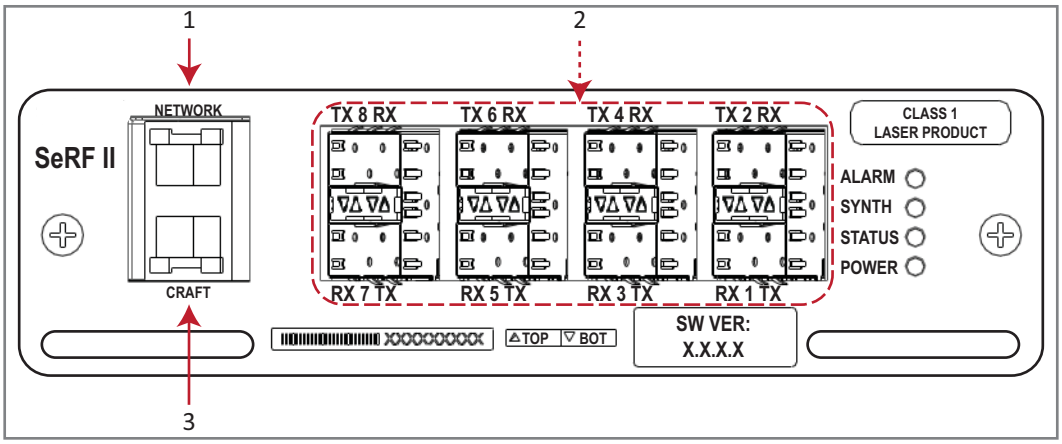
SeRF II Module

The SeRF II Module:

- manages communications and alarms
- sends digitized and designated RF bands to the Remote Unit
- receives digitized RF signals (from PRUs, FRUs, DRUs, and HEUs) and directs it to the appropriate DART for conversion back to RF or CDIU for CPRI connection back to the BBU
- supports embedded element management system for system configuration and network monitoring
- determines optical propagation delay
- supports eight Small Form-factor Pluggable (SFP) optical transceivers
- supports 100 Mbps Ethernet overhead per SFP
- provides two Ethernet interfaces.

SeRF II Module Ports



Ref #	Component	Device	Function
1	Network port	RJ-45 jack (female)	Ethernet access to the LAN (DHCP is used by default)
2	TX/RX Optical port (1–8)	LC (flat-polished) connector (single-mode)	Input/output connection points for Ports 1 through 8 Transmit (TX) and Receive (RX) optical fiber pairs
3	Craft port	RJ-45 jack (female)	Local Ethernet access to the Host Unit

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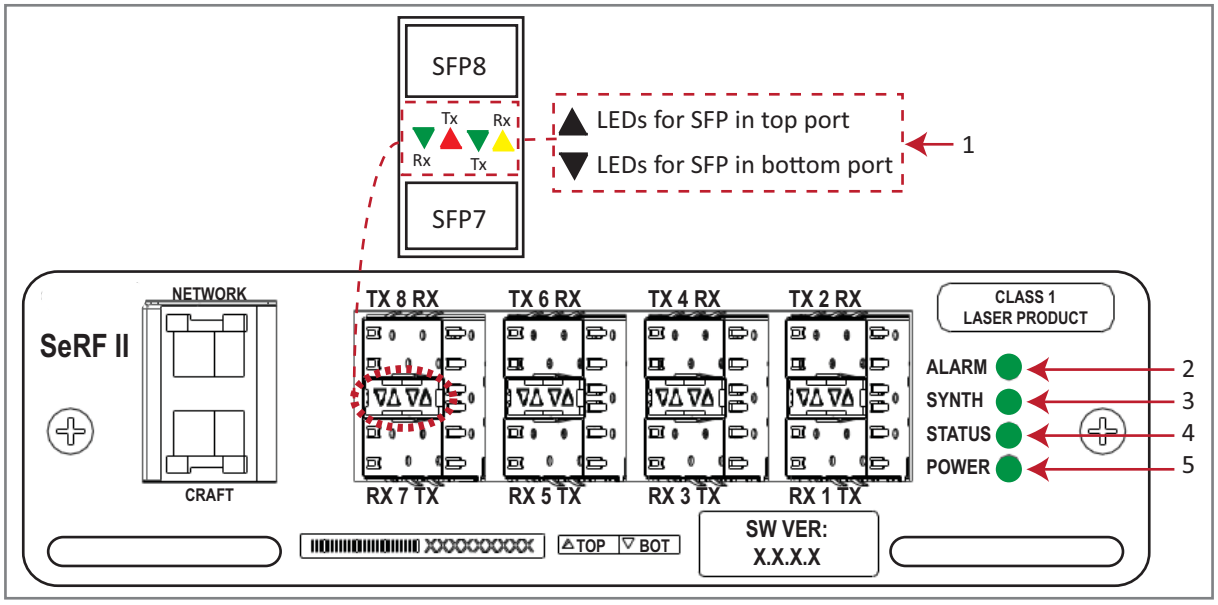
SeRF II Module LEDs



Ref #	LED	LED Color	Description
1	SFP TX	• Off • Green • Red	• No Small Form-Factor Pluggable (SFP) transceiver present • SFP transceiver is present and the FPGA internal Phase-Locked Loop (PLL) is locked • SFP transceiver is present and the FPGA internal PLL is not locked
	SFP RX	• Off • Green • Amber • Red	• No SFP transceiver present • Receiver has locked and framed to the incoming signal • Receiver has light, but is not locked to the incoming frequency or not framed • Receiver has no light
2	ALARM	• Green • Red • Off	• No major alarms on the Host Unit or connected Remote Unit (PRU, FRU, or DRU) • Major alarm on the Host Unit or connected Remote Unit (PRU, FRU, or DRU); also red during SeRF II Module bootup sequence (see "Power on the Host Unit" on page 49 for the bootup LED sequence) • SeRF II Module is powered off or working through bootloader sequence
3	SYNTH	• Green • Red	• Locked • Unlocked; also red during SeRF II Module bootup sequence (see "Power on the Host Unit" on page 49 for the bootup LED sequence)
4	STATUS	• Green • Red • Off	• No alarm for the SeRF II Module. • Initial bootup sequence and should become GREEN within 1 minute; if RED after bootup, a Major alarm exists for the SeRF II Module (see "Power on the Host Unit" on page 49 for the bootup LED sequence). **NOTE: A Software Version Mismatch Fault alarm for a Remote Unit can also turn the STATUS LED on the Host Unit SeRF II Module red. Therefore, if the Status LED on a Host Unit SeRF II Module is red and you cannot find a major alarm for the SeRF II Module, check to see if a connected Remote Unit has an active Software Version Mismatch Fault alarm.** • SeRF II Module is powered off or working through bootloader sequence
5	POWER	• Green • Red • Off	• Power OK and operating properly • Power supply out of tolerance • No power present

Host System III Module

The Host System III Module provides:

- output alarm contacts for reporting alarms to an external management system
- alarm inputs that allow you to monitor external devices
- four external reference inputs (EXT REF IN) used to synchronize the Host Unit to the CDIU reference output(s) when CPRI connections are present (if using more than one CDIU, the system automatically determines the external clock priority)
- the reference clock to a daisy-chained Host Unit (in the FlexWave Element Management System (EMS), you set the 10MHz reference clock as the master reference input for the second Host Unit).

CAUTION! CommScope also produces a Remote System Module for Spectrum DART Remote Units (DRUs) and Prism Host Expansion Units (HEUs). You cannot interchange the use of the Remote System II Module with the Host System III Module. Only a Host System III Module will work within the Host Unit, and Spectrum DRUs and Prism HEUs require the use of the Remote System II Module.

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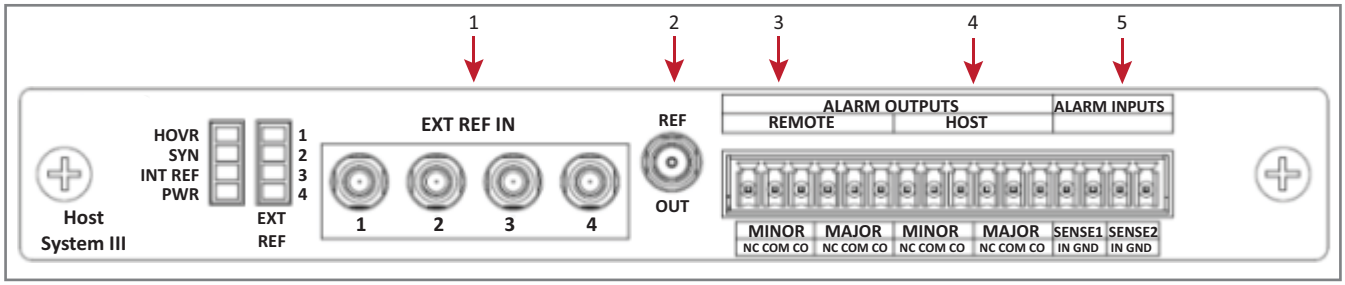
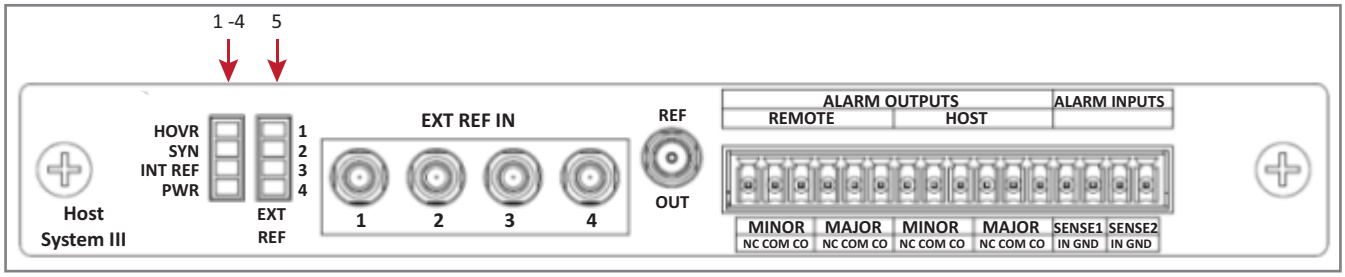
Host System III Module Ports and Connectors



Ref #	Component	Device	Function
1	EXT REF IN 1 - 4 connectors	SMB-Type female RF coaxial connectors	10 MHz reference clock input that may be used to synchronize between multiple Host Units in a daisy-chain configuration. For CDIUs, the System III Module selects a valid 10MHz CPRI reference clock to serve as the master DAS reference. The System III Module detects all REF IN signals present in the EXT REF IN connectors (1-4) and assigns the 10MHz CPRI reference clock. If a reference input goes away (the CPRI link goes down causing CDIU to mute REF OUT), then the System III Module automatically selects the next available EXT REF IN connector.
2	REF OUT connector	QMA-Type female RF coaxial connector; green ring indicates that this is a QMA connector	10 MHz reference clock output that may be used to synchronize between multiple Host Units in a daisy-chain configuration; for further information on daisy-chain configurations see "Cascading Host Units" on page 64.
3	Alarm Outputs—Remote	Twelve position terminal block. Screw-type terminal connector (14–26 AWG)	Connection points for a major and minor dry alarm contacts. Includes Normally Closed (NC), Common (COM), and Normally Open (NO) wiring connections. The Host contacts are for the Host Unit and the Remote contacts are for any of the Remote Units in the system. If you need to monitor all alarms from the system, then both the Host and Remote contacts must be used. If the BTS does not have enough inputs, daisy-chain the Host and Remote contacts so there is only one major and one minor alarm to monitor. Maximum voltage and current is 250V @ 2A.
4	Alarm Outputs—Host		
5	Alarm Inputs	Two contact closure inputs	Connection points for monitoring external devices. Dry contact only. Maximum is 3.3VDC @ 6ma.

Host System III Module LEDs



Ref #	LED Label	LED Name	LED Color	Description
1	HOVR*	Hold Over	Green	Host System III Module is transitioning between clock inputs.
			Off	Host System III Module clock transition complete.
2	SYN	Synthesizer	Green	Host System III Module is locked to a clock via the EXT REF IN connector.
			Red	Host System III Module is not locked to a clock.
3	INT REF	Internal Reference	Green	**10 MHz Reference Clock** parameter is set to **Internal** in the FlexWave EMS
			Off	**10 MHz Reference Clock** parameter is set to **External** in the FlexWave EMS
4	PWR	Power	Green	Power to the Host System III Module is within specifications.
			Red	Host System III Module has power but one or more voltages is out of specification.
			Off	No power to the Host System III Module.
5	EXT REF IN (1 - 4)	External Reference 1 - 4	Green	External reference is present in corresponding EXT REF IN connector.
			Green Flashing	A valid external reference is present in the corresponding EXT REF IN connector.
			Off	No valid clock input on associated EXT REF IN connector.

* When you have CDIU(s) and RF DART(s) in the same Host Unit, and if none of the CDIUs are providing a Reference Output to the System III Module, then the System III Module is still providing a valid Reference for the RF DARTs even though the System III Module has a Red SYN LED; there will also be a **System Board Synthesizer Fault** alarm present in the GUI.

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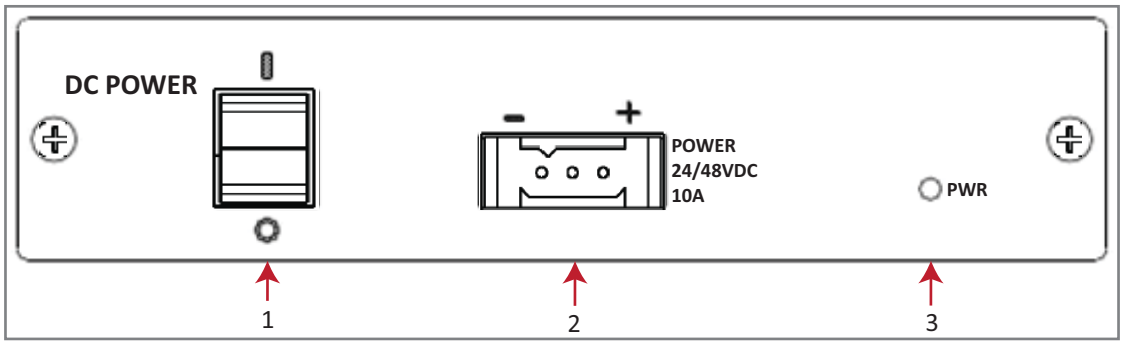
DC Power Module

The DC Power Module converts an input voltage (±21 Vdc to ±60 Vdc) to the various voltages needed by the Host Unit.



Ref #	Component	Device	Function
1	On/Off Switch	Rocker switch	Turns Host Unit power on/off
2	POWER connector	Three-pin receptacle	10A connection point for DC power wiring; FCC qualification meets 21-60 VDC

Ref #	LED	LED Color	Description
3	PWR	• GREEN • RED • OFF	• DC Power Supply OK • DC Power Supply Fault • Host Unit is not receiving power.

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HOST UNIT DART MODULES

The Host Unit can support up to eight Classic DART Modules and/or Single SuperDART Modules or four Dual SuperDART Modules (Prism only). Figure 2 provides generic representations of FlexWave RF DARTs.

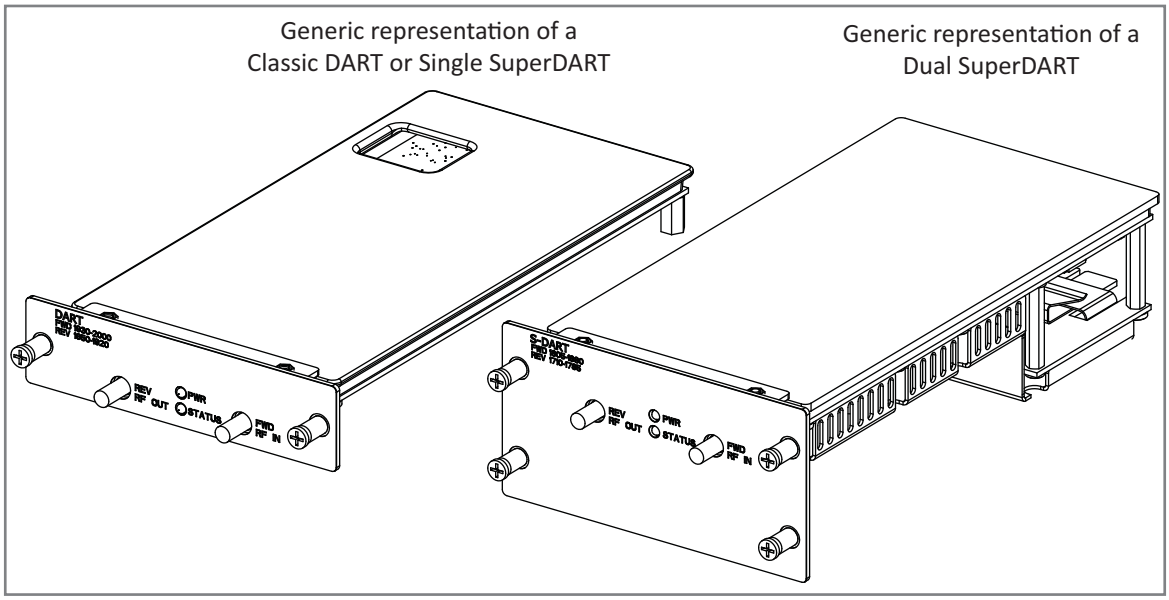

Figure 2. RF DART Modules

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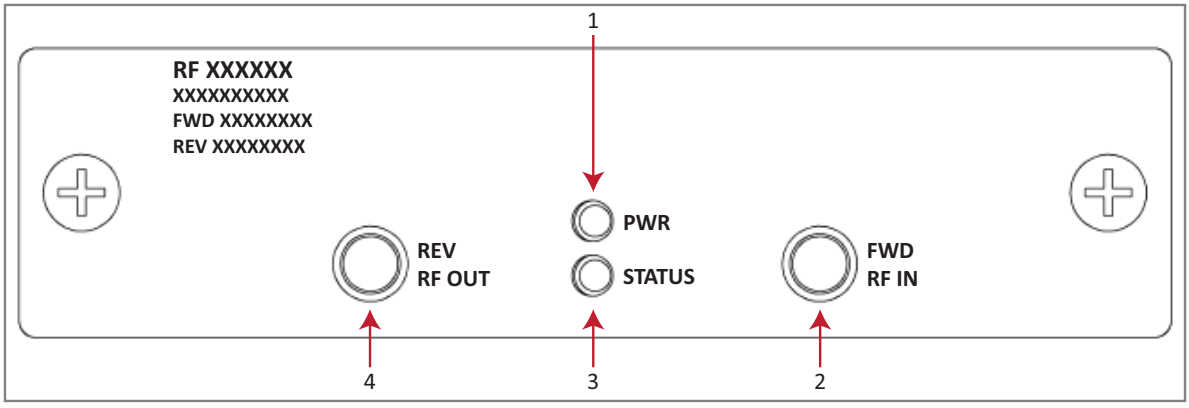
RF DART Connectors and LEDs



Host Unit DART Module Connectors				
DART Type	**Ref #**	**Component**	**Device**	**Function**
Host RF	2	FWD RF IN	QMA-Type female RF coaxial connectors	Input connection point for the forward path RF coaxial cable to the BTS
	4	REV RF OUT		Output connection point for the reverse path RF coaxial cable to the BTS

Host Unit DART Module LEDs			
Ref #	**LED**	**LED Color**	**Description**
1	PWR	• Green • Red • Off	• Card is powered. • Problem with board power • No power present at card.
3	STATUS	• Green • Blinking Green • Red • Amber	• DART is linked. • A linked IF DART or Host Unit RF Super DART is in Data Path Reset due to a clocking issue.* • A major alarm is active for this DART Module. • A minor alarm is active for this DART Module, for example an Automatic Level Control alarm.

* The DART STATUS LED blinks whenever the DART is in Data Path Reset. Data Path Reset occurs when there is a clocking event within the DART, which occurs when the reference to the DART is bad or missing. If the STATUS LED is blinking green, the DART has been linked and was not in an alarm state when the clocking event occurred.

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DART Types

FlexWave supports the following types of RF DART Modules:

- **Classic DARTs**—are 6-timeslot RF DARTs that support up to 35 MHz contiguous bandwidth (see Table 4).
- **Single SuperDARTs**—are 6-timeslot RF DARTs that support two non-contiguous bands in the entire frequency range of the DART, but cannot exceed 35 MHz total RF bandwidth (see Table 5 on page 15). Additionally, a Single SuperDART can support 75 MHz bandwidth if installed in Slot 1 or Slot 3 of a Host Unit that has both a Host System III Module (or a Host System II Module) and a SeRF II Module.
- **Dual SuperDARTs**—are 12-timeslot RF DARTs that support up to 75 MHz with two non-contiguous bands (see Table 6 on page 15).

Table 4. *Single-Slot Classic DARTs*

DART Module Type	Used in…			Maximum Bandwidth (MHz)	Maximum Number of Fiber Slots
	Host Units	HEUs	DRUs		
800 APAC iDEN	Yes	No	No	19	3
800 SMR	Yes	Yes	Yes	7*	2
850 Cell	Yes	Yes	Yes	25	4
900 SMR	Yes	No	No	5	1
1900 PCS	Yes	No	No	35	6
2100 AWS	Yes	No	No	35	6
* Classic Prism RF Modules and Spectrum RAUs support 18 MHz; Prism HDM 800 only supports 7 MHz.					

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Table 5. *Single-Slot SuperDARTs* [1]

DART Name	Used in…			Maximum Frequency Span (MHz)	Maximum Bandwidth (MHz)	Maximum Number of Fiber Slots	
	Host Units	HEUs	DRUs			For 6 Timeslots use Slots 2, 4, 5, 6, 7, 8	For 12 Timeslots use Slots 1 and 3
700 APT [2]	Yes	No	No	45	45	NA	8
700 Lower ABC	Yes	Yes	Yes	18	18	3	3
700 Upper C	Yes	Yes	Yes	10	10	2	2
800 DD	Yes	No	No	30	30	6	6
900 EGSM	Yes	No	No	35	35	6	6
1800 GSM [3]	Yes	No	No	75	35	6	12
1900 PCS [3]	Yes	Yes	Yes	70	35	6	12
2100 AWS [3]	Yes	Yes	Yes	45	35	6	12
2100 UMTS [3]	Yes	No	No	60	35	6	12
2300 WCS	Yes	No	Yes	10	10	2	2
2500 TDD Low	Yes	No	No	75	35	6	6
2500 TDD High	Yes	No	No	75	35	6	12
2600 LTE [3]	Yes	No	Yes	70	35	6	12

1 When deploying Single -Slot SuperDARTs in Slots 1 and 3 of a Host Unit populated with both the SeRF II and System Board II or III, Slots 1 and 3 will support up to 12 Timeslots if selected.

2 The 700 APT band requires more than 6 timeslots, so can only be installed in Slot 1 or Slot 3.

3 For full bandwidth usage, Slots 1 or 3 must be used. Slots 2, 4, 5, 6, 7, or 8 may also be used, with a maximum bandwidth of 35 MHz total.

Table 6. *Dual-Slot SuperDARTs*

DART Module Type	Used in…			Maximum Bandwidth (MHz)	Maximum Number of Fiber Slots
	Host Units	HEUs	DRUs		
1800 GSM	Yes	No	No	75	12
1900 PCS	Yes	Yes	No	70	12
2100 AWS	Yes	Yes	No	45	8
2100 UMTS	Yes	No	No	60	12

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Basic Timeslot Allocation per RF Bandwidth Transported

Each fiber pair supports 12 timeslots, or up to 75 MHz of bandwidth. Table 7 shows the maximum bandwidth versus the number of timeslots.

If more than 75 MHz is required per Remote Unit, up to three additional fiber pairs can be brought to the Prism Remote or Spectrum DRU to accommodate up to 300 MHz of bandwidth.

Table 7. *Maximum Contiguous RF Bandwidth (MHz)*

Number of Timeslots	Maximum Contiguous RF Bandwidth (MHz)	
	Classic DARTs	Single and Dual SuperDARTs
1	5	6
2	12.5	12
3	20	18
4	25	25
6	35	35
8	---	45
12	---	60-75

For example, if you need to transport PCS A block, Cellular A, and AWS B block, the system requires the following:

PCS A	15MHz, 3 timeslots
Cellular A	10MHz, 2 timeslots
AWS B	10MHz, 2 timeslots
Total =	35MHz, 7 timeslots

NOTE: In this example, 7 timeslots are needed to carry the 35 MHz of RF. If a single DART was used, then the 35 MHz could be transported using 6 timeslots.

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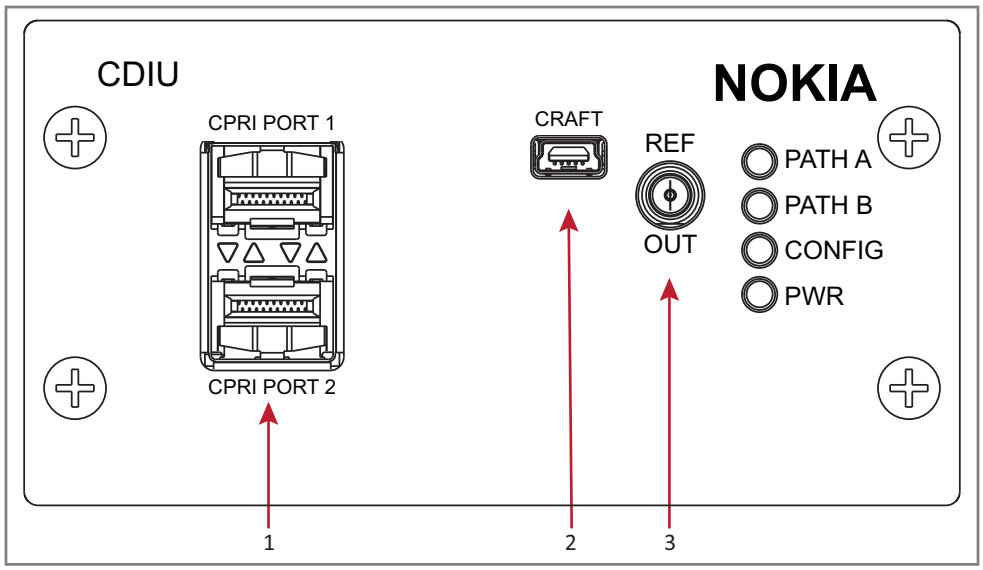
CPRI Digital Interface Units

CommScope FlexWave systems distribute signals from a common RF source (Baseband Unit) to multiple Remote Units. In order to interface the DAS to a digital baseband unit (BBU) rather than an RF base station, a CPRI Digital Interface Unit (CDIU) will need to be populated in the FlexWave DAS Host Unit chassis in one or more slots. CDIU supports single carrier LTE and up to 2 carriers for UMTS.

NOTE: The information about the CDIUs presented in this install guide only provide an overview of the CDIUs. For information on how to install and use CDIUs in a FlexWave system, refer to the *FlexWave CPRI Digital Interface Unit Installation and Provisioning Guide* (FWPP-507).

CDIU Connectors



Ref #	Component	Device	Function
1	CPRI Port 1 and CPRI Port 2	SFP/SFP+ connectors that while MSA compliant, are a specific line rate offered by Nokia. Maximum transceiver power per CPRI Port is 2W.	Two connectors for single-mode fiber (one per CPRI link) where one is Tx and the other is Rx.
2	Craft	Mini-USB to serial port connection.	Functionality reserved for use by CommScope or Nokia.
3	REF OUT	50-Ohm QMA-F connector	10 MHz reference clock output that is derived from either the CPRI Port 1 or the CPRI Port 2 connector. Connects to the FlexWave Host System III Module.

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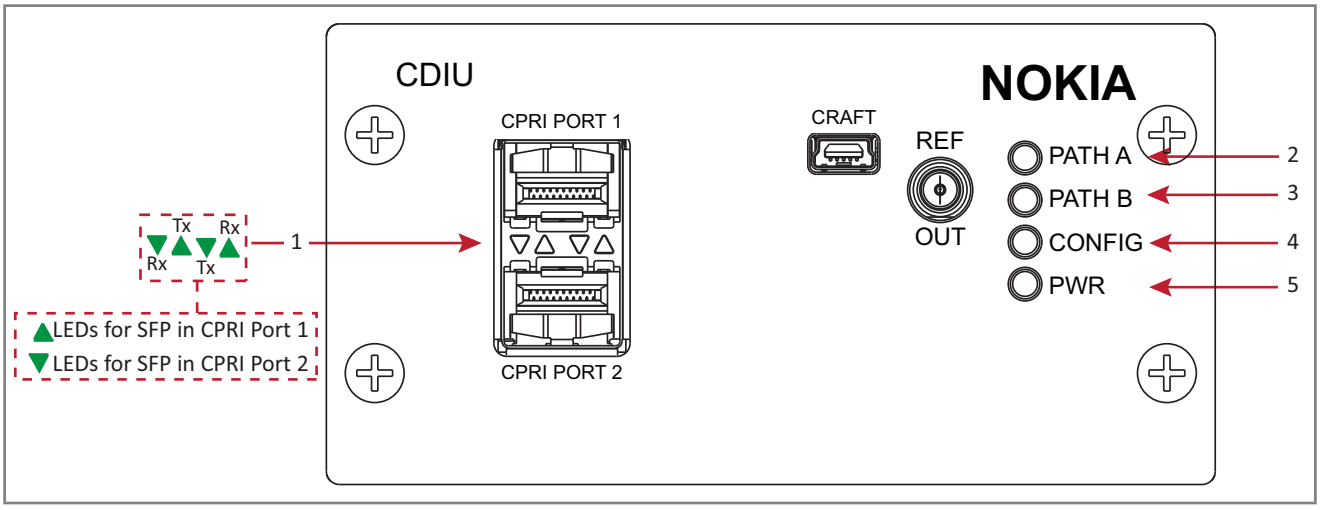
CDIU LEDs



Ref #	LED	LED Color	Description
1	RX	Off	No SFP is present.
		Red	Receiver has no light.
		Amber	Receiver detects light, but is not locked or is not framed to incoming signal.
		Green	Receiver is locked and framed to the incoming signal.
	TX	Off	There is no SFP inserted in this TX connector.
		Red	An SFP is installed in this TX connector, but the internal FPGA PLL has not locked (this is highly unlikely).
		Green	An SFP is installed in this TX connector, and the internal FPGA PLL is locked.
2, 3	PATH A and PATH B	Off	CDIU Path A/B is not linked. On startup, Path A/B is defaulted by the FPGA to be Off.
		Amber*	The DAS user has configured CDIU Path A/B, but the BBU has not provisioned the Path A/B Antenna Carriers.
		Green	The DAS user has configured CDIU Path A/B, and the BBU has provisioned the Path A/B Antenna Carriers. For CDIU **Connection Types 3**, **4**, and **5**, the CDIU PATH A and PATH B LEDs will not turn green until Antenna Carriers are present for both CPRI ports.
4	CONFIG	Off	FPGA files are not present; error may have occurred during a software upgrade.
		Red*	FPGA has loaded, but the processor has not booted, which indicates a file corruption or hardware problem.
		Amber*	CDIU is still booting or not booting correctly; CDIU is therefore not communicating with the BBU.
		Green	FPGA is configured, and the master processor is running according to specification.
5	PWR	Off	CDIU is not receiving power from the backplane, or there has been a power-on failure.
		Red	One or more of the internal power rails is out of tolerance.
		Green	All power rails are present and in-tolerance.

* If the CONFIG LED remains red or amber, there may be file corruption or a missing file; check for an active CDIU configuration fault alarm and follow the alarm remedy. If alarm remedy does not turn the CONFIG LED green, contact CommScope for assistance (see "Contacting DCCS Global Technical Support" on page 72).

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CDIU Connector Types

Table 8 describes the supported signal-routing options between two CPRI ports and two RF paths.

Table 8. *CPRI to RF Path Mapping*

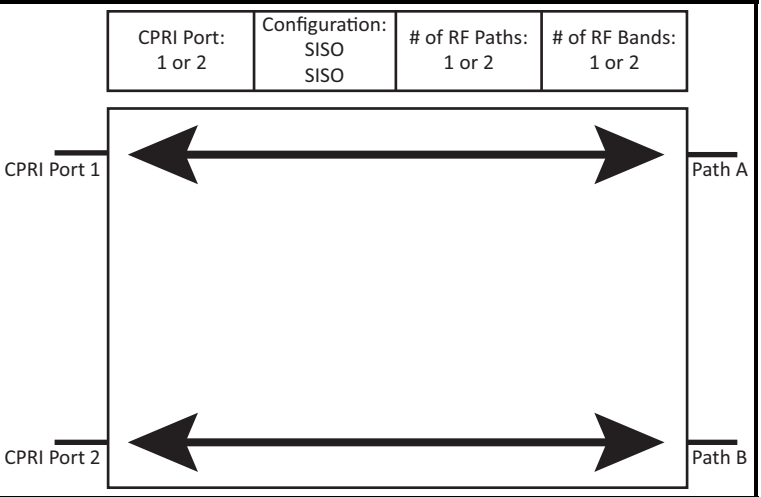
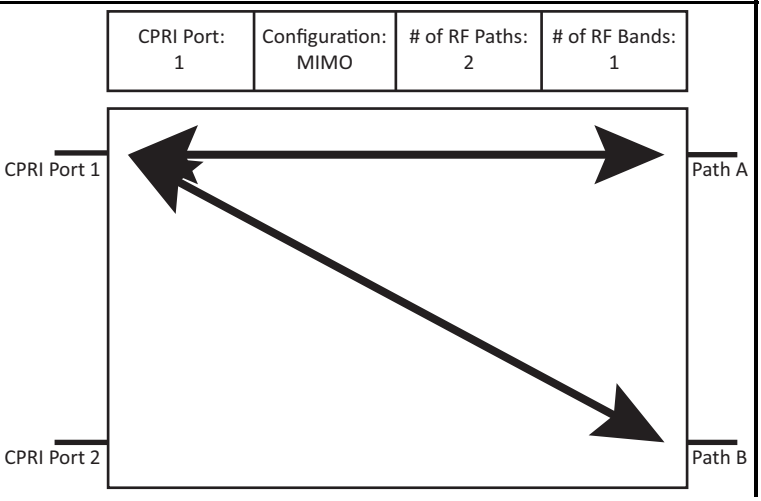
Configuration Type	Description	Mapping Diagram
Type 1: Dual Independent SISO	Both CPRI Port 1 and CPRI Port 2 map to a single RF path. The two RF paths can be in different RF bands. Note that with the Type 1 mapping, you will configure CPRI Port 1 and CPRI Port 2 independently from each other.	
Type 2: Single MIMO	One CPRI port maps to two RF paths—that must be in the same band—for MIMO deployment. **NOTE: Only Port 1 is allowed in Type 2. Port 2 is disabled.**	

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Table 8. *CPRI to RF Path Mapping (Continued)*

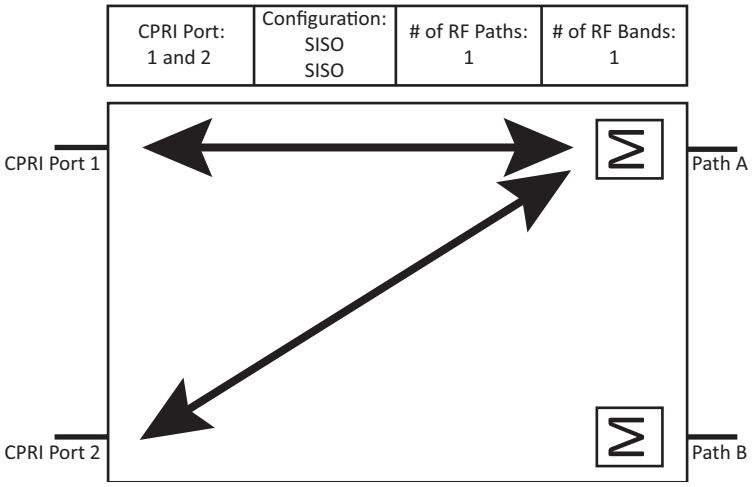
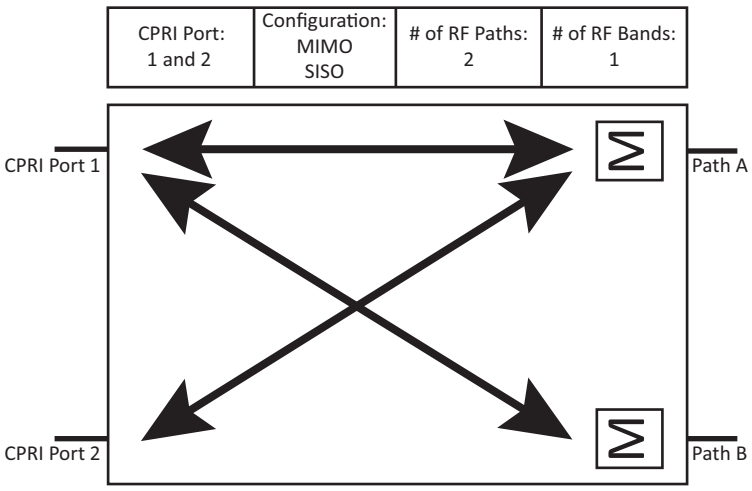
Configuration Type	Description	Mapping Diagram
Type 3: Summed SISO	Sums carriers from two CPRI links into a single RF path. Applications include placing LTE and WCDMA carriers (from separate BBUs) in a single RF band, and two WSPs summing into the same RF Band. **NOTE: The passband selected for Types 3, 4, or 5 must be sufficient to accommodate the antenna carriers from both CPRI ports. For example, when using Type 5, if AWS Block A is on Port 1 and AWS Block B/C is on Port 2, then the passband on Paths A and Path B must both be tuned to AWS A/B/C. This applies for any of the summed connections (Types 3, 4, and 5).**	
Type 4: MIMO + Summed SISO	This configuration combines Single MIMO with Summed SISO: • CPRI Port 1 maps to both Path A and Path B—that must be in the same band—for MIMO deployment. • CPRI Port 2 maps to Path A only **NOTE: This application supports placement of SISO WCDMA carriers in the same RF band as CPRI Port 1.** **NOTE: The passband selected for Types 3, 4, or 5 must be sufficient to accommodate the antenna carriers from both CPRI ports. For example, when using Type 5, if AWS Block A is on Port 1 and AWS Block B/C is on Port 2, then the passband on Paths A and Path B must both be tuned to AWS A/B/C. This applies for any of the summed connections (Types 3, 4, and 5).**	

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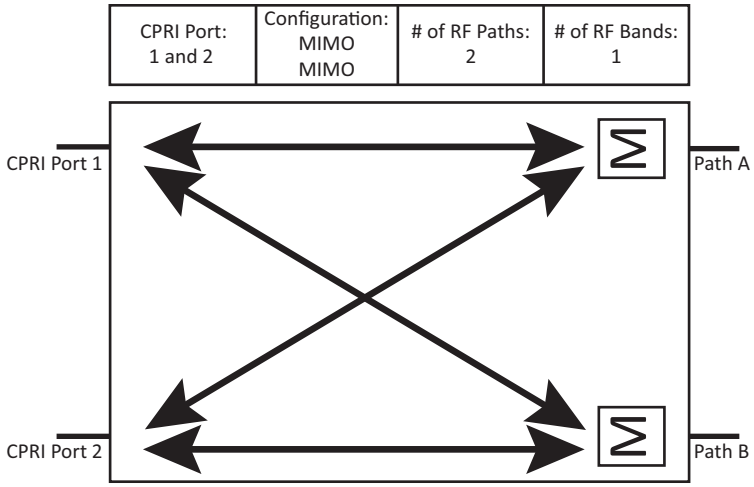
Table 8. *CPRI to RF Path Mapping (Continued)*

Configuration Type	Description	Mapping Diagram
Type 5: Dual-Summed MIMO	Combines MIMO channels from both CPRI Port 1 and CPRI Port 2 and maps them to common (dual) RF paths. For example, you can combine LTE5 and LTE10 MIMO channels in the same RF band, as would occur when multiple WSPs are in the same RF band (i.e., Neutral Host). **NOTE: The passband selected for Types 3, 4, or 5 must be sufficient to accommodate the antenna carriers from both CPRI ports. For example, when using Type 5, if AWS Block A is on Port 1 and AWS Block B/C is on Port 2, then the passband on Paths A and Path B must both be tuned to AWS A/B/C. This applies for any of the summed connections (Types 3, 4, and 5).**	

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Prepare for Installation

Do the following before beginning installation.

- Review the system design plan.
- Review the power plant requirements to make sure the site can support this installation.
- Identify the equipment installation site.
- Map out all cable runs.
- Identify and obtain all tools and materials required to complete the installation.

Recommended Tools

- Electrostatic Discharge (ESD) wrist strap
- Medium size flat-bladed screwdriver
- Phillips screwdriver (#2)
- Pliers
- Wire cutters
- Wire stripper
- Tool kit for attaching QMA-Type male connectors to coaxial cable
- Crimp tool to attach ring terminals
- Optical power meter
- Fiber cleaning equipment

Recommended Materials

See Table 9 for a list of components that ships with each Host Unit. The following components may be required in addition to the items listed in Table 9.

- Two vertical cable guides (optional)
- Category 3 or 5 cable for external alarm system (optional)
- Category 5 cable with RJ45 connectors for the Craft port (required) and Network port (optional)
- #18 AWG (1.0 mm) insulated stranded copper wire for chassis ground
- #6 ring terminal (1) for #18 wire for chassis ground wire connection
- #6 fork terminals (2) for #18 wire for DC power wire connection
- Single-mode patch cord(s) with LC connectors; quantity is dependent on the system design
- High performance, flexible, low-loss 50-ohm coax cable with male QMA connectors
- Wire ties

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Installing a Host Unit

This chapter guides you through installing a FlexWave Host Unit. Follow the steps in the order in which they are provided.

Guard Against Damage from Electro-Static Discharge

CAUTION! Electro-Static Discharge (ESD) can damage electronic components. To prevent ESD damage, always wear an ESD wrist strap when working on the Host Unit and when handling any of its components. Connect the ground wire on the ESD wrist strap to an earth ground source before touching the Host Unit or any of its components. Wear the wrist strap the entire time that you work with the Host Unit and its components.

Unpack and Inspect the Host Unit

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. See Table 9 for a list of components that ships with each Host Unit.

Table 9. *Host Unit Components*

Quantity	Accessory	Purpose
1	Power cable	Connects the Host Unit to a power source.
4	M6X1X10MM screw	Secures the Host Unit to the equipment rack.
4	12-24X3/8 screw	Secures the Host Unit to the equipment rack.

3. If damage is found or parts are missing, file a claim with the commercial carrier and notify CommScope Technical Support (see "Contacting DCCS Global Technical Support" on page 72). Save the damaged cartons for inspection by the carrier.
4. Save all shipping containers for use if the equipment requires shipment at a future date.

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INSTALL THE HOST UNIT IN AN EQUIPMENT RACK

US standard and metric machine screws are included for rack mounting the Host Unit.

CAUTION! This is restricted access equipment and only qualified service personnel should service and operate this equipment using appropriate tools.

CAUTION! The maximum ambient operating temperature for the Host Unit is 50º C (122º F).

CAUTION! 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.

CAUTION! When loading the Host Unit in a rack, make sure the mechanical loading of the rack is even to avoid a hazardous condition such as an unbalanced rack.

CAUTION! The rack should safely support the combined weight of all the equipment it holds.

NOTE: To ensure all optical connectors remain dust-free during installation, leave all dust caps and dust protectors in place until directed to remove them for connection.

NOTE: Vertical guides are recommended, but are not provided with the Host Unit. Vertical cable guide kits are available as separate items from CommScope. Contact a CommScope sales representative for further information (see "Contacting DCCS Global Technical Support" on page 72).

Do the following to install the Host Unit in an equipment rack:

1. Position the Host Unit chassis in the rack per site design, and then secure (but do not tighten) the chassis to the rack, using the four machine screws provided (use #12-24 or M6 x 10 screws, whichever is appropriate).
2. Locate two vertical cable guides (optional, not provided with the Host Unit).
3. Back out the Host Unit mounting screws just enough to provide clearance for installation of the cable guides.
4. Slide each cable guide into position for installation and then securely tighten the corresponding mounting screws.

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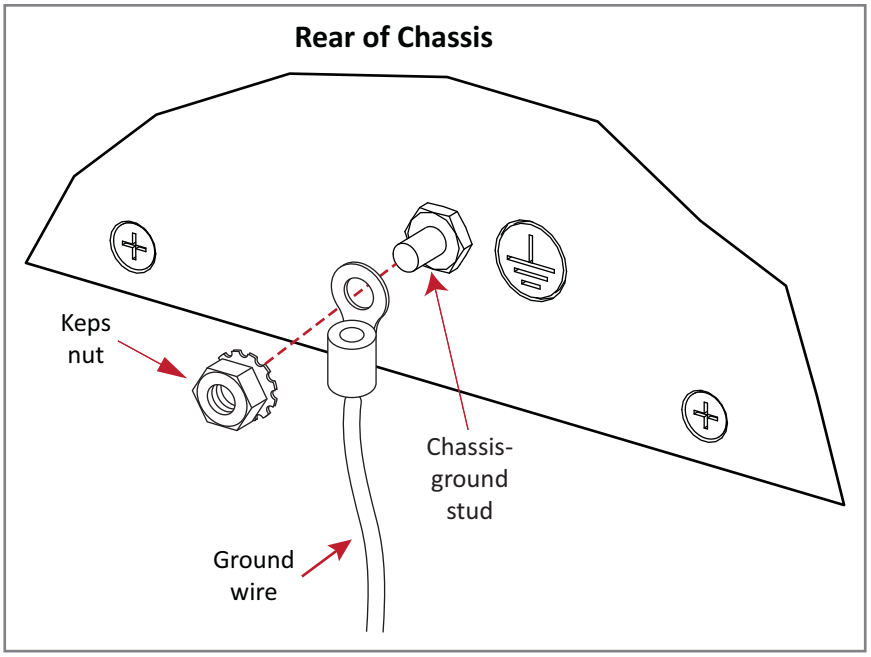
GROUND THE HOST UNIT CHASSIS

CAUTION! Maintain reliable grounding. Pay particular attention to ground source connections. Route the grounding wire to an approved earth ground source.

NOTE: The chassis ground stud is the only connection point on the Host Unit that is on the back of the Host Unit.

1. Obtain a length of #18 AWG (1.00 mm) insulated stranded copper wire for use as a chassis grounding wire.
2. Terminate one end of the wire with a ring terminal.
3. Locate the chassis-ground stud at the rear of the Host Unit.
4. Remove the Keps nut from the chassis-ground stud.
5. Attach the ring end of the wire to the chassis ground stud, as shown below.
6. Use the Keps nut removed in Step 4 to secure the ground wire to the chassis-ground stud.
7. Route the free end of the chassis grounding wire to an approved (per local code or practice) earth ground source.



INSTALL THE RF DART MODULE(S)

This procedure is split into the following sections; refer to each section in the order presented:

- "Working with the Host Unit Slots" on page 26
- "Install RF DART Module(s)" on page 27
- "Connect the RF DART Modules to the BTS" on page 29.

Working with the Host Unit Slots

Figure 3 illustrates a FlexWave Host Unit that has both CDIUs and DARTs.

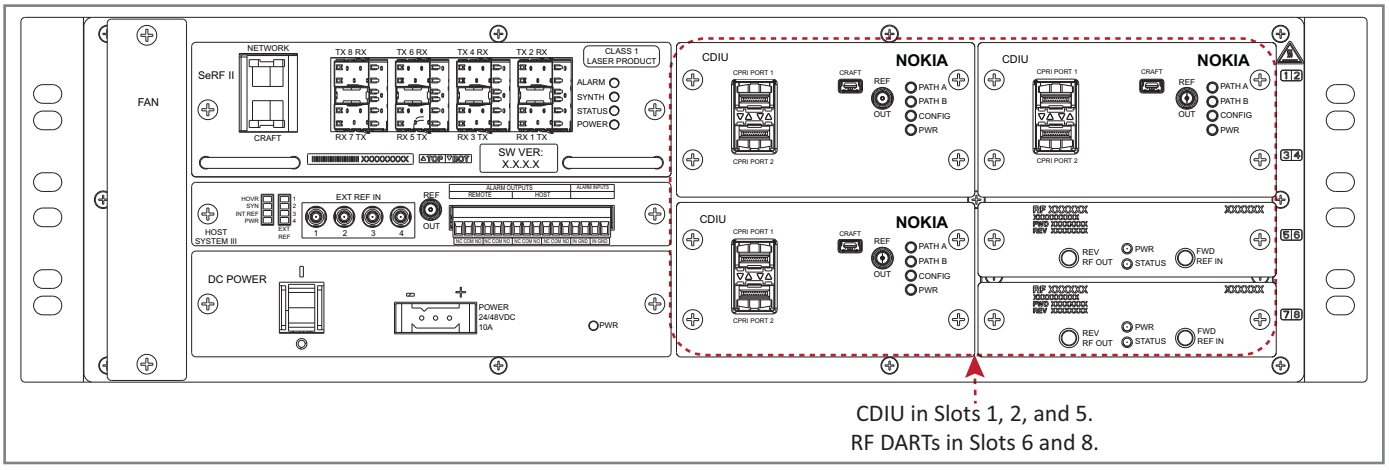


Figure 3. CDIUs and RF DARTs Installed in a FlexWave Host Unit

Possible slot assignments for DARTs and CDIUs are listed below. Any combination of DARTs and CDIUs may be installed.

- A Classic DART or Single SuperDART can be installed in each of the eight slots in the Host Unit.
- Dual SuperDARTs require that slot divider bars be removed as their size requires two-slot combinations, which are available in the following vertical groupings:
  - Slots 1 and 3
  - Slots 2 and 4
  - Slots 5 and 7
  - Slots 6 and 8.
- A CDIU requires two slot spaces, and can only be installed in the following slot combinations:
  - Slots 1 and 3
  - Slots 2 and 4
  - Slots 5 and 7
  - Slots 6 and 8.
- You cannot install CDIU Modules and Dual SuperDARTs in the following slot combinations as the chassis does not have removable slot dividers between these positions:
  - Slots 3 and 5
  - Slots 4 and 6.

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Figure 4 shows possible slot assignments and where slot-divider bars are located. Note that for Dual SuperDARTs and CDIUs you need to remove divider bars.

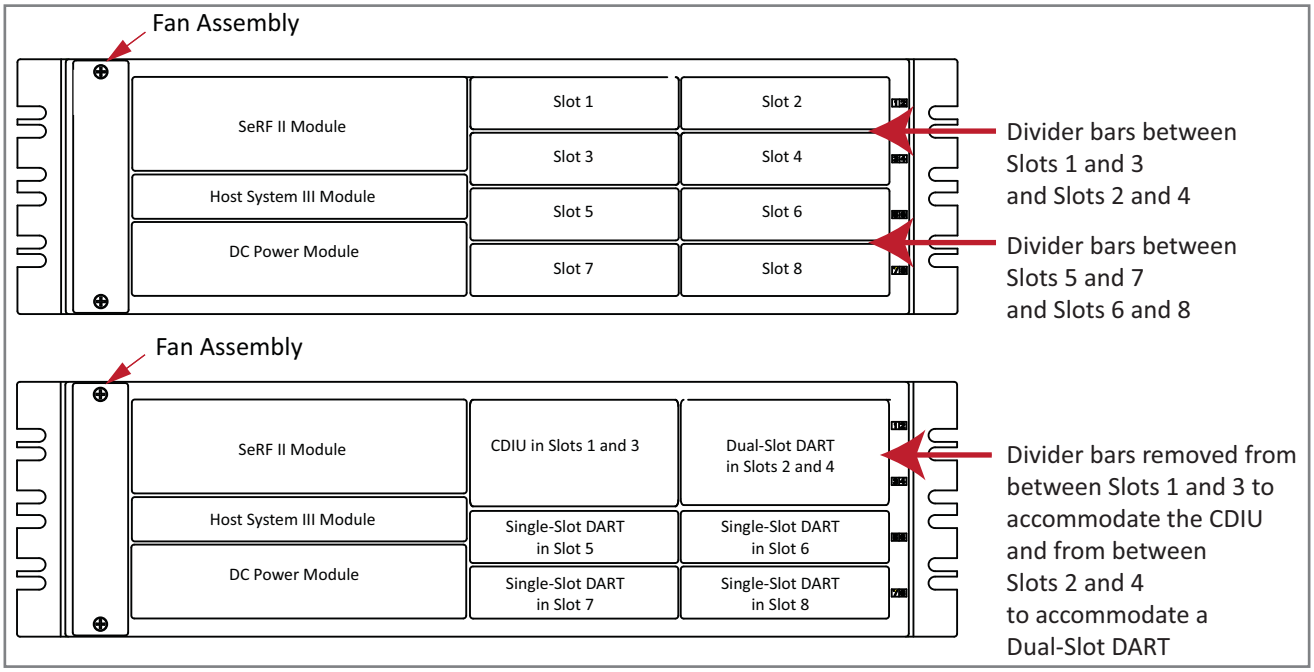


Figure 4. DART Slot Assignments in Host Unit Chassis

Install RF DART Module(s)

CAUTION! Only install the DART Modules listed in Table 2 on page 2; do not install IF DARTs or Host Expansion Unit DART Modules.

Do the following, as necessary, to install RF DART Modules into the Host Unit chassis.

1 Before removing a DART Module from its shipping packaging, make sure you are following the ESD precautions in "Guard Against Damage from Electro-Static Discharge" on page 23.

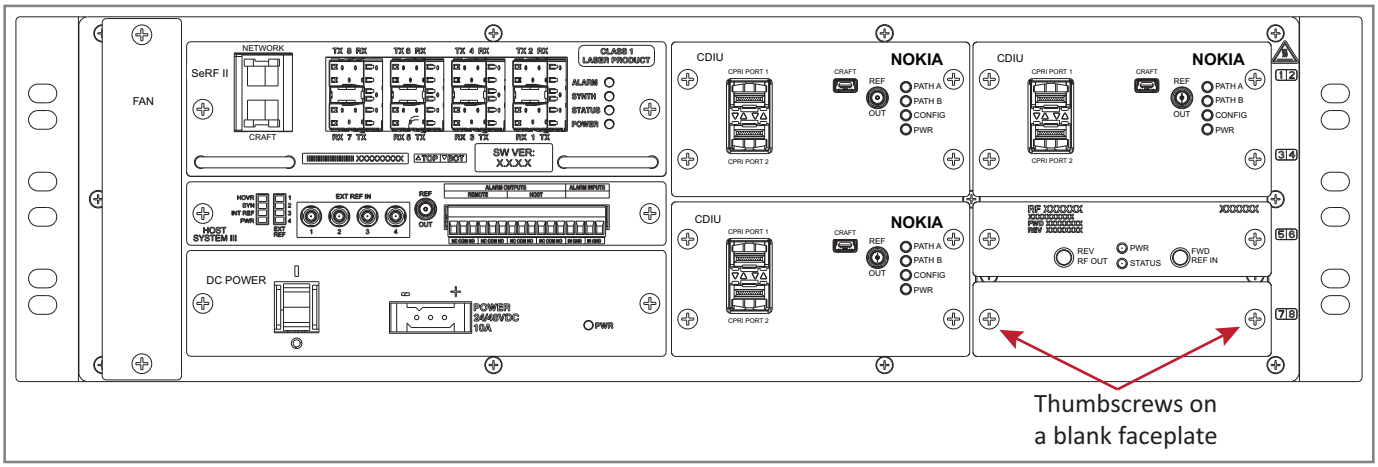
2 Refer to the system design document and to "Working with the Host Unit Slots" on page 26 to identify the slot(s) in which to install the RF DART Module(s).

3 If necessary, remove the blank faceplate(s) from the slot(s) in which the DART is to be installed.

a Loosen the two thumb screws that secure the blank faceplate(s) to the Host Unit chassis.

b Carefully withdraw the blank DART faceplate from the chassis.

c Reserve the blank faceplates for future use.



CAUTION! Do not remove the blank faceplate from a slot in which an RF DART Module or CDIU will not be installed. To maintain correct airflow through the Host Unit chassis, unused DART/CDIU slots must be covered with a blank faceplate with divider bars in place. The Host Unit ships with four blank faceplates. If additional blank faceplates are required, you can order them from CommScope (see "Contacting DCCS Global Technical Support" on page 72).

4 If necessary, remove the two Phillips head screws securing the slot-divider bar from between the two slots in which the RF DART Module will be installed, and then remove the divider bar from the chassis; reserve the divider bar and two Phillips head screws for future use (see Figure 4 on page 27).

5 Slide the RF DART Module into the slot(s) that it will occupy, and then push it back until its faceplate is flush against the Host Unit chassis.

6 Tighten the two thumbscrews that secure the RF DART Module in the Host chassis.

7 Do not leave any unoccupied slots open; replace divider bars and/or blank faceplates, as necessary.

CAUTION! To maintain correct airflow through the Host Unit chassis, unused DART/CDIU slots must be covered with a blank faceplate with divider bars in place. The Host Unit ships with four blank faceplates. If additional blank faceplates are required, you can order them from CommScope (see "Contacting DCCS Global Technical Support" on page 72).

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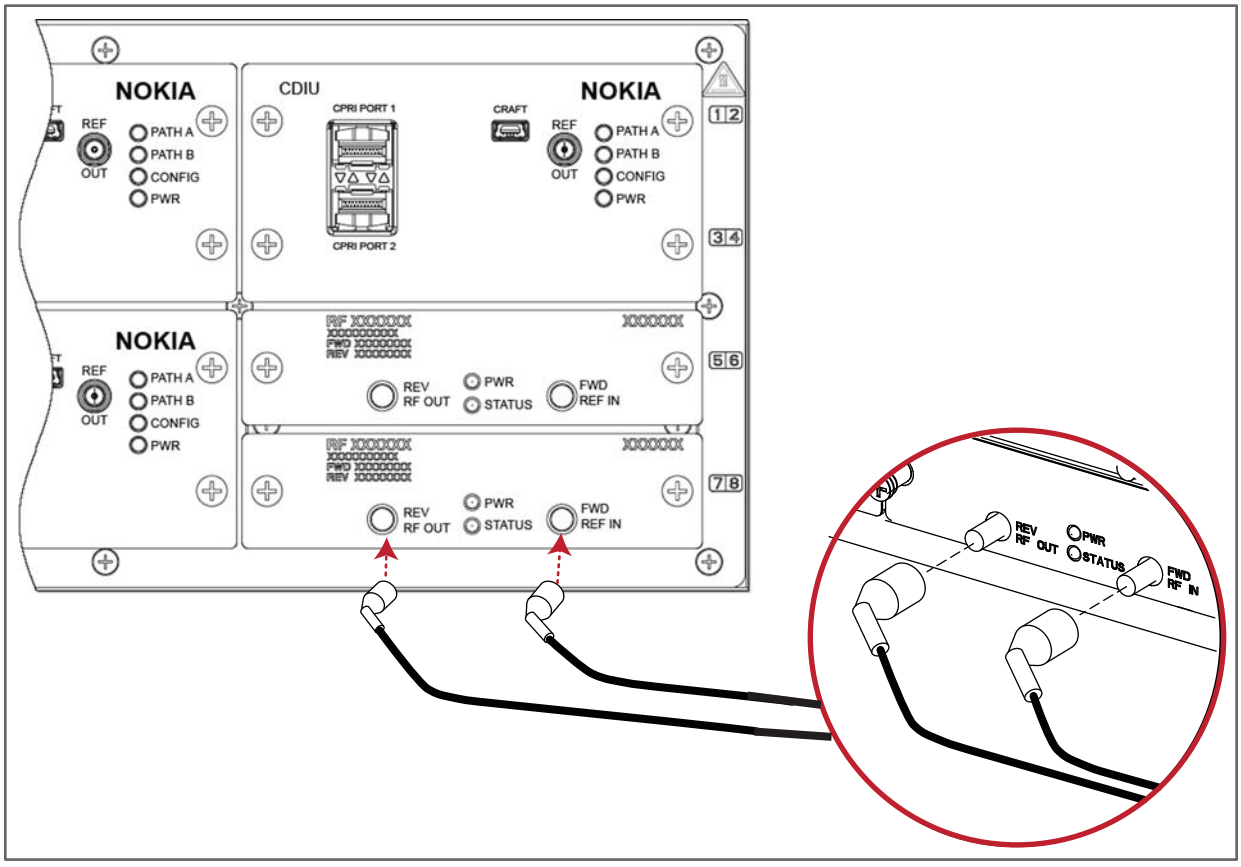
Connect the RF DART Modules to the BTS

CAUTION! To minimize cable loss, mount the Host Unit as close as possible to the BTS.

Two QMA female connectors support the RF interface between the Host Unit DART Modules and the BTS: one for the forward path (downlink) signal, and the other for the reverse path (uplink) signal.

1. Obtain the required lengths of high performance, flexible, low loss 50-ohm coaxial communications cable (RG-400 or equivalent) for all coaxial connections.
2. Route the forward and reverse path coaxial cables between the Host Unit DART card interface and the BTS/conditioning panel interface (per system design plan) and cut to the required length.
3. Terminate each cable as follows:
   - Terminate one end of the cable with a QMA male connector following the connector supplier's recommendations. This end of the cable will connect to a Host Unit DART.
   - Terminate the other cable end as appropriate to mate with a DAS Tray, Active Integration Panel (AIP), or other signal-conditioning interface.



CAUTION! Running System Test in the Prism EMS (System Configuration > Perform System Test) with unterminated Host Unit DARTs may cause a false RLM Upconvert Fault. Ensure that all Host Unit DARTs are terminated before running System Test.

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4 You may need to take the following signal-conditioning steps to ensure proper input and signal levels to the DART:

- Convert duplexed RF from the RF sources to a simplex signal.
- Provide attenuation on both the forward and reverse paths to ensure proper RF levels are met.

NOTE: CommScope recommends the use CommScope's active or passive integration panels/modules for signal conditioning.

NOTE: Validate the loaded forward path connection at the BTS. Verify that the maximum composite forward path RF signal level at the Host Unit is between -25 and +6 dBm before connecting the forward path to the Host DART RF Input. Take into consideration the current level of signal loading when conditioning the RF level going into the Host Unit DART and when adjusting the FlexWave system gain setting. The RF input signal should be conditioned so that the maximum composite forward path RF signal level will never exceed +6 dBm. CommScope recommends a -15 dBm input into the forward path of the DART.

5 Dress and secure cables to the right side of the Host Unit.

Install and Connect CDIU(s)

If you need to install or connect one or more CDIUs, refer to the *FlexWave CPRI Digital Interface Unit Installation and Provisioning Guide* (FWPP-507) for the steps that you need to follow.

Optical Connections

Small Form-Factor Pluggable (SFP) transceivers support the optical connections between the Host Unit SeRF card and the Remote Unit. The optical interfaces should be standard single-mode duplex LC (flat polished UPC). You order the SFP transceivers separately, as needed (up to 8 per Host Unit).

Fiber Connections

For each optical SFP transceiver, there are two fiber connections: one Transmit (TX) and one Receive (RX). As the SeRF holds up to eight SFP transceivers, there are 16 connections: eight TX and eight RX. There are two types of SFP transceivers:

- Long Reach (LR) SFP transceivers that have a 26 dB optical range
- Intermediate Reach (IR) SFP transceivers that have a 13 dB optical range.

You can identify which SFP transceiver type is in use by its part number (see Table 10 on page 33).

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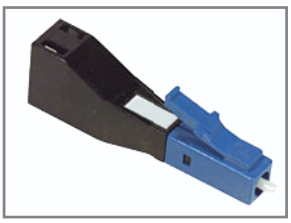
15 dB LC Attenuator

When using the LR 1551nm or LR 1310nm SFP transceivers, the optical receive power specification is -9 to -27 dBm. Based on typical fiber runs, there is usually only a few dB of loss, so to put the receive level in the optimum receive range, install a 15 dB LC attenuator at the Host Unit SFP TX and RX ports. The 15 dB LC attenuator (see graphic at right) can be ordered separately from CommScope (part number FOA-INLC015). For information on how to contact CommScope, see "Contacting DCCS Global Technical Support" on page 72.



NOTE: 5dB and 10dB optical attenuators are available as needed based on the optical link budget of the system (part numbers FOA-INLC05 and FOA-INLC010, respectively).

Fiber Paths for Prism

26 dBo Budget Option: (1551 SFP: FWU-SMCW1550XVR; 1310 nm SFP: FWU-SMRU1310XVR)

The transmit path is 1551nm (from the Host Unit to the Remote Unit). Each TX port provides an optical connection for the forward path (downlink) signal.

The receive path is 1310nm (from the Remote Unit to the Host Unit). Each RX port provides an optical connection for the reverse path (uplink) signal. Each RX port can also provide the optical connection for the diversity reverse path (uplink) signal.

13 dBo Budget Option: (uses only 1310 nm SFPs: FWP-SMIR1310XVR)

The transmit path is 1310nm (from the Host Unit to the Remote Unit). Each TX port provides an optical connection for the forward path (downlink) signal.

The receive path is 1310nm (from the Remote Unit to the Host Unit). Each RX port provides an optical connection for the reverse path (uplink) signal. Each RX port can also provide the optical connection for the diversity reverse path (uplink) signal.

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Cabling Fiber between Buildings

When the Host Unit and the Remote Unit are located in different buildings, route and terminate outside plant (OSP) fiber optic cables between the Host Unit and Remote Unit distribution panels.

Figure 5 shows a diagram of typical OSP cable routing. In general, you will do the following. (For specific install steps, go to "Install the Optical Fiber" on page 35.)

- You connect the Host Unit to a Fiber Distribution Panel (FDP), using either of the methods listed below:
  - Terminate the OSP fiber at the FDP; you need to field terminate a connector on the individual fiber strands of the OSP cable, then connect them inside the FDP.
  - Splice individual OSP fiber strands to the existing fiber splice pigtail assemblies in the FDP.
- Use jumper cords to connect the Host Unit SeRF II SFP TX and RX connections to the adapters in the FDP.
- Whenever possible, provide a guide, such as the FiberGuide system, to protect the fiber optic patch cords from damage and to prevent excessive bending.

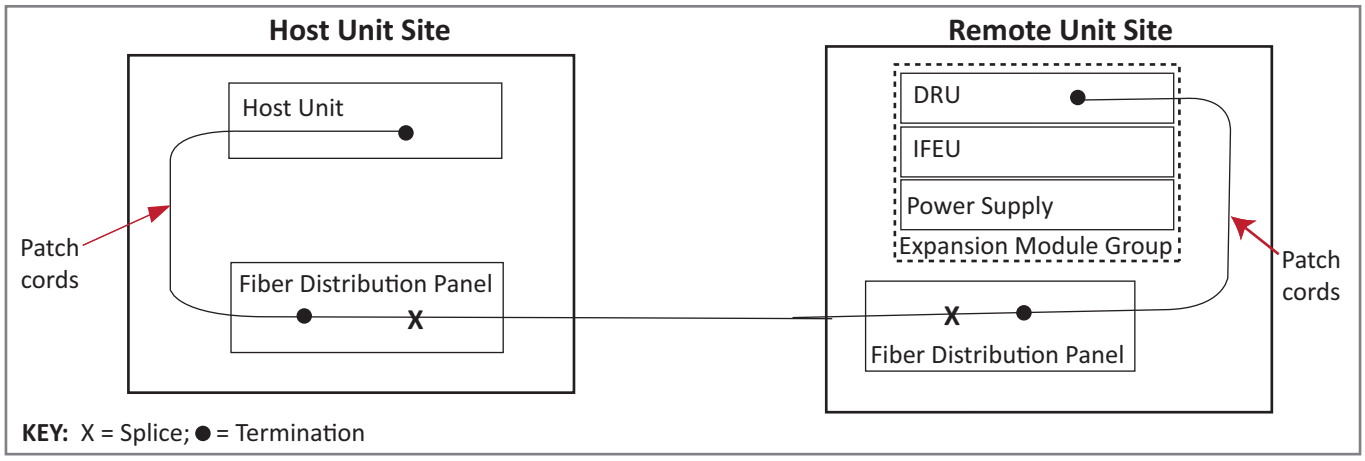

Figure 5. Routing Fiber Optic Cable between Buildings in a Spectrum Installation

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Select the Correct Optical SFP Transceiver

Table 10 provides specifications for LR and IR SFP transceivers.

Table 10. *Typical Values for LR and IR SFP Transceivers*

Specification	26 dB LR Optical Range	13 dB IR Optical Range
TX Launch	-2 to 3 dBm	-5 dBm to 0 dBm
Normal Operation Minimum Maximum	 -27 dBm -9 dBm	 -18 dB 0 dBm
Optical Overdrive	> -9 dBm	> 0 dBm
Optical Underdrive	< -27 dBm	< -18 dBm
RX No Light condition	< -34 dBm	< -30 dBm
CommScope Part Number(s)	FWU-SMCW1550XVR or FWU-SMRU1310XVR	FWP-SMIR1310XVR

Use Table 10 and the following rules and to help you select the appropriate SFP transceiver based on the expected fiber loss:

- If the FlexWave system uses WDM modules, only use LR 26 dB SFP transceivers.
- If using the 26 dB optical SFP transceivers, use a 1551 nm SFP transceiver at the Host Unit, and a 1310 nm SFP transceiver at the Remote Unit.
- If using the 13 dB optical SFP transceivers, use the 1310 nm SFP transceiver at both the Host Unit and the Remote Unit, but do not use optical attenuators as they are not required for 13dB optical transceivers.
- If you are connecting the Host Unit to a CWDM, refer to the *FlexWave Prism Coarse Wavelength Division Multiplexer User Guide* (FWPP-509); refer to Table 11 for information on which SFP transceivers to use.

Table 11. *Supported SFP Transceivers for CWDM Systems*

CommScope Part Number	Description
FWU-SMCW1470XVR XCVR	CWDM SFP 1471 nm
FWU-SMCW1490XVR XCVR	CWDM SFP 1491 nm
FWU-SMCW1510XVR XCVR	CWDM SFP 1511 nm
FWU-SMCW1530XVR XCVR	CWDM SFP 1531 nm
FWU-SMCW1550XVR XCVR	CWDM SFP 1551 nm
FWU-SMCW1570XVR XCVR	CWDM SFP 1571 nm
FWU-SMCW1590XVR XCVR	CWDM SFP 1591 nm
FWU-SMCW1610XVR XCVR	CWDM SFP 1611 nm

CAUTION! Do not use 13 dB optical SFP transceivers (FWP-SMIR1310XVR) with WDM modules.

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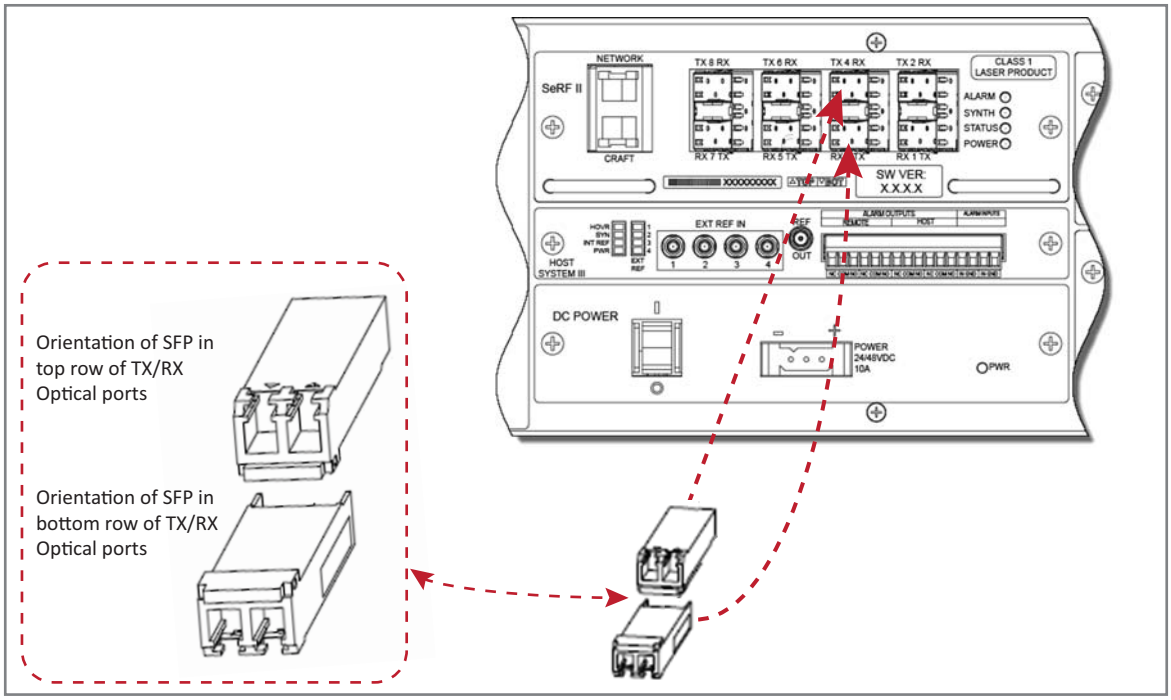
Install the SFPs

1. Obtain the required number of SFPs; follow the recommendations in "Select the Correct Optical SFP Transceiver" on page 33.
2. Use the system design to identify which TX/RX Optical port(s) (1–8) will be used in this system.
3. Slide the SFP into the TX/RX Optical port identified in Step 2, and push the SFP into the Host Unit chassis until you hear it click into place. The following graphic shows the correct orientation of the SFPs. Note that the orientation of the SFP is reversed between the top and bottom row of SFP ports.



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Install the Optical Fiber

The optical connections are dependent on whether or not a WDM Host Unit module (accessory) is included in the system configuration. If the installation does not include a WDM module, complete the steps in this section. If the installation includes a WDM module, proceed to "Optical Connections for Systems with a WDM Module" on page 60.

NOTE: If the installation includes a CWDM, refer to the *FlexWave Prism Coarse Wavelength Division Multiplexer User Guide* (FWPP-509).

CAUTION! This equipment uses a Class 1 Laser according to FDA/CDRH rules. Laser radiation can seriously damage the retina of the eye. Do not look into the ends of any optical fiber. Do not look directly into the optical transceiver of any digital unit or exposure to laser radiation may result. Use an optical power meter to verify active fibers. To avoid the potential of dangerous amounts of radiation exposure, immediately place a protective cap or hood over any radiating transceiver or optical fiber connector. This practice also prevents dirt particles from entering the adapter or connector.

CAUTION! You must clean the SFP optical ports at the Host Unit and at the Remote Unit, and clean the tip of the fiber-patch cords. Failure to clean the ports and cord tips may result in an optical RX or TX alarm state.

CAUTION! Improper handling can damage fiber optic cables. Always allow sufficient fiber length to permit routing of patch cords and pigtails without severe bends. Do not bend fiber optic cable more sharply than the minimum recommended bend radius specified by the cable manufacturer. Do not apply more pulling force to the cable than specified.

If a WDM module is not present in the system, do the following to connect the optical fibers.

1. Do one of the following as appropriate to the installation.
   - Obtain two fiber-patch cords that are of sufficient length to reach from the Host Unit to the Remote Unit, which may be located in the same equipment rack as the Host Unit.
   - Obtain two patch cords that are of sufficient length to reach from the Host Unit to the Fiber Patch Panel.
2. Designate one of the fiber-patch cords as the TX path link and the other as the RX path link and attach an identification label or tag next to the connector.
3. Remove the dust caps from the Host Unit SeRF II SFP optical ports and the patch-cord connectors that will connect to the Host Unit SeRF II SFP optical ports. Leave the dust caps on all unused SFP optical ports and patch-cord connectors.
4. Clean each patch cord connector following the patch cord supplier's recommendations.
5. Follow the approved cleaning technique to clean the Host Unit SFP optical port.
6. If required, connect the LC attenuator into the SFP and then to the patch cord. (See "15 dB LC Attenuator" on page 31.)

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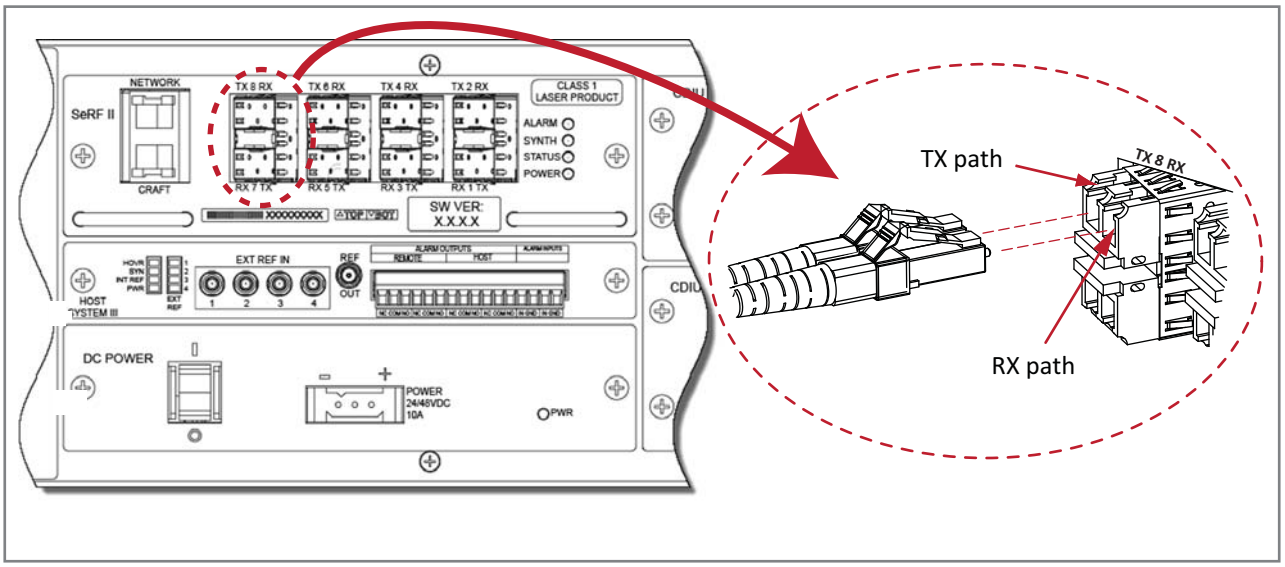
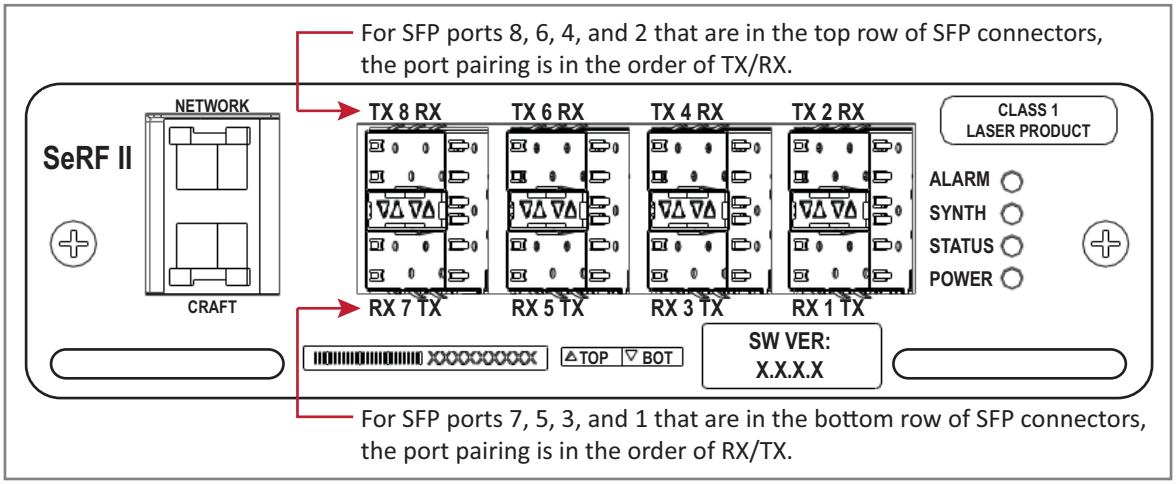
7 Plug the TX and RX path patch cords to the corresponding Host Unit SeRF II SFP TX and RX connections depending on the remote node SFP position.



The order of the TX and RX ports are reversed between the top and bottom row of SFP ports, as shown in the following graphic.



8 Route the patch cords from the Host Unit to the Remote Unit or the Fiber Patch Panel.

NOTE: The Host Unit optical adapters are angled to the left. Therefore, always route patch cords to the Host Unit from the left side of the rack. Routing patch cords to the Host Unit from the right may exceed the bend radius limitations for the optical fiber.

9 At the Remote Unit or the Fiber Patch Panel, identify the cable optical fiber terminations that correspond to the forward (TX) and reverse (RX) paths.

10 Remove the dust caps from the Remote Unit or the Fiber Patch Panel SeRF SFP optical ports. Remove the dust caps only from those SFPs that will be used.

11 Follow the approved cleaning technique to clean the Remote Unit or the Fiber Patch Panel SeRF SFP optical port.

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12 If you have not already done so, clean the tip of the patch-cord connector, and then plug the TX and RX path patch cords to the corresponding TX and RX connections depending on the remote node SFP position.

13 Repeat this procedure for the remaining SFPs that are to be used in this installation.

14 Store any excess patch cord slack at the storage panel.

Optional Connections

As necessary for the system design, do the following **before** you proceed to "Install Power Wiring" on page 37:

- If the Host Unit Alarm Interface will be connected to the BTS and/or an Uninterruptible Power Supply (UPS), complete the appropriate steps in "Optional Alarm Interface Connections" on page 52.
- If a WDM system is being configured, follow the steps in "Optional Wavelength Division Multiplexer Components" on page 56.

CAUTION! To prevent damage due to overpowering signal levels, validate optical power levels prior to powering on the Host Unit.

Install Power Wiring

There are six different power options that are dependent on how the Host Unit is to be deployed. You first need to calculate the power consumption for this installation as described in "Calculate the Power Consumption" on page 38., then go to the power option section that meets your installation requirements.

- "Power Option 1 Prism: Connect to the Host Unit DC Power Module" on page 39
- "Power Option 2 Prism and Spectrum: Connect the Host Unit to a Fuse Panel (21-60 Vdc)" on page 40.
- "Power Option 3 Spectrum: Connect to an EMG 2400 Watt AC to DC Power Supply Unit (SPT-2400ACDC-1)" on page 42
- "Power Option 4 Spectrum: Connect to the EMG 2000 Watt DC-to-DC Power Supply Unit (SPT-2000DCDC-1)" on page 45
- "Power Option 5 Spectrum: Connect to the 2000 WATT AC-to-DC Power Supply Unit (SPT-2000ACDC-1)" on page 47

  If the Host Unit is not located in the same rack as the EMG, it will require a dedicated EMG Power Supply Unit. A dedicated EMG Power Supply Unit can power from one to five Host Units; a 2400 Watt EMG Power Supply can power up to 11 Host Units.

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Calculate the Power Consumption

Use the Host Unit power consumption matrix in Table 12 to calculate power consumption for a system when powering from a fuse panel, where:

- The Host DC Power board is 89% efficient. The numbers shown in Table 12 reflect the DC power needed by the Host Unit to power a given module
- The fuse selection criteria should include the total power divided by the minimum voltage. For example, with a 48V DC system that shuts off at 44VDC, and a Host Unit that requires 240 Watts, the fuse must be: ≥5.5 amps (240/44).

Table 12. *Host Unit Power Consumption*

PCB		Classic DART, Single or Dual SuperDART	CDIU Module	Host System III Card	SeRF II Module Plus One SFP	SeRF II Module Plus Eight SFPs*	Fan
Power Consumption	Nominal	21.0	20.6	3.4	25.8	33.7	8.3
	Maximum	22.5	23.4	5.6	28.1	36.0	8.3
1) Add 1W for each installed SFP, so if 6 SFPs installed, calculate at 28W for Nominal and 30W for Maximum.							

Example One

Example One shows the power consumption of a Host Unit that has eight DARTs and one System III Module with eight SFP transceivers, but no CDIUs.

Module(s)	Nominal Watts		Maximum Watts	
8 DARTs	8 * 21 =	168.0	8 * 22.5 =	180.0
CDIU(s)		0.0		0.0
1 Host System III Module		3.4		5.6
8 SFPs (in SeRF II Module)	25.8 + 7 =	32.8	28.1 + 7 =	35.1
Fan		8.3		8.3
Total		212.5		229.0
15% Headroom		244.4		263.3

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Example Two

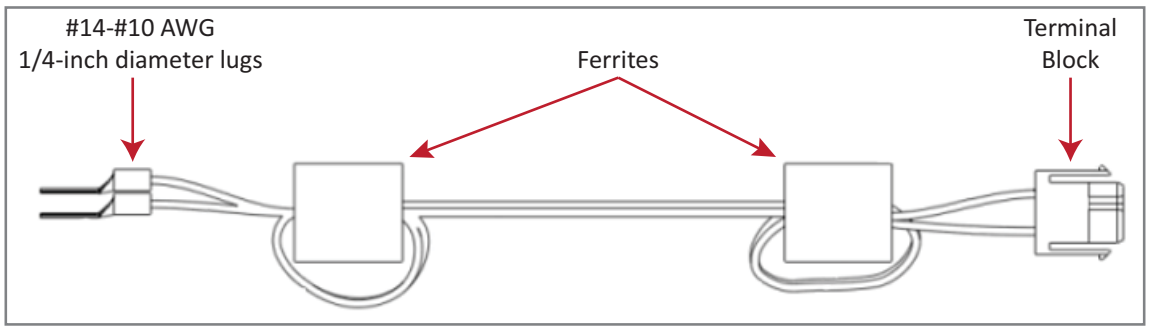
Example Two shows the power consumption of a Host Unit that has six DARTs, one CDIU, and one SeRF III Module with six SFP transceivers.

Module(s)	Nominal Watts		Maximum Watts	
6 DARTs	6 * 21 =	126.0	6 * 22.5 =	135.0
1 CDIU		20.6		23.4
1 Host System III Module		3.4		5.6
8 SFPs (in SeRF II Module)	25.8 + 7 =	32.8	28.1 + 7 =	35.1
Fan		8.3		8.3
Total		191.1		207.4
15% Headroom		219.77		238.5

Power Option 1 Prism: Connect to the Host Unit DC Power Module

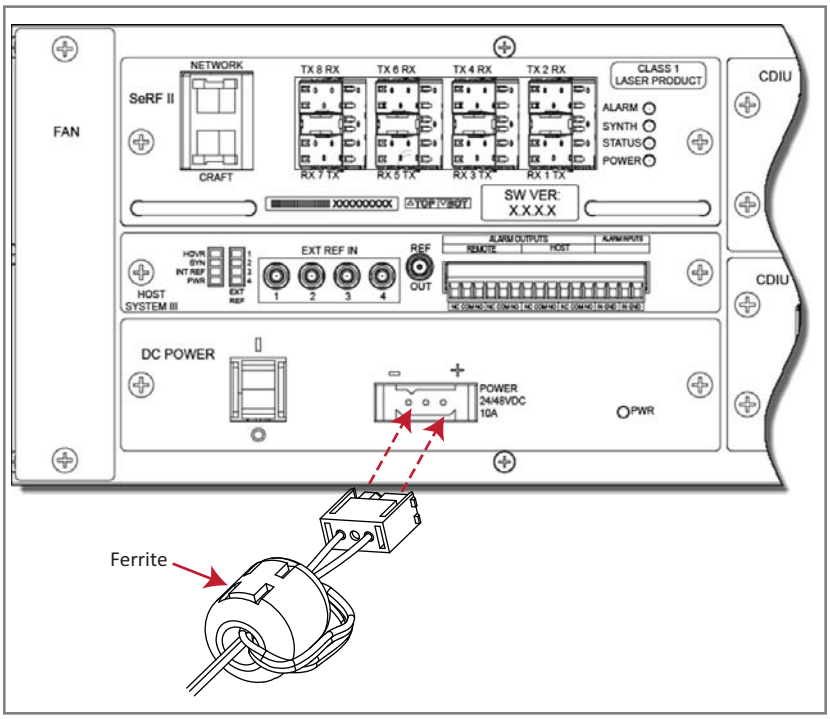
Do the following to connect the Host Unit to the Host Unit DC Power Module.

1. Use the information in "Calculate the Power Consumption" on page 38 to determine the power consumption for this installation.
2. Turn OFF the power switch on the Host Unit DC Power Module.
3. Make sure the power switch on the local power supply is OFF.
4. Locate the Power cable (shown below) that ships with the Host Unit.



CAUTION! Do not remove the two Ferrite beads from the Power cable; they are required for compliance with FCC standards for radiated emissions.

5 Insert the Terminal Block on the Power cable into the 3-pin Power connector on the front panel of the Host Unit DC Power Supply Module.



6 Follow local practice to connect the lug end of the Power cable to the local power supply:

- The red Vdc power wire connects to the V+ terminal.
- The black Vdc power wire connects to the V- terminal.

7 Dress and secure the wires to the rack following local practice. Route wiring away from sharp edges and secure in place to prevent chaffing and provide strain relief.

Power Option 2 Prism and Spectrum: Connect the Host Unit to a Fuse Panel (21-60 Vdc)

The Host Unit is powered by ± 21 to ± 60 Vdc power (nominal ± 24 or ± 48 Vdc), which is fed to the Host Unit through a connector located on the front of the module. Power to the Host Unit can be supplied through a fuse panel (available separately).

CAUTION! If using a fuse panel, protect each Host Unit with a separate fuse.

The Host DC Power Module (DC to DC), located on the lower left side of the chassis, provides the On/Off switch for the Host Unit (see "DC Power Module" on page 11).

A three position terminal block is also provided for connecting the power wires. Power to the Host Unit can be supplied through a fuse panel, such as the 20 position PowerWorx GMT Fuse Panel (available separately).

CAUTION! Protect the power with an GMT fuse appropriate for this installation. Use the information in "Calculate the Power Consumption" on page 38 to determine the correct fuse size to use.

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Do the following to connect the Host Unit to a Fuse Panel (21-60 Vdc).

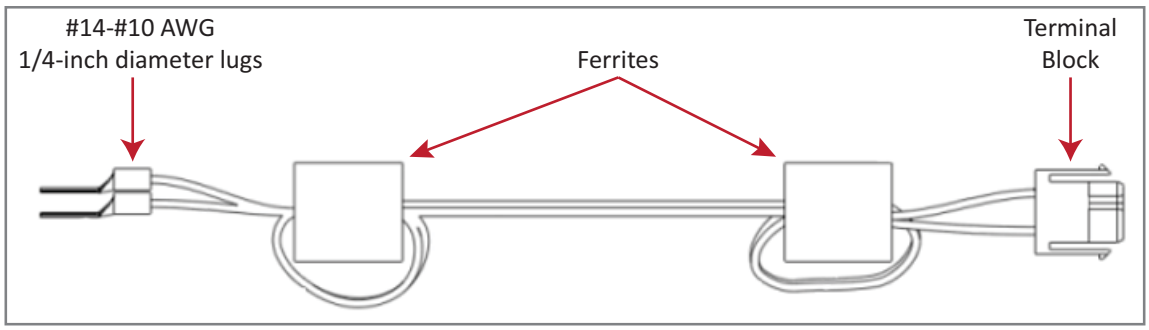
1 Use the information in "Calculate the Power Consumption" on page 38 to determine the power consumption for this installation.

2 Verify that the power switch on the Host Unit DC Power Module is in its OFF position.

3 Verify that the fuses are removed from the designated terminals on the fuse panel.

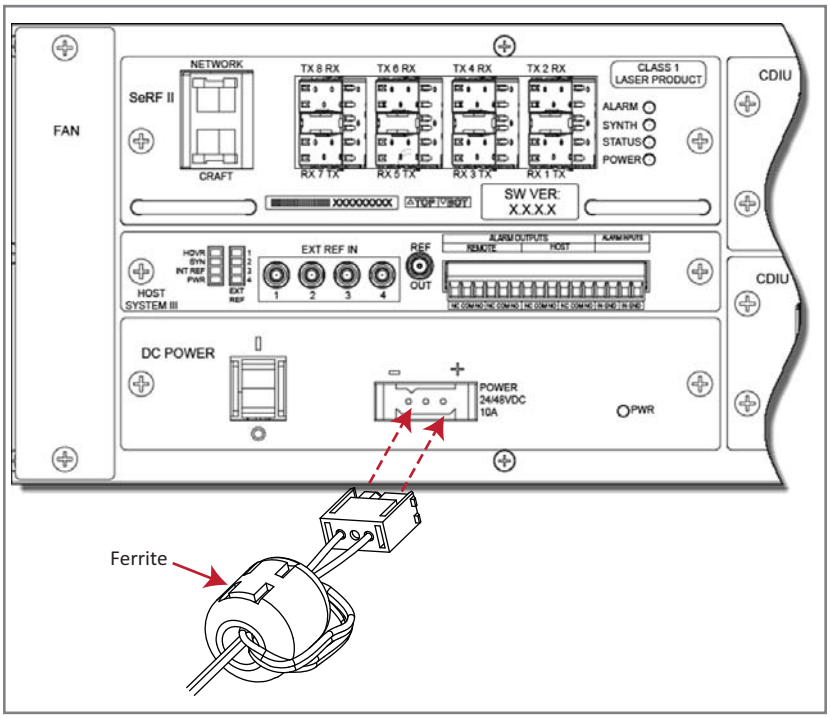
4 Obtain a wire stripper and a screwdriver.

5 Locate the Power cable (shown below) that ships with the Host Unit.



CAUTION! Do not remove the two Ferrite beads from the Power cable; they are required for compliance with FCC standards for radiated emissions.

6 Insert the terminal block into the 3-pin receptacle on the front of the Host Unit DC Power Module.



7 Route the lug-end of the Power cable to the fuse panel.

8 Follow local practice to connect the positive and negative wires to the designated terminals on the fuse panel.

   a If necessary, strip 0.5 inch (1.27 cm) of insulation from the end of each wire.

   b Insert one end of each wire into the terminal block:

   - The red lead connects to a positive terminal.
   - The black lead connects to a negative terminal.

NOTE: When connecting the equipment to the supply circuit, check equipment nameplate ratings to avoid overloading circuits, which may cause damage to over-current protection devices and supply wiring.

NOTE: The Host Unit uses a floating ground, so polarity of the power connections is not critical or important.

9 Install fuses in the fuse panel. Update office records as required.

10 Update office records as required.

Power Option 3 Spectrum: Connect to an EMG 2400 Watt AC to DC Power Supply Unit (SPT-2400ACDC-1)

A Host Unit that is installed in the same equipment rack as the EMG can be powered by the EMG 2400 Watt AC to DC Power Supply Unit (SPT-2400ACDC-1). Follow the steps that correspond to the PSU type that was shipped with the EMG.

NOTE: For information on the SPT-2400ACDC-1, refer to the "2400 Watt AC to DC Power Supply Unit (SPT-2400ACDC-1)" section of the *Spectrum Expansion Module Group Installation Guide* (SPTP-401).

CAUTION! The Power Supply Unit must be a UL listed UL60950 ITE unit with a Nominal Output Voltage of +54 Vdc and a 44 A Output Current.

CAUTION! The Power Supply Unit requires two 20 Amp 120 Vac outlets.

CAUTION! Make the protective earth connection before proceeding with power connections. Confirm the DC power source has no power during installation.

CAUTION! The warning color code of the power cables depends on the color coding of the DC power source installed at the site. Color code standards for DC wiring do not exist. To ensure that the correct polarity is connected to the hubs, confirm the connection of the power cables to the + (positive) and - (negative) leads at the power source.

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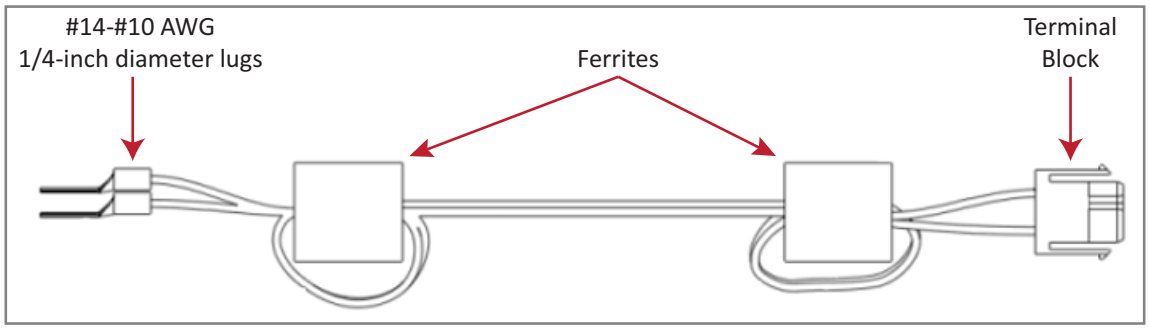
Do the following to connect the Host Unit to an EMG 2400 Watt AC to DC PSU:

1 Use the information in "Calculate the Power Consumption" on page 38 to determine the power consumption for this installation.

2 Make sure the power is off to all modules:

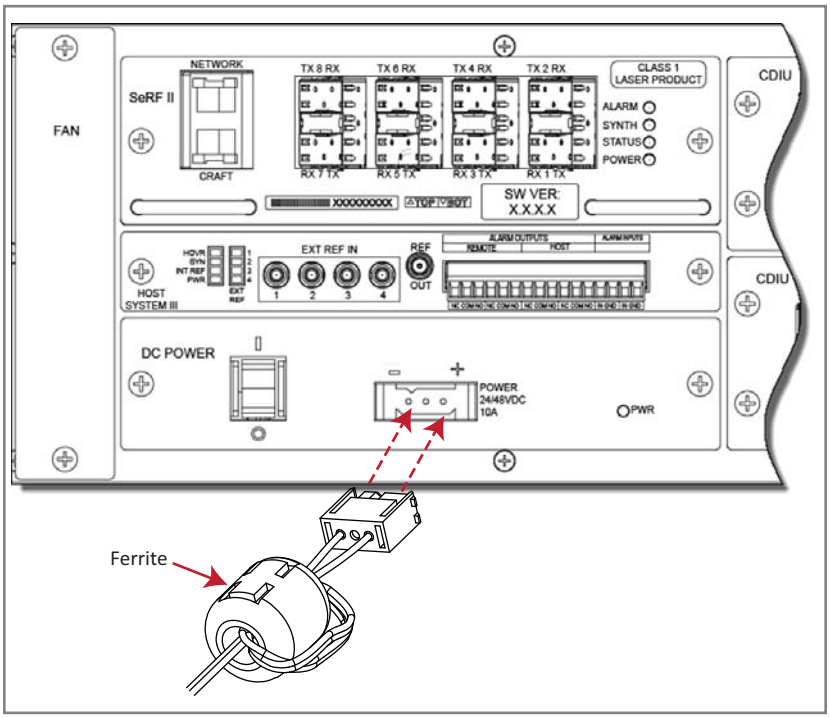
- The DC power switch on the Host Unit DC Power Module is in its OFF position.
- The DC power switch on the DRU DC Power Module is in its OFF position.
- The DC power switch on the IFEU Controller Module is in its OFF position.
- The two AC power cords (one each for the two Rectifier Modules in the PSU) to the EMG Power supply are disconnected from the AC power supply.

3 Locate the Power cable (shown below) that ships with the Host Unit.



CAUTION! Do not remove the two Ferrite beads from the Power cable; they are required for compliance with FCC standards for radiated emissions.

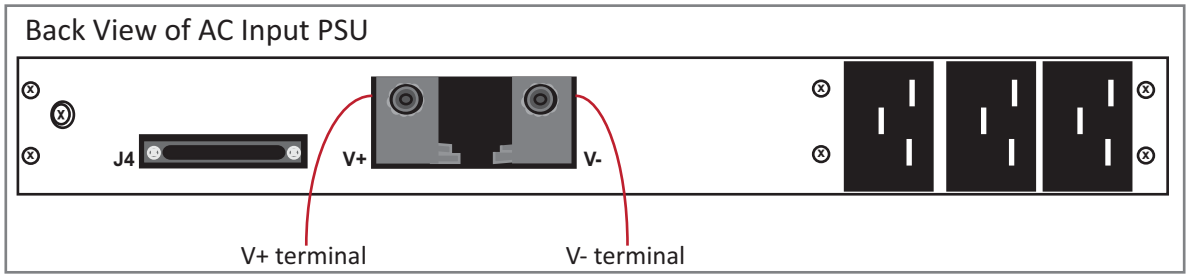
4 Insert the Terminal Block on the Power cable into the 3-pin Power connector on the front panel of the Host Unit DC Power Supply Module.



5 Connect the lugs on the other end of the Power cable to the +V and -V terminals on the back of the EMG 2400 Watt AC to DC PSU:

- The red Vdc power wire connects to the V+ terminal.
- The black Vdc power wire connects to the V- terminal.

(There can be three sets of cables—one set each for the Host Unit, the DRU, and the IFEU.)



6 Dress and secure the wires to the rack following local practice. Route wiring away from sharp edges and secure in place to prevent chaffing and provide strain relief.

7 Turn the DC power switch on the DRU DC Power Module to its ON position.

8 Turn the DC power switch on the IFEU Controller Module to its ON position.

CAUTION! Do not power on the Host Unit until directed to do so.

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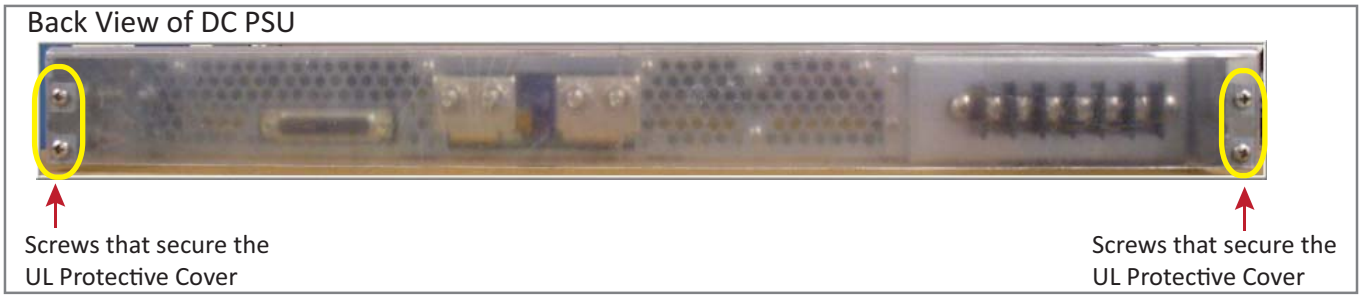
Power Option 4 Spectrum: Connect to the EMG 2000 Watt DC-to-DC Power Supply Unit (SPT-2000DCDC-1)

A Host Unit that is installed in the same equipment rack as the EMG can be powered by the EMG 2000 Watt DC-to-DC Power Supply Unit (SPT-2000DCDC-1).

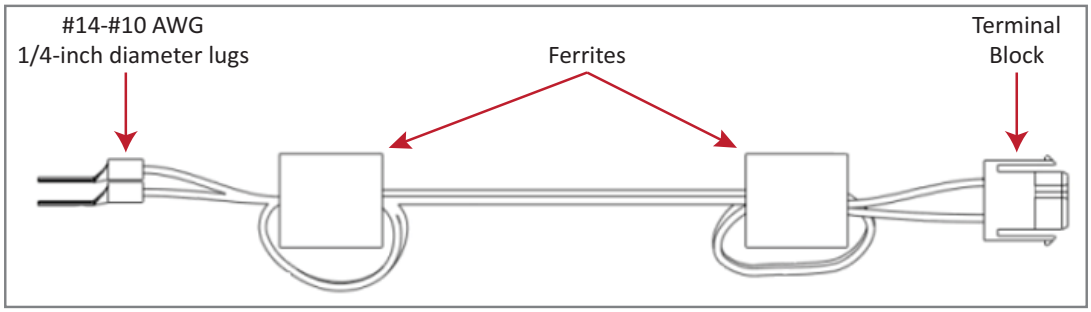
NOTE: For information on the SPT-2000DCDC-1, refer to the "2000 Watt DC-to-DC Power Supply Unit (SPT-2000DCDC-1)" section of the *Spectrum Expansion Module Group Installation Guide* (SPTP-401).

Do the following to connect the Host Unit to an EMG 2000 Watt DC-to-DC PSU:

1. Use the information in "Calculate the Power Consumption" on page 38 to determine the power consumption for this installation.
2. Make sure the power is off to all modules:
   - The DC power switch on the Host Unit DC Power Module is in its OFF position.
   - The DC power switch on the DRU DC Power Module is in its OFF position.
   - The DC power switch on the IFEU Controller Module is in its OFF position.
   - The DC power source to the PSU with the breakers on the power distribution panel.
   - The DC Input PSU has three input power feeds; turn off all three to disengage power to the unit.
3. Remove the Protective Cover from the PSU. The connectors on the back of the DC Input PSU are protected with a UL Protective Cover that must be removed to allow for cabling and wiring.
   a. Use a Phillips head screwdriver to remove the four screws from the sides of the protective cover.
   b. Keep the four screws as you need to replace the UL Protective Cover at the end of this process.



4. Locate the Power cable (shown below) that ships with the Host Unit.



CAUTION! Do not remove the two Ferrite beads from the Power cable; they are required for compliance with FCC standards for radiated emissions.

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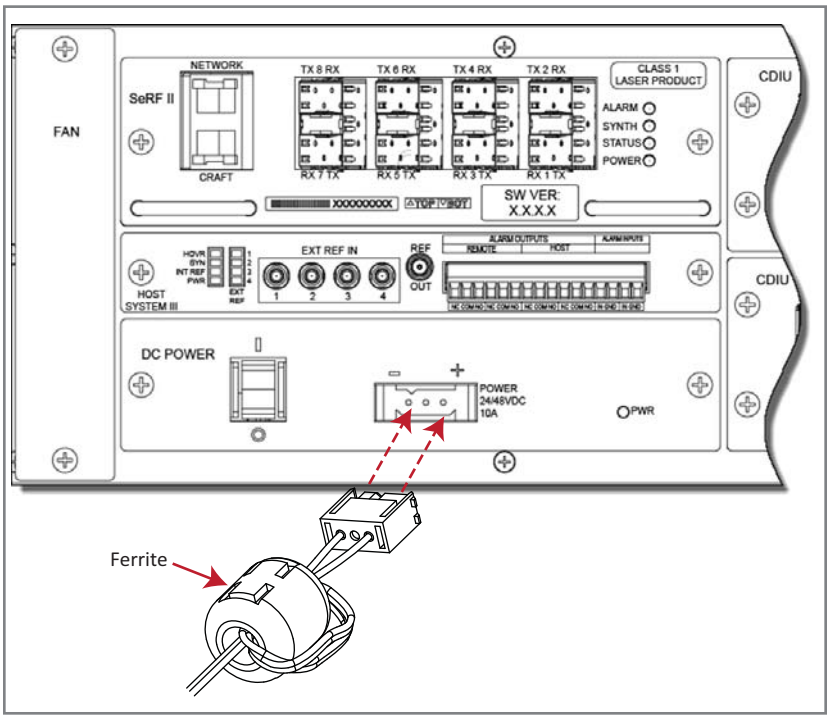
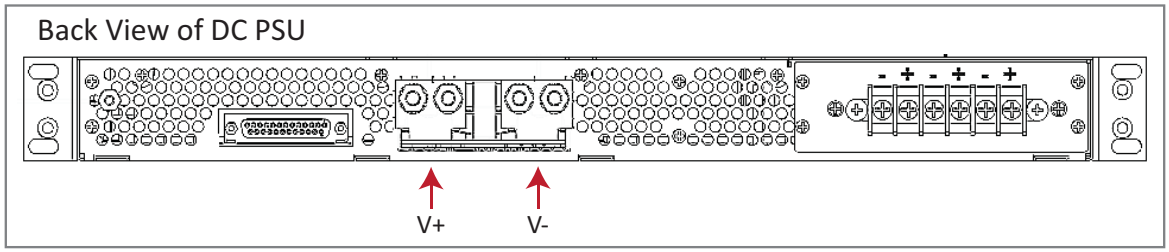
5 Insert the Terminal Block on the Power cable into the 3-pin Power connector on front panel of the Host Unit DC Power Supply Module.



6 Connect the lugs on the other end of the Power cable to the +V and -V terminals on the Power Supply Output Terminal on the back of the EMG 2000 Watt DC-to-DC PSU, as shown below.

- Up to four Vdc power cables can be connected, one cable per set of terminals.
- Use only one power lug per terminal.



7 Dress and secure the wires to the rack following local practice. Route wiring away from sharp edges and secure in place to prevent chaffing and provide strain relief.

8 Use the four screws removed in Step 3 on page 45 to reinstall the UL Protective Cover.

9 Turn ON the DC power breakers to restore power to the PSU.

10 Turn the DC power switch on the DRU DC Power Module to its ON position.

11 Turn the DC power switch on the IFEU Controller Module to its ON position.

CAUTION! Do not power on the Host Unit until directed to do so.

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Power Option 5 Spectrum: Connect to the 2000 WATT AC-to-DC Power Supply Unit (SPT-2000ACDC-1)

CAUTION! The Power Supply must be a UL listed UL60950 ITE unit with a Nominal Output Voltage of 54Vdc and a 33A Output Current.

CAUTION! The Power Supply requires two 15A 120 Vac outlets.

CAUTION! This procedure tells you how to power the Host Unit from the AC Power Supply Unit, which is part of the Spectrum Expansion Module Group. If you are wiring the Host Unit to a fuse panel, do not complete this procedure; follow instead the procedure in "Power Option 3: Connect the Host Unit to a Fuse Panel (48V-60Vdc)" in the Host Installation Guide.

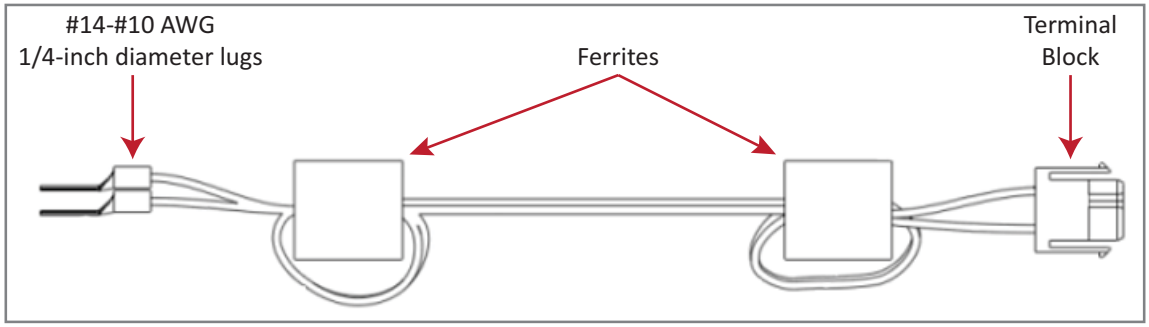
Do the following to connect the Host Unit to an EMG 2000 WATT AC-to-DC Power Supply Unit (SPT-2000ACDC-1).

1 Use the information in "Calculate the Power Consumption" on page 38 to determine the power consumption for this installation.

2 Make sure the power is off to all modules:

- The DC power switch on the Host Unit DC Power Module is in its OFF position.
- The DC power switch on the DRU DC Power Module is in its OFF position.
- The DC power switch on the IFEU Controller Module is in its OFF position.
- The two AC power cords (one each for the two Rectifier Modules in the PSU) to the EMG Power supply are disconnected from the AC power supply.

3 Locate the Power cable (shown below) that ships with the Host Unit.

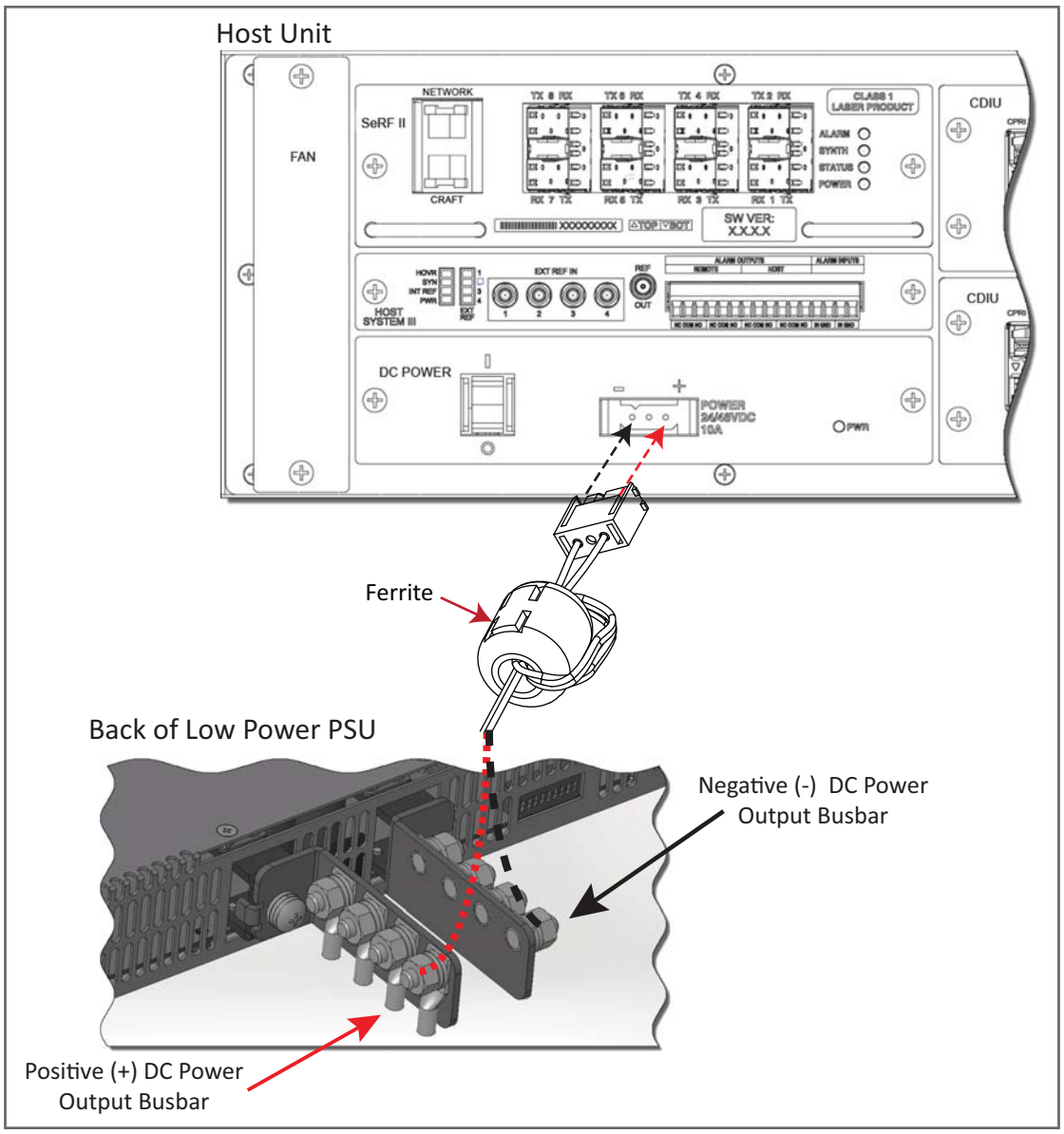


CAUTION! Do not remove the two Ferrite beads from the Power cable; they are required for compliance with FCC standards for radiated emissions.

4 Insert the Terminal Block on the Power cable into the 3-pin Power connector on front panel of the Host Unit DC Power Supply Module.

5 Connect the lugs on the other end of the Power cable to the +/- DC Power Output Busbars on the 2000 WATT AC-to-DC PSU. (There can be three sets of wires—one set each for the Host Unit, the DRU, and the IFEU.)

- The red lead connects to a positive terminal.
- The black lead connects to a negative terminal.



6 Dress and secure the wires to the rack following local practice. Route wiring away from sharp edges and secure in place to prevent chaffing and provide strain relief.

CAUTION! Do not power on the Host Unit until directed to do so.

7 If necessary, follow the steps in the "Cover the +/- DC Power Busbars" section of the *Spectrum Expansion Module Group Installation Guide* (SPTP-401).

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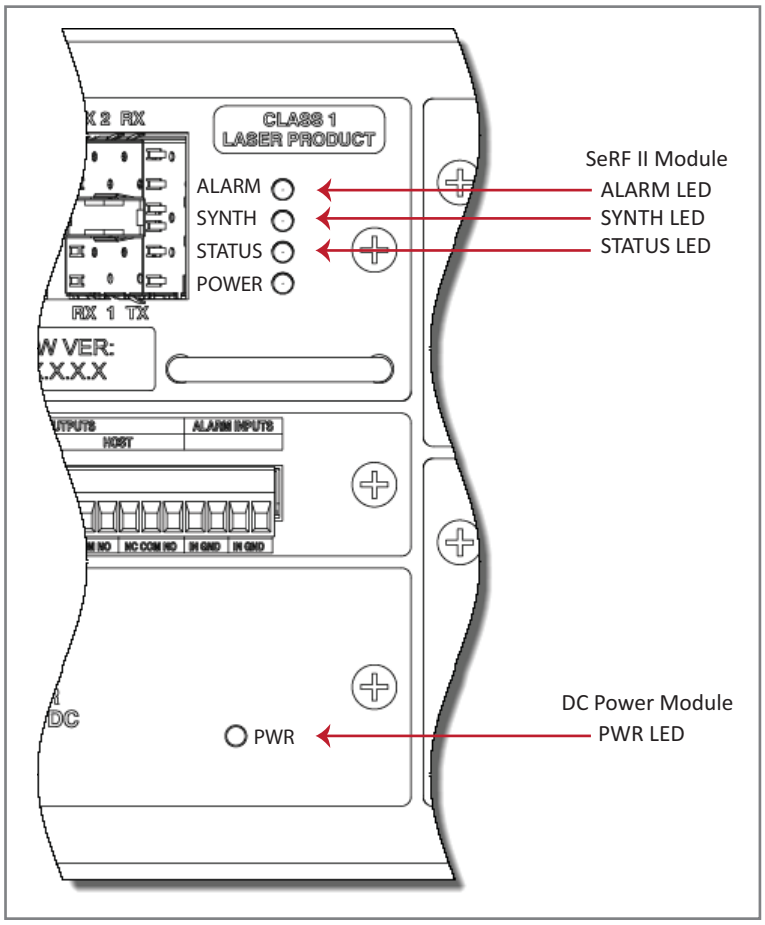
POWER ON THE HOST UNIT

1. To avoid damage to the optical transceivers resultant from overpowering, confirm that the optical power levels are within specification.
2. Turn the DC power switch to its ON position. Under normal operating conditions, the Host Unit responds as listed below. (Refer to the following graphic for location of the referenced LEDs.)



- Immediately: PWR LED on the DC Power Module turns Green and POWER LED on the SeRF Module turns on
- Within 6 to 7 seconds: ALARM, SYNTH, and STATUS LEDs on the SeRF II Module turn Red
- Approximately 10 seconds: ALARM LED goes out
- Approximately 30 seconds: SYNTH LED goes out
- Approximately 1 minute: STATUS LED goes out
- Approximately 3 minutes: All LEDs, including the SFPs, flash on and off several times, and then the SYNTH LED turns green
- Approximately 30 seconds: ALARM and STATUS LEDs turn green
- Approximately 1 to 2 minutes after all LEDs turn green (depending on the size of the system), you can access the EMS login or **Welcome** page, but will not be able to log in to the EMS until after the EMS initializes.

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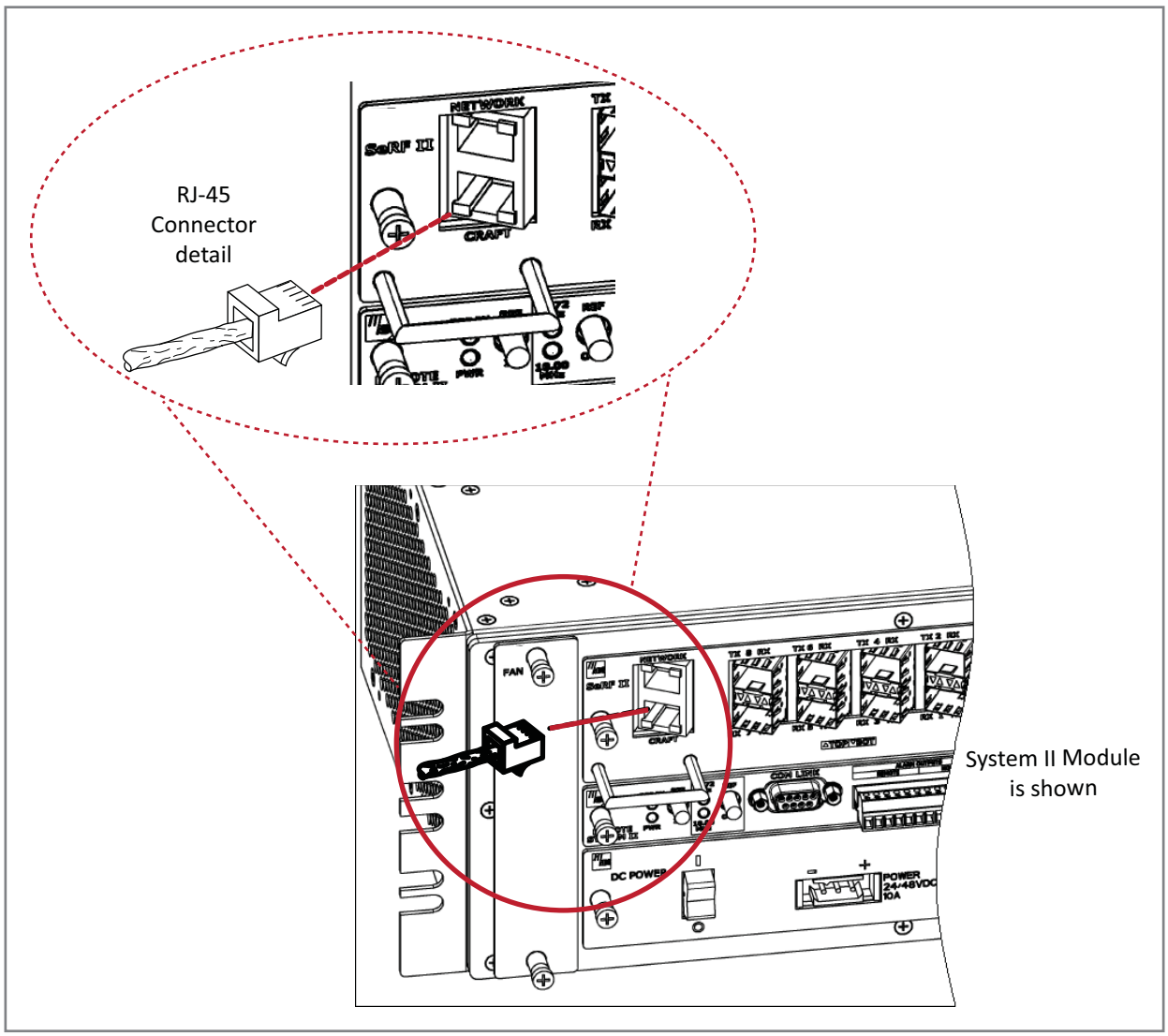
CONNECT THE HOST UNIT TO A COMPUTER

The SeRF II front panel provides a Craft port that provides an Ethernet interface that allows you to connect a computer to access the EMS.

1 Connect one end of an Ethernet cable (CAT5 or better, not provided by CommScope) to the Craft port as shown in the following graphic.

2 Connect the free end of the cable to the computer's Ethernet port. Refer to the user manual provided with the computer to locate and configure the specified port.

NOTE: In the default configuration, the Craft port has IP address of 192.168.0.1 and has a DHCP server in the subnet 192.168.0.0/24. The DHCP server allows a connected laptop to receive an IP address to allow communication to the Host Unit.



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RUN SYSTEM TESTS

Perform all required cable and system tests required by site design or scope of work.

- For information on required cable tests, refer to the system design.
- For information on how to use the FlexWave EMS to run a system test, refer to the “System Test” section of the *FlexWave System Setup and Provisioning Guide* that corresponds with the FlexWave Software Release installed on this Host Unit.

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Optional Alarm Interface Connections

A sixteen-terminal block is on the Host System III Module, which allows the Host Unit to be connected to a BTS and/or an Uninterruptible Power Supply (UPS) or a Bi-Directional Amplifier (BDA). Category 3 or 5 cables are typically used.

NOTE: For the Output Contacts, the maximum voltage and current is 250V @ 2A. The Alarm Inputs are dry contact only, and the maximum voltage and current is 3.3VDC @ 6ma.

The following rules apply to the Alarm Interface connections:

- The Sense 1 and Sense 2 inputs are for the dry contact monitoring, and are referenced to their associated GND input (see Table 14).
- Both NO (Normally Open) and NC (Normally Closed) output contacts are supported. CommScope recommends using the NC contacts for best performance.
- The Sense 1 and Sense 2 inputs can be configured to report the alarm states as a Minor or Major alarm. For information on how to configure the contact alarms, refer to the "Manage Contact Alarms" section of the *FlexWave System Setup and Provisioning Guide* that corresponds with the FlexWave Software Release installed on this Host Unit.
- SNMP trap generation of the alarm inputs is also supported.

Figure 6 provides an overview of how you connect the Alarm Input connectors on the Host Unit Host System III Module to external equipment.

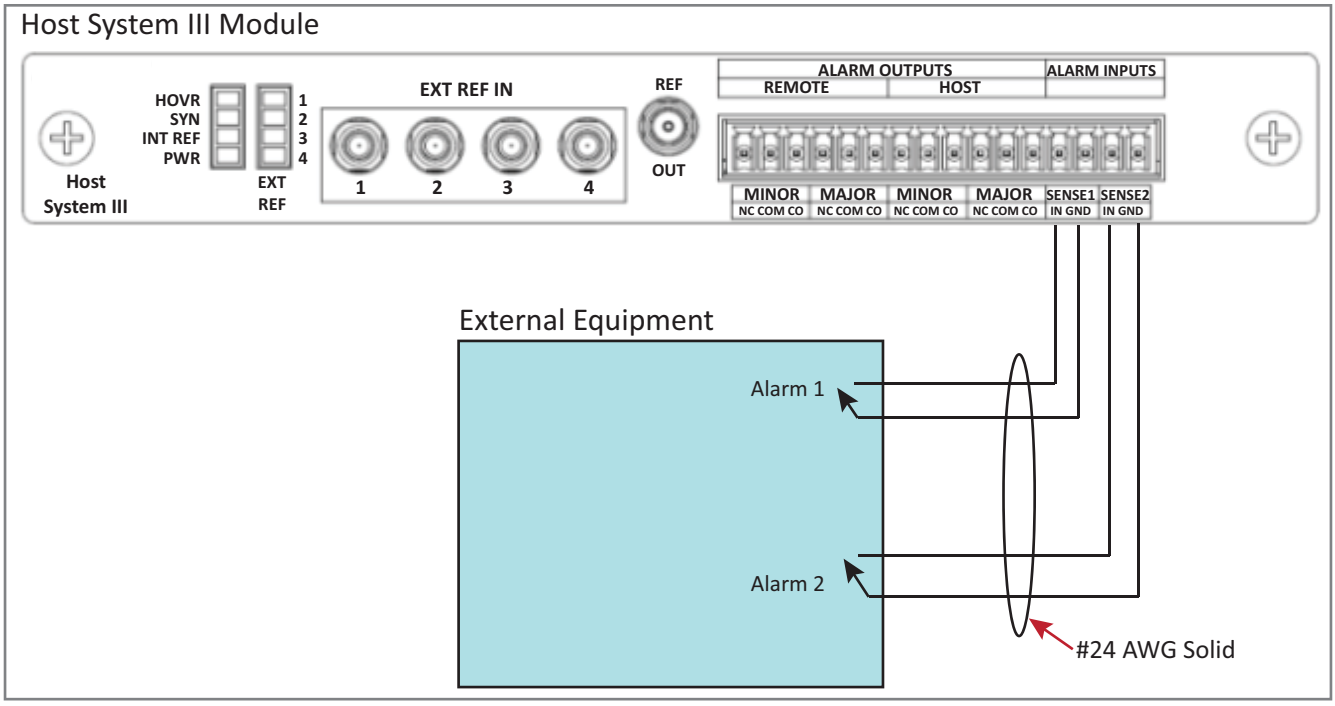

Figure 6. Dry Contact Schematic

For information on the pins used in the Alarm Input connectors, see Table 13. The sense alarms in Table 14 connect to the non-alarm state Normally Closed (NC) contacts of the UPS/BDA.

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Table 13. *Host System III Card Alarm Pin Designations for BTS Alarm Outputs*

PIN	Description	Wires		
		Common	NC	NO
16	Remote Unit Minor		X	
15	Remote Unit Minor	X		
14	Remote Unit Minor			X
13	Remote Unit Major		X	
12	Remote Unit Major	X		
11	Remote Unit Major			X
10	Host Unit Minor		X	
9	Host Unit Minor	X		
8	Host Unit Minor			X
7	Host Unit Major		X	
6	Host Unit Major	X		
5	Host Unit Major			X

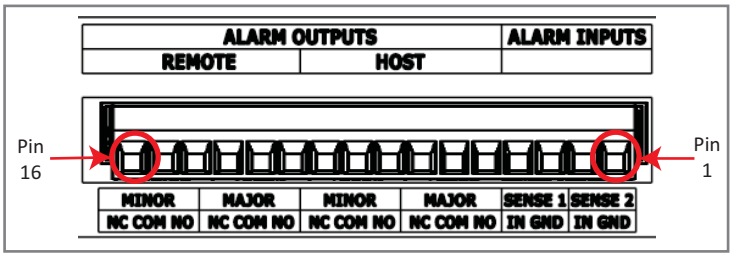

Table 14. *System Card Alarm Pin Designations for UPS or BDA Alarm Inputs*

PIN	Description	Wires	
		In	Ground (GND)
4	Sense 1	X	
3	Sense 1		X
2	Sense 2	X	
1	Sense 2		X

CONNECT THE HOST UNIT ALARM INTERFACE TO A BTS

This procedure can be used in Prism or Spectrum systems, or in a Common Host system.

1. Obtain the required length of category 3 or 5 cable.
2. Route the cable between the Host System III Module and the alarm system (if not already routed) and then cut to the required length. Allow sufficient slack for dressing and organizing the cable at the Host Unit.
3. Strip back the outer cable sheath and insulation to expose the wires at both ends of the cable and strip back 0.2 inches (5 mm) of insulation from each wire.

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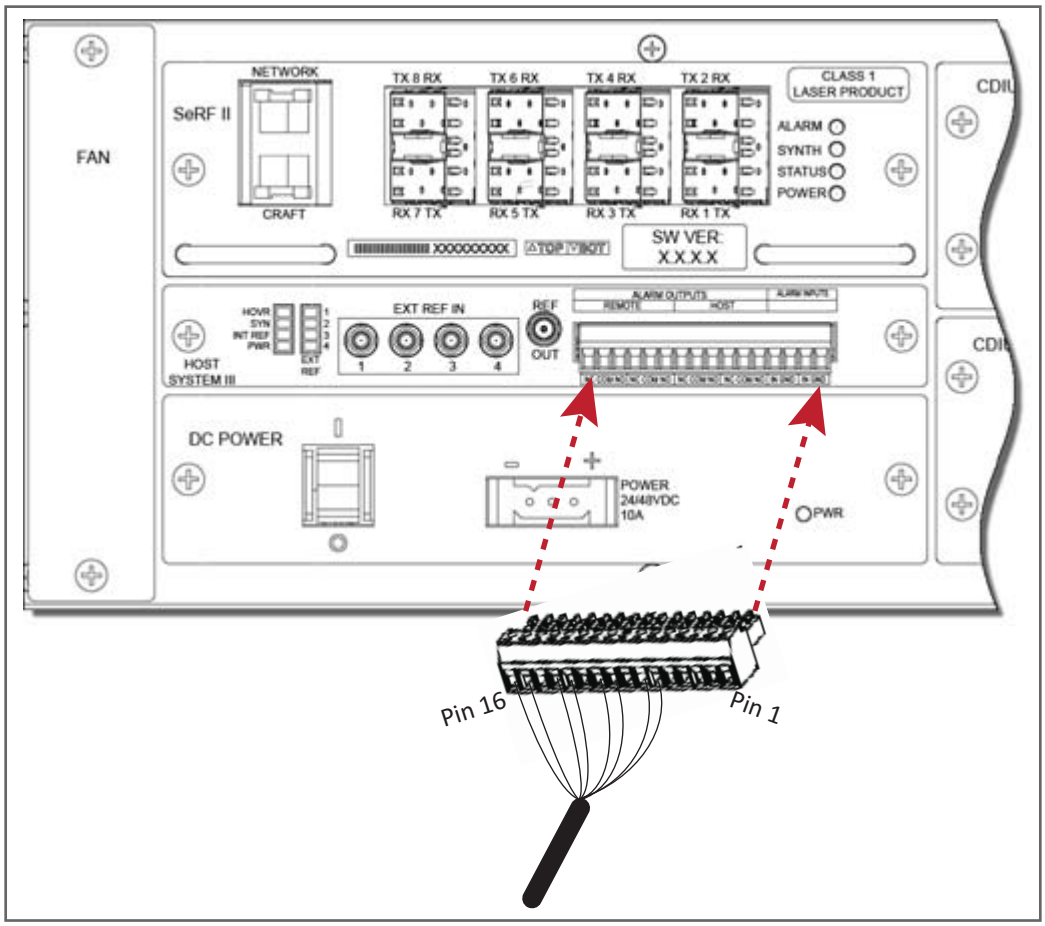
4 On the Host System III Module, connect the alarm wire pairs to the Alarm Outputs on the Alarm connector (for alarm connection pinouts, see Table 13 on page 53). To monitor Remote Unit and Host Unit alarms, both Host and Remote Alarm contacts must be used. If the BTS has limited alarm inputs, then daisy chain the Remote Unit and Host Unit Major contacts together and the Remote Unit and Host Unit Minor contacts together.

   a Connect the Major alarm wire pair to the MAJOR COM/NC or MAJOR COM/NO terminals (whichever is required by the alarm system).

   b Connect the Minor alarm wire pair to the MINOR COM/NC or MINOR COM/NO terminals (whichever is required by the alarm system).



5 Connect the Major and Minor alarm wire pairs to the appropriate terminals on the external alarm system.

6 Dress and secure cable per standard industry practice.

7 (Optional) In situations where multiple Host Units are installed and only one single Major or Minor alarm is available on the Base Station (BTS) for monitoring, a daisy chain of the NC contacts can be built with an alarm being generated if any one contact opens up. For example, with two Host Units, connect the Major NC terminal on Host Unit 1 to the Major COM on Host Unit 2, then you can run the Host Unit 1 Major COM and the Host Unit 2 Major NC leads to the BTS for alarming. When either Host Unit 1 or Host Unit 2 MAJOR contacts open up in an alarm state, the BTS will see the alarm.

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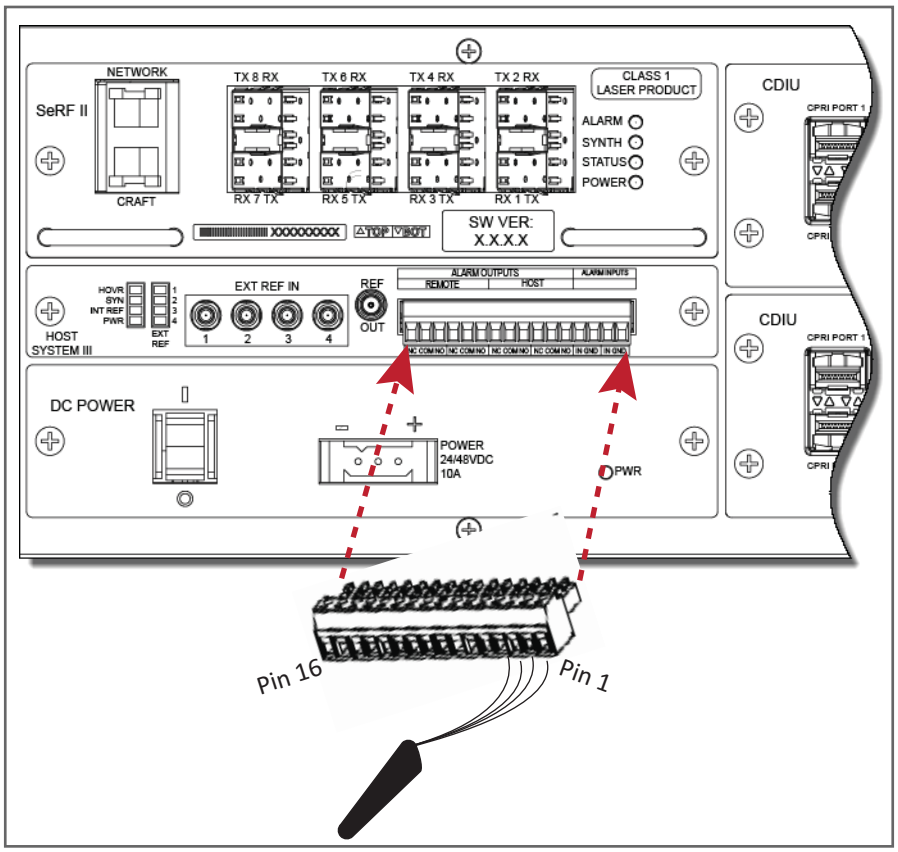
CONNECT THE HOST UNIT ALARM INTERFACE TO A UPS OR BDA

This procedure allows the Alarm connector to monitor the output contact closures from an Uninterruptible Power Supply (UPS) or a Bi-Directional Amplifier (BDA).

1. Obtain the required length of category 3 or 5 cable.
2. Route the cable between the Host System III Module and the UPS/BDA (if not already routed) and then cut to the required length. Allow sufficient slack for dressing and organizing the cable at the Host Unit.
3. Strip back the outer cable sheath and insulation to expose the wires at both ends of the cable and strip back 0.2 inches (5 mm) of insulation from each wire.
4. On the Host System III Module, connect the alarm wire pairs to either of or both Alarm Inputs on the Alarm connector (for alarm connection pinouts, see Table 14 on page 53).
   - Connect one alarm wire pair to the Sense 1 IN/GND terminals.
   - Connect another alarm wire pair to the Sense 2 IN/GND terminals.



5. Connect the Sense 1 and/or Sense 2 alarm wire pairs to the appropriate terminals on the external UPS/BDA.
6. Dress and secure cable per standard industry practice.

Optional Wavelength Division Multiplexer Components

When it is desirable or necessary to combine transmit and receive path optical signals from one FlexWave system onto a single optical fiber, use the Wavelength Division Multiplexer (WDM) system, which is an accessory product. The WDM option consists of Host and Remote WDM Modules. The Host WDM modules are the same for Prism and Spectrum Hosts. The Remote WDM modules for DRUs and HEUs are contained in a WDM rack-mount chassis, whereas the Remote WDM Modules for Prism are contained in an internal fiber jumper within the PRU. Both the Host WDM Module and the Remote Unit WDM Module consist of a bi-directional wavelength division multiplexer, as shown in Figure 7.

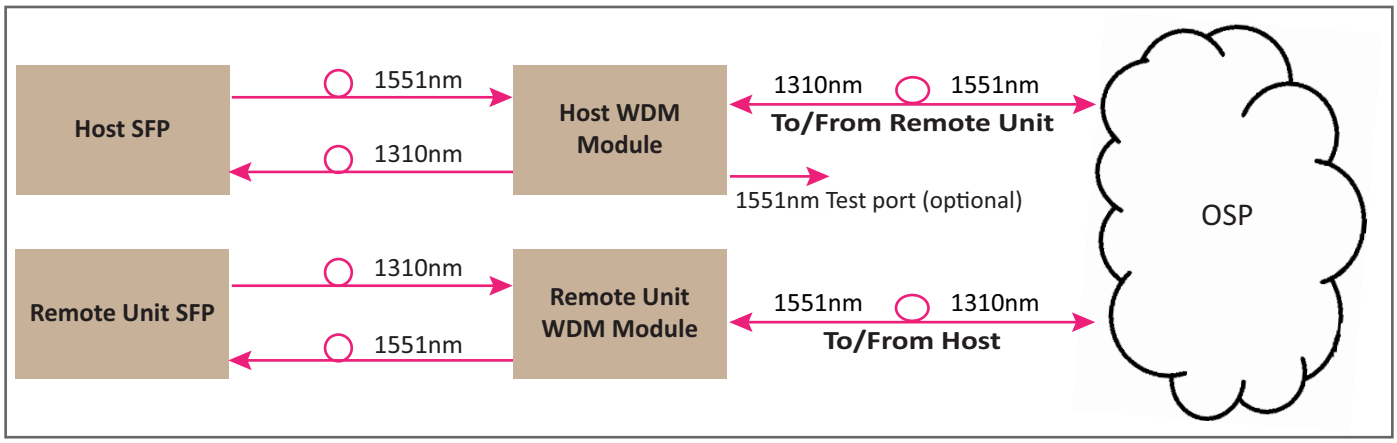


Figure 7. WDM System

There are various WDM platforms that can be used. The Host/Remote WDM module is mounted within a powder-paint coated sheet metal enclosure. A straight LC-type optical connector port is provided for connecting the transmit/receive path optical fiber to the WDM module. A pair of fiber patch cords with LC-type connectors connects the WDM module to the TX/RX Optical ports on the Host SeRF II Module.

NOTE: The configurations shown for WDM at the Host Unit can also be applied to DRUs and HEUs.

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Each WDM module supports a single Small Form-Factor Pluggable (SFP) port on the Host Unit, but a WDM chassis can support up to eight WDM modules, which allows the sharing of the WDM chassis among multiple Host Units, dependent on the SFP transceiver port counts and system configuration. That is, the eight WDM modules allow a fully loaded Host Unit with eight SFP modules or multiple partially loaded Host Units (for a maximum of eight total SFP transceivers). The WDM Host module-mounting shelf installs in the equipment rack with the Host Unit. Figure 8 shows a WDM system with only one Host Unit.

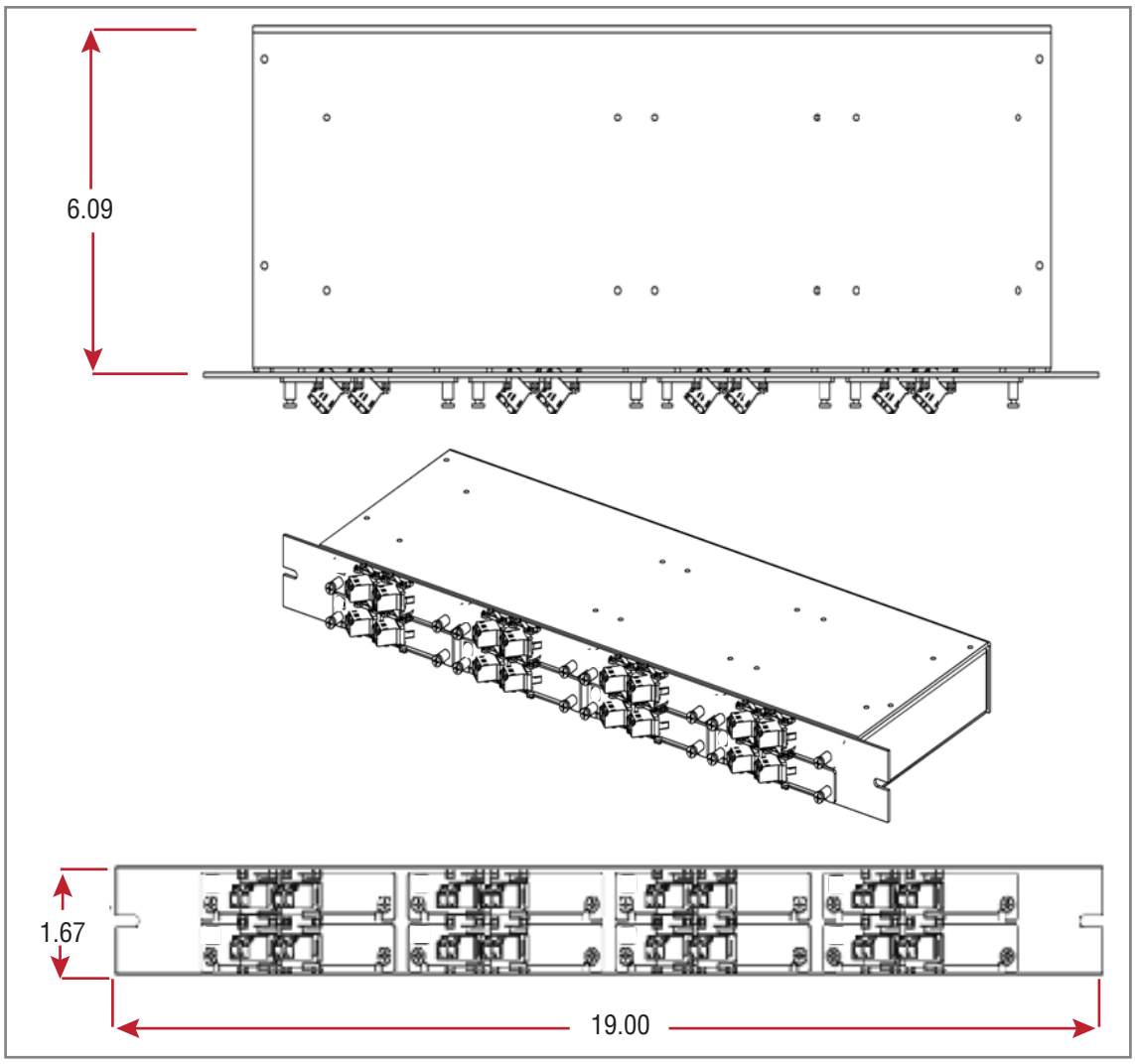

Figure 8. One Host WDM System

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SUPPORTED WDM PRODUCTS

The following sections describe the WDM products that you can use with a FlexWave Prism or Spectrum system.

MicroVAM Host Bay (FMT-MW2KUKUBG1A00) and VAM Chassis (FMX-ATT-BARVM00-20)

Table 15 lists the MicroVAM products that are compatible with the Host Units in a Prism or Spectrum system.

Table 15. *MicroVAM Part Numbers*

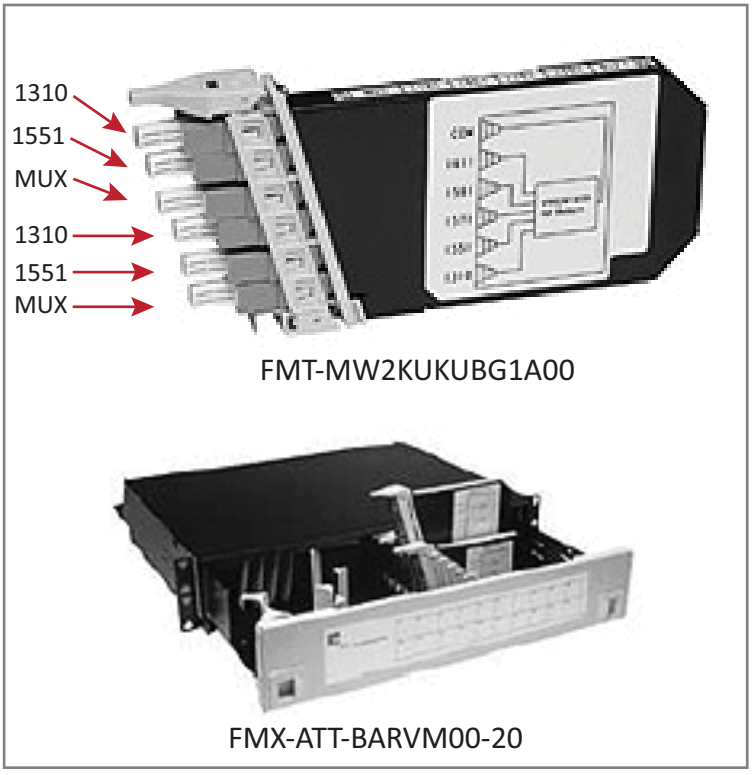
MicroVAM Unit	Part Number	See Figure 9
FMT-MW2KUKUBG1A00	WDM FMT Module, supports two WDM Circuits; fits in any FMT style chassis or enclosure.	
FMX-ATT-BARVM00-20	VAM Chassis 19IN, 2RU, supports up to 20 FMT-MW2KUKUBG1A00 modules	

Figure 9. MicroVAM Module and Bay

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WDM Host Module Mounting Shelf (FWU-CHASSIS-8) and Host Module (FWU-27A7AAG1ABK00)

This sections describes the WDM products in Table 16.

Table 16. *WDM Part Numbers*

Part Number	WDM Unit	See in Figure...
FWU-27A7AAG1ABK00	Host WDM Module; supports one WDM circuit	Figure 10
FWU-CHASSIS-8	Host WDM Chassis; No active modules (8 slots); supports up to 8 Host WDM Modules (FWU-27A7AAG1ABK00)	Figure 10 and Figure 11

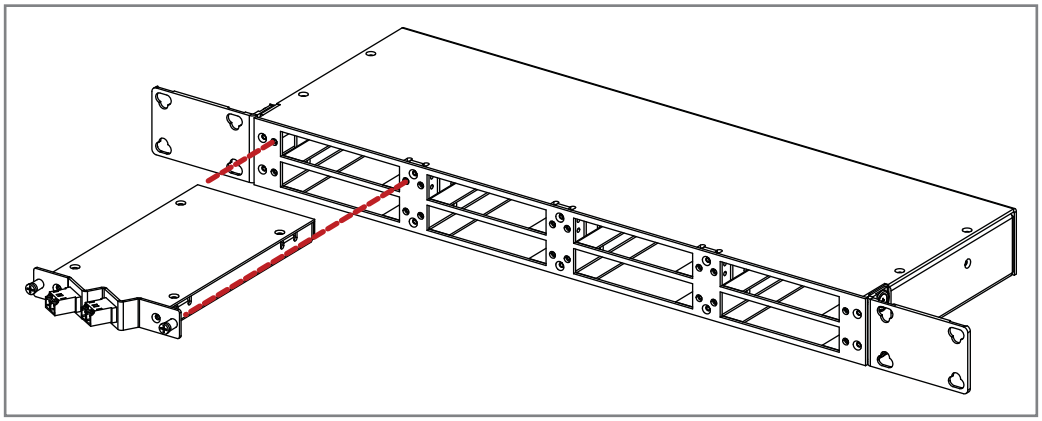

Figure 10. Host WDM Module and Host/DRU WDM Module Mounting Shelf

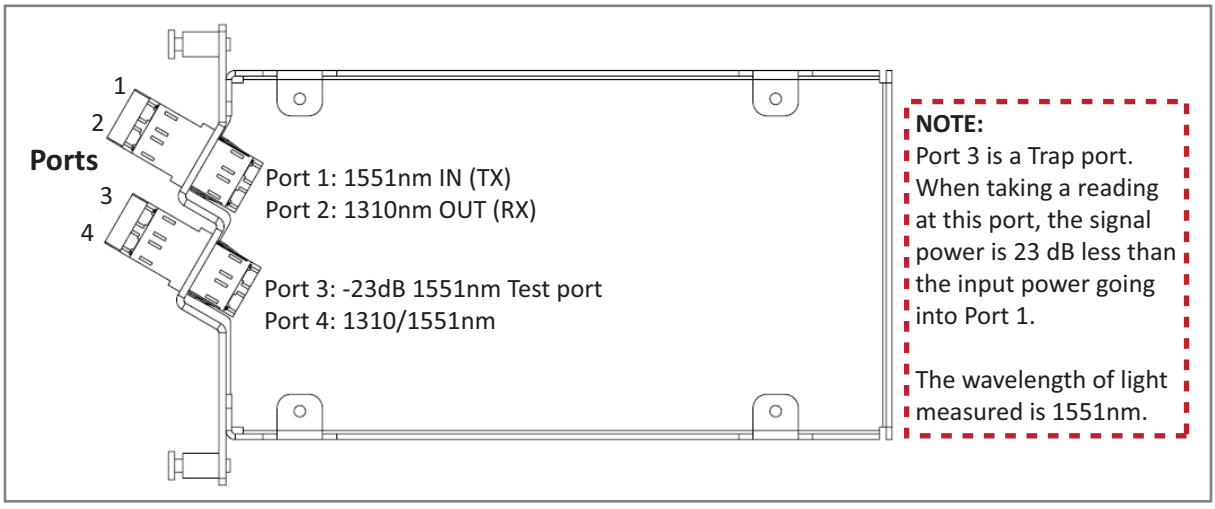

Figure 11. Host WDM Ports

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Installing Optional WDM Host Unit Components

Mount the WDM Host module-mounting shelf in a 19-inch EIA or WECO equipment rack. do the following to install the WDM Host module-mounting shelf in the equipment rack and to mount the WDM modules in the WDM Host module mounting shelf.

1. Position the mounting shelf in the designated mounting space in the rack (per system design plan) and then secure the mounting brackets to the rack using the four provided #12-24 machine screws.
2. Install each WDM Host module in the mounting shelf. A rail on the side of the module fits into a guide within the mounting.
3. Secure each WDM Host module to the mounting shelf by tightening the panel fasteners.
4. Carefully store the fiber patch cord leads from each Host module. At the Remote end, the HMFOC or Pass-Through fiber used in WDM deployments is Fiber Number 1 for a single WDM circuit; if you add a second WDM circuit, use Fiber Number 3. "Optical Connections for Systems with a WDM Module" on page 60 provides the routing and connection procedures for the fiber patch cords. Or, after connecting the fiber patch cord, correctly store the slack cable.

Optical Connections for Systems with a WDM Module

When a system configuration deploys a WDM module with the Host Unit, do the following to connect the optical fibers.

1. Obtain a patch cord that is of sufficient length to reach from the WDM module to the Fiber Distribution Panel.
2. Remove the dust cap from the WDM port on the WDM module and from the patch cord connector that will be connected to the WDM module.

NOTE: The WDM module ports are labeled as FWD, REV, TEST, and WDM.

3. Clean the patch cord connector (follow patch cord supplier's recommendations).
4. Insert the connector into the WDM multiplexed port on the WDM module.
5. Obtain two patch cords that are of sufficient length to reach from the WDM module to the Host Unit.
6. Designate one of the patch cords as the forward-path link (Tx, 1551 nm) and the other as the reverse-path link (Rx, 1310 nm) and attach an identification label or tag next to the connector.
7. Remove the dust caps from the Host Unit SeRF II Module SFP transceiver optical ports and from the patch cord connectors that will be connected to the SeRF SFP transceiver optical ports.
8. If required, connect the LC attenuator into the SFP and then to the patch cord. (See "15 dB LC Attenuator" on page 31.)
9. Refer to one of the following graphics to understand the fiber-optic connections to the WDM module.
   - For a Prism-only system, see Figure 12 on page 61
   - For a Spectrum-only system, see Figure 13 on page 62.

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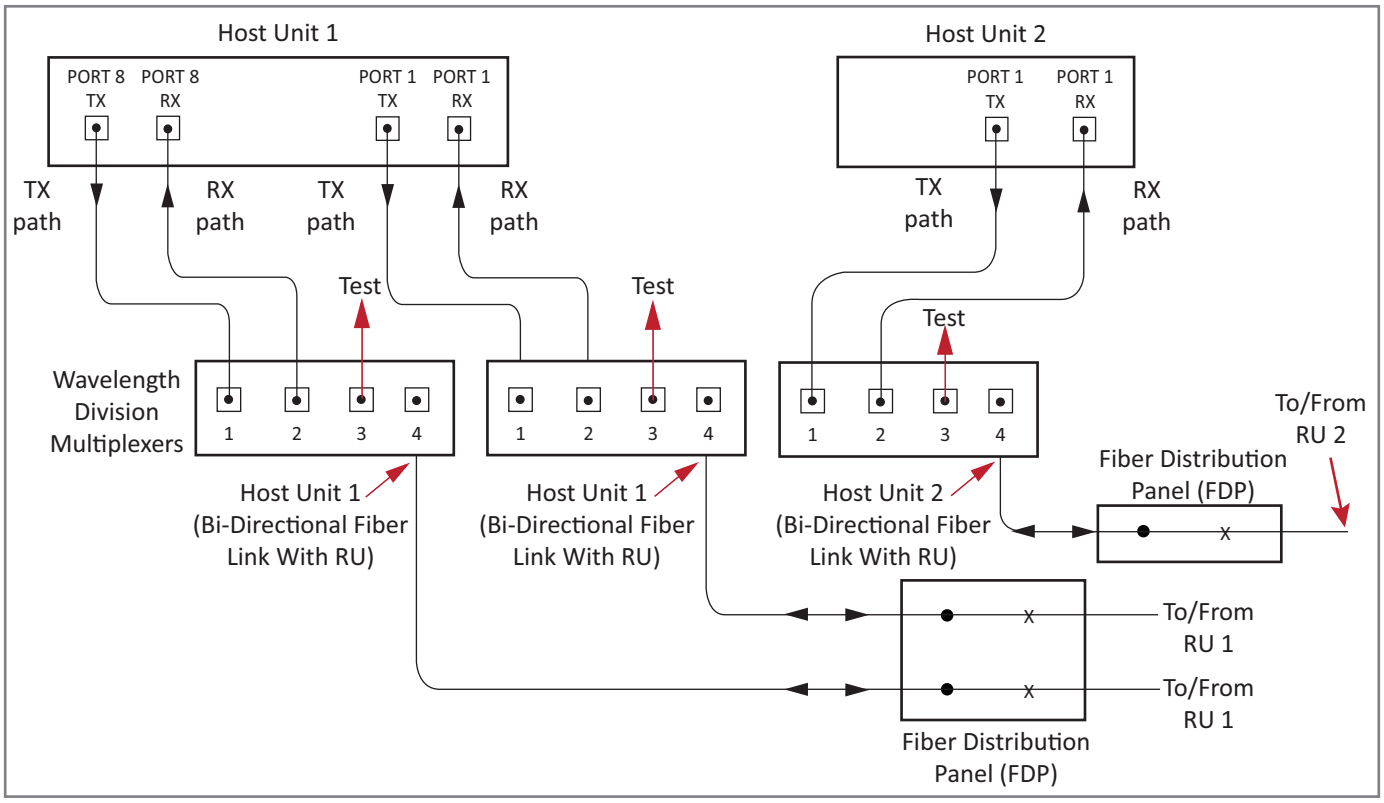

Figure 12. Fiber-Optic Connections the WDM Module in a FlexWave System

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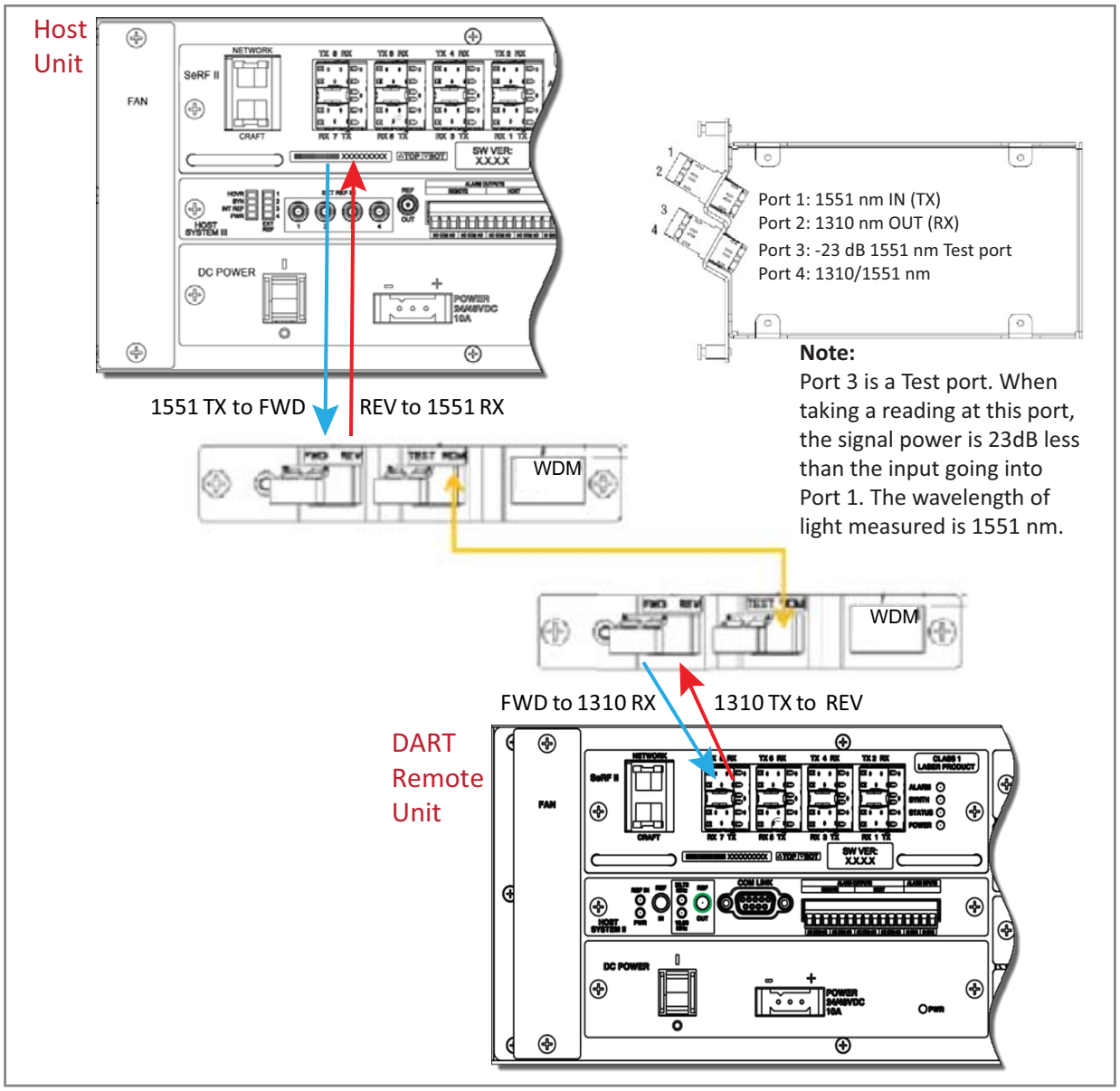

Figure 13. Fiber-Optic Connections the WDM Module in a Spectrum-Only System

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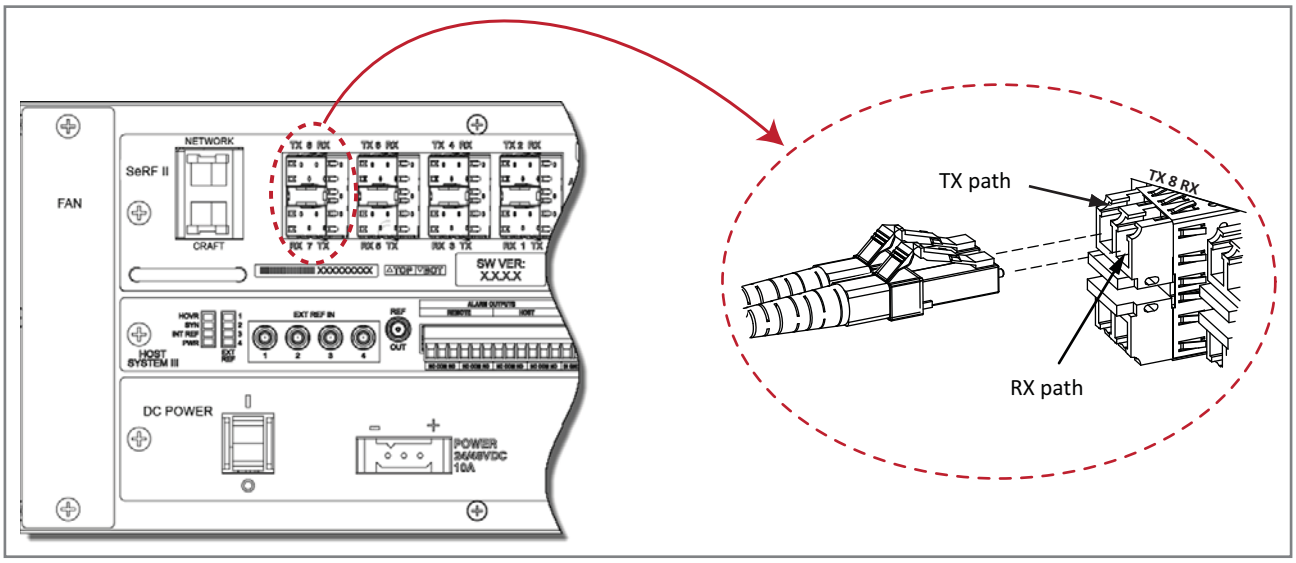
10 Clean each fiber patch cord connector and then insert the connector into the appropriate Host Unit optical port (1 - 8), as shown below.



NOTE: **The Host Unit SeRF II Module SFP transceiver optical adapters are angled to the left. Therefore, always route the fiber patch cords to the Host Unit from the left side of the rack. Routing fiber patch cords to the Host Unit from the right side of the rack may exceed the bend radius limitations for the optical fiber.**

CASCADING HOST UNITS

NOTE: Host-to-Host and Multi-Host systems do not support cascading.

FlexWave systems can be cascaded, which allows a single sector to be simulcasted from Remote Unit to Remote Unit. By utilizing a fiber daisy chain between Remote Units, you eliminate the need for fiber home-runs between the common Host Unit and simulcasted Remote Units.

Electrical cascading allows you to maximize fiber efficiency, by eliminating the need for individual home-run/star topology configurations, thereby saving on fiber costs, as well as fiber installation costs.

Figure 14 shows a cascade system, in which there is one Host Unit with a single Remote Unit connected to it, and then a second Remote Unit connected to the first Remote Unit. In this configuration, the RF signal passes from the Host Unit through Remote Unit 1 where it is retransmitted to Remote Unit 2; RF will be present on both Remote 1 and Remote 2.

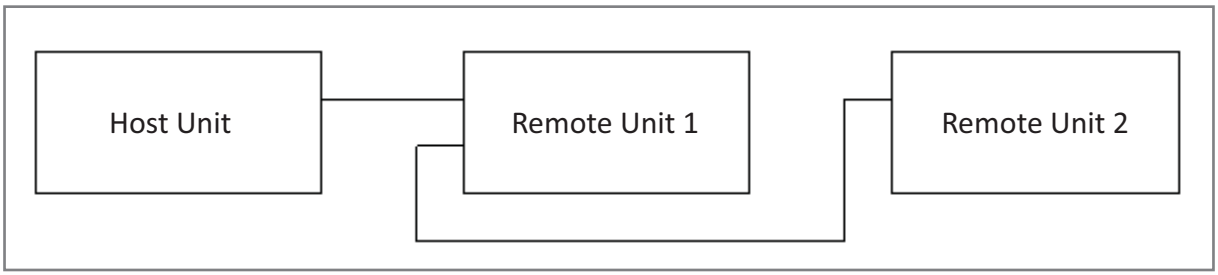


Figure 14. Cascaded System

Cascade restrictions and requirements are listed below.

- Up to 8 Remote Units can be cascaded in a system, and each Remote Unit can only subtend one Remote Unit that must be connected directly to it.
- The maximum number of Remote Units that can be cascaded is 16.
- A Remote Unit can only cascade to another Remote Unit of the same type. That is, a PRU can only cascade another PRU, and a DRU can only cascade another DRU.
- Each Remote Unit in a cascade must contain the same DART type or a subset of the DARTs contained in the first Remote Unit of the chain. The DARTs in each Remote Unit of a cascade must be in the same slots as the DARTs in the first Remote Unit of the chain. DART linking to the Host Unit is the same on every Remote Unit in a cascade.
- The fibers in and out of a Remote Unit must follow a N+4 rule. That is, if a Remote Unit has an input fiber on SFP 1, then the output is on SFP5. This applies to all Remote Unit, with the exception of the last cascaded Remote Unit as it would not require outgoing fibers. See Figure 15 on page 65 for an illustration of this rule.
- All cascaded Remote Units must have the same number of upstream (RX) and downstream (TX) fibers. If 4 fibers from the Host Unit are directed to the Remote Unit, 4 fibers must cascade to the next Remote Unit. The last Remote Unit in a cascade does not have downstream fibers. This ensures that all RF on a Remote Unit can be cascaded. See Figure 15 on page 65 for an illustration of this rule.

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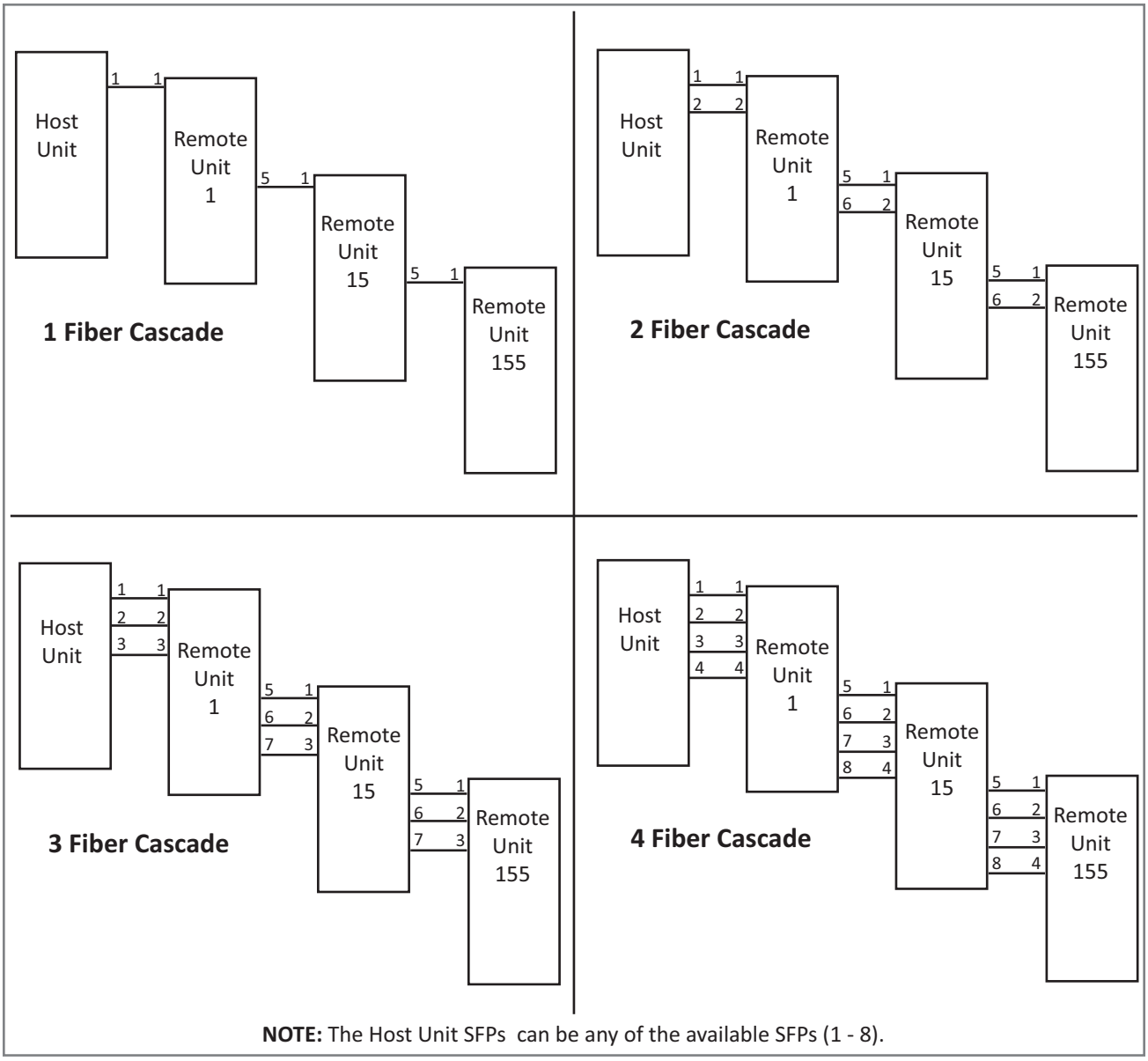

Figure 15. Matching Host Unit and Cascaded Fibers

For information on how to configure cascaded Host Units, refer to the "Cascaded Systems" chapter of the EMS guide that corresponds to the FlexWave Software Release installed on the Host Unit.

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FlexWave systems can be configured to operate in Point-to-Multipoint Star and Cascade configurations.

In a point-to-multipoint star configuration, the Host Unit provides the interface between a single group of BTSs and up to eight Remote Units, each of which is linked directly to the Host Unit by an optical fiber path. Figure 16 shows a Prism system in a star configuration.

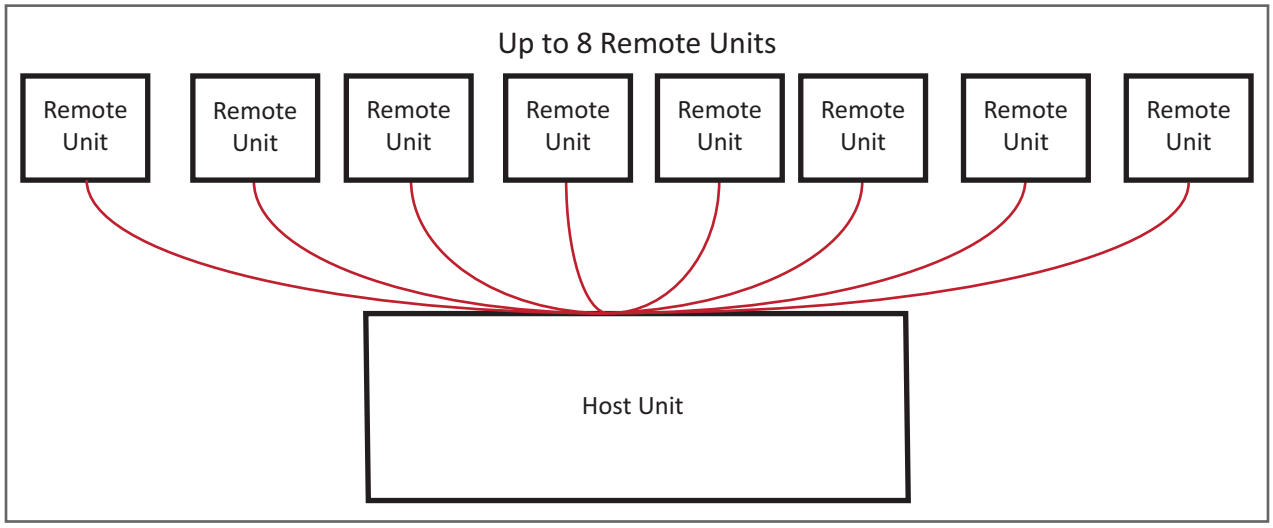

Figure 16. Star Configuration

In a point-to-multipoint star configuration, in the forward path (Host Unit to Remote Unit), the digitized RF signals are replicated for transport to each of the Remote Units. In the reverse path (Remote Unit to Host Unit), RF signals from each Remote Unit are transported independently to the Host Unit over dedicated fibers. Within the Host Unit, the signals from all the Remote Units in each band are digitally combined, and a composite RF signal for each band is presented to the corresponding BTS.

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Figure 17 shows a dual-cascade system, in which there are two Spectrum DRUs connected to a single Host Unit on four fibers each. Both DRUs connected to the Host Unit also have seven cascaded DRUs. In this configuration, the RF signal passes from the Host Unit through the two connected DRUs, which then pass the IF signal to the 14 cascaded DRUs.

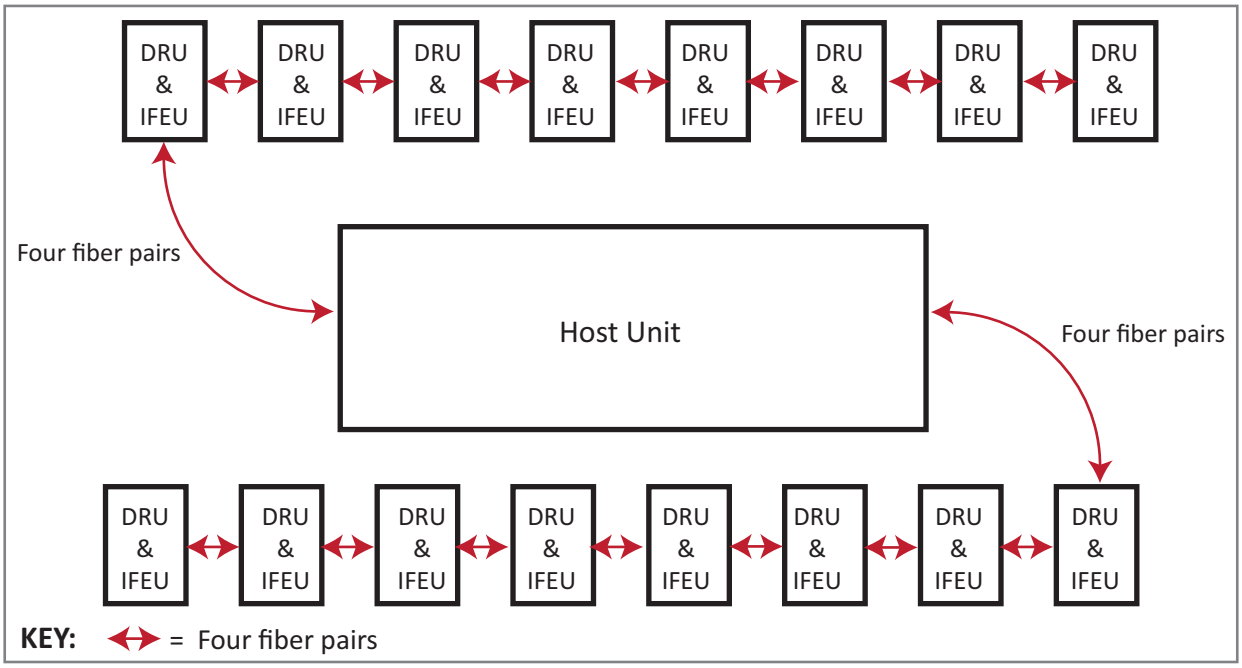

Figure 17. Dual-Cascade System (Spectrum)

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FAN MODULE MAINTENANCE

Continuous airflow to cool the Host Unit is provided by the Fan Module that is mounted on the left side of the Host Unit chassis. The cooling fans blow cool air into the chassis, and heated air is exhausted through the vent openings on the right side of the chassis. This constant movement of air requires that the Fan Module be placed on a maintenance/replacement schedule:

- The Fan Module of a Host Unit installed in a controlled environment, such as a base station or office environment, should meet the 40,000-hour fan life.
- The Fan Module of a Host Unit installed in a dusty environment or an environment where there is a large range in ambient temperature (~0°C to 50°C) will require more maintenance and may not meet the forty-thousand-hour fan life.
- You should also check the Fan Module should either of these Host alarms occur:
  - **Fan Fault** (`fwuHstSysCardFanFault`)
  - **Temperature High** (`fwuHstOverTempFault`).

Regardless of the environment in which the Host Unit is installed, at the minimum, check the Fan Module on an annual basis. Verify the following:

- intake and exhaust vents are clear of obstructions and/or debris
- ambient temperature is less than 50C.

The Fan Module is field replaceable and can be hot swapped. Should you need to replace the Fan Module, refer to the *FlexWave Host Unit and Host Expansion Unit Module Replacement Guide* (FWPP-514).

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TECHNICAL SPECIFICATIONS

Table 17. *Host Unit II Specifications*

Parameter	Specification	Notes
Power		
DC Power	±21 – ±60 Vdc floating	
Power consumption	**Maximum** **Nominal** 240 Watts 204 Watts	See also "Calculate the Power Consumption" on page 38.
Current rating for maximum system (eight DARTs and eight SFPs)	5 Amps @ 48Vdc 10 Amps @ 24Vdc	
Battery Backup	UPS	
Connectors and Ports		
RF coaxial cable connectors	50 ohm QMA – type (female)	50 ohms input/output impedance
Network and Craft connectors	RJ–45 jack	
External alarm connector	Screw-type terminals	Normally Open (NO), Common (COM), and Normally Closed (NC) relay contacts
Optical ports	SFP transceivers	Industry standard LC (UPC); Host and WDM
Physical Specifications		
Dimensions	**Height** **Width** **Depth** Inches 5.174 17.26 8.427 Millimeters 131.4 438.4 214	Width dimension does not include the mounting brackets for 19- or 23-inch racks.
Protrusion from front of rack	1.376” (35 mm)	
Mounting	19- or 23-inch rack	EIA or WECO
Weight	20 lbs. (9.1 kg)	
Environmental		Environmentally controlled outdoor cabinet
Weather resistance	Indoor installation only	
Operating temperature	0º to 50º C (32º to 122ºF)	
Storage temperature	–40º to 70º C (–40º to 158ºF)	
Humidity	10% to 90%	No condensation
Reliability at 25ºC	MTBF 200,000 hours	Excluding fans

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STANDARDS CERTIFICATION

Federal Communications Commission (FCC)

This equipment complies with the applicable sections of Title 47 CFR, Part 22 (800 MHz Cellular), Part 24 (1900 MHz - PCS), Part 90 (800/900 - SMR), and Part 27 (700 MHz, 2100 MHz - AWS).

Signal Boosters

WARNING. This is **NOT** a **CONSUMER** device. It is designated 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.

Part 90 Signal Boosters

The following statement is applicable to the following RAUs that are documented in this installation guide: SPT-M3-8019-31-HP, SPT-S1-8019-22, SPT-S1-8090-1, SPT-S1-80AWS-1, SPT-S3-8019-22-HP.

WARNING. This is **NOT** a **CONSUMER** device. It is designated for installation by **FCC LICENSEES** and **QUALIFIED INSTALLERS**. You **MUST** have an **FCC LICENSE** or express Consent of an FCC Licensee to operate this device. You **MUST** register Class B signal boosters (as defined in 47 CFR 90.219) online at http://www.fcc.gov/signal-boosters/registration. Unauthorized use may result in Significant forfeiture penalties, including penalties in excess of $100,000 for each continuing violation.

Industry Canada (IC)

This equipment complies with the applicable sections of RSS-131- Zone Enhancers for the Land Mobile Service. The term “IC:” before the radio certification number only signifies that Industry Canada Technical Specifications were met.

The Manufacturer's rated output power of this equipment is for single carrier operation. For situations when multiple carrier signals are present, the rating would have to be reduced by 3.5 dB, especially where the output signal is re-radiated and can cause interference to adjacent band users. This power reduction is to be by means of input power or gain reduction and not by an attenuator at the output of the device.

NOTE: Industry Canada PCS 20 dB nominal bandwidth is less than 61.5 MHz.

NOTE: Industry Canada AWS 20 dB nominal bandwidth is less than 47.2 MHz.

NOTE: The U. S. Federal Communications Commission (FCC) has developed guidelines for evaluation of human exposure to RF emissions. The guidelines incorporate limits for Maximum Permissible Exposure (MPE) for power density of transmitter operating at frequencies between 300 kHz and 100 GHz. Limits have been set for portable, mobile, and fixed equipment. CommScope products fall in the category of fixed equipment; products intended to be permanently secured and exposures are evaluated for distances greater than 40cm (15.75”). Portable devices fall into exposures of less than 20cm, where SAR evaluations are used.

Antenna gain is restricted to 1.5 W ERP (2.49 W EIRP) in order to satisfy RF exposure compliance requirements. If higher than 1.5 W ERP, routine MPE evaluation is needed. The antennas should be installed to provide at least 40cm from all persons to satisfy MPE requirements of FCC Part 2, 2.1091.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d’Industrie Canada applicables aux appareils radio exempts de licence. L’exploitation est autorisée aux deux conditions suivantes: (1) l’appareil ne doit pas produire de brouillage, et (2) l’utilisateur de l’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement.

The device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS-102 RF exposure, users can obtain Canadian information on RF exposure and compliance.

Le dispositif rencontre l'exemption des limites courantes d'évaluation dans la section 2.5 de RSS 102 et la conformité à l'exposition de RSS-102 rf, utilisateurs peut obtenir l'information canadienne sur l'exposition et la conformité de rf.

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UL/CUL

This Host Unit equipment complies with UL and CUL 60950-1 Standard for Safety for Information Technology Equipment, including Electrical Business Equipment.

All Spectrum RAUs are Plenum rated and suitable for use in environmental air space in accordance with Section 300-22(C) of the National Electrical Code, and Sections 2-128, 12-010(3) and 12-100 of the Canadian Electrical Code, Part 1, CSA C22.1.

FDA/CDRH

This equipment uses a Class 1 LASER according to FDA/CDRH Rules. This product conforms to all applicable standards of 21 CFR Part 1040.

EU Harmonized Standards: Meets essential requirements of R&TTE 1999/5/EC.

- Article 3.1a-The protection of the health and the safety of the user and any other person, including the objectives with respect to safety requirements contained in Directive 2006/95/EC, but with no voltage limit applying.
- Article 3.1b-The protection requirements with respect to electromagnetic compatibility contained in Directive 2004/108/EC.
- Article 3.2-In addition, radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communication and orbital resources so as to avoid harmful interference.

EMC Standards

EN 55022 and EN55024 (CE marked)

Safety Standards

This equipment complies with IEC 60950-1, First Edition (CE marked) and with UL 60950-1 (File number E174166) (USA and Canada)

Burn-In Testing

CommScope is committed to delivering the highest quality products. Ongoing reliability testing of products prior to sale is one element of our quality management system. This includes random sample system burn-in on Prism HDM RF Modules and Remote Unit enclosures, to ensure we deliver the most reliable solution possible.

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Contacting DCCS Global Technical Support

The following sections tell you how to contact the CommScope Distributed Coverage and Capacity Solutions (DCCS) Technical Support team. Support is available 7 days a week, 24 hours a day.

Helpline Support

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 Access

Click on the following URL link to access an online DCCS Technical Support Form:

http://www.commscope.com/wisupport

Alternatively, you can enter the preceding URL into your web browser, and then press **ENTER** on your keyboard.

Return Material Authorizations

Prior to removing any equipment from the field, please contact DCCS Technical Support to assist in troubleshooting and fault isolation. If the issue cannot be resolved, Technical Support will facilitate your RMA request.

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TECHNICAL TRAINING

You can access training on the online CommScope DAS and Small Cell Institute, as described below.

1. Click on the following URL link to the Infrastructure Academy:

   http://www.commscopetraining.com/courses/dassc/

   (Alternatively, enter the preceding URL into your web browser, and then press ENTER on your keyboard.)

2. Review the courses listed in separate course panels; for further information on a course, click its **Full details** button. Instructor-led courses are conducted in North America and Europe. Before choosing a course, please verify the region.

3. To view the course schedule and register, click **Course Registration** at the top of the course page; this opens the **Partner Learning Center Login** page.

   - If you have an account, enter your **Username** and **Password**, and then click **Login**. (Click on the **Reset Password** link if you do not have your login information.)
   - If you don't have an account, click on the **Create New User Account** link under the **Login** button, and follow the prompts.

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

4. Click the date you prefer and select the **Enroll** or **Register Now** button to enroll. Follow the prompts through the payment process.

5. Click either the **Available Training** or **Calendar** tab to view other training courses.

6. For training related questions, please contact CommScope at one of the following emails:

   - Americas: DASTrainingUS@CommScope.com
   - EMEA: DASTrainingEMEA@CommScope.com

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ACCESSING FLEXWAVE USER DOCUMENTATION

refer to one of the following sections for information on how to obtain Flexwave Prism or Flexwave Spectrum user documentation:

- "Accessing FlexWave Prism User Documentation" on page 74
- "Accessing FlexWave Spectrum User Documentation" on page 74.

ACCESSING FLEXWAVE PRISM USER DOCUMENTATION

You can access the FlexWave Prism user documentation on the CommScope DCCS Customer Portal, as described below.

1 Click on the following URL link:

https://www.mycommscope.com

(Alternatively, enter the preceding URL into your web browser, and then press **ENTER** on your keyboard.)

2 Access to the Customer Portal requires a user account and password. On the **Sign In** page, do one of the following:

- If you have an account, enter your **Email** address and **Password**, and then click **Sign In**.
- If you don't have an account, click **New user registration**, and follow the prompts.

3 Click **DCCS**.

4 Select your site, and then click **FlexWave Prism**.

5 Click on the title of any document to open it.

ACCESSING FLEXWAVE SPECTRUM USER DOCUMENTATION

You can access the FlexWave Spectrum user documentation on the CommScope Spectrum Collateral web site, as described below.

1 Click on the following URL link:

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

(Alternatively, enter the preceding URL into your web browser, and then press **ENTER** on your keyboard.)

2 Click on the title of any document to open it.

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