![ADC logo]

ADC FlexWave™ Prism
Host, Remote and EMS 5.1
System Reference

**Quad Band
Remote Unit**

Host Unit

Antenna

Antenna

Antenna

Antenna

77073-001

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Screenshots in User Documentation

Due to concurrent development of this documentation, artwork, and the FlexWave URH EMS product, there may be some minor discrepancies between screenshots contained in this documentation and those actually displayed in the FlexWave URH EMS. These discrepancies will generally be few and minor and should not affect your understanding of FlexWave URH EMS.

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PREFACE

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This document provides basic description, application, and configuration information about the ADC® FlexWave™ Prism system. The information in this document guides you through:

- designing a Prism system

- installing Prism Host and Remote Units

- configuring the Prism system through the FlexWave Web-Based Element Management System (EMS) Version 5.1. The EMS is an embedded software application that runs on the Host and that may be accessed via an internet connection using a Web browser. This document shows how to connect to the EMS software using a SNMP manager to interact with the SNMP database that is used to store system parameters. SNMP (Simple Network Management Protocol) is an international standard for remote management of online devices.

Throughout this publication, all items referenced as "accessory items" are not furnished with the basic product and must be purchased separately.

FLEXWAVE PRISM USER DOCUMENTATION

The FlexWave Prism user documentation is intended for system engineers, administrators, and end users that are responsible for planning, administering, configuring, and maintaining ADC FlexWave Prism systems. Familiarity with SNMP and common network technologies is required.

Each FlexWave Prism document describes a different aspect of the FlexWave Prism system. The following manuals correspond to this FlexWave Prism release:

Title	ADCP Number
ADC® FlexWave Prism Host, Remote and EMS 5.1 System Reference	**77-073**
ADC® FlexWave Prism Host Unit Installation Guide	**77-071**
ADC® FlexWave Prism Remote Unit Installation Guide	**77-072**
ADC® FlexWave Prism Remote Mounting Kit Installation Instructions	**77-077**
ADC® FlexWave Prism Remote RF Module Installation Instructions	**77-079**
ADC® FlexWave Prism Coarse Wavelength Division Multiplexer User Manual	**77-075**

Icons

Three types of messages, identified by icons, appear in the text:

The Caution icon indicates operations or steps that could:

- **cause personal injury**
- **induce a safety problem in a managed device**
- **destroy or corrupt information**
- **interrupt or stop services.**

The Note icon indicates text that contains information about special circumstances.

The User icon indicates text that lists which user roles are required for a procedure or EMS access.

Fonts

You will find the following font conventions in use throughout the document:

- `This font` indicates a reference to a EMS dialog box, menu item, configuration option, or other parameter.

- `This font` indicates text you type at a prompt.

- THIS FONT indicates keys that you need to press on your keyboard.

- When a procedure requires clicking on a sequence of items, commas separate the items. For example, "click **User Account Management, User Account**" indicates that in the Function Explorer Tree, you select the **User Account Management** node, and then select the **User Account** node.

Illustrations

Some illustrations have numeric callouts. These callouts indicate the related step numbers in the accompanying text.

FOLLOWING THE EMS PROCEDURES IN THIS DOCUMENT

This document includes descriptions of how to use the FlexWave EMS to configure and manage FlexWave Prism devices.

Starting a Procedure

All procedures in this document assume that you have already logged in to FlexWave EMS as described in .

Finishing or Canceling a Procedure

In general, the procedures in this document end each procedure with having you click **OK** or **Apply** to accept changes or input. However, you can also click **Close** without clicking **Apply** to abandon any changes made, or click **Refresh** to update the data being shown.

The following table describes the most common EMS dialog buttons.

Button	Function
OK	Applies your configuration changes and closes the dialog.
Apply	Applies your configuration changes without closing the dialog.
Close	Discards any changes you have made in the dialog—unless you have previously clicked Apply—and closes the dialog. In a performance or status dialog, closes the dialog.
Refresh	Updates status information to reflect current conditions.

GENERAL SAFETY PRECAUTIONS

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

This 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. An optical power meter should be used to verify active fibers. A protective cap or hood MUST be immediately placed over any radiating transceiver or optical fiber connector to avoid the potential of dangerous amounts of radiation exposure. This practice also prevents dirt particles from entering the adapter or connector.

This system is an RF Transmitter and continuously emits RF energy. Maintain 3 foot (91.4 cm) minimum clearance from the antenna while the system is operating. Wherever possible, shut down the RAN before servicing the antenna.

Always allow sufficient fiber length to permit routing of patch cords and pigtails without severe bends. Fiber optic patch cords or pigtails may be permanently damaged if bent or curved to a radius of less than 2 inches (5.1 cm).

Exterior surfaces of the Remote may be hot. Use caution during servicing.

STANDARDS CERTIFICATION

FCC: This equipment complies with the applicable sections of Title 47 CFR Part 15 (Host unit), Part 22 (800 MHz Cellular), Part 24 (1900 MHz - PCS), Part 90 (800/900 - SMR), and Part 27 (2100 MHz - AWS).

IC: This equipment complies with the applicable sections of RSS-131. 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: To comply with Maximum Permissible Exposure (MPE) requirements, the maximum composite output form the antenna cannot exceed 1000 Watts ERP (Cellular and SMR), the antenna cannot exceed 1640 Watts EIRP (PCS), and the antenna must be permanently installed in a fixed location that provides at least 6 meters (20 feet) of separation from all persons.

UL/CUL: This will be installed in a restricted access location. This equipment complies with NEMA Type 4, per UL and CUL 50, Standard for Enclosures for Electrical Equipment. This equipment provides the degree of protection specified by IP65 as defined in IEC Publication 529.

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.

Caution: Modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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:

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

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PART 1

FLEXWAVE PRISM SYSTEM OVERVIEW

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1

FLEXWAVE PRISM SYSTEM

This section provides a basic description and application and configuration information about the FlexWave Prism system. Throughout this publication, all items referenced as "accessory items" are not furnished with the basic product and must be purchased separately.

1.1　Prism System Overview

ADC's FlexWave™ Prism is a compact radio head for macro gap coverage that supports up to four frequency bands delivering high-performance coverage with end-to-end management.

The FlexWave Prism enhances wireless networks in outdoor locations and large venues in an easy and cost-effective manner. Based on patented technology and ADC's 15-year leadership in outdoor wireless distributed antenna system (DAS) technology, FlexWave Prism offers mobile operators a small, light, and flexible solution for extending macro network coverage for 2G, 3G, and 4G services.

The new FlexWave Prism system is ideal for enhancing outdoor and indoor coverage in cities, suburbs, canyons, tunnels, campuses, stadiums, and other public areas. It is 35 percent lighter and up to 60 percent smaller than the FlexWave URH product it replaces, and is available in four different cabinet sizes to support one, two, three or four frequency bands. Operators can future-proof their deployments by purchasing a larger cabinet and adding more frequency bands when needed. FlexWave Prism uses ADC's proven radio head technology and management system along with an IP-65 rated remote.

1.1.1　Product Features

- Management under the same host end equipment and EMS as the FlexWave URH, allowing operators to scale legacy URH deployments with the FlexWave Prism

- ADC's patented RF-over-fiber transport eliminates installation-dependent gain or fiber length adjustments

- Improved manageability for installation and upgrades

- Smaller size to ease placement and zoning approvals

- 4G readiness with Four Band remote, which is ideal for incorporating 2G and 3G services with needs of 4G technologies such as LTE

- The unique capability to support digital RF as well as baseband compatibility into a single fiber pair and remote radiating point

- Support for millimeter wave backhaul

- With its unique use of wideband digital RF transport, FlexWave Prism delivers reliable and consistent performance in all environments. Signals are not affected by reflection, dispersion, or frequency attenuation over fiber. FlexWave Prism delivers a reliable signal at every remote location.

1.1.2   Applications

- Dense urban environments
- Tunnels and canyons
- Roadside and coastal
- Suburban areas
- Corporate and university campuses
- Stadium and large public venues
- Next-generation network augmentation

1.2   BASIC SYSTEM COMPONENTS

A very basic Prism system consists of a Host Unit (Host) and a Remote Unit (Remote):

- The Host is a three rack unit high chassis with multiple cards that mounts in a standard equipment rack.

- The Remote consists of multiple electronic and optical modules mounted in an outdoor enclosure.

On an optional basis, the Prism system supports reverse path diversity. In addition, various accessory items including a passive Wavelength Division Multiplexer (WDM) system, Coarse Wavelength Division Multiplexer (CWDM) system, and expansion panels are available as accessories.

Control and monitoring functions are provided by the FlexWave Element Management System (EMS).

Some examples of FlexWave Prism Systems are shown in Figure 1-1, Figure 1-2, Figure 1-3.
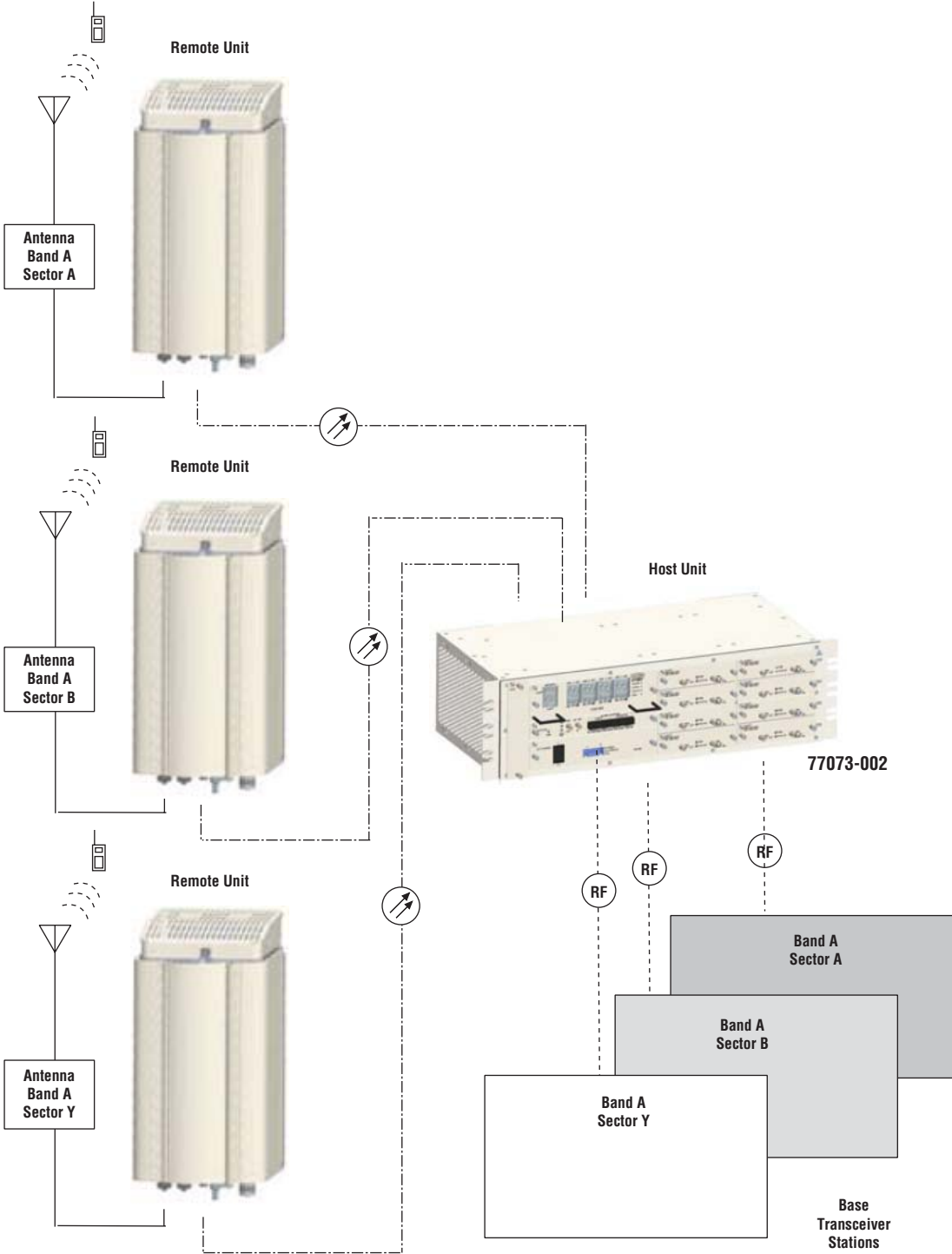
Figure 1-1. Multiple Point-to-Point Configuration
(One Band per Remote, Three Nodes)
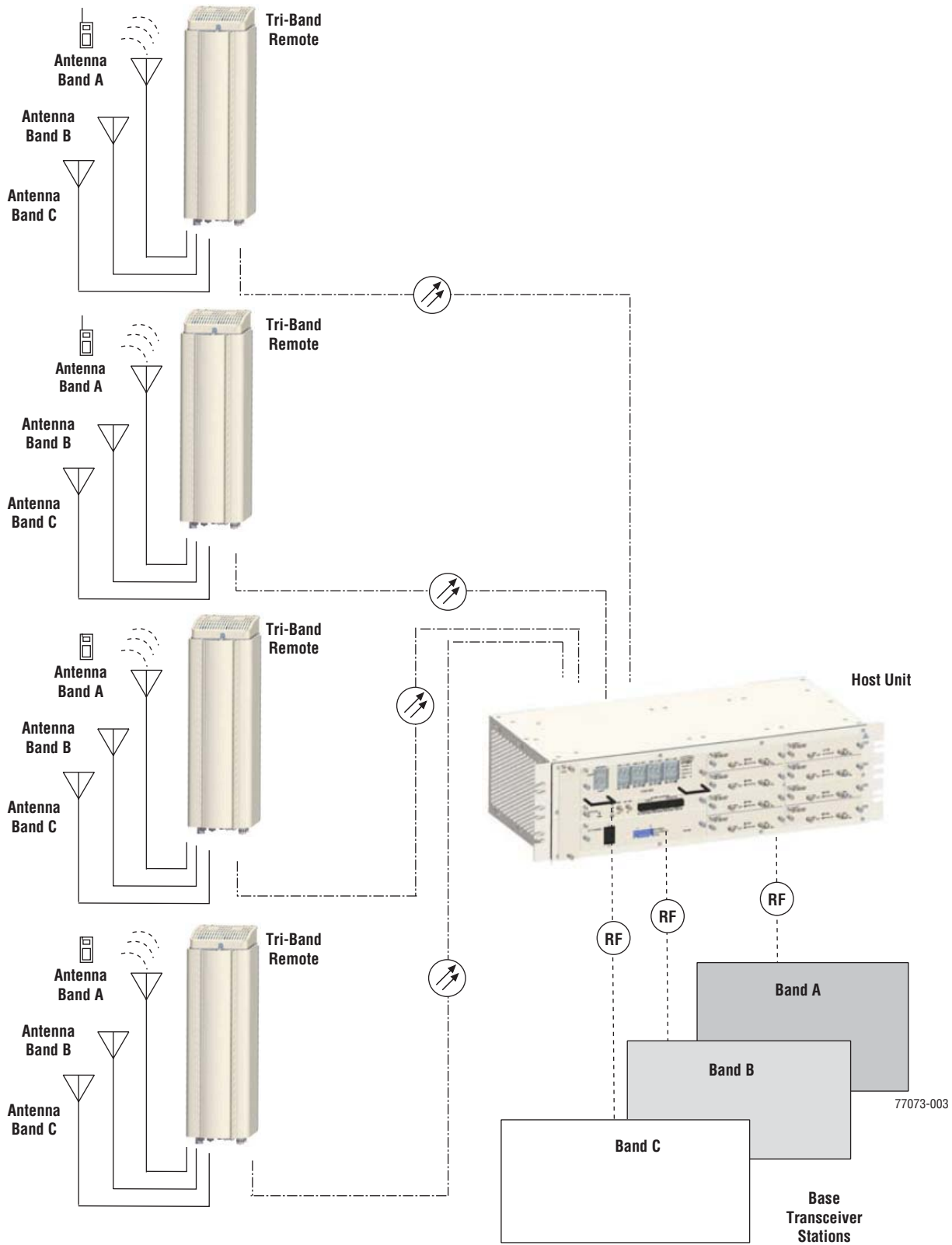
Figure 1-2. Four Remote Simulcast, Three Bands
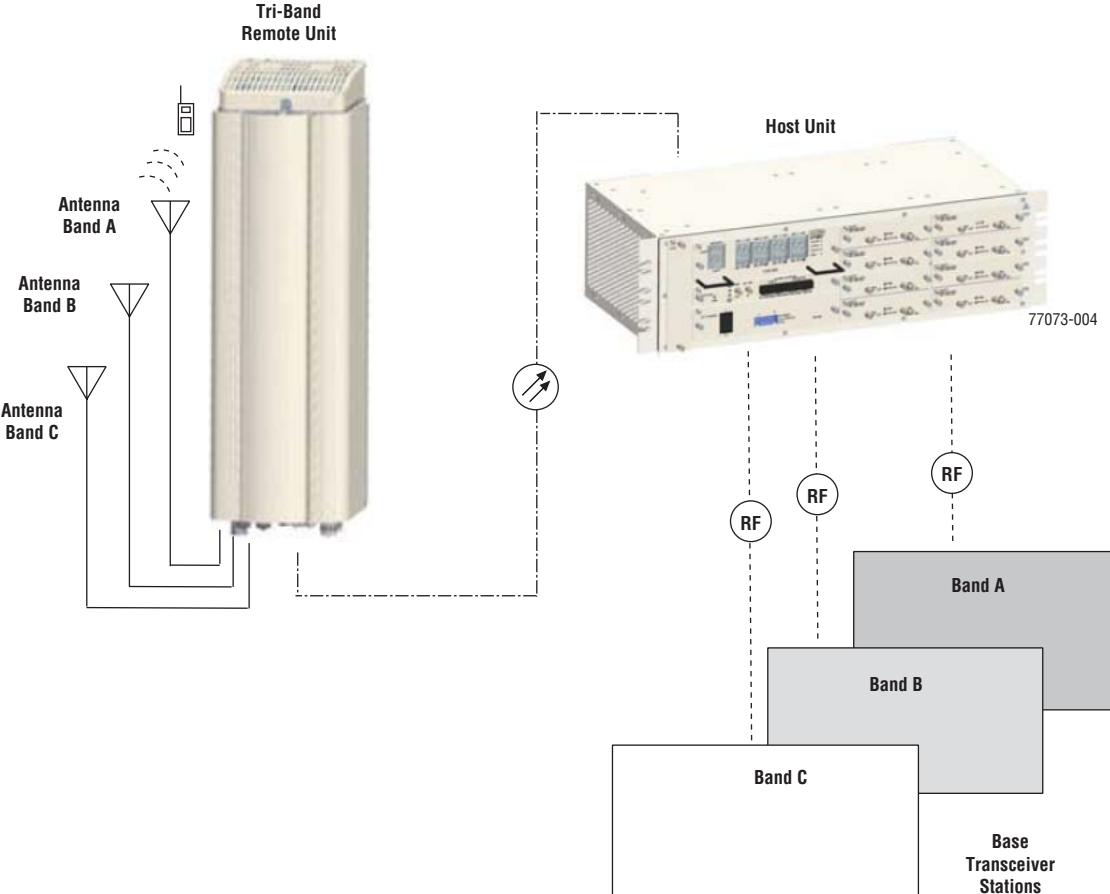
Figure 1-3. Three Bands to One Remote

1.3 MULTI-HOST SYSTEMS

ADC's FlexWave Prism provides a Multi-Host feature that allows a Prism Remote to be shared by multiple Host Units. To accomplish this:

- One Host is designated as the IP Manager for a set of Remotes; this Host can serve as IP manager for multiple Remotes. As the IP Manager, the managing Host controls the exchange of management data with the Remote(s).

- There is no Host to Host connectivity.

- A Prism Remote can receive bands over multiple fibers that originate on different Hosts. However, only one Host, the IP Manager, can manage the Remote. If a Host attempts to manage a Remote already under the management of an IP Manager, the second Host causes an IP Conflict fault (see "Viewing Host SeRF Optical Ports" on page 224).

- All the Hosts in a Multi-Host network can be configured to serve as clock master. Each Host will be configured with a priority level in the range of **0-15**. The Host with the priority level of **1** distributes the clock in the network. If the Host designated as clock master fails or shuts down, the Host with the next highest priority level takes over. (For information on setting the master clock, see "Set the Clock Priority Level" on page 150.)

- The FlexWave EMS provides a **Linking Mode** parameter that can be set to **Automated** or **Manual** for each Host. The **Linking Mode** is applicable for all Remotes connected to the IP Manager. A Multi-Host system requires that the **Linking Mode** be set to **Manual** (see "(Optional) Configuring Multi-Host Systems for Manual Mode" on page 168.

- The Host that manages the Remote must be able to provision one or more passbands on that Remote for which the Host does not have a DART card. Remote DARTs are linked back to one or more Hosts in a Multi-Host system.
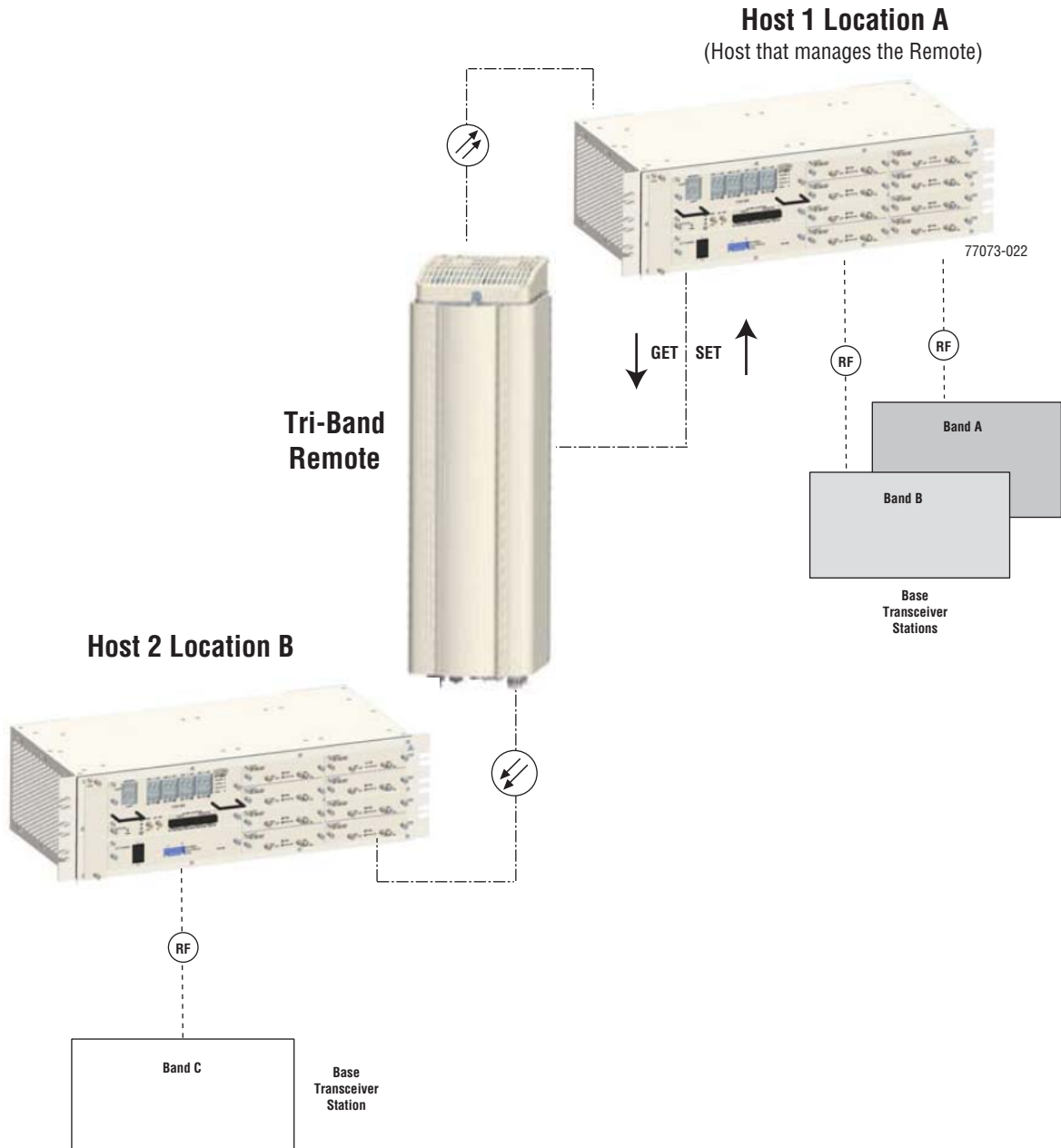
Figure 1-4. Multi-Host System

1.4 DART CARDS

Digital/Analog Radio Transceiver (DART) cards provide the interface between base station equipment and the SeRF. There are three types of FlexWave DART cards:

· Classic

· Single SuperDART

· Dual SuperDART.

FlexWave DARTS are band specific assemblies available in the versions listed in Table 1-1.

Table 1-1. *FlexWave DART Card Types*

Band	Maximum Bandwidth (MHz)	Number of Fiber Slots	Slot Requirement
Classic DART Cards			
AWS 2100	35	6	Single
Cell 850	35	6	Single
PCS 1900	35	6	Single
SMR 800	35	6	Single
SMR 900	35	6	Single
Single SuperDART Cards			
GSM 900	35	6	Single
Dual SuperDART Cards			
AWS 2100	45	8	Dual
GSM 1800	75	12	Dual
PCS 1900	70	12	Dual
UMTS 2100	60	12	Dual

DART cards:

· amplify, down-convert, filter and digitize the incoming RF signal from the BTS

· convert incoming digital signal from the Remote to analog, filter, amplify and up-convert the frequency from Intermediate Frequency (IF) to RF

· provide a bi-directional interface between parallel digital RF (to D/A and from A/D) and Serial RF (SeRF) to/from SeRF board

· perform adjustable delay processing.

1.4.1   **DARTs and Host Units**

The Host can support up to eight Classic DARTS and/or Single SuperDARTs or up to four Dual SuperDARTs. Figure 1-5 provides generic representations of Classic DARTS or Single SuperDARTs and Dual SuperDARTs.
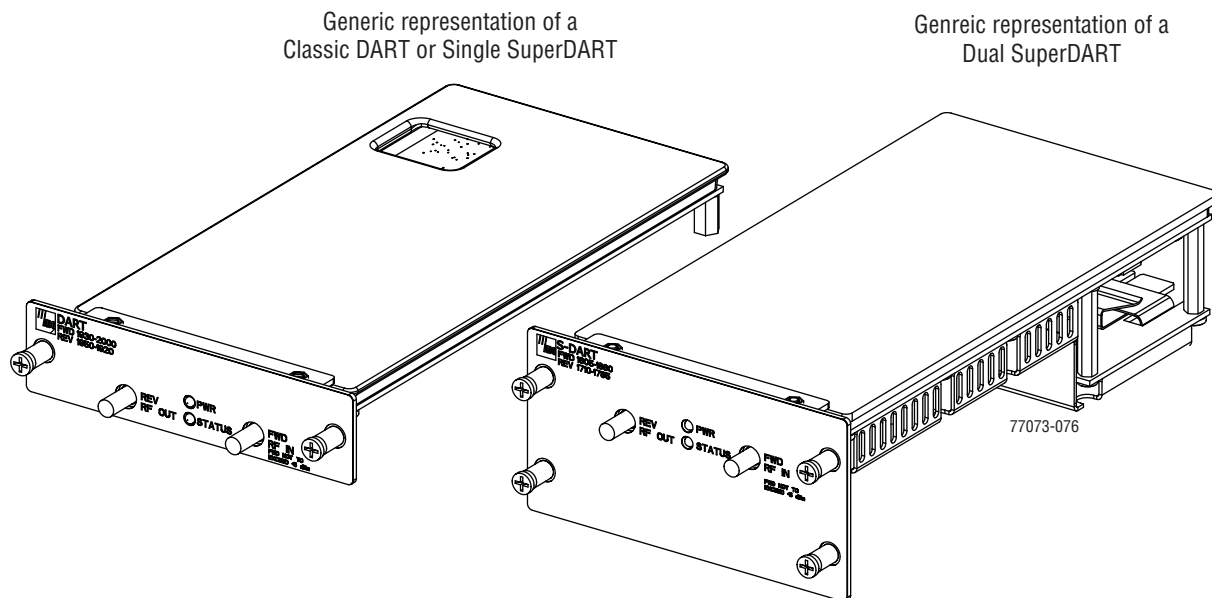
Figure 1-5. DART Cards

Figure 1-6 shows the possible slot assignments for Single and Dual SuperDARTs, and where slot-divider bars are located.

· A Classic DART or Single SuperDART can be installed in each of the eight slots in the Host.

· Dual SuperDARTs occupy two slots (1/3, 2/4, 5/7 or 6/8).

· Dual SuperDARTs cannot occupy slot combinations 3/5 or 4/6.

· Any combination of DARTs may be installed.
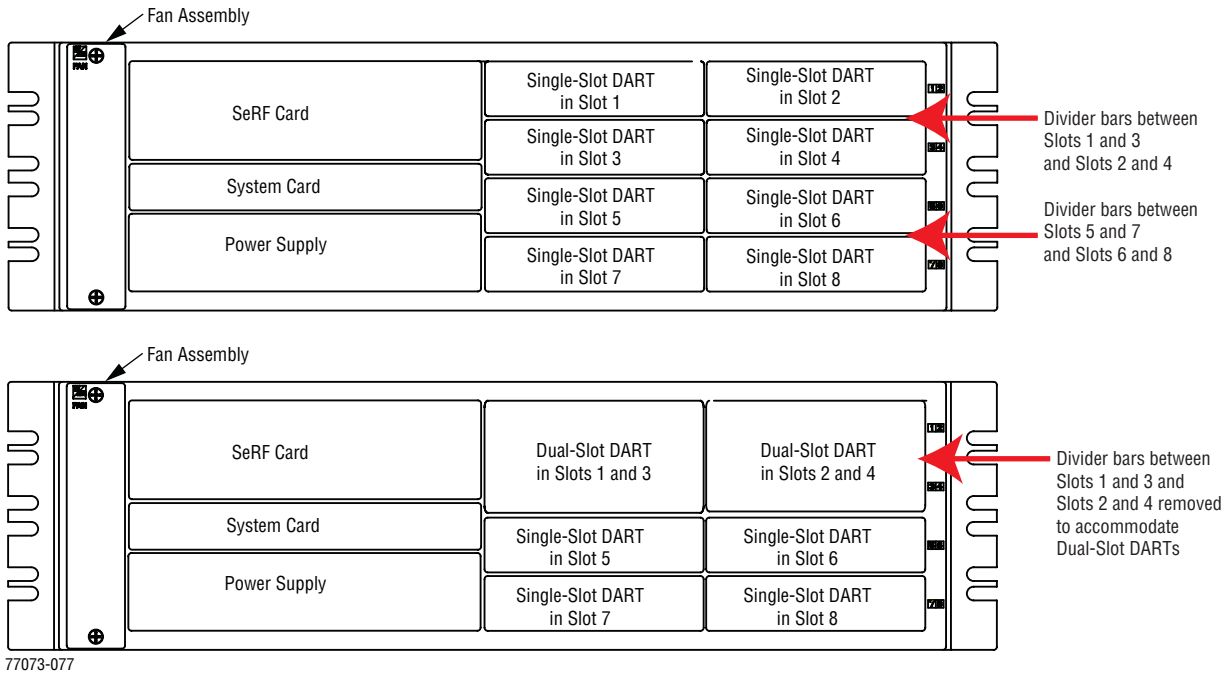
Figure 1-6. DART Slot Assignments in Host Chassis

Figure 1-7 shows a Host that is fully loaded with Dual SuperDART cards.
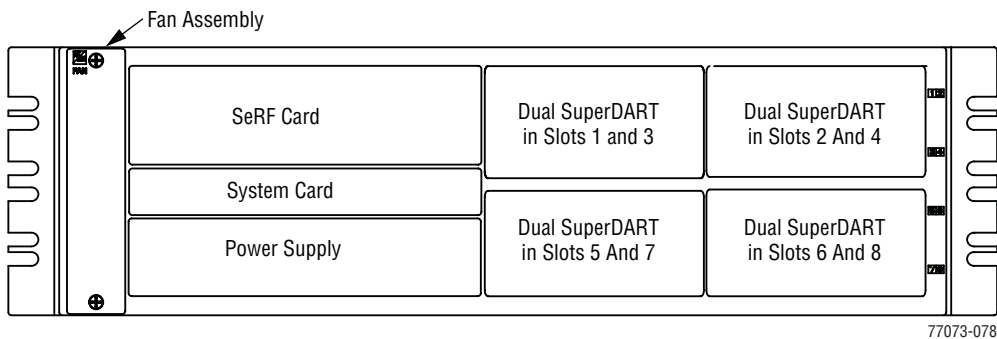
Figure 1-7. Host with Dual SuperDARTs

1.4.2 DARTs and Remote Units

The Remote DARTs are encased in its RF Module. Each RF Module will have up to two Classic DARTs or Single SuperDARTs, or one Dual SuperDART, and there can be up to:

- one RF Module in a Single-Band chassis
- two RF Modules in a Dual-Band chassis
- three RF Modules in a Tri-Band chassis
- four RF Modules in a Quad-Band chassis.

The Remote DART Interface cards (RDI) and the Remote SeRF interface board (RSI) provide Remote SeRF and DART connectivity for the Prism high speed digital connections. The configuration of the DART cards provide the RF spectrum.

Prism Remote RF Modules are not field serviceable. To replace a DART within a Prism Remote, you must replace the RF Module.

1.5   E911 SUPPORT

The DART type determines the maximum number of links, where there can be up to 8 DARTs for a 35MHz spectrum and up to 4 DARTs for a ≤75MHz spectrum.

E911 support may be achieved by using a configuration similar to the one shown in Figure 1-8. Remote simulcasting in this configuration requires analog splitting and combining to and from the individual Host DARTs. External analog splitting/combining ensures that the E911 system receives uplink signals from each Remote location before they are combined with uplink signals from the other Remotes in the simulcast.
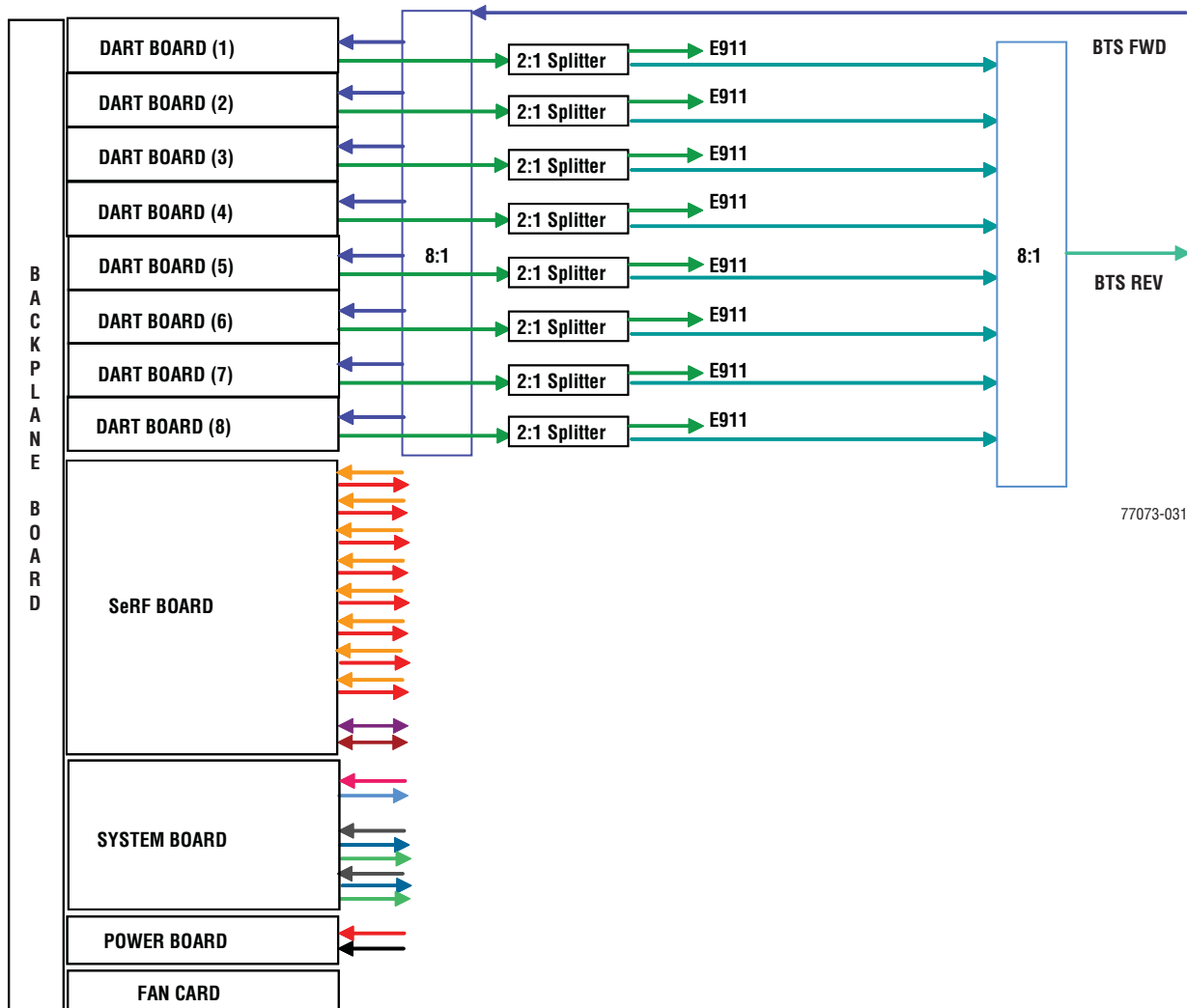
Figure 1-8. 8:1 Analog Simulcast U-TDoA E911 Support Diagram

1.6 FIBER OPTIC TRANSPORT

In a typical Prism system the Host is connected to the Remote using two single-mode optical fibers. One fiber is used to transport the **forward path** optical signal and a second fiber is used to transport the **reverse path** optical signal. With the diversity option, the **diversity reverse path** optical signal is sent on the same **reverse path** fiber. (However, the diversity signal can also be transmitted on a separate fiber pair if more than 12 timeslots are required at a single Remote.) Because the optical signal is digital, the input and output RF signal levels at the Host or the Remote are not dependent on the level of the optical signal or the length of the optical fiber. A diagram of the standard fiber optic transport system for both a non-diversity and diversity system is shown in Figure 1-9.

The maximum length of the optical links is dependent on the loss specifications of the optical fiber and the losses imposed by the various connectors and splices. The system provides an optical budget of **25 dB** (typical) when used with 9/125 single-mode fiber. There must be at least 10 dB of optical loss to prevent over-driving and possible damage to the optical receiver.
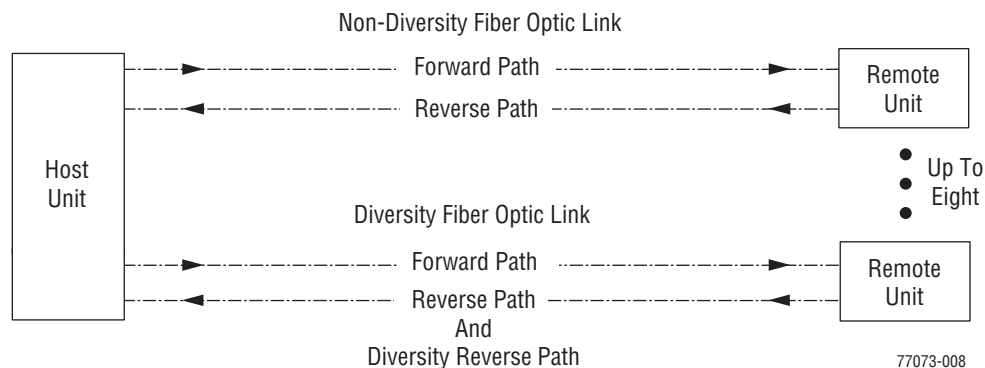
Figure 1-9. Standard Fiber Optic Transport Application

The SeRF (Serialized RF) digital protocol consists of digitized RF, Fast Ethernet, and Host to Remote communication and management. The protocol provides you with full access to the 100BASE-T (Ethernet) connection between the Host and each Remote, and the ability to provision the RF spectrum of the DARTs. The digitized RF portion of the SeRF protocol is divided into 12 timeslots, with each timeslot representing roughly 5 MHz of digitized RF spectrum. Utilizing the full 12 timeslots yields between 60 and 75 MHz of total digitized RF on each SeRF Small Form-Factor Pluggable (SFP) laser connection.

The available RF bandwidth per timeslot is shown in Table 1-2.

Table 1-2. *Available RF Bandwidth*

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	---
6	35	39
8	---	45
12	---	60-75

For example, a user who wishes to transport PCS A block, Cellular A, and AWS B block, the system would require the following:

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

1.7   TIMESLOTS VERSUS BANDWIDTH

Each fiber pair supports 12 timeslots, or up to 75 MHz of bandwidth. Table 1-2 shows the maximum bandwidth versus the number of timeslots.

If more than 70 MHz is required per Remote, up to three additional fiber pairs can be brought to the Remote to get up to up to 280MHz per Remote (or 300MHz if all four are GSM-1800). This supports applications where there are two Classic DARTs or Single SuperDARTs or one Dual SuperDART in a Remote RF Module.

The SeRF (Serialized RF) digital protocol consists of digitized RF, 100BASE-T Ethernet, and Host to Remote communication and management. The protocol provides you with full access to the 100BASE-T Ethernet connection between the Host and each Remote, and the ability to provision the RF spectrum of the DARTs. The digitized RF portion of the SeRF protocol is divided into 12 timeslots, with each timeslot representing roughly 5 MHz of digitized RF spectrum. Utilizing the full 12 timeslots yields between 60 and 80 MHz of total digitized RF on each SeRF SFP laser connection.

1.8 BANDWIDTHS

In the FlexWave Prism system, there are different Bandwidths from which to select, ranging from 5 to 75 MHz. The different bandwidths allow you to configure the system to use any contiguous or non-contiguous blocks within the 35 MHz of a single Host 6-timeslot DART or 60-75 MHz using a 12-timeslot DART. DART bandwidth options are shown in Table 1-3.

For DART cards, if you need to use non-contiguous blocks within a given 35 MHz, then the selected bandwidth must span both of these blocks, even if the blocks in between are not used. For example, if you want to use both **PCS D** and **E** blocks, select **PCS D+B+E**, which spans 25 MHz. This allows both **PCS D** & **E** to be transported and the **B** block is effectively unused.

PCS D and E are only 10 MHz of spectrum, four timeslots are required since the actual transported spectrum is 25 MHz for the PCS D, B, E block, as shown in Table 1-3.

Table 1-3. *DART Bandwidths*

Band	Down- Link RF Band (MHz)		Up- Link RF Band (MHz)		Bandwidth Slots (MHz)	
	Start	Stop	Start	Stop	Bandwidth in MHz	# of Timeslots
AWS A	2110	2120	1710	1720	10	2
AWS A+B	2110	2130	1710	1730	20	3
AWS A+B+C	2110	2135	1710	1735	25	4
AWS A+B+C+D	2110	2140	1710	1740	30	6
AWS A+B+C+D+E	2110	2145	1710	1745	35	6
AWS B	2120	2130	1720	1730	10	2
AWS B+C	2120	2135	1720	1735	15	3
AWS B+C+D	2120	2140	1720	1740	20	3
AWS B+C+D+E	2120	2145	1720	1745	25	4
AWS B+C+D+E+F	2120	2155	1720	1755	35	6
AWS C	2130	2135	1730	1735	5	1
AWS C+D	2130	2140	1730	1740	10	2
AWS C+D+E	2130	2145	1730	1745	15	3
AWS C+D+E+F	2130	2155	1730	1755	25	4
AWS D	2135	2140	1735	1740	5	1
AWS D+E	2135	2145	1735	1745	10	2
AWS D+E+F	2135	2155	1735	1755	20	3
AWS E	2140	2145	1740	1745	5	1
AWS E+F	2140	2155	1740	1755	15	3
AWS F	2145	2155	1745	1755	10	2
AWS 2100	2110	2155	1710	1755	45	8
AWS H	1995	2000	1915	1920	5	1
Cellular A	870	880	825	835	10	2

Table 1-3. *DART Bandwidths (Cont.)*

Band	Down- Link RF Band (MHz)		Up- Link RF Band (MHz)		Bandwidth Slots (MHz)	
	Start	Stop	Start	Stop	Bandwidth in MHz	# of Timeslots
Cellular A'	890	891.5	845	846.5	1.5	1
Cellular A"+A	869	880	824	835	11	2
Cellular A"+A+A'	869	891.5	824	846.5	22.5	4
Cellular A"+A+B+A'+B'	869	894	824	849	25	4
Cellular B	880	890	835	845	10	2
Cellular B'	891.5	894	846.5	849	2.5	1
Cellular B+B'	880	894	835	849	14	3
GSM 1800 FullBand	1805	1880	1710	1785	75	12
GSM 900 FullBand	921	960	876	915	39	6
PCS A	1930	1950	1850	1865	20	3
PCS A+D	1930	1950	1850	1870	20	3
PCS A+D+B	1930	1965	1850	1885	35	6
PCS A+D+B1	1930	1955	1850	1875	25	4
PCS A+D+B1+B2	1930	1960	1850	1880	30	6
PCS A1	1930	1935	1850	1855	5	1
PCS A1+A2	1930	1940	1850	1860	10	2
PCS A2	1935	1940	1855	1860	5	1
PCS A2+A3	1935	1945	1855	1865	10	2
PCS A2+A3+D	1935	1950	1855	1870	15	3
PCS A2+A3+D+B	1935	1965	1855	1885	30	6
PCS A2+A3+D+B+E	1935	1970	1855	1890	35	6
PCS A2+A3+D+B1	1935	1955	1855	1875	20	3
PCS A2+A3+D+B1+B2	1935	1960	1855	1880	25	4
PCS A3	1940	1945	1860	1865	5	1
PCS A3+D	1940	1950	1860	1870	10	2
PCS A3+D+B	1940	1965	1860	1885	25	4
PCS A3+D+B+E	1940	1970	1860	1890	30	6
PCS A3+D+B+E+F	1940	1975	1860	1895	35	6
PCS A3+D+B1	1940	1955	1860	1875	15	3
PCS A3+D+B1+B2	1940	1960	1860	1880	20	3
PCS B	1950	1965	1870	1885	15	3
PCS B+E	1950	1970	1870	1890	20	3
PCS B+E+F	1950	1975	1870	1895	25	4
PCS B+E+F+C3	1950	1980	1870	1900	30	6
PCS B+E+F+C3+C4	1950	1985	1870	1905	35	6
PCS B1	1950	1955	1870	1875	5	1
PCS B1+B2	1950	1960	1870	1880	10	2
PCS B2	1955	1960	1875	1880	5	1
PCS B2+B3	1955	1965	1875	1885	10	2

Table 1-3. *DART Bandwidths (Cont.)*

Band	Down- Link RF Band (MHz)		Up- Link RF Band (MHz)		Bandwidth Slots (MHz)	
	Start	Stop	Start	Stop	Bandwidth in MHz	# of Timeslots
PCS B2+B3+E	1955	1970	1875	1890	15	3
PCS B2+B3+E+F	1955	1975	1875	1895	20	3
PCS B2+B3+E+F+C	1955	1990	1875	1910	35	6
PCS B2+B3+E+F+C2	1955	1982.5	1875	1902.5	27.5	6
PCS B2+B3+E+F+C3	1955	1980	1875	1900	25	4
PCS B2+B3+E+F+C3+C4	1955	1985	1875	1905	30	6
PCS B3	1960	1965	1880	1885	5	1
PCS B3+E	1960	1970	1880	1890	10	2
PCS B3+E+F	1960	1975	1880	1895	15	3
PCS B3+E+F+C	1960	1990	1880	1910	30	6
PCS B3+E+F+C + SMR G	1960	1995	1880	1915	35	6
PCS B3+E+F+C2	1960	1982.5	1880	1902.5	22.5	4
PCS B3+E+F+C3	1960	1980	1880	1900	20	3
PCS B3+E+F+C3+C4	1960	1985	1880	1905	25	4
PCS C	1975	1990	1895	1910	15	3
PCS C + SMR G	1975	1995	1895	1915	20	3
PCS C + SMR G + AWS H	1975	2000	1895	1920	25	4
PCS C1	1982.5	1990	1902.5	1910	7.5	2
PCS C1 + SMR G	1982.5	1995	1902.5	1915	12.5	2
PCS C1 + SMR G + AWS H	1982.5	2000	1902.5	1920	17.5	3
PCS C2	1975	1982.5	1895	1902.5	7.5	2
PCS C3	1975	1980	1895	1900	5	1
PCS C3+C4	1975	1985	1895	1905	10	2
PCS C4	1980	1985	1900	1905	5	1
PCS C4+C5	1980	1990	1900	1910	10	2
PCS C4+C5 + SMR G	1980	1995	1900	1915	15	3
PCS C4+C5 + SMR G + AWS H	1980	2000	1900	1920	20	3
PCS C5	1985	1990	1905	1910	5	1
PCS C5 + SMR G	1985	1995	1905	1915	10	2
PCS C5 + SMR G + AWS H	1985	2000	1905	1920	15	3
PCS D	1945	1950	1865	1870	5	1
PCS D+B	1945	1965	1865	1885	20	3
PCS D+B+E	1945	1970	1865	1890	25	4
PCS D+B+E+F	1945	1975	1865	1895	30	6
PCS D+B+E+F+C3	1945	1980	1865	1900	35	6
PCS D+B1	1945	1955	1865	1875	10	2
PCS D+B1+B2	1945	1960	1865	1880	15	3
PCS E	1965	1970	1885	1890	5	1
PCS E+F	1965	1975	1885	1895	10	2

Table 1-3. *DART Bandwidths (Cont.)*

Band	Down- Link RF Band (MHz)		Up- Link RF Band (MHz)		Bandwidth Slots (MHz)	
	Start	Stop	Start	Stop	Bandwidth in MHz	# of Timeslots
PCS E+F+C	1965	1990	1885	1910	25	4
PCS E+F+C + SMR G	1965	1995	1885	1915	30	6
PCS E+F+C + SMR G +AWS H	1965	2000	1885	1920	35	6
PCS E+F+C2	1965	1982.5	1885	1902.5	17.5	3
PCS E+F+C3	1965	1980	1885	1900	15	3
PCS E+F+C3+C4	1965	1985	1885	1905	20	3
PCS F	1970	1975	1890	1895	5	1
PCS F+C	1970	1990	1890	1910	20	3
PCS F+C + SMR G	1970	1995	1890	1915	25	4
PCS F+C + SMR G + AWS H	1970	2000	1890	1920	30	6
PCS F+C2	1970	1982.5	1890	1902.5	12.5	2
PCS F+C3	1970	1980	1890	1900	10	2
PCS F+C3+C4	1970	1985	1890	1905	15	3
PCS FullBand	1930	2000	1850	1920	70	12
SMR 851-869 (SMR Low Wide)	851	869	806	824	18	3
SMR 863-869 (SMR Low)	863	869	818	824	6	2
SMR 935-940 (SMR High)	935	940	896	901	5	1
SMR G	1990	1995	1910	1915	5	1
SMR G + AWS H	1990	2000	1910	1920	10	2
UMTS 2100	2110	2170	1920	1980	60	12

1.9 AWS AND PCS BAND OPTIONS

The Dual-AWS and Dual-PCS DARTs allow you to span non-contiguous bands:

- the Dual-AWS DART comprises two 6-Timeslot AWS DARTs that span the full 45 MHz of the AWS band

- the Dual-PCS DART provides two PCS blocks over the entire 70 MHz PCS spectrum.

In the forward path, the two Remote DARTs are summed together before being sent to the Linear Power Amplifier (LPA). In the reverse direction, the Low Noise Amplifier (LNA) is split providing the full PCS or AWS spectrum to each DART. Each DART is responsible for transporting its own spectrum, as shown in an the following example for a PCS configuration.
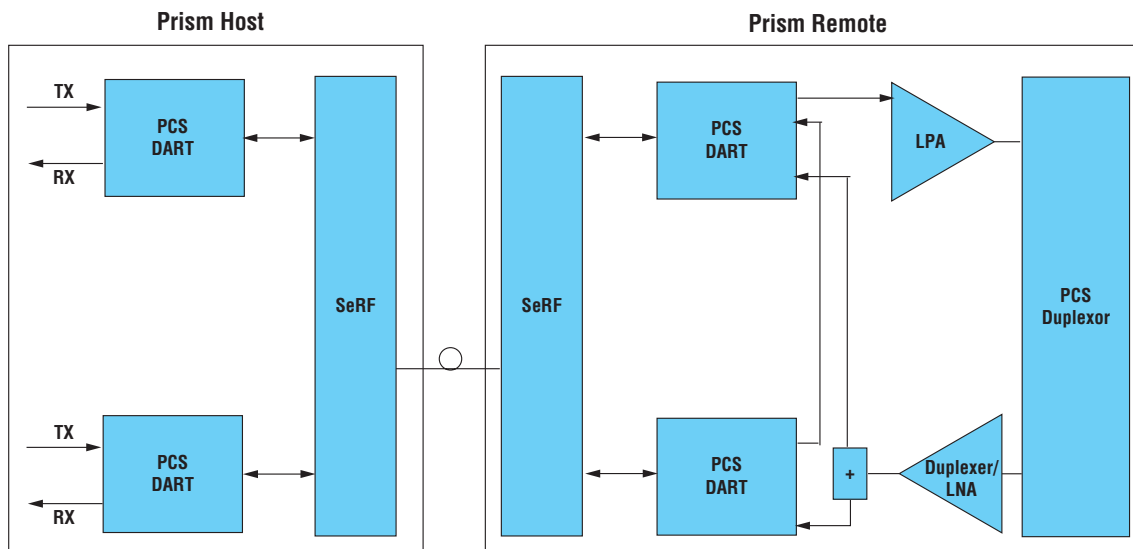
77073-028

PCS Configuration Example:

If the application requires both the A and C block, in the Remote the forward path of the PCS A band is combined with the forward path of the PCS C band and these signals are sent to the LPA to be amplified. In the reverse direction, the Duplexer/LNA passes/amplifies the entire PCS band. The first DART digitizes the PCS A block reverse path and the second DART digitizes the PCS C block reverse path and then sends them back to the Host to be reconstructed back into RF.

The installer needs to provide the separate connections at the Host location either by splitting already combined signals to/from each DART, or by providing them independently.

If the two PCS reverse path blocks are combined at the Host location, then they must be separated by at least 5 MHz to insure that the reverse paths do not interfere with each other during the re-combining.

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2

PRISM SYSTEM COMPONENTS

2.1 FLEXWAVE PRISM FAMILY OVERVIEW

The ADC FlexWave Prism family of products is a Distributed Antenna System (DAS) that provides ADC's patented technology—bidirectional transport of digitized RF spectrum over fiber. The high-speed digitalization of a wideband portion of spectrum allows for transport of RF signals over extended distances, without the RF degradation that normally results when analog systems are impacted by optical effects. The basic function of the FlexWave Prism platform is to transport via fiber optic cable RF signals from a Base Transceiver Station (BTS) to an antenna interface allowing communication to a mobile device. Multiple BTS communication paths are allowed over a single Prism system. Each link consists of a Host that provides the interface between the base station RF ports and the optical fiber, and at least one Remote that provides the interface between the optical fiber and the remote antenna. A block diagram of the system is shown in Figure 2-1.
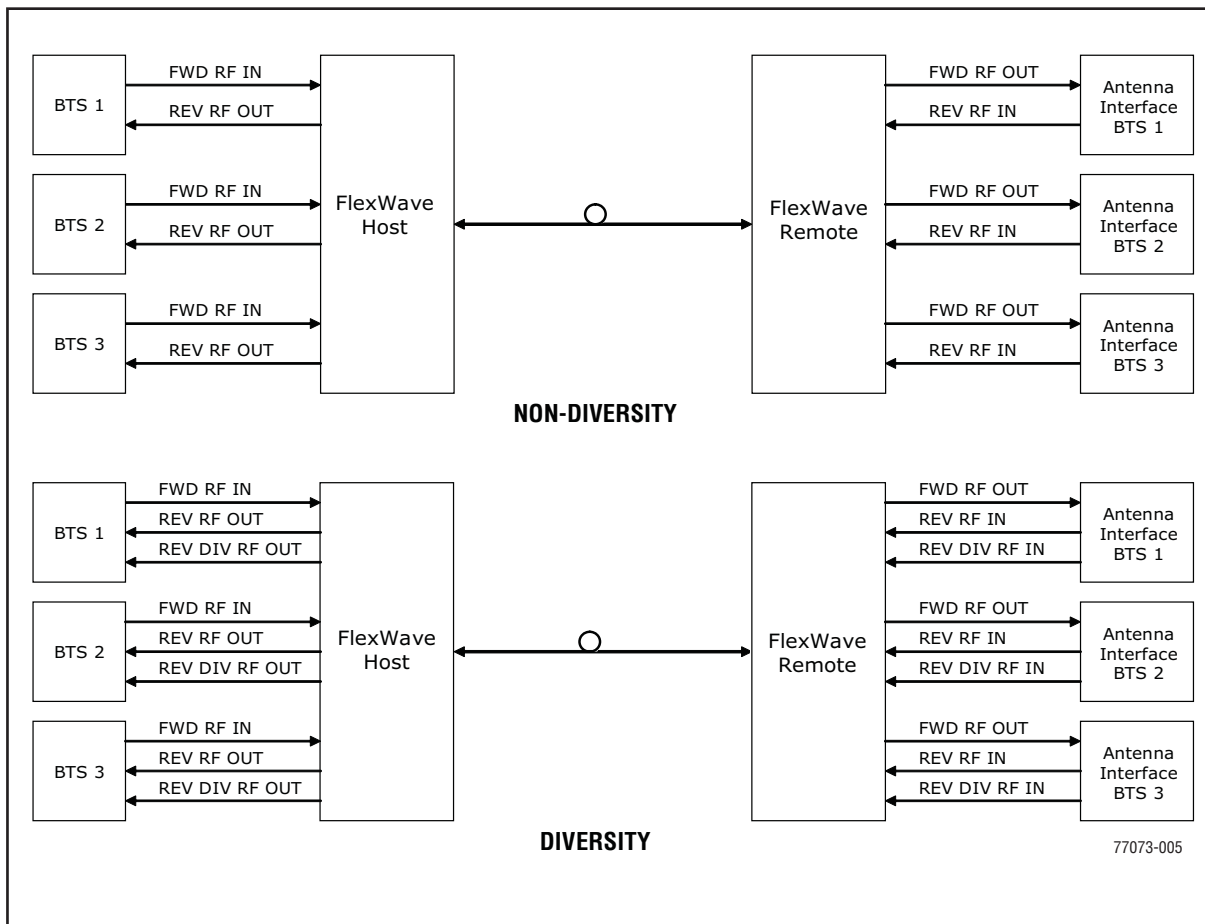
Figure 2-1. FlexWave Tri-Band Prism Block Diagram

The basic function of FlexWave Prism simulcast (point-to-multipoint) is to transport, via fiber optic cable, RF signals from a Base Transceiver Station (BTS) to multiple antenna interfaces allowing communication to a mobile device (see Figure 2-2). Up to 8 simulcast Remotes are supported.
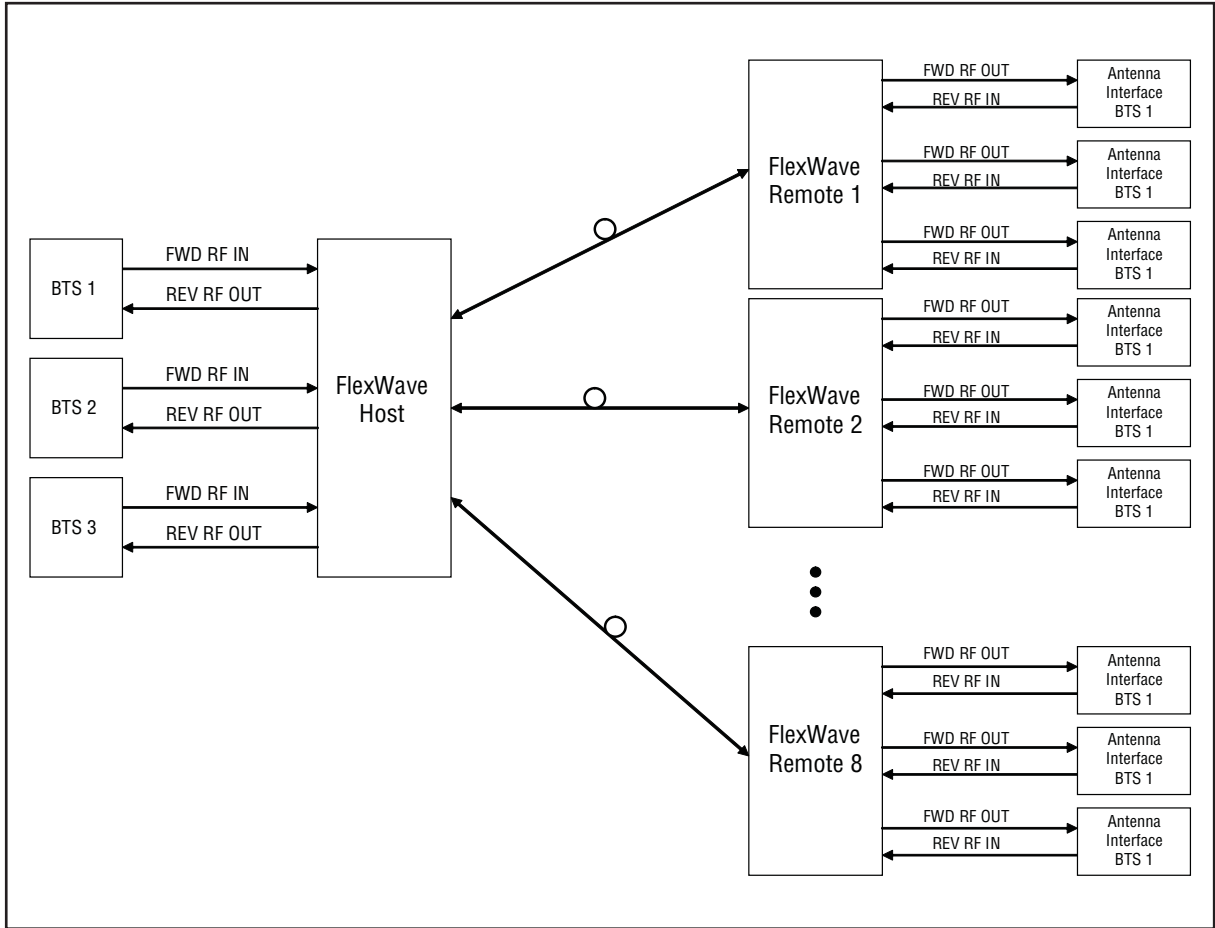
77073-006

Figure 2-2. System Block Diagram for Eight-Way Simulcast

2.2   FLEXWAVE PRISM HOST UNITS

The Host is designed for maximum RF flexibility to address Carriers' changing and evolving spectrum needs, making the most use of cost efficient resources for serving multiple remotes such as simulcast architecture and sharing of common functions such as power, control and management over multiple Hosts. Each Host may be interfaced with one or more Base Transceiver Station (BTS). Each BTS provides the RF channel inputs and outputs for a designated sector.

The Host is designed as a compact package that reduces rack space required within a BTS Hotel. The Host is a three rack-unit high single-unit assembly that mounts in a standard 19- or 23-inch equipment rack. Its front access interfaces with the BTS for transport to subtended Remotes, and performs the analog to digital and electrical to optical conversions for transport to a Host and subtended Remotes. Each Host can support up to eight Remotes. The Remote is a modular self-contained outdoor enclosure that houses various electronic components.

2.2.1   Host Front Panel.

The Host is designed for use within a non-condensing indoor environment such as inside a wiring closet or controlled environment cabinet. All controls, connectors, and indicators (except the grounding point) are mounted on the Host front panel and allows vertical cable guides to be installed over the mounting brackets on either side. The Host user interface on its front panel comprises the connectors, switches, terminals, and LEDs that are described in Figure 2-3 and Table 2-1.

The Host can be mounted in either a 19- inch or 23- inch EIA or WECO equipment rack. Unless noted otherwise, views of the Host in this document show the mounting brackets in the 23- inch position. The default is the 19- inch position.
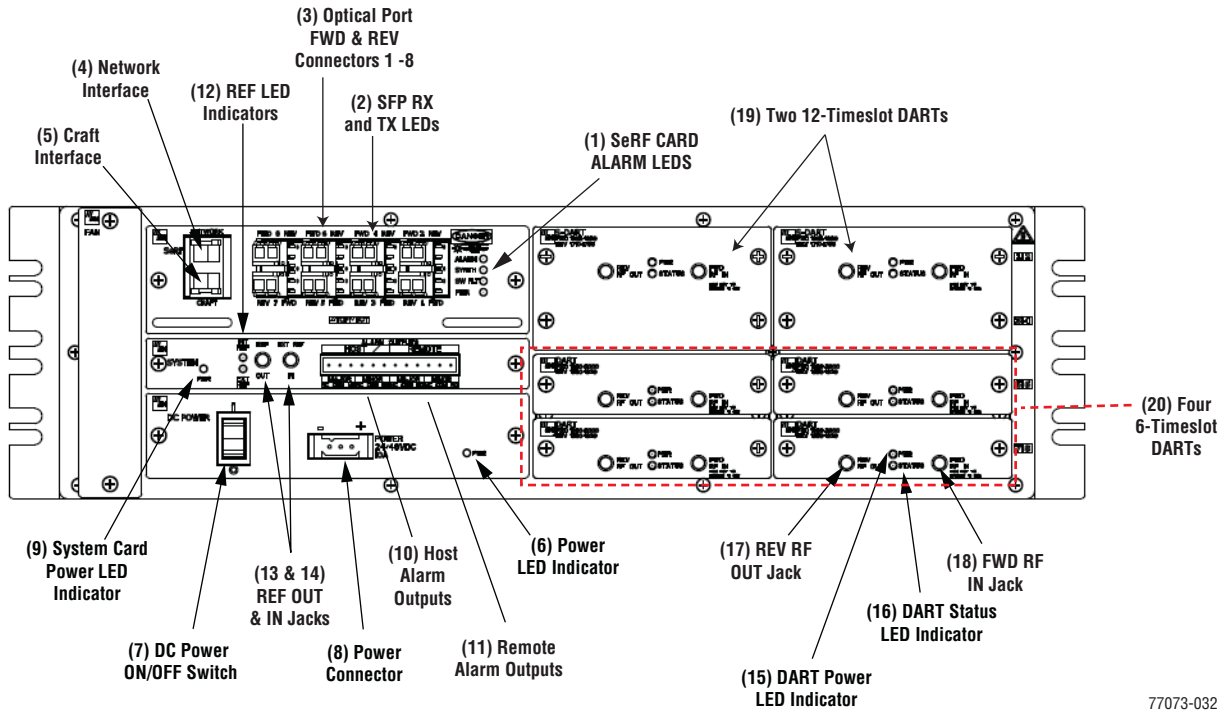
Figure 2-3. User Interface on Host Front Panel

Table 2-1. *Host User Interface*

Ref No	User Interface Designation	Device	Functional Description
		SeRF Card	
1	SeRF Card LEDs		
	ALARM	• ON	• Initial bootup sequence
		• OFF	• System operation normal
	SYNTH	• GREEN	• Locked
		• RED	• Unlocked
	SW FLT	• ON	• Initial bootup sequence
		• OFF	• Software operating OK
		• RED	• Software failed to start
	PWR	• GREEN	• Power OK and operating properly
		• RED	• Power supply out of tolerance
		• OFF	• No power present

Table 2-1. *Host User Interface (Cont.)*

Ref No	User Interface Designation	Device	Functional Description
2	SFP TX (LED)	• OFF • GREEN • RED	• **No Small Form-Factor Pluggable (SFP) present** • **SFP is present and the FPGA internal PLL is locked** • **SFP is present and the FPGA internal PLL is not locked**
	SFP RX (LED)	• OFF • GREEN • AMBER	• **No Small Form-Factor Pluggable (SFP) present** • **Receiver has locked and framed to the incoming signal** • **Receiver has locked to the incoming frequency, but there is no framing information on the fiber**
3	PORT 1–8	LC connector (single-mode)	**Input/output connection points for Ports 1 through 8 optical fibers. (FWD and REV)**
4	NETWORK	RJ-45 jack (female)	**Connection point for the NETWORK interface**
5	CRAFT	RJ-45 jack (female)	**Connection point for the CRAFT interface**
POWER SUPPLY			
6	PWR (LED)	• GREEN • RED	• **DC Power Supply OK** • **DC Power Supply Fault**
7	ON/OFF	On/Off rocker switch	**Provides Host power on/off control**
8	POWER 20–60 Vdc	Three position connector	**Connection point for the DC power wiring**
SYSTEM CARD			
9	PWR (LED)	• GREEN • RED	• **System Card Power Supply OK** • **System Card Power Supply Fault**
10	ALARM OUTPUTS HOST	Twelve position terminal block. Screw-type terminal connector (14–26 AWG)	**Connection points for a major and minor dry alarm contacts. Includes normally open (NO), normally closed (NC), and common (COM) wiring connections**
11	ALARM OUTPUTS REMOTE		
12	INT REF (LED)	• GREEN • OFF	• **Internal 10 MHz reference selected as the as Reference Clock.** • **Internal 10 MHz reference not selected.**
	EXT REF (LED)	• GREEN • OFF	• **External 10 MHz reference selected as the as Reference Clock.** • **External 10 MHz reference not selected**
13	REF OUT	QMA-Type female RF coaxial connector	**10 MHz reference clock output that may be used to synchronize between multiple host units.**
14	EXT REF IN	QMA-Type female RF coaxial connector	**10 MHz reference clock output that may be used to synchronize between multiple host units.**

Table 2-1. *Host User Interface (Cont.)*

Ref No	User Interface Designation	Device	Functional Description
DART CARD			
15	PWR (LED)	• GREEN • OFF	• Card is powered. • No power present at card.
16	STATUS (LED)	• GREEN • RED • YELLOW	• OK • Major Alarm • ALC activated
17	REV RF OUT	QMA-Type female RF coaxial connector	Output connection point for the primary reverse path RF coaxial cable
18	FWD RF IN	QMA-Type female RF coaxial connector	Input connection point for the forward path RF coaxial cable
19 & 20	Slots 1 - 8	• Classic DARTs • Single SuperDARTs • Dual SuperDARTs	• Classic DARTS and Single SuperDARTs can occupy Slots 1 - 8 (usually a 6-Timeslot DART) • Dual SuperDARTs can occupy Slots 1/3, 5/7, 2/4 or 6/8 (12-Timeslot DARTs)

2.2.2 Host Network Connection

The SeRF front panel has a Network port that creates a network connection between the Host and the network to monitor and configure the FlexWave Prism system through the FlexWave EMS.

The network interface connection between the Host and the network is supported by a Gigabit Ethernet (10/100/1000) RJ-45 jack with integrated green ACTIVITY and LINK LEDs. The Network port supports a maximum cable length of 100 meters (328 feet) to a switch or back-to-back nodes. CAT5 or better cable should be used when making this connection. The Ethernet connection should not be connected to an Ethernet circuit used outside the building.

For further information on using the Network port and the FlexWave EMS, see "System Setup and Management."

2.2.3 Host RF Signal Connections

The RF signal connections between the Host DART cards and the BTS are supported through two (FWD RF IN and REV RF OUT) QMA-Type female connectors. One connector is used for the forward path RF signal. The other connector is used for the reverse path RF signal. In some installations, it may be necessary to install a Conditioning Panel and/or Duplexing Panel (accessory items) to support the interface between the Host and the BTS. The Host should be as close as possible to the BTS to minimize cable losses.

2.2.4   Host System Card

The System Card contains the fan controller, the clocking circuitry (internal or external), the temperature sensor and the DCC contacts. Its front panel provides connections for alarm outputs, 10 MHz output, and status LEDs. This card may be used to provide a 10 MHz clock reference to which the SeRF's Master clock is frequency locked from the internal crystal oscillator. When the internal clock is not used the clock can be obtained from an external 10 MHz input.

2.3 PRISM REMOTE UNITS

The Remote, shown in Figure 2-4, controls RF emissions, interfaces with the FlexWave Host and performs the optical to electrical conversions for transport to the antennas. The Remote is an environmentally-sealed unit that houses the electronic assemblies such as the DART board and the Power Amplifier, and seals out dirt and moisture. The Prism uses fans located on the top of each unit to cool the chassis. The antenna cable connectors, fiber connectors, AC power connector, and the unit status indicator are located on the bottom of the unit.

Single-Band Remote

Dual-Band Remote

Tri-Band Remote

Quad-Band Remote

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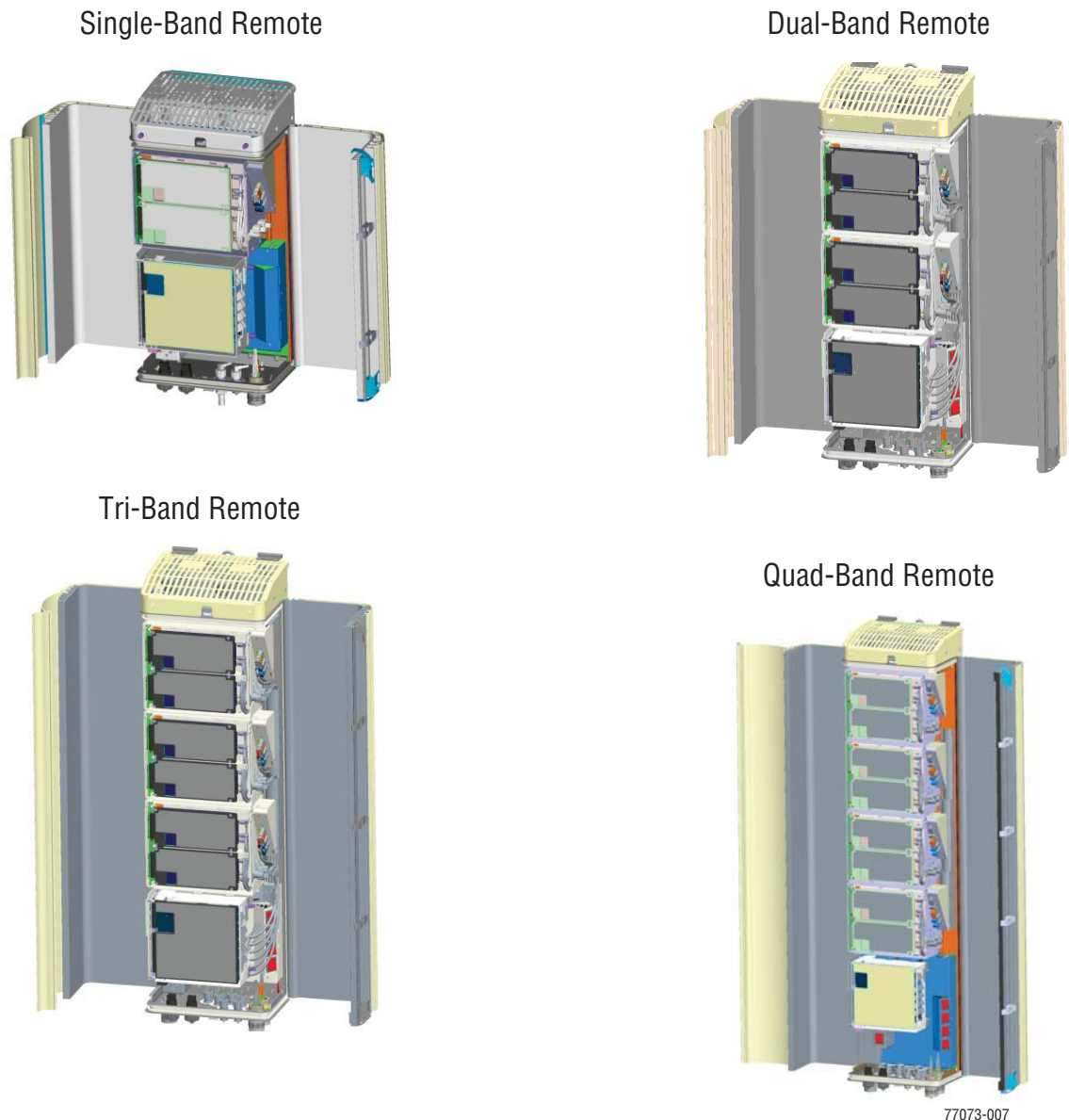
Figure 2-4. Prism Remote Units

The FlexWave Remote supports or provides the following basic functions:

- Receives on the forward path the digitized spectrum from the Host and converts the spectrum back into an RF signal to be distributed via an externally mounted antenna system. On the reverse path, the Remote digitizes the designated RF spectrum and digitally transports it over single mode fiber or Millimeter Wave (MMW) to the Host.

- Provides RF interface (antenna port) for the antennas.

- Accepts AC power input.

2.3.1　Handset Interface

The Remote interfaces with the handsets (cell phones) through an antenna. In the reverse path, the Remote receives RF signals from each handset (see Figure 1-3 on page 9). The Remote digitizes the RF signals and then converts them to digital optical signals for transport to the Host over the optical fiber link. In the forward path, the Remote receives digital optical signals from the Host. The Remote converts the optical signals to RF signals for transmission to the handsets.

2.3.2　Remote Components

Prism Remotes are shipped ready to accept easy to install RF Modules. The following sections describe the Remote components listed below and shown in Figure 2-5.

- RF Modules
- SeRF Module
- Remote SeRF interface board (RSI)
- DART cards
- Remote DART Interface (RDI) board
- Power supply boards
- Linear Power Amplifier (LPA)
- Duplexer with a Low Noise Amplifier (LNA)
- Solar shield
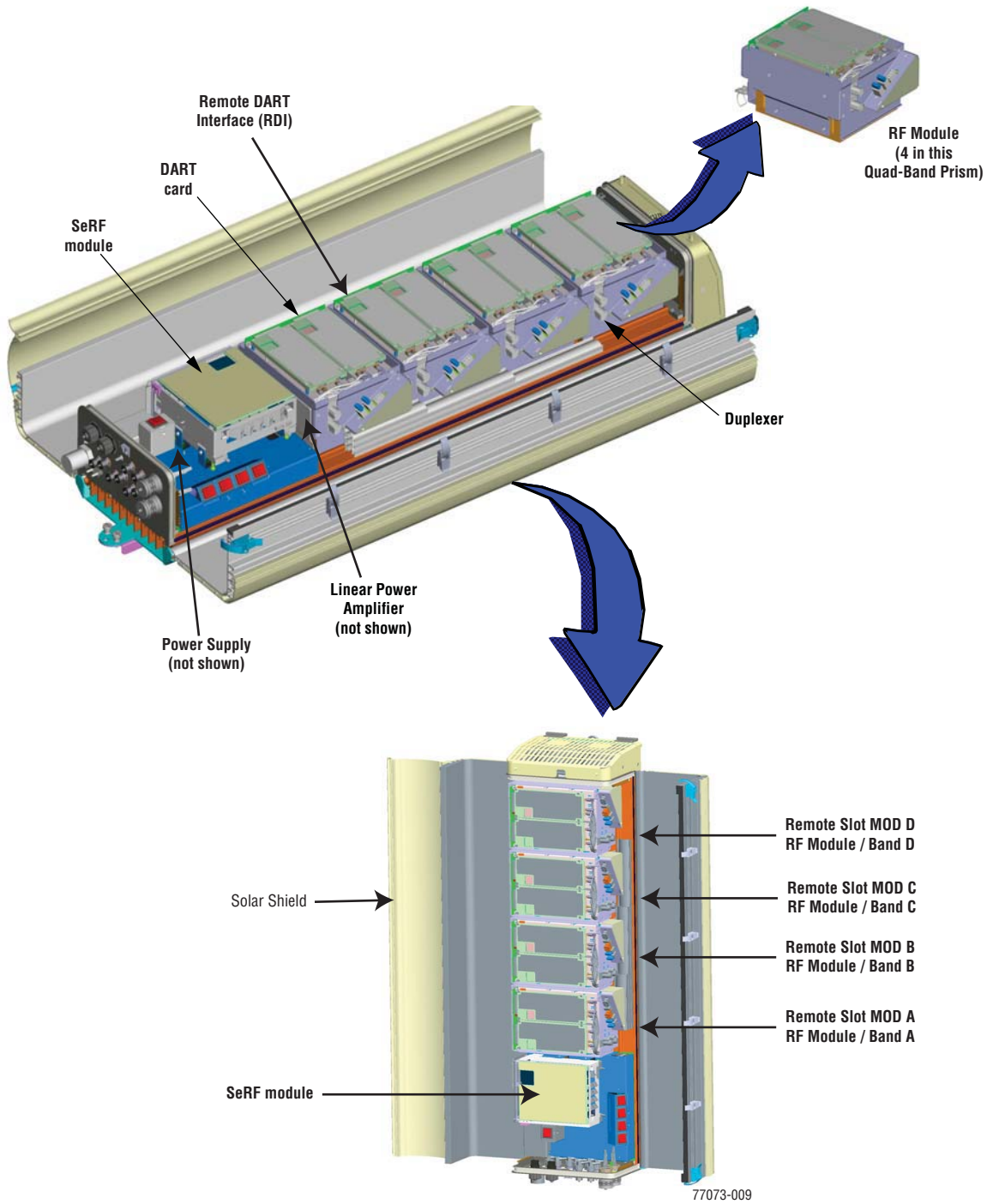
Figure 2-5. Prism Remote Components

2.3.2.1   Remote RF Modules

The Prism Remote comprises from 1 to 4 RF Module slots as shown in Figure 2-6.

Single-Band Remote
with 1 RF module slot

Dual-Band Remote
with 2 RF module slots

RF module slots

Tri-Band Remote
with 3 RF module slots

Quad-Band Remote
with 4 RF module slots

RF module slots

77073-019
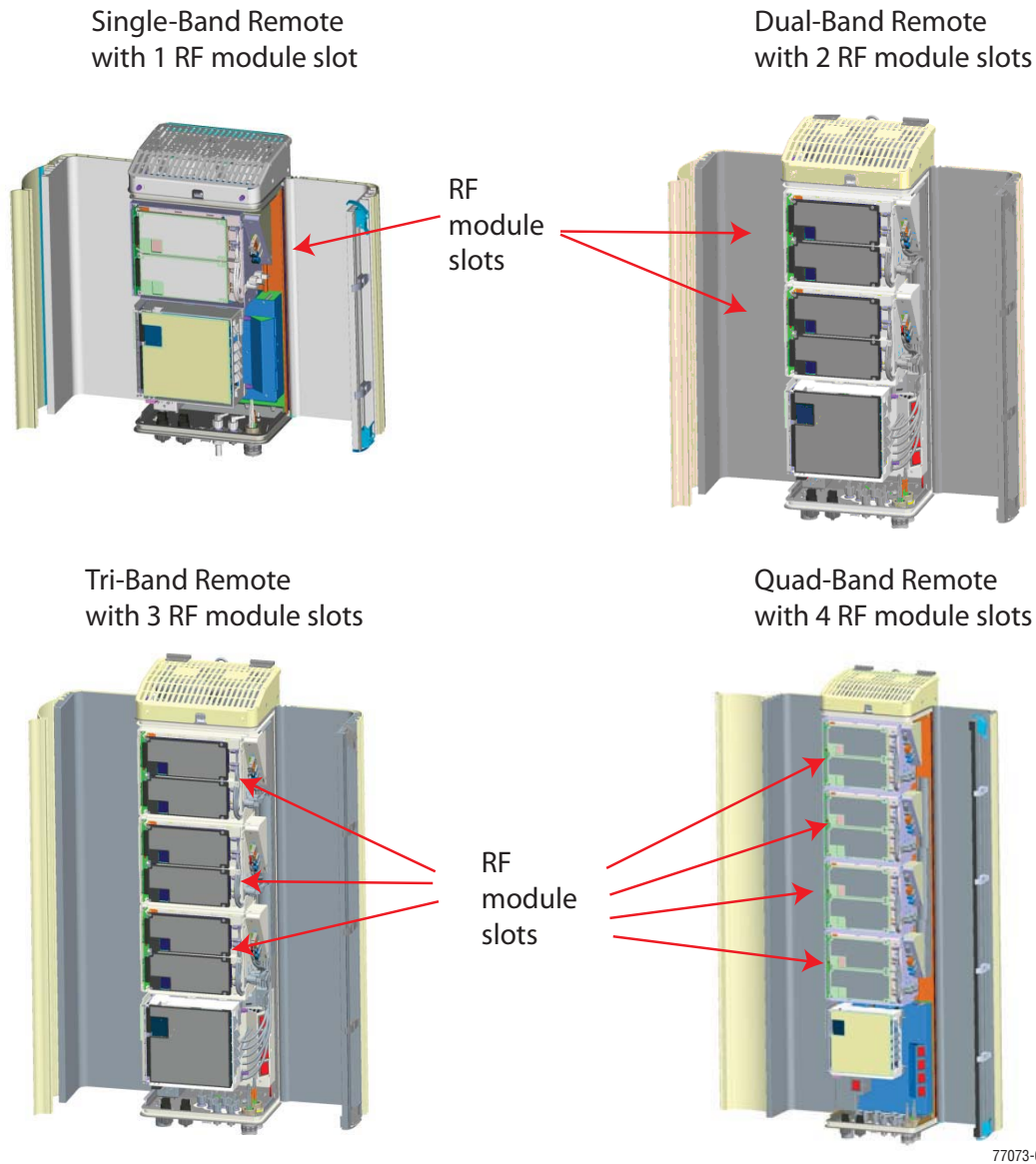
Figure 2-6. RF Modules in Prism Remotes

A Prism can support up to four RF Modules, dependent on the chassis size. Each RF Module can comprise any of the following DART combinations:

- one Classic DART or one Single SuperDART
- two Classic DARTs
- two Single SuperDARTs
- one Classic DART and one Single SuperDART
- one Dual SuperDART.

A Prism Remote can therefore comprise up to eight single-slot DARTS or up to four Dual SuperDARTs, dependent on the Remote chassis size.

The Remote RF Modules are not field serviceable. To replace a DART card, you have to replace the RF Module.
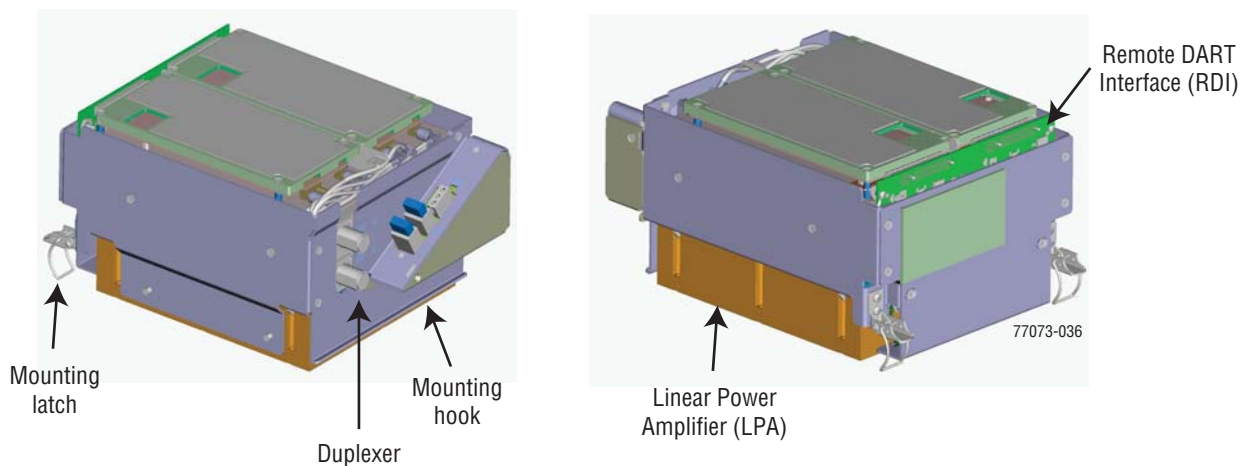
Figure 2-7. Remote RF Module

2.3.2.1.1 Remote Duplexer and Low Noise Amplifier

The Remote has an internal Duplexer that is optimized to provide the desired RF band-pass filtering and in-band equipment isolation between FWD and REV paths. The Duplexer contains up to two REV path Low Noise Amplifiers (LNA for PRI and/or SEC reverse paths). Each LNA (shown in Figure 2-8) is a high quality low noise amplifier providing the Prism reverse path with nominal 30dB REV gain and system NF of 5dB per RX path. The Duplexer and its LNA are housed in the RF Module, and are not field servicable.

Low Noise Amplifiers in Duplexer
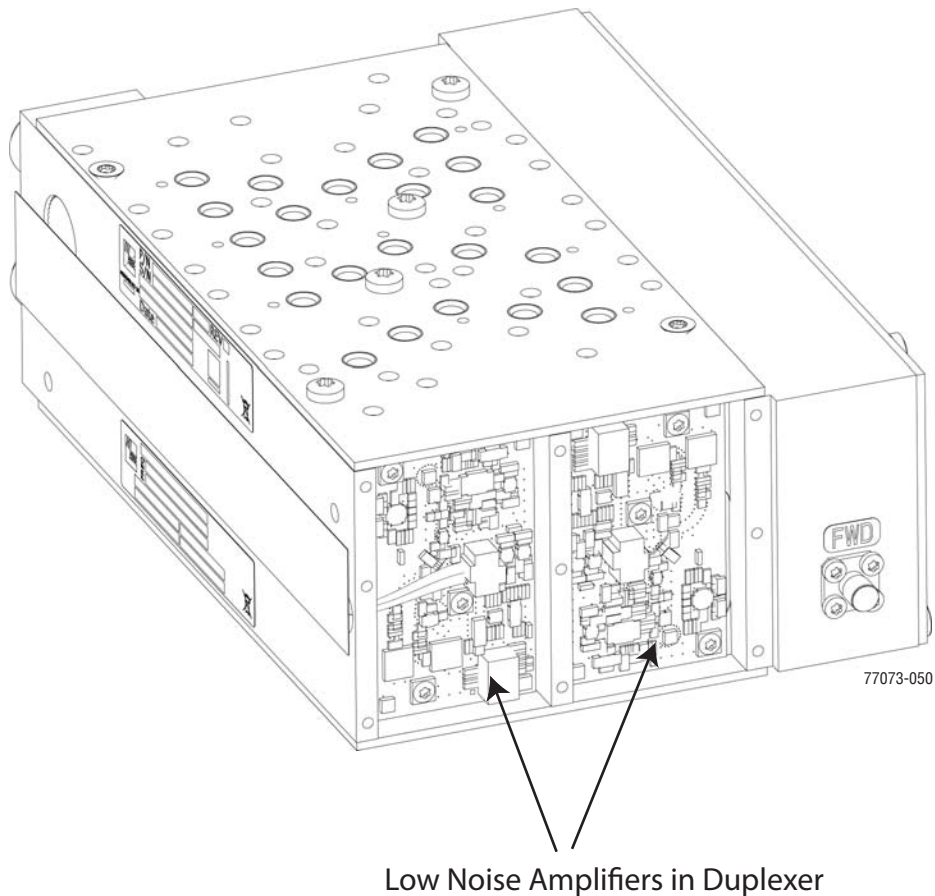
Figure 2-8. Remote Duplexer with Low Noise Amplifiers

2.3.2.1.2   Linear Power Amplifiers

Figure 2-9 shows a Prism Linear Power Amplifier (LPA), which is a high quality broadband RF amplifier used for achieving Prism product rated power for the Remote Tx forward path spectrum RF.

75347-0006
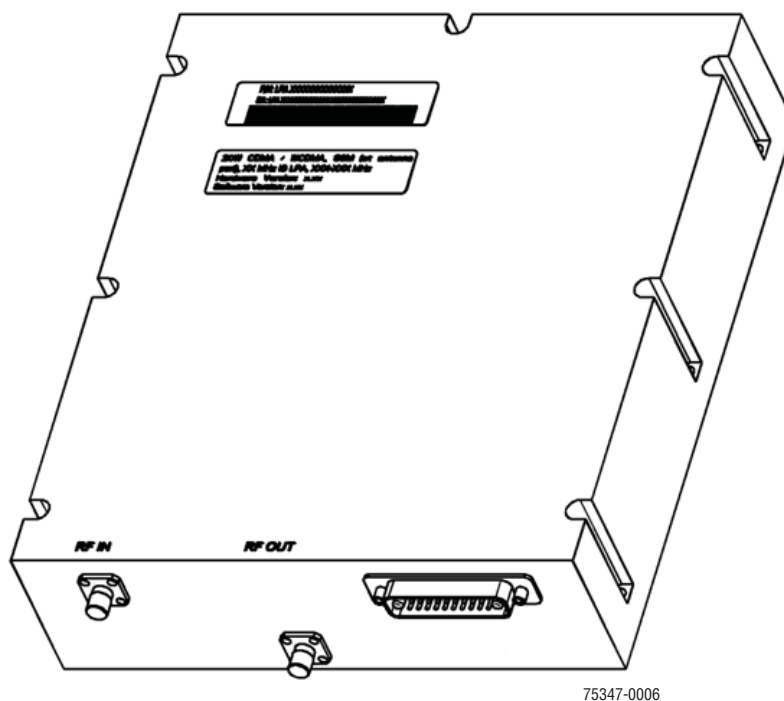
Figure 2-9. Linear Power Amplifier

The FlexWave Prism Remote 40W RF Module is designed for AWS and PCS frequencies. The Prism Remote 40W RF Module comprises one DART, two Linear Power Amplifiers (LPAs), and one or two Remote DART Interface (RDI) boards (two for a diversity module and one for a non-diversity module).

The LPAs are pass-band specific, with the maximum composite Tx power levels, and ≥10dB instantaneous peak power rating listed in Table 2-2.

Table 2-2.   *LPA Maximum Composite Tx Power Levels*

Passband*	Maximum dBm (WATT)	Instantaneous Bandwidth
AWS	+43dBm (20W)	45 MHz
AWS 2100 Dual-LPA	+43dBm (20W)	45 MHz
Cellular	+43dBm (20W)	25 MHz
EGSM 900	+40 dBm (10W)	39 MHz
GSM 1800/DCS	+41 dBm (12.6W)	75 MHz
PCS	+43dBm (20W)	70 MHz
PCS 1900 Dual-LPA	+43dBm (20W)	70 MHz

Table 2-2. *LPA Maximum Composite Tx Power Levels*

Passband*	Maximum dBm (WATT)	Instantaneous Bandwidth
SMR 800/900	+38dBm (6.5W)	18 MHz SMR800, 5 MHz SMR900
UMTS	+42 dBm (15.8W)	60 MHz
* LPAs of the same passband can be combined to double the output power or +3dBm.		

The LPA is housed within the Duplexer, and is not field serviceable.

2.3.2.2   Remote SeRF Modules

The SeRF Module houses the SeRF board that supports:

- eight SFP Fiber interfaces that run the SeRF protocol
- eight DART Board interfaces
- one crossbar multiplexer that splits, sums, and routes combinations of up to eight DART links to a maximum of eight identical SeRF links
- 10/100 Mbps ENET over fiber (up to 8 fibers)
- hardware control of Remote under direction from the managing Host
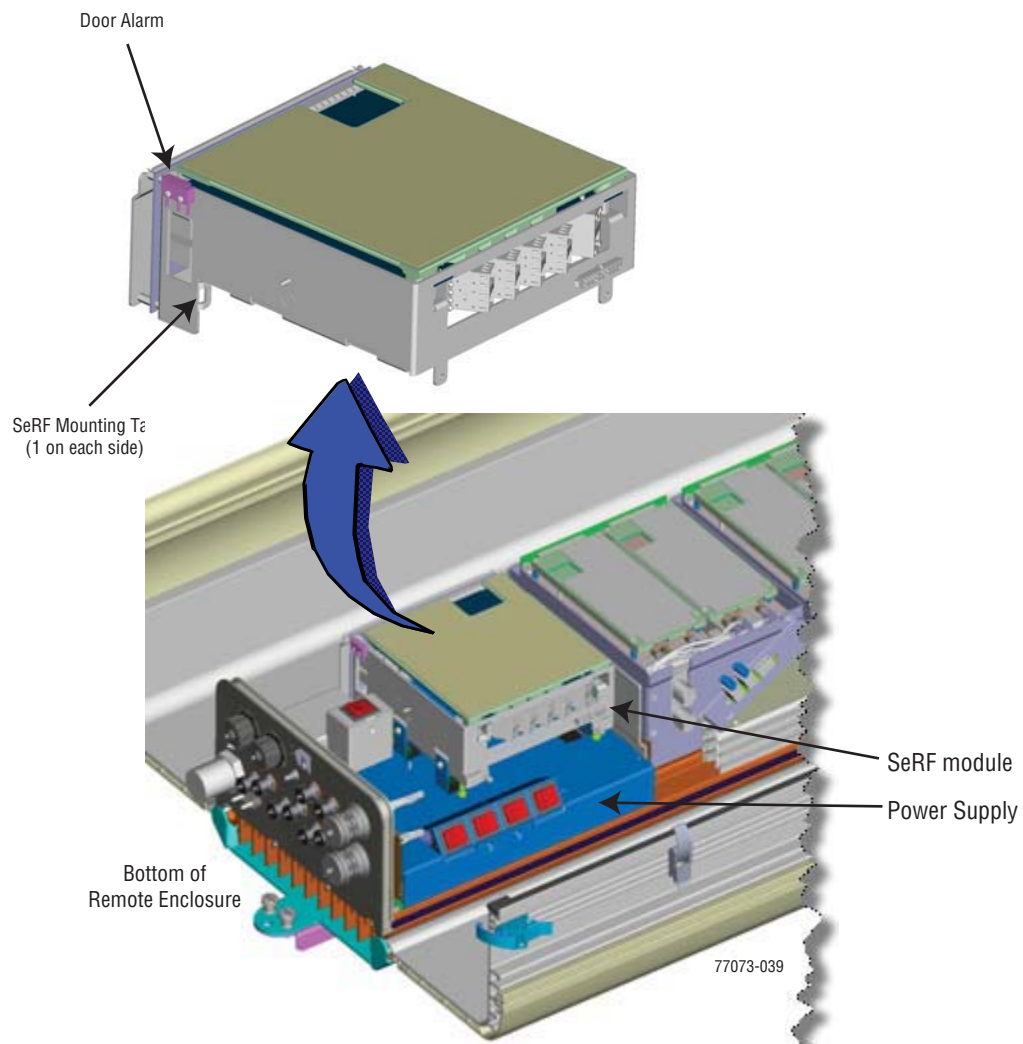
Figure 2-10. Remote SeRF Module

2.3.2.3 Remote Power Supply and Cable Assembly

The Remote is powered by 100 to 240 VAC (nominal 120 or 240 VAC), 50 to 60 Hz power. The AC power is supplied through a 15-foot (4.6m) three-wire power cable that is provided with the unit. The power cable connects to a 3-pin AC power connector mounted on the bottom of the Remote.

The stub end of the power cable must be routed to an external junction box (not provided) for connection to the AC power source. A circuit breaker rated at 20 Amps (120 VAC) should be used to provide over-current protection for the Prism power circuit. It is also recommended that an external AC outlet (not provided) be installed near the Remote to power test equipment and tools.

The Remote model determines the number of power supplies.

- The Single-Band Remote is powered by one power supply.

- The Dual-Band Remote is powered by two power supplies.

- The Tri- and Quad-Band Remotes are powered by three power supplies.

There are up to four switches that independently control DC power for each RF Module. These switches are labeled MOD A, MOD B, MOD C, and MOD D and correspond to the RF Module shelves, from bottom to top, that are labeled the same.
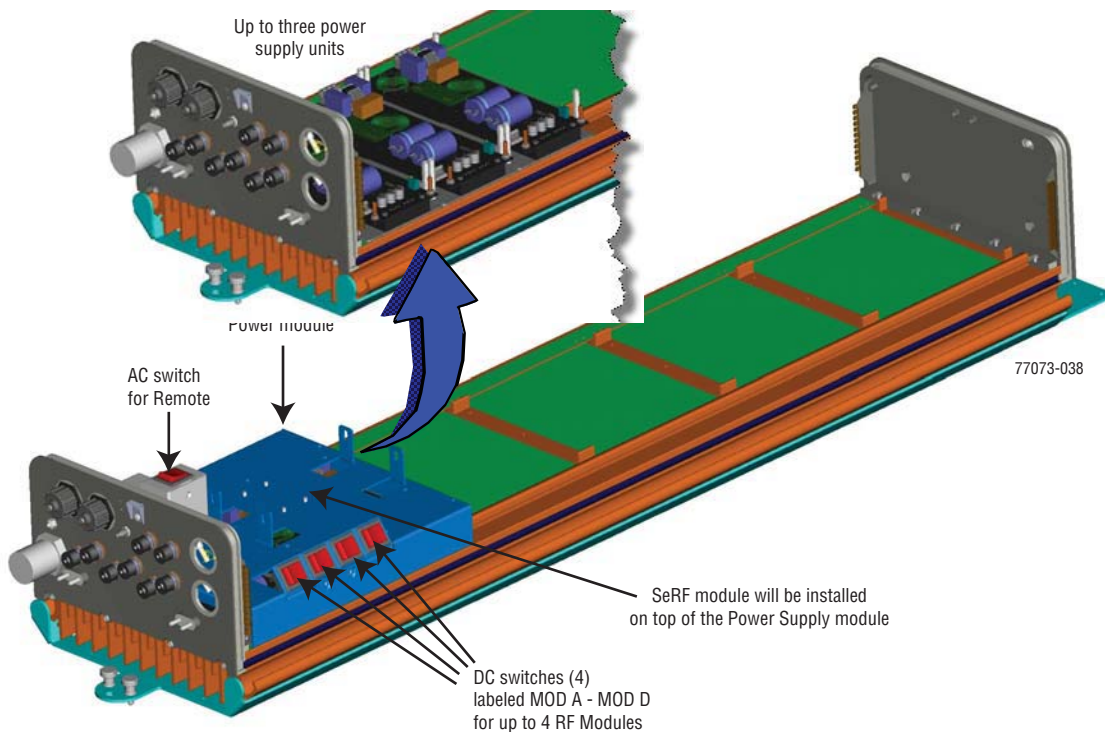
Figure 2-11. Remote Power Supply

For further information on calculating required power, see "Power Consumption" on page 129.

2.3.2.4 Solar Shield

The Prism solar shields are required to conduct air over the outside of the Prism. The Prism ships with the solar shield factory installed.

Quad-Band Remotes

Solar Shield is closed

Solar Shield is open,
Remote door is closed

Solar Shield and Remote door are open

77073-024
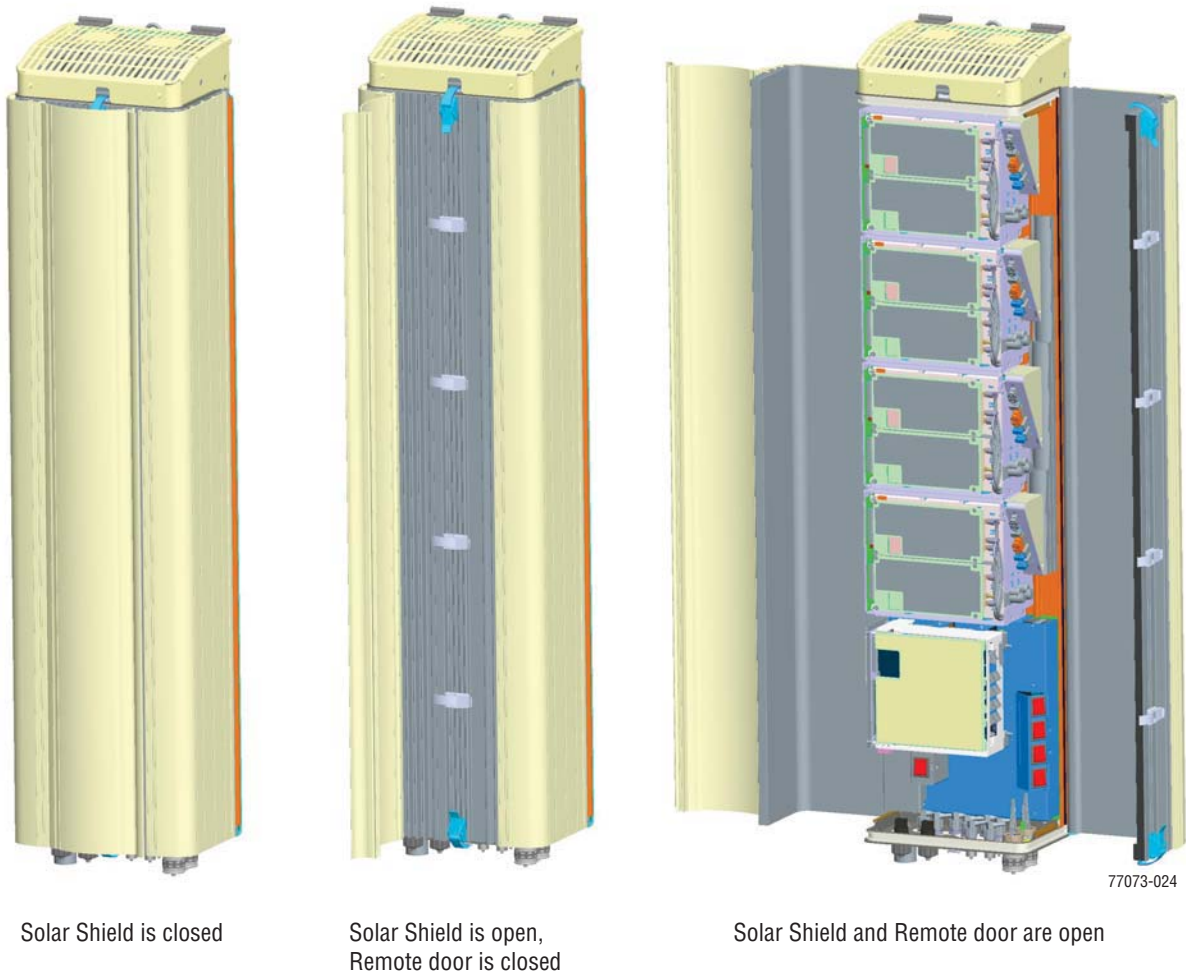
Figure 2-12. Solar Shield

2.3.2.5   Mounting Bracket (Remotes)

The Prism is designed to be pole or wall mounted or mounted on a flat surface.

Retracting-Lifting
Eye

Wall-Attachment
points (2)

Four pairs of
Mounting Hooks

77077-007
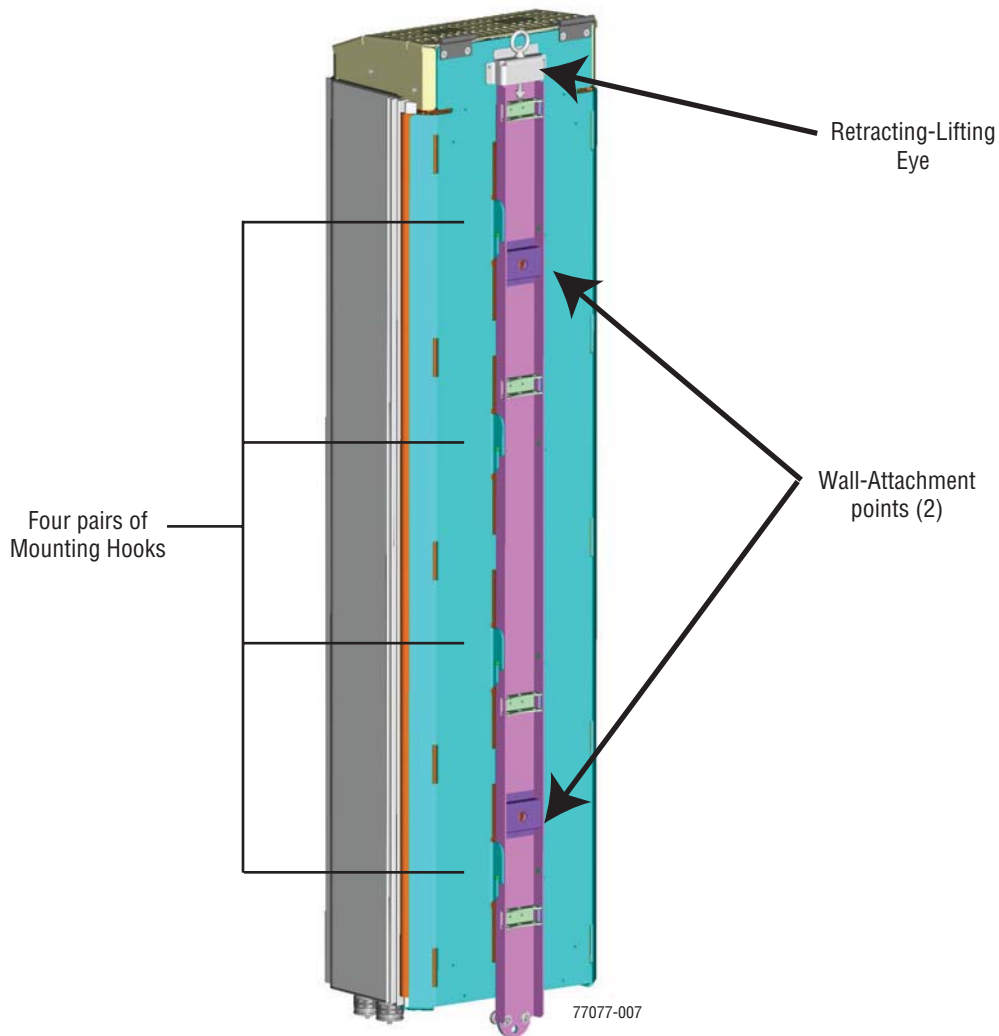
Figure 2-13. Prism Back View—Mounting Components

2.3.2.6   Remote Connectors

The bottom of the Remote comprises the RF, fiber and RJ-45 connectors as well as a Status LED as indicated in Figure 2-14 and described in Table 2-3.
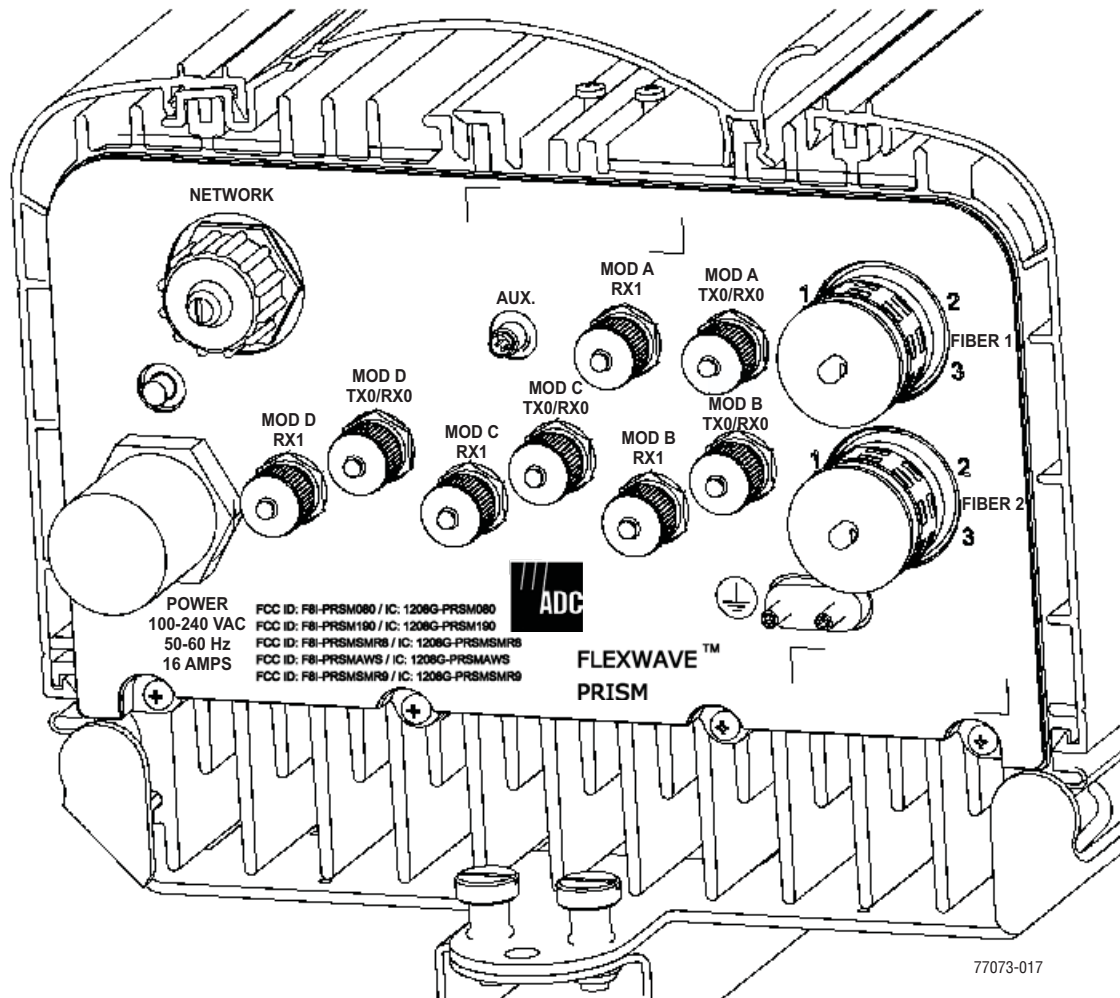
Figure 2-14. FlexWave Prism Remote Unit User Interface

Table 2-3. *FlexWave Prism Remote Unit User Interface*

User Interface Designation	Device	Functional Description
FIBER 1	BX5 Duplex Female single-mode angled UPC fiber (>50 dB return loss [1])	Two fiber pairs which can support up to 140 MHz of duplexed RF spectrum.
FIBER 2	BX5 Duplex Female single-mode angled UPC fiber (>50 dB return loss [1])	Two additional fiber pairs which can be used to get to the maximum of 280 MHz of RF spectrum.
Mod A TX0/RX0 [2]	N-Type 50-Ohm female RF coaxial connector	RF Module A connection point for transmit RF power and primary receive to/from the antenna.
Mod A RX1	N-Type 50-Ohm female RF coaxial connector	RF Module A connection point for diversity receive for RF power from the antenna.
Mod B TX0/RX0	N-Type 50-Ohm female RF coaxial connector	RF Module B connection point for transmit RF power and primary receive to/from the antenna.
Mod B RX1	N-Type 50-Ohm female RF coaxial connector	RF Module B connection point for diversity receive for RF power from the antenna.
Mod C TX0/RX0	N-Type 50-Ohm female RF coaxial connector	RF Module C connection point for transmit RF power and primary receive to/from the antenna.
Mod C RX1	N-Type 50-Ohm female RF coaxial connector	RF Module C connection point for diversity receive for RF power from the antenna.
Mod D TX0/RX0	N-Type 50-Ohm female RF coaxial connector	RF Module D connection point for transmit RF power and primary receive to/from the antenna.
Mod D RX1	N-Type 50-Ohm female RF coaxial connector	RF Module D connection point for diversity receive for RF power from the antenna.
Network	Sealed RJ-45 female connector	Connection point for communication with the entire connected network: Host, Remote, and ENET connected devices at the Remote.
Status LED	Red LED	At startup, the Status LED is ON (solid red) prior to being controlled by the SeRF processor. Otherwise, when the Remote is in service, the Status LED is OFF.
100/240 VAC 50–60 HZ 16 Amps (Quad-Band) 13 Amps (Tri-Band) 10 Amps (Dual-Band) 6 Amps (Single-Band)	Sealed 3-wire AC power connector	Connection point for the AC power cord.
⏚	Supplied ground lug	Connection point for grounding unit.

[1]   ADC connector specification

[2]   Mod A/RF Module A is the bottommost Module in a Remote and Mod D/RF Module D is the topmost module in a Quad-Band Remote.

Prism Remote Units

2.3.2.7 Remote Fiber Connector Cable Assembly

A fiber connector cable assembly is provided with 10 meters of environmentally hardened cable and 1 meter of exposed, un-terminated single-mode 900μm optical fiber sufficient for splicing in an OSP splice tray.

The pigtail is a reduced bending radius type fiber. Therefore not all fusion splicers will work to splice it. Do not use a splicer that uses light to align the cores.

30M, 40M, 60M, 80M, 100M and 150M fiber connector cable assemblies are also available from ADC.

2.3.2.8 Remote Antenna Cable Connections

The TX0/RX0 antenna cable connections are through 50-ohm N-type female connectors. The Remote includes an internal Duplexer which allows a single antenna cable to carry both forward and reverse path RF signals between the antenna and the Remote. The RX1 diversity antenna cable connections are through 50-ohm N-type female connectors.

2.3.2.9 Remote Grounding

A double-ground stud and ring lug is supplied with the unit. A #6 copper wire terminated with the provided ring terminal must be provided to link the Remote to an earth ground source.

For proper and safe equipment operation, an approved earth ground connection must be provided. The recommended minimum wire size is #6 AWG copper wire.

2.3.2.10 Remote Cooling

The electronic compartment of the Prism is sealed to the environment. Prism conducts its heat to a rear heat sink and the front doors. Two external environmentally hardened fans are controlled and monitored by the system. When turned on, these fans pull air over the external surfaces of the enclosure to ensure the electronics run within their rated temperature. The fans run at three different speeds depending on the internal temperature of the system. An alarm is generated if a high temperature condition occurs within the enclosure.

The maximum ambient operating temp is 50℃ (122℉).

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2.4   PRISM SYSTEM ACCESSORIES

This section provides a brief description of various accessory items that are available separately. The accessory items may or may not be required depending on the application.

2.4.1   Lightning Surge Suppressor (Remote Accessory)

An externally-mounted lightning surge suppressor is available separately as an accessory for the Remote. To reduce the chance of damage to electronic components should a lightning strike occur, install a lightning surge suppressor at each antenna port that connects to an outdoor antenna. The surge/antenna connector on the lightning suppressor is an N-type female connector. The Prism Remote Unit must be properly grounded for the lighting surge suppressor to function properly.

2.4.2   Uninterruptible Power Supply (Accessory)

Any power interruption without an external Uninterruptible Power Supply (UPS) system will potentially result in an RF power outage. If a UPS is required it should be designed into the site plan during the engineering process.

2.4.3   Wavelength Division Multiplexer System (Accessory)

In some applications, it may be desirable or necessary to combine the forward path and reverse path optical signals from a single Host/Remote pair onto a single optical fiber. This can be accomplished by using a passive bi-directional Wavelength Division Multiplexer (WDM) system. The optical wavelengths used in the Prism system are 1550 nm for the forward path and 1310 nm for the reverse path. Because different wavelengths are used for the forward and reverse paths, both signals can be combined on a single optical fiber. A WDM application is shown in Figure 2-15.
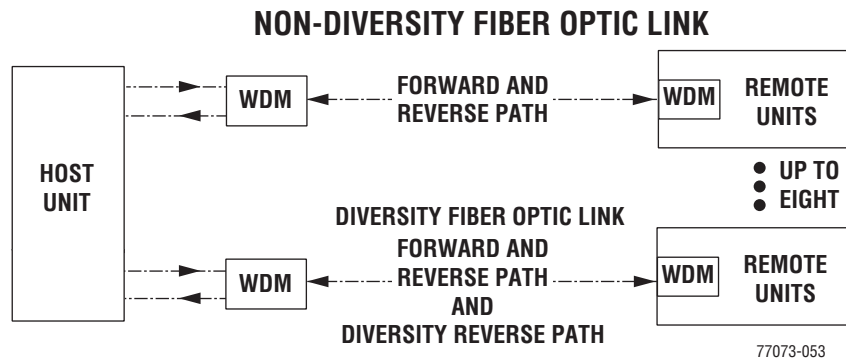
Figure 2-15. Wavelength Division Multiplexer Application

The WDM Host module mounting shelf and Host module are shown in Figure 2-16. The WDM module is shown in Figure 2-17. WDMs at the Remote are in the fiber patch cord and placed in the enclosure.

77073-054
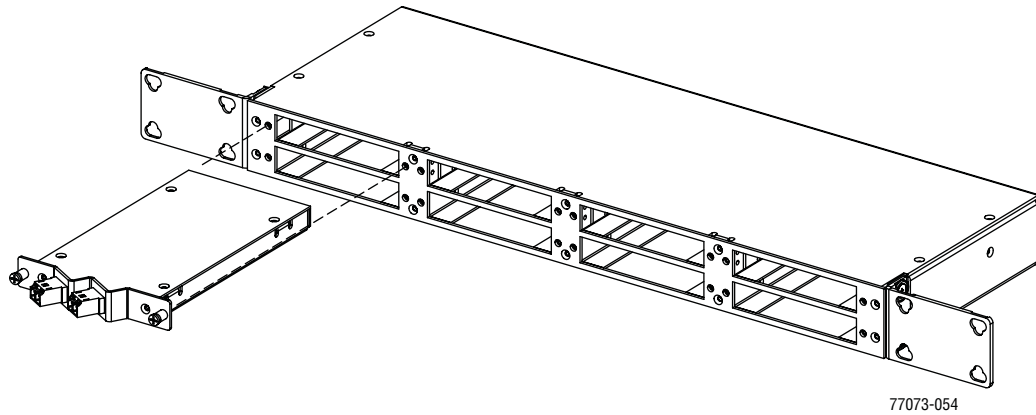
Figure 2-16. WDM Host Module and Host Module Mounting Shelf

77073-055
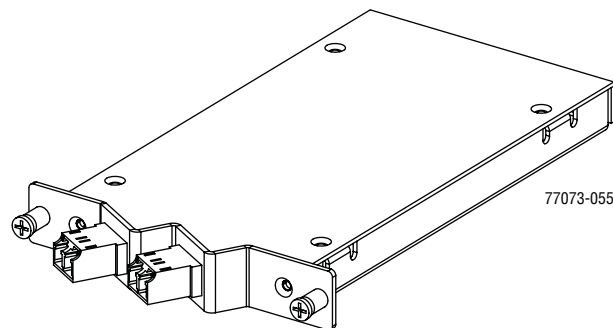
Figure 2-17. Host Unit WDM Module

2.4.4 Course Wavelength Division Multiplexer System (Accessory)

Prism Coarse Wavelength Division Multiplexer (CWDM) systems are pre-configured with the correct wavelength SFPs installed as well as the correct wavelength OADM module. SFPs installed in the Host provides the following optical wavelengths:

- 1470 nm   · 1550 nm
- 1490 nm   · 1570 nm
- 1510 nm   · 1590 nm
- 1530 nm   · 1610 nm

The Host is connected to a CWDM chassis that contains the CWDM Mux/DeMux Units that multiplex the wavelengths from the transceivers onto a single fiber in the Forward path and de-multiplexes the wavelengths from the Remotes into their respective wavelengths. The Remote within a CWDM system requires an internal Prism CWDM Fiber Cable Assembly. Figure 2-18 on Page 52 shows the CWDM Mux/DeMux unit and Figure 2-19 shows the CWDM Fiber Cable Assembly. For further information on the Prism CWDM system, see the *ADC FlexWave™ Prism Coarse Wavelength Division Multiplexer User Manual* (ADCP-75-353).
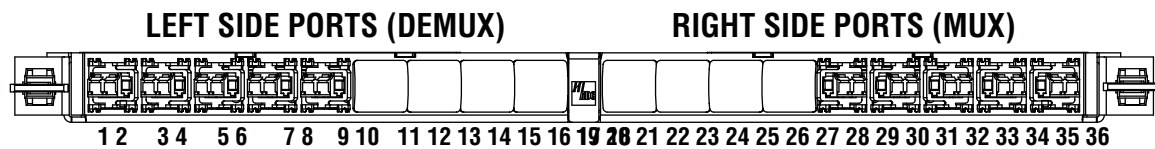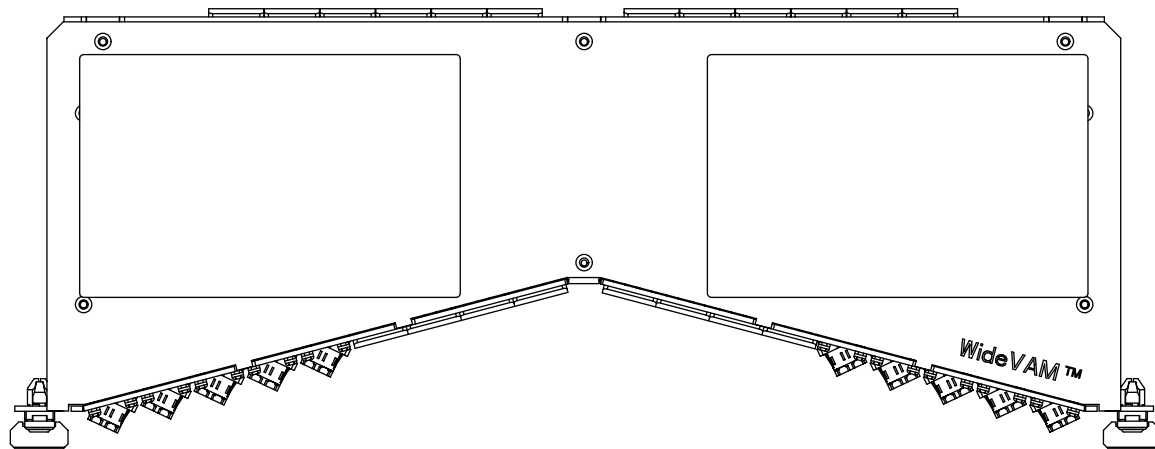
DEMUX PORTS (FRONT, LEFT SIDE OF CWDM MUX/DEMUX UNIT)

CWDM	COM	NOT USED	1611	1591	1571	1551	1531	1511	1491	1471	NOT USED	NOT USED	NOT USED	NOT USED
PORTS	1	2	3	4	5	6	7	8	9	10	11 12	13 14	15 16	17 18

MUX PORTS (FRONT, RIGHT SIDE OF CWDM MUX/DEMUX UNIT)

NOT USED	NOT USED	NOT USED	NOT USED	1471	1491	1511	1531	1551	1571	1591	1611	NOT USED	COM	CWDM
19 20	21 22	23 24	25 26	27	28	29	30	31	32	33	34	35	36	PORTS

77073-056

Figure 2-18. Prism Multiplexer/DeMultiplexer

OUT FROM OADM 2, REV PRIM
OUT FROM OADM 1, REV SEC
FWD (DROP FROM OADM 1 & 2)
REV (ADD FROM OADM 1 & 2)
IN FROM OADM 2, FWD SEC
IN FROM OADM 1, FWD PRIM

77073-057
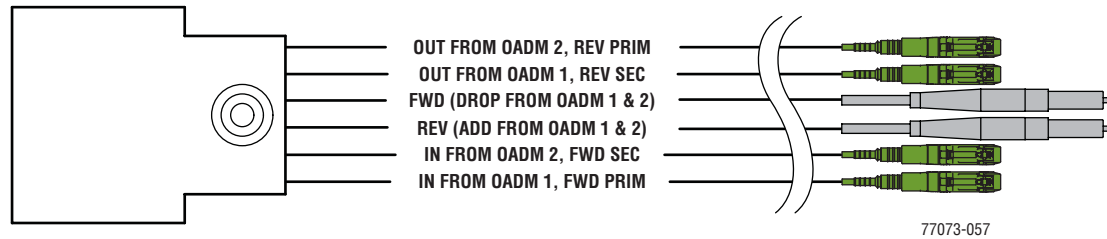
Figure 2-19. CWDM Fiber Cable Assembly

The Prism CWDM system works with ADC's 7- and 3.5-inch industry-standard WideVAM chassis to ensure consistent, superior cable management within the frame.

The 3.5-inch standard VAM chassis fits into any 19-inch rack mounting environment. It accommodates a maximum of 4 plug-in modules, 4 bulkhead plates, 4 blank panels or any combination thereof. Adjustable mounting brackets are provided for 23-inch rack mounting environments.

77073-051
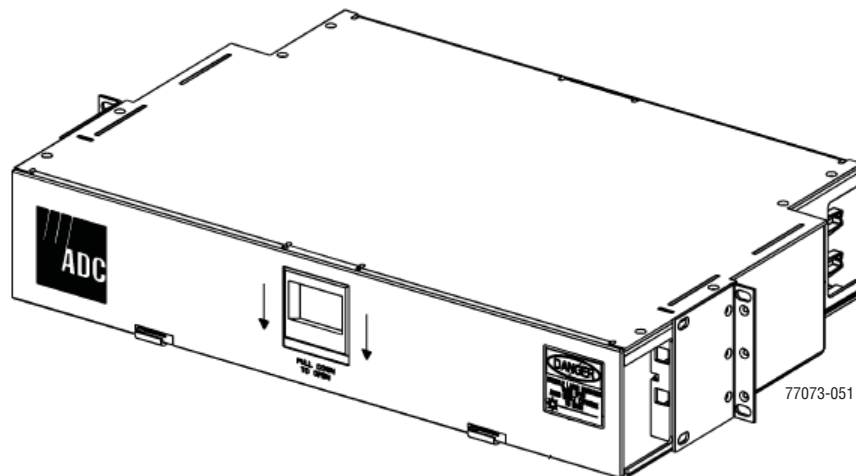
Figure 2-20. 3.5-Inch Standard VAM Chassis (FVM-19x350-M6)

The 7-inch standard VAM chassis fits into any open chassis location within an existing ADC 7-inch panel system or in an LGX® compatible frame. It accommodates a maximum of six components, in any combination of the following:

- single plug-in modules
- bulkhead plates
- blank panels.

The 7-inch chassis mounts in EIA or WECO racks. Adjustable mounting brackets are provided for 19- or 23-inch rack mounting environments.

77073-052
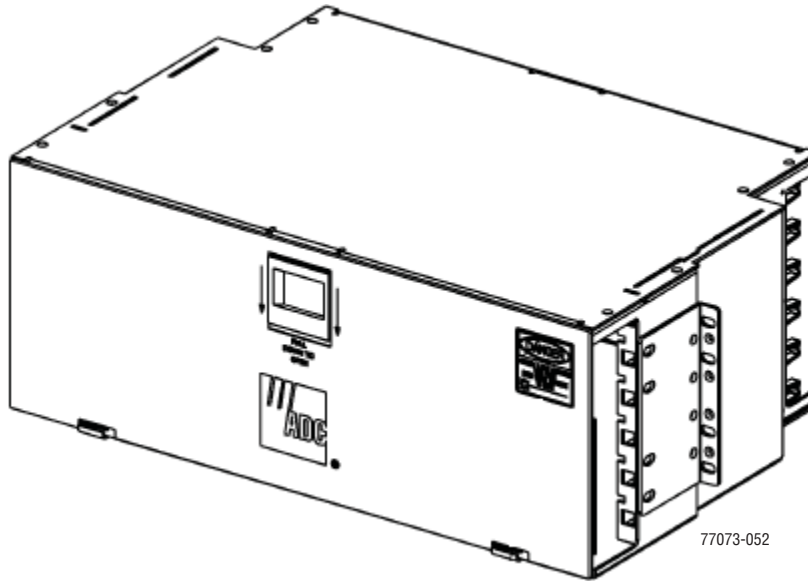
Figure 2-21. 7-inch Standard VAM Chassis (FVM-19X700W)

2.4.5   Millimeter Wave Systems (Accessory)

A Millimeter Wave (MMW) system with a data rate of not less than 3 Gbps (that meets the FlexWave Prism data rate performance and BER requirements) may be used in applications where it is desirable or necessary to bridge an open span and where it is impractical to lay a fiber optic cable. One MMW transceiver unit may be mounted on the Host side of the open span and the other MMW transceiver unit may be mounted on the Remote side of the open span. A system diagram of an MMW application is shown in Figure 2-22. MMW systems are available from various equipment manufacturers.

FLEXWAVE MILLIMETER WAVE
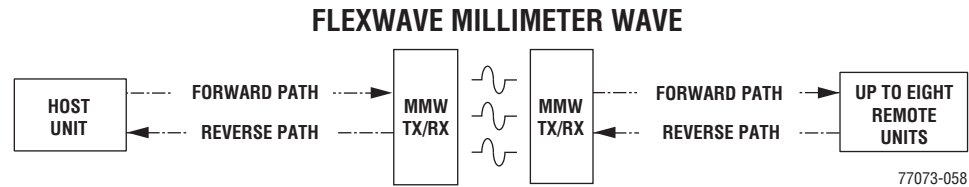
Figure 2-22. FlexWave Millimeter Wave Application

A mmw link (3GBps) is required for 12 timeslots worth of RF traffic between the Host and the Remote. This is roughly 60 - 75MHz depending on the modulation. If a Remote has more bandwidth requirements (such as 210MHz of RF), there would need to be 3 point-to-point mmw links.

2.5 PRISM SYSTEM SPECIFICATIONS

2.5.1 Host Unit Specifications

Parameter	Specification	Remarks
Dimensions (H×W×D)	5.17 × 17.26 × 9.5 inches (131.3 × 438.4 × 241.3 mm)	Dimension for width does not include the mounting brackets which can be installed for either 19- or 23-inch racks.
Mounting	19- or 23-inch rack	EIA or WECO
Weight	20 lbs. (9.1 kg)	
Weather resistance	Indoor installation only	Environmentally controlled outdoor cabinet.
Operating temperature	0º to 55º C (32º to 131º F)	
Storage temperature	–40º to 70º C (–40º to 158ºF)	
Humidity	10% to 90%	No condensation
Optical ports	SFP transceivers	LC (UPC)

Optical power levels	Launch power
	    Minimum: -2 dBm
	    Maximum: 3 dBm
	Receive power
	    Minimum: -27 dBm
	    Maximum: -9 dBm	

Transceivers	Wavelengths: • Host transmits a 1550 nm signal • Remote transmits a 1310 nm signal • Host and Remote can receive either a 1550 or 1310 nm signal	For information on transceiver transmissions with a CWDM, see the *ADC FlexWave Prism Coarse Wavelength Division Multiplexer User Manual* (ADCP-75-353).
External alarm connector	Screw-type terminals	NO, COM, and NC relay contacts
DC Power	±20 – ±60 Vdc	
Power consumption	Maximum: 320 Watts Nominal: 202 Watts	
Current rating	4.2 Amps 8.4 Amps	At –48Vdc At +24Vdc
RF coaxial cable connectors	50 ohm QMA – type (female)	50 ohms input/output impedance
Network and Craft connectors	RJ–45 jack	
Reliability at 25ºC	MTBF 200,000 hours	Including fans

2.5.2   Remote Unit Specifications

Parameter	Specification	Remarks
Enclosure dimensions (H×W×D)		
Single-Band	23.1" x 12.15" x 10.125" (58.67 cm x 30.86 cm x 25.71 cm)	
Dual-Band	31.1" x 12.15" x 10.125" (78.99 cm x 30.86 cm x 25.71 cm)	
Tri-Band	39.1" x 12.15" x 10.125" (99.31 cm x 30.86 cm x 25.71 cm)	
Quad-Band	50.2" x 12.15" x 10.125" (127.51 cm x 30.86 cm x 25.71 cm)	
Mounting	Wall, Pole, Inside Pole, and Vault	
Weight (with solar shields installed)		
Single-Band	64 lbs. (29 kg)	
Dual-Band	96 lbs. (43 kg)	
Tri-Band	127 lbs. (58 kg)	
Quad-Band	163 lbs. (74 kg)	
Outside Ambient		
Temperature Rating	-40˚ C to +50˚ C (-40º F to +122º F)	
Storage Temperature	-40˚ C to +70˚ C (-40º F to +158º F)	
Humidity	10% to 90% non-condensing	
Lightning Protection	20kA IEC 1000-45 8/30 ìs Waveform	Provided by external lightning protector (accessory)
Weather Resistance	IP-65	Indoor or outdoor installation
Cooling	Fan, IP-55	
Connectors		
Network port	RJ-45 female connector	
AC power connector	Sealed 3-pin	Connection point for the AC power cord
Antenna cable connector	50 ohm N-Type (female)	50 ohms input/output impedance
Voltage input	100 to 240 VAC, 50 to 60 Hz	Operating range 90 to 265 VAC
Current rating	15 AMPS	

2.5.3 System Nominal Optical Specifications

Parameter	Specification [a]	Remarks
Optical - Host and Remote Unit **Fiber type**	**9/125, single-mode**	

Number of fibers required
    Non-diversity with WDM
    Diversity with WDM
    Non-diversity without WDM
    Diversity without WDM
	1
	1
	2
	2
		Assumes RF bandwidth does not exceed 3 Gbps data rate capacity of the fiber.

Forward path wavelength	1550 nm	
Reverse path wavelength	1310 nm	
Diversity path wavelength	1310 nm	

Optical power levels	**Launch power**
	    Minimum: -2 dBm
	    Maximum: 3 dBm
	Receive power
	    Minimum: -27 dBm
	    Maximum: -9 dBm	

Optical budget	25 dB	**For optical BER of 10^{-6}**
Optical connectors	**Industry standard LC**	**Host and WDM**
Optical - Host and Remote WDM		
WDM Passband	1310 nm ± 20 nm 1550 nm ± 20 nm	

Forward path insertion loss
    Host WDM
    Remote WDM
	0.7 dB
	0.3 dB
		Does not include connector loss

Reverse path insertion loss
    Host WDM
    Remote WDM
	0.3 dB
	0.7 dB
		Does not include connector loss

Isolation	**> 30 dB minimum**	
Return loss (Reflectance)	**< –50 dB**	**All input ports**
[a] **All specifications apply after a five minute warm-up period.**		

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PART II

HOST AND REMOTE INSTALLATION

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3

INSTALLING THE HOST UNIT

This section provides the installation procedures for the Host and the WDM Host module (accessory item). Installation of the Remote components may proceed separately from installation of the Host.

3.1   BEFORE STARTING INSTALLATION

Do the following before you begin installation.

- Review the system design plan.
- Identify the equipment installation site.
- Make sure all cable runs are mapped out.
- Identify and obtain all tools and materials required to complete the installation.

3.2   TOOLS AND MATERIALS

The following tools are required to complete the procedures in this section:

- 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
- Multimeter
- Optical power meter
- Fiber cleaning equipment

The following materials are required to complete the procedures in this section:

- #18 AWG (1.0 mm) insulated stranded copper wire (for chassis grounding wire)
- #18 AWG (1.0 mm) red and black insulated copper wire (for DC power wires)
- Category 3 or 5 cable (for external alarm system wires)
- Category 5 cable with RJ45 connectors for the Network and Craft port
- #6 ring terminal (1) for #18 wire (for chassis ground wire connection)
- #6 fork terminals (2) for #18 wire (for DC power wiring connection)
- Single-mode patch cord(s) with LC connectors (1 – 8 depending on the application)
- High performance, flexible, low-loss 50-ohm coaxial cable
- QMA-type male connectors
- Wire ties

3.3   INSTALL THE HOST

This chapter guides you through installing a Prism Host, which requires 70 steps that are divided into 11 sections. Follow the steps in the order in which they are provided.

3.3.1   Unpacking and Inspection

This section provides instructions for opening the shipping boxes, verifying that all parts have been received, and verifying that no shipping damage has occurred.

1   Inspect the exterior of the shipping container(s) for evidence of rough handling that may have damaged the components in the container.

2   Unpack each container while carefully checking the contents for damage and verify with the packing slip.

3   If damage is found or parts are missing, file a claim with the commercial carrier and notify ADC Customer Service (see "Contacting ADC" on page 335). 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.

3.3.2   Install Host in Equipment Rack

A pair of reversible mounting brackets is provided that allow the Host to be mounted in either a 19-inch or 23-inch EIA or WECO equipment rack. When installed, the Host front panel is flush with the front of the rack.

The Host to be mounted in either a 19- inch or 23- inch EIA or WECO equipment rack. Unless noted otherwise, views of the Host show the mounting brackets in the 23- inch position.

Both US standard and metric machine screws are included for rack mounting the Host. When loading the Host in a rack, make sure the mechanical loading of the rack is even to avoid a hazardous condition such as an unbalanced rack. The rack should safely support the combined weight of all the equipment it holds.

The maximum ambient temperature for the Host is 55º C (131º F).

**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.**

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

Use the following procedure to install the Host in the equipment rack:

5 The Host is shipped with the mounting brackets installed for 19-inch rack installations. If mounting the Host in a 19-inch rack, proceed to Step 6. If mounting the Host in a 23-inch rack, proceed to Step 8.

6 Remove both mounting brackets from the Host (requires TORX screwdriver with T20 bit) and save screws (six-screws on each side) for reuse.

7 Reinstall both mounting brackets so the long side of the bracket is flush with the Host front panel as shown below. Use the screws removed in Step 6 to re-attach the brackets to the Host chassis.

Install Mounting Brackets as shown for installation in 23-inch Racks

77073-060
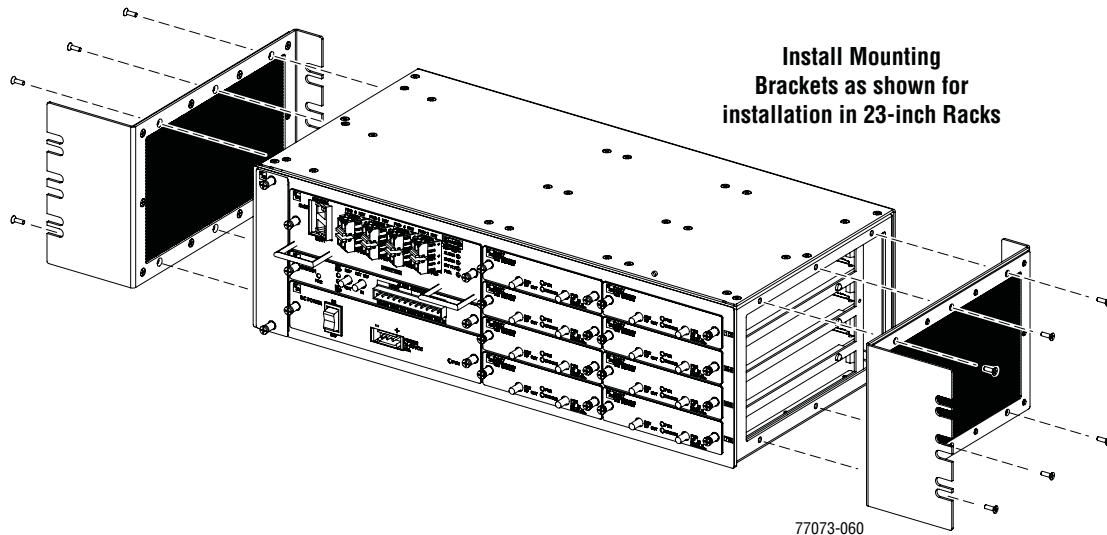
8 Position the Host in the designated mounting space in the rack (per system design plan) and then secure (but do not tighten) the Host to the rack using the four machine screws provided (use #12-24 or M6 x 10 screws, whichever is appropriate).

9 Locate two vertical cable guides, not provided with the Host.

A vertical cable guide kit is available separately as an accessory.

10 Back out the Host mounting screws just enough to provide clearance for installation of the cable guides.

11 Slide each cable guide into position for installation and then securely tighten the corresponding mounting screws.

3.3.3   OSP Fiber Cable Installation Guidelines

The outside plant (OSP) fiber optic cables should be routed between the Host distribution panel and Remote outside plant cabinet and terminated before the equipment is installed. A diagram of a typical OSP cable routing is shown in Figure 3-1. At the Host, the OSP cable should be terminated at a fiber distribution panel and spliced to fiber patch cords. Jumper patch cords may then be used to link the Host optical ports to the OSP cable terminations. Whenever possible, a guideway such as the FiberGuide system should be provided to protect the fiber optic patch cords from damage and to prevent excessive bending. The procedures for connecting the OSP cable optical fibers to the Host is provided in "Optical Connections Without WDM System" on page 74. and "Optical Connections For Systems With a WDM" on page 76.

X   Splice

●   Termination

Host Site

Host Unit

Fiber
Distribution
Panel

Patch
cords

Outside Plant
Cable

**Indoor
Remote Site**

Remote
Unit

**Outdoor
Remote Site**

Remote
Unit

Indoor/Outdoor
Quad Cable with
Pre-Terminated
Connector *

**Outside Plant
Cabinet**

77073-059

* One end of the Quad cable is
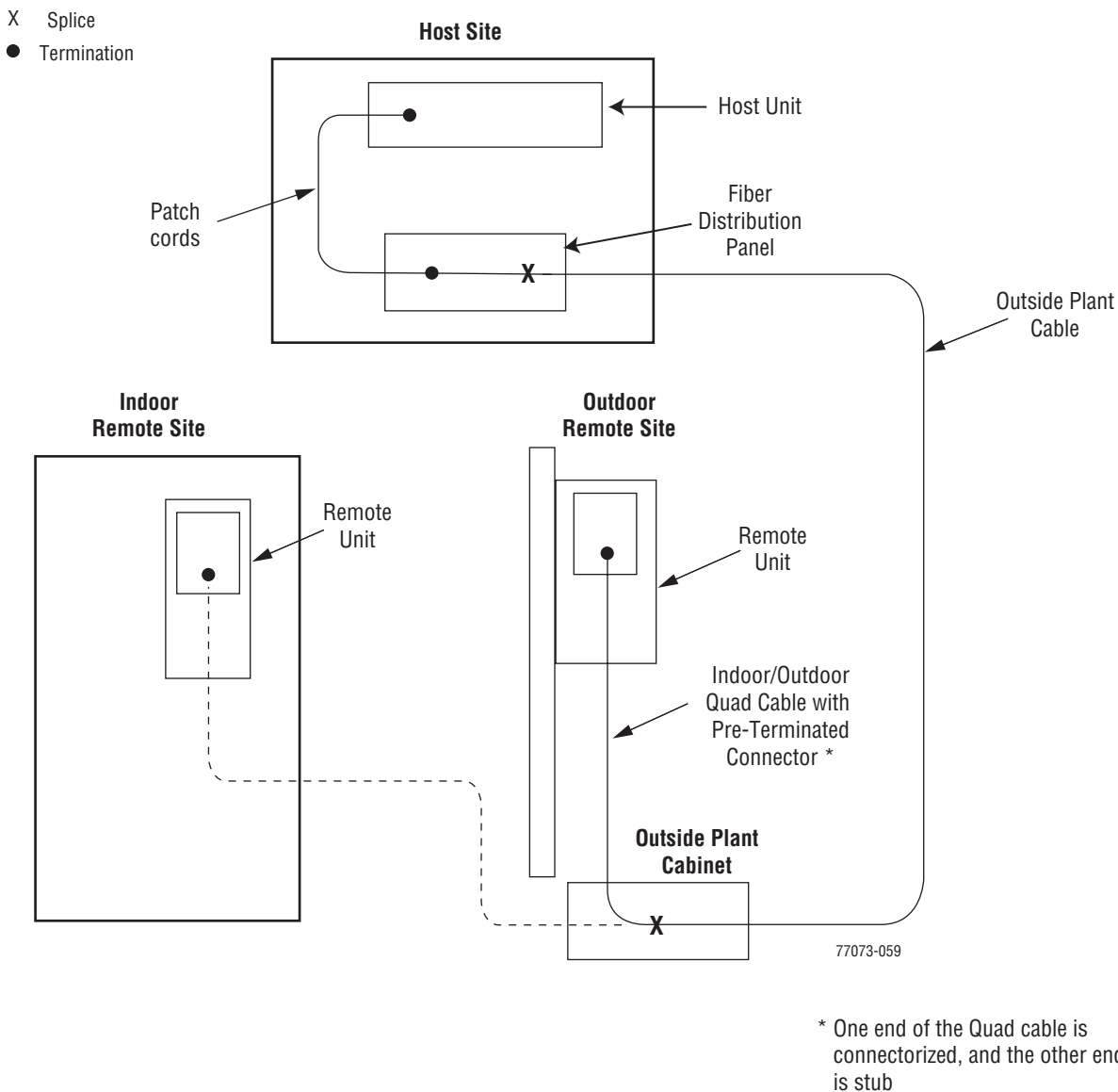connectorized, and the other end
is stub

Figure 3-1. Typical Fiber Optic Cable Routing

3.3.4   Chassis Ground Connection

A stud is provided on the rear side of the chassis for connecting a grounding wire to the chassis. Use the following procedure to connect the grounding wire to the chassis and to route the grounding wire to an approved earth ground source.

⚠️ **Maintain reliable grounding. Pay particular attention to ground source connections.**

12 Obtain a length of #18 AWG (1.00 mm) insulated stranded copper wire for use as a chassis grounding wire.

13 Terminate one end of the wire with a ring terminal.

14 Locate the chassis-ground stud at the rear of the Host chassis as shown in in the following graphic, and then attach the ring end of the wire to the chassis ground stud.

Rear of Host Chassis
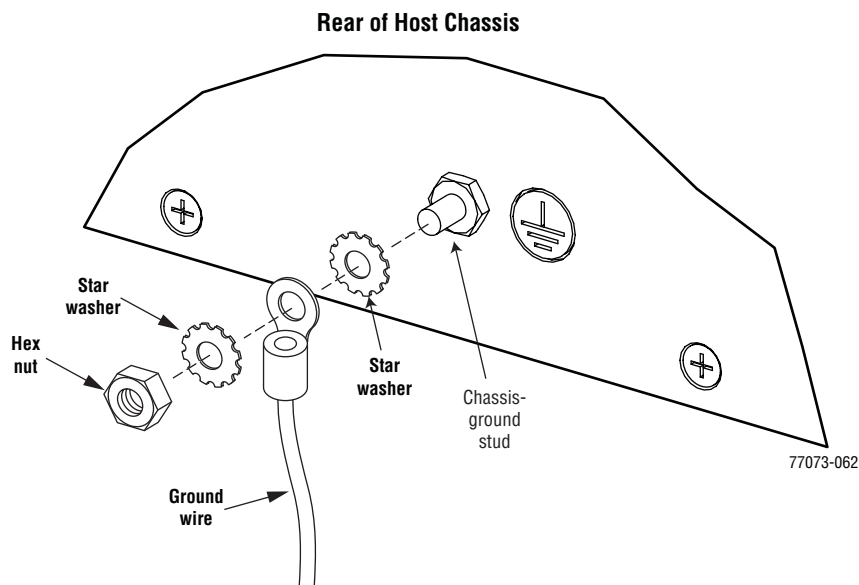
15 Route the free end of the chassis grounding wire to an approved (per local code or practice) earth ground source.

16 Cut the chassis grounding wire to length and connect it to the approved ground source as required by local code or practice.

3.3.5 Coaxial Cable Connections

The RF interface between the Host DART card and the EBTS/BTS is supported through two type QMA female connectors mounted on each DART front panel. One connector provides the coaxial cable connection for the forward path (downlink) signal and the other connector provides the coaxial cable connection for the reverse path (uplink) signal.

In most installations, it is usually necessary to insert an external attenuator into the forward path link between the Host and the BTS. Before completing the forward path connection at the BTS, verify that the composite forward path RF signal level at the Host is between –25 and +5 dBm.

The Host should be mounted as close as possible to the EBTS/BTS to minimize cable losses. Use the following procedure to route and connect the forward and reverse path coaxial cables to the Host DART cards:

17 Obtain the required lengths of high performance, flexible, low loss 50-ohm coaxial communications cable (RG-400 or equivalent) for all coaxial connections.

18 Route the forward and reverse path coaxial cables between the Host and the BTS interface (per system design plan) and cut to the required length. Allow sufficient slack for dressing and organizing cables at the Host and for installing an external attenuator in the forward path link.

19 Terminate each cable with a QMA-Type male connector following the connector supplier's recommendations.

20 If required, install an external attenuator in the forward path.

The composite forward path RF signal level at the Host must be between –25 and +5 dBm. Do not connect the forward path cable until the composite forward path RF signal level is measured and the amount of external attenuation required is determined.

21 Connect the forward and reverse path cables as shown in the following graphic.

 a Connect the forward path cable to the FWD RF IN connector on the Host DART front panel.

 b Connect the reverse path cable to the REV RF OUT connector on the Host DART front panel.

77073-063
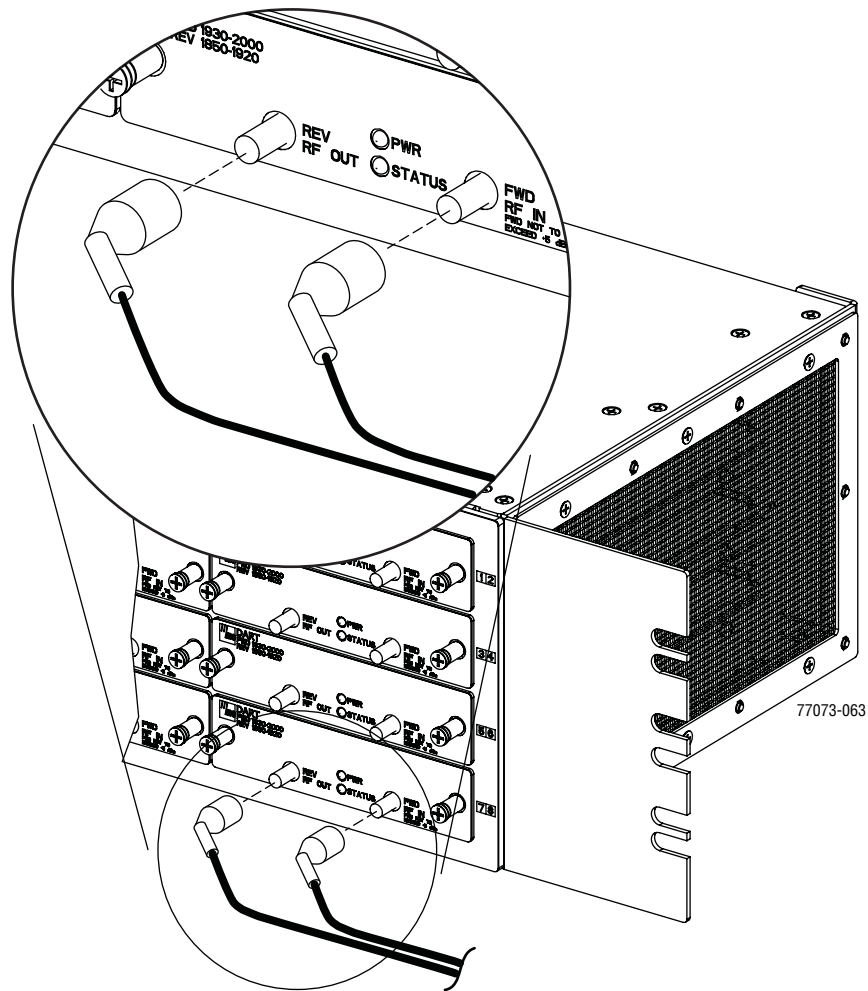
22 Repeat this procedure for the remaining DART cards in the Host.

23 Dress and secure cables at the right side of the Host.

24 Complete all remaining coaxial connections as specified in the system design plan.

3.3.6 Optical Connections

Optical connections between the Host SeRF card and the Remote are supported through Small Form-Factor Pluggable (SFP) transceivers. The optical interfaces are standard single-mode duplex LC (flat polished UPC). One SFP comes with the Host—additional SFPs (up to 7) must be ordered separately as needed.

There are two fiber connections—one FWD and one REV—for each SFP. As the SeRF holds up to eight SFPs, there is a total of 16 connections: eight FWD and eight REV. The FWD path is 1550nm (from the Host to the Remote) and the REV path is 1310nm (from the Remote to the Host).

Each FWD port provides an optical connection for the forward path (downlink) signal. Each REV port provide an optical connection for the reverse path (uplink) signal. Each REV port can also provide the optical connection for the diversity reverse path (uplink) signal.

The optical connections are dependent on whether or not a WDM Host module (accessory) is installed:

- If the installation does not include a WDM module, proceed to Section 2.9.2 for the optical connections procedure.
- If the installation includes a WDM module, proceed to Section 2.10 for the optical connections procedure.

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 transmitter of any unit or exposure to laser radiation may result. An optical power meter should be used to verify active fibers. A protective cap or hood MUST be immediately placed over any radiating transmitter or optical fiber connector to avoid the potential of dangerous amounts of radiation exposure. This practice also prevents dirt particles from entering the connector.

3.3.7 LC Attenuator

To meet 3Gbps optical transmission requirements, the long reach transceivers (SFPs) must be used. SFPs have the following specifications:

· Launch: 0dBm

· Normal Operation: -9dBm maximum to -27dBm minimum

· Overdrive: >-9dBm

· Underdrive: <-27dBm

· RX No Light condition: <-34dBm

The receiver's specification is -9 to -27dBm. Based on typical fiber runs, there's usually only a few dB of loss, so the 15dB LC attenuator (Figure 3-2) ships with each Host to put the receive level in the optimum receive range.

77073-064

Figure 3-2. LC Attenuator

There is an option of ordering the WDM with a fiber pigtail. The document for the WDM option describes using the LC attenuator option and requires an additional fiber patch cord.

3.3.7.1 Optical Connections Without WDM System

Use the following procedure to connect the optical fibers when a WDM is not installed.

25 Obtain two patch cords that are of sufficient length to reach from the Host to the fiber distribution panel.

26 Designate one of the patch cords as the forward path link and the other as the reverse path link and attach an identification label or tag next to the connector.

27 Remove the dust caps from the Host SeRF SFP optical ports and from the patch cord connectors that will be connected to the SeRF SFP optical ports.

28 Clean each patch cord connector following the patch cord supplier's recommendations.

29 Connect the LC attenuator to the patch cord.

30 Plug the FWD and REV path patch cords to the corresponding transmit (FWD) and receive (REV) connections depending on the remote node SFP position.

Improper handling can damage fiber optic cables. 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.
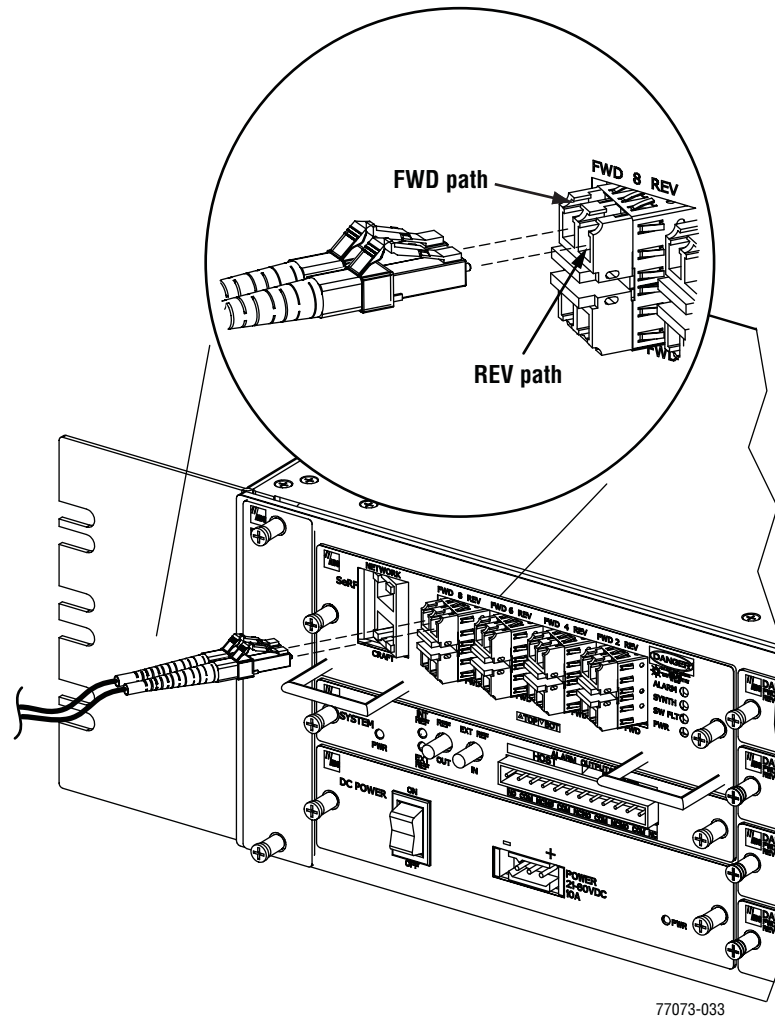
31 Route the patch cords from the Host to the fiber distribution panel.

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

32 At the fiber distribution panel, identify the OSP cable optical fiber terminations that correspond to the forward and reverse paths.

33 Remove the dust caps from the OSP cable optical fiber adapters and from the patch cord connectors.

34 Clean each patch cord connector (follow patch cord supplier's recommendations) and then mate the connector with the appropriate OSP cable adapter.

35 Repeat this procedure for the remaining SeRF SFPs in the Host.

36 Store any excess patch cord slack at the fiber distribution panel or storage panel.

3.3.7.2 Optical Connections For Systems With a WDM

Use the following procedure to connect the optical fibers when a WDM module is installed with the Host.

37 Obtain a patch cord that is of sufficient length to reach from the WDM module to the fiber distribution panel.

38 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.

WDM module ports are labeled FWD, REV, TEST, and WDM.

39 Clean the patch cord connector (follow patch cord supplier's recommendations).

40 Insert the connector into the WDM port on the WDM module.

41 Obtain two patch cords that are of sufficient length to reach from the WDM module to the Host.

42 Designate one of the patch cords as the forward path link and the other as the reverse path link and attach an identification label or tag next to the connector.

43 Remove the dust caps from the Host SeRF SFP optical ports and from the patch cord connectors that will be connected to the SeRF SFP optical ports.

44 Connect the LC attenuator (see Figure 3-2 on Page 73) to the patch cord.

45 Refer to the following diagram to understand the fiber optic connections to the WDM module.
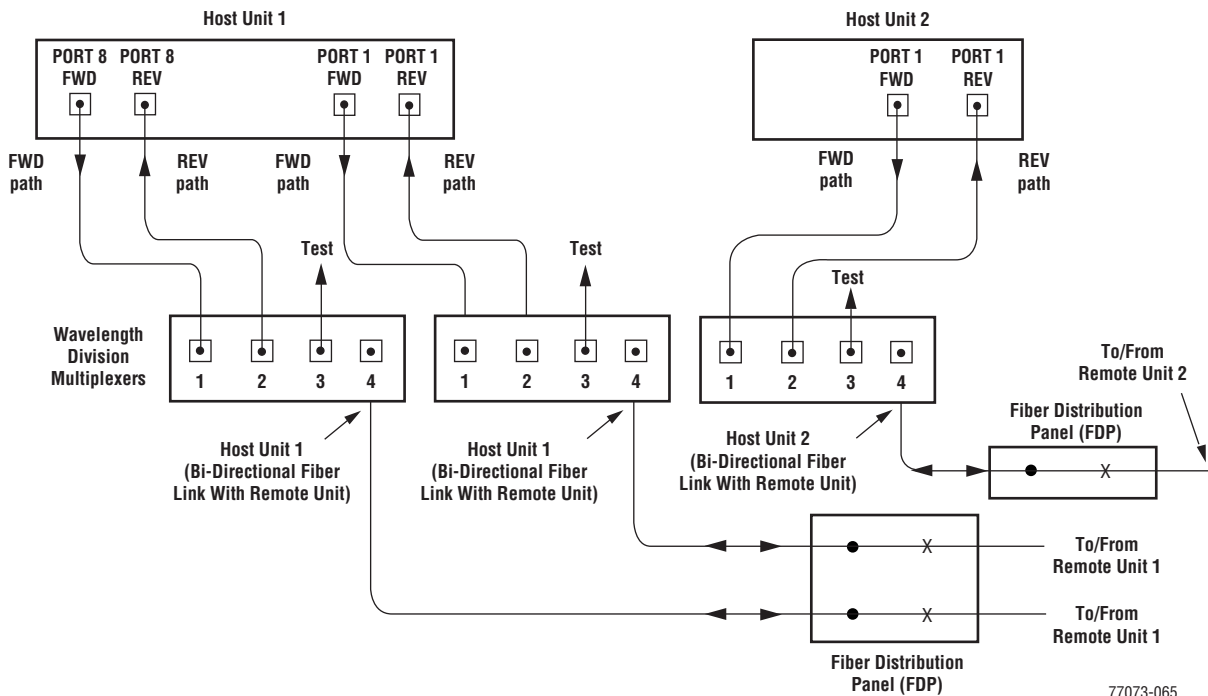
46 Clean each fiber patch cord connector and then insert the connector into the appropriate optical port on the Host as shown below.
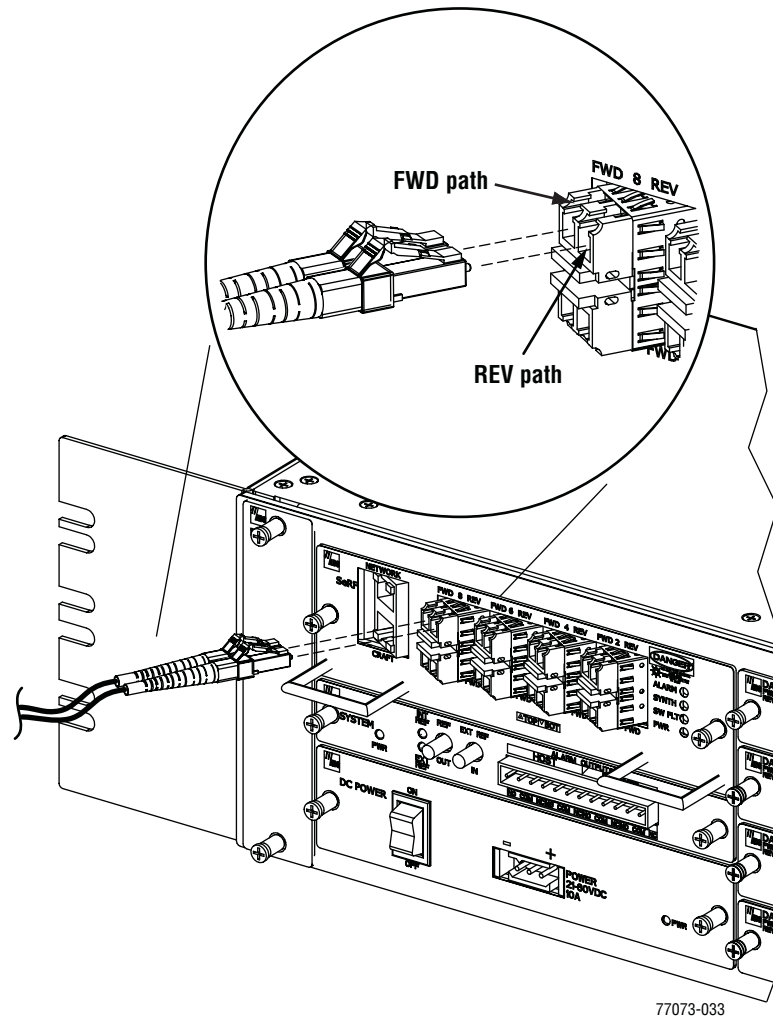
77073-033

The Host SeRF SFP optical adapters are angled to the left. Therefore, fiber patch cords should always be routed to the Host from the left side of the rack. Routing fiber patch cords to the Host from the right side of the rack may exceed the bend radius limitations for the optical fiber.

47 (Optional) If adding CWDM accessories, see the *ADC FlexWave™ Prism Coarse Wavelength Division Multiplexer User Manual* (ADCP-75-353) for installation information. (For an overview of a Prism CWDM system, see Section 1.2, Course Wavelength Division Multiplexer System, on page 4).
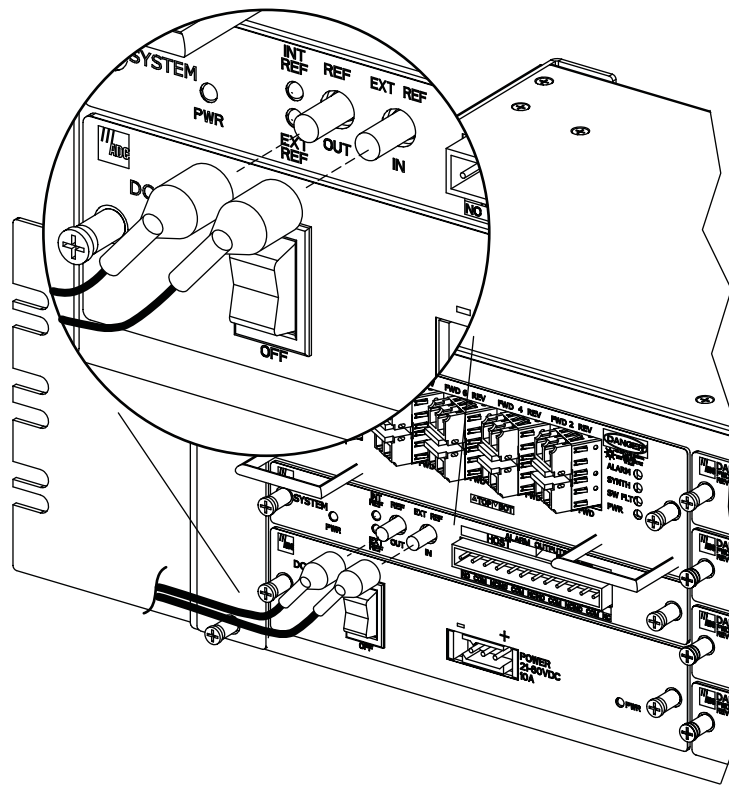
3.3.8　EXT REF Connections

When using the 10 MHz external reference clock the signal must be connected to the Host before enabling the clock source in the software. If there isn't a working external clock source when you configure external timing, the optical sync at the Remote will be lost and all traffic will stop flowing.

EXT REF connections between multiple Hosts is supported through two QMA type female connectors mounted on the System card. One of the jacks is designated as the IN port and the other jack is designated as the OUT port. The EXT REF interface allows Hosts to be connected together (in daisy-chain fashion) and clocked through a single source.
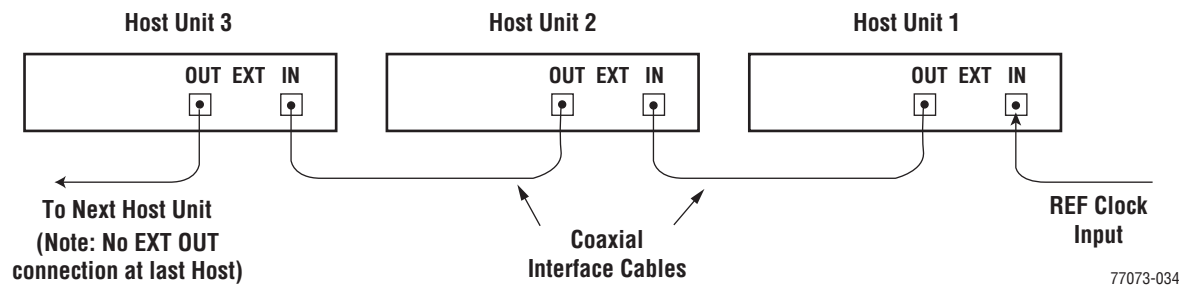
Use the following procedure to connect EXT REF interface cables between multiple Hosts:

48 Connect one end of the EXT REF interface cable (accessory) to the EXT REF OUT port on Host #1.

77073-066

49 Connect the interface cables to the other Hosts that are to be daisy-chained to Host 1. A diagram of typical EXT REF interface connections is shown below. At the stopping point where no further Hosts are to be connected, the OUT would be left unconnected:

   a Connect the interface cable from the EXT REF OUT port on Host 1 to the IN port on Host 2.

   b Connect the interface cable from the EXT REF OUT port on Host 2 to the IN port on Host 3.

Host Unit 3   **Host Unit 2**   **Host Unit 1**

OUT EXT IN   OUT EXT IN   OUT EXT IN

To Next Host Unit
(Note: No EXT OUT
connection at last Host)

Coaxial
**Interface Cables**

REF Clock
Input

77073-034

50 Repeat Step 49 for each additional Host that is added to the network.

3.3.9 Computer Connection (Craft)

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

51 Connect one end of an Ethernet cable (CAT5 or better, not provided by ADC) to the Host Craft port as shown below.

77073-067
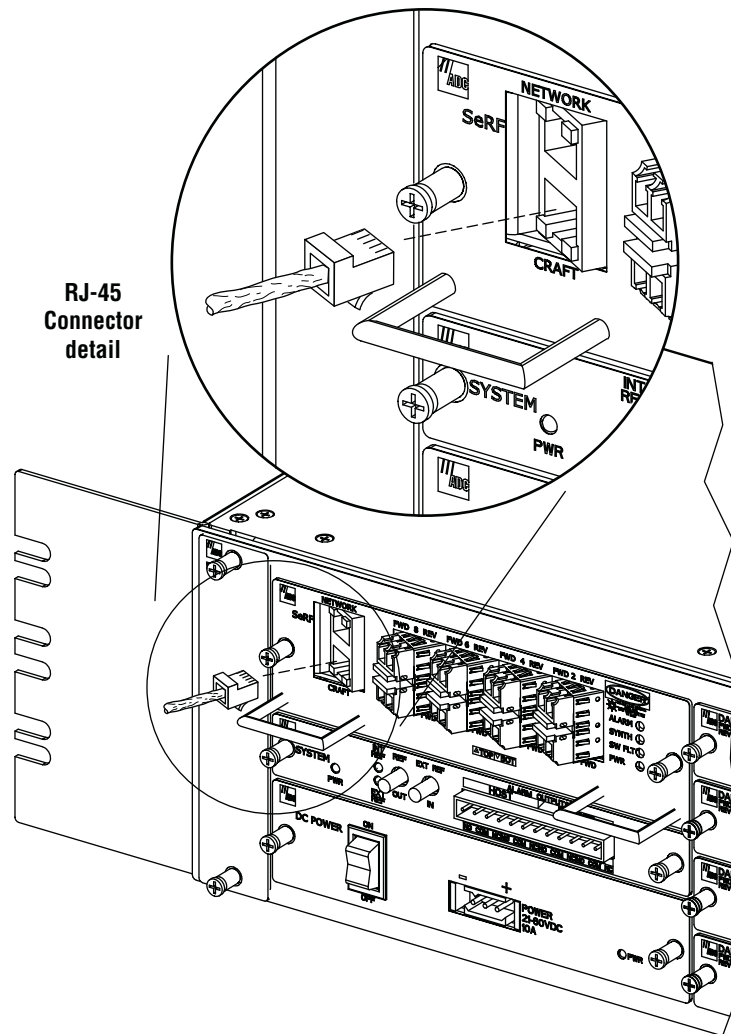
52 Connect the free end of the cable to the computer's port. Refer to the user manual provided with the computer to locate and configure the specified port.

> In the default configuration, the Craft port has a DHCP server that assigns an IP address to the computer that is connected. You should therefore have your network interface configured for DHCP, or configured with a static IP address in the same subnet, where the default is 192.168.0.1/24.

3.3.10   System Alarm Connections

The alarm interface between the Host and an alarm system is supported by twelve-terminal plug (with screw-type terminals) that connects to a receptacle mounted on the Host System card front panel. The terminal plug provides connections to normally open (NO) and normally closed (NC) dry type alarm contacts for both major and minor alarms. A category 3 or 5 cable is typically used to connect the Host System card to the alarm system.

Table 3-1.   *System Card Alarm Pin Designations*

PIN	Description	Required Wires	
		NC	NO
1	Host Minor Normally Closed	X	
2	Host Minor Common	X	X
3	Host Minor Normally Open		X
4	Host Major Normally Closed	X	
5	Host Major Common	X	X
6	Host Major Normally Open		X
7	Remote Minor Normally Closed	X	
8	Remote Minor Common	X	X
9	Remote Minor Normally Open		X
10	Remote Major Normally Closed	X	
11	Remote Major Common	X	X
12	Remote Major Normally Open		X

Use the following procedure to install the alarm wiring and connect it to the Host:

53 Obtain the required length of category 3 or 5 cable.

54 Route the cable between the Host System card 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.

55 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.

56 Connect the Major alarm wire pair to the MAJOR COM/NC or MAJOR COM/NO terminals (whichever is required by the alarm system) on the Host System card alarm terminal connector (supplied with Host System card).
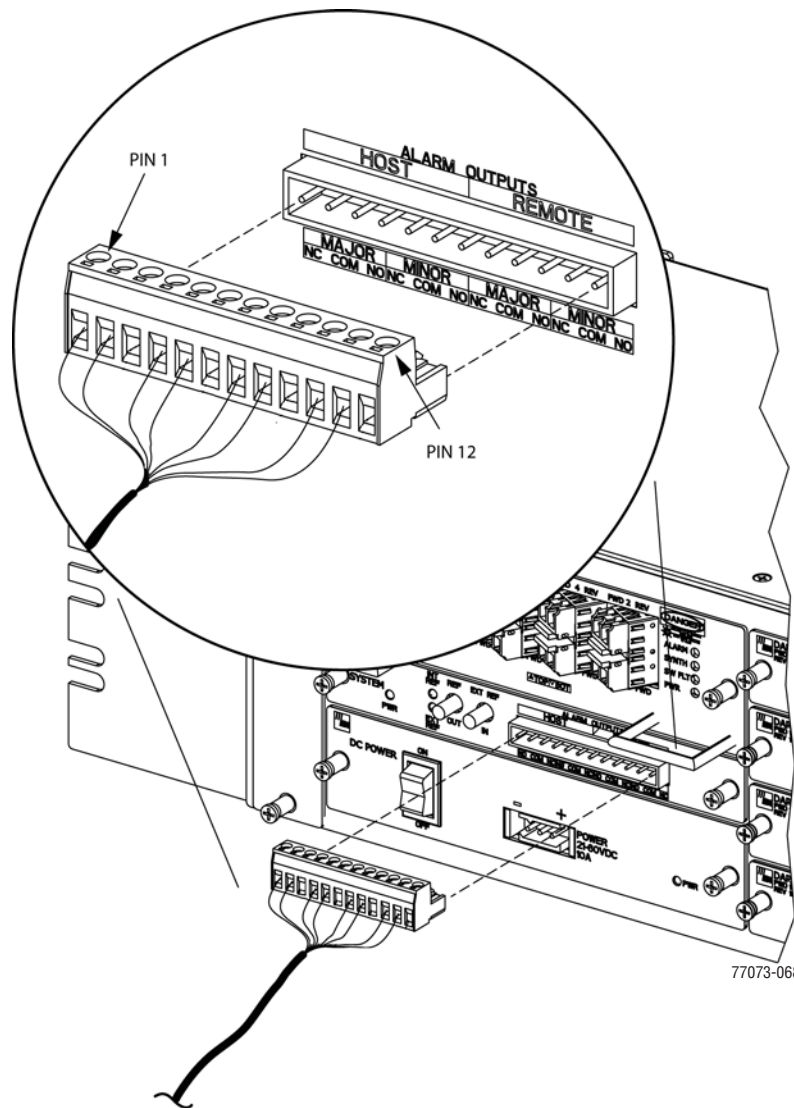
57 Connect the Minor alarm wire pair to the MINOR COM/NC or MINOR COM/NO terminals (whichever is required by the alarm system) on the Host System card alarm terminal connector (as shown above and in Table 3-1).

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

59 Dress and secure cable per standard industry practice.

3.3.11   Power Connections

The Host has a modular DC to DC power supply located on the lower left side of the chassis, which is secured by turning its screws clock-wise until tight.

An On/Off switch is provided on the Host power supply module front panel (Figure 3-3).
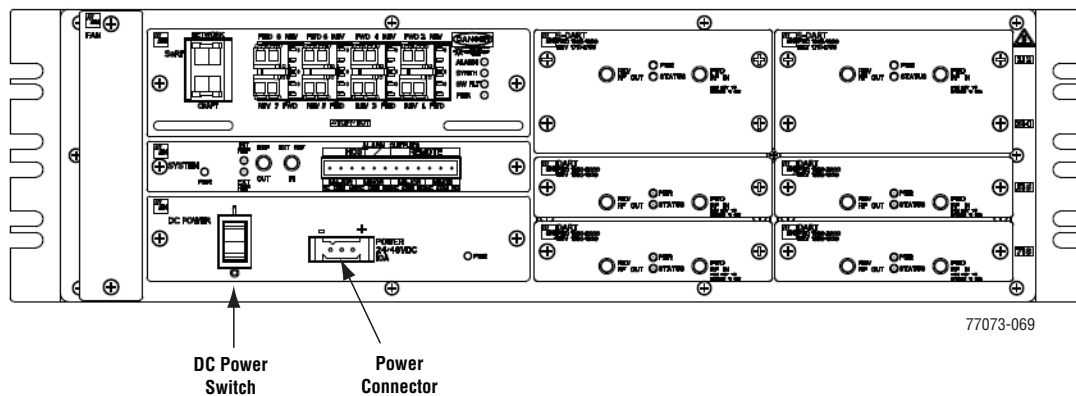

Figure 3-3. Host Power Connector

The Host is powered by ± 20 to ± 60 Vdc power (nominal ± 24 or ± 48 Vdc), which is fed to the Host through a connector located on the front of the module. Power to the Host must be supplied through a fuse panel (available separately). Each Host must be protected with a fuse.

A three position terminal block is provided for connecting the power wires. The power is fed to the Host Power Supply module through the Power Connector located on the Host front panel (Figure 3-3). Power to the Host must be supplied through a fuse panel such as the 20 position PowerWorx GMT Fuse Panel (available separately) and the power must be protected with an appropriate GMT fuse:

· 5 Amp GMT fuse for 48Vdc

· 10 Amp GMT fuse for 24 Vdc

Table 3-2 provides a Host power consumption matrix that you should use to calculate power consumption for your system.

Table 3-2. *Host Power Consumption*

PCB		Classic or Single SuperDART	Dual SuperDART	System Card (including Fans)	SeRF (1 SFP)	SeRF (8 SFPs)*
Power Consumption	Nominal	18.7W	23W	12W	23W	30W
	Maximum	20W	26W	12.4W	25W	32W

* Add 1W for each SFP added

For example, the power consumption of a fully-loaded Host, with four Dual SuperDARTs, a SeRF card (that comprises eight SFPs), and a System card would be:

· Nominal—131W

· Maximum—148.4W

· 15% Headroom—171W

Use the following procedure to install the power wiring:

60 Obtain the items listed below:

· Wire stripper and screwdriver

· Wire, #18 AWG (1.00 mm) red and black insulated copper wire. Recommended wire size for the power leads, when fused in the same bay.

**61** Turn power switch on power supply OFF.

62 Connect the wires to the designated terminals on the fuse panel.

63 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.

All DC input wiring should be routed away from any sharp edges and properly secured in place to prevent chafing and to provide strain relief. This may be achieved by tie-wrapping wires to the rack frame or by a similar means.

64 Route the wires to the terminal block on the Host Power Supply and cut them to length, allowing sufficient length for termination.

77073-070
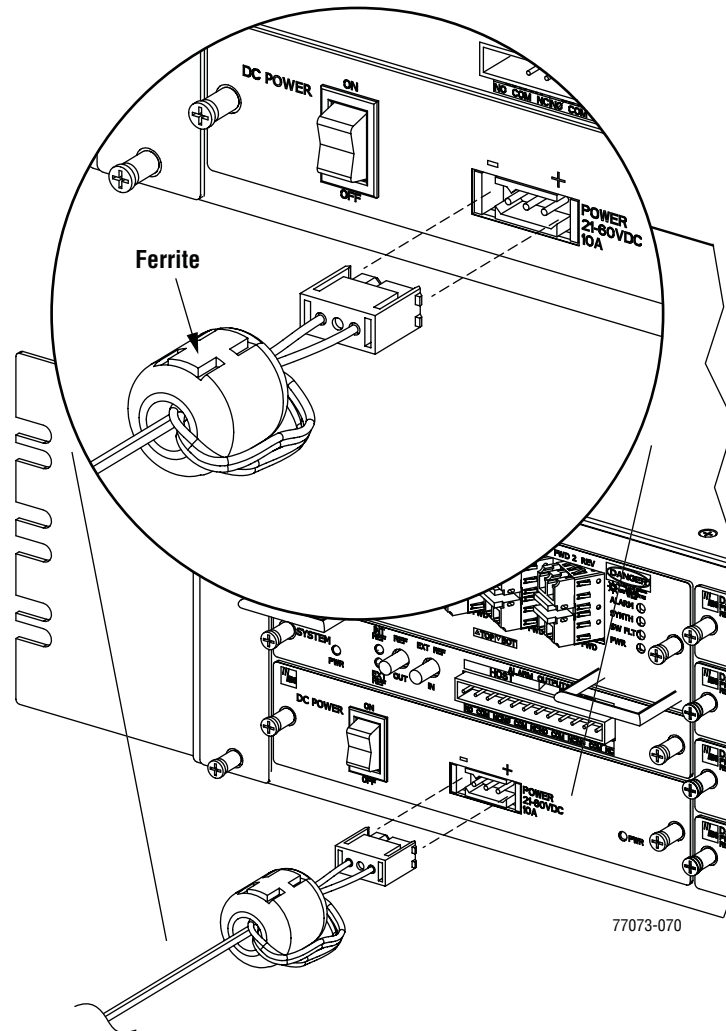
65 Loop both power wires around and through the Ferrite as shown above. (The Ferrite is required for FCC radiated-emissions compliance.)

66 Strip 0.5 inch (1.27 cm) of insulation from the end of each wire.

67 Insert one end of each wire into the terminal block, one into the positive (+) and the other into the negative (–) position.

68 Insert the terminal block into the 3-pin receptacle on the front of the Host Power Supply.

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

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.

70 Turn the DC power switch to its ON position.

Under normal operating conditions, the Host responds as follows:

a Immediately—PWR LED turns Green

b Within 6 to 7 seconds—ALARM, SYNTH, and SW FLT LEDs turn Red

c Approximately 10 seconds—ALARM LED goes out

d Approximately 30 seconds—SYNTH LED goes out

e Approximately 1 minute—SW FLT LED goes out

f Approximately 2.5 minutes—Craft port assigns IP Address to Laptop, making Telnet management through the Craft port available

g Approximately 3 minutes—SYNTH LED turns Green

h Approximately 5 minutes—Element Management System (EMS) available on Craft port (1 - 2 minutes after SYNTH LED turns Green)

Refer to the following graphic for location of the LEDs referenced above.
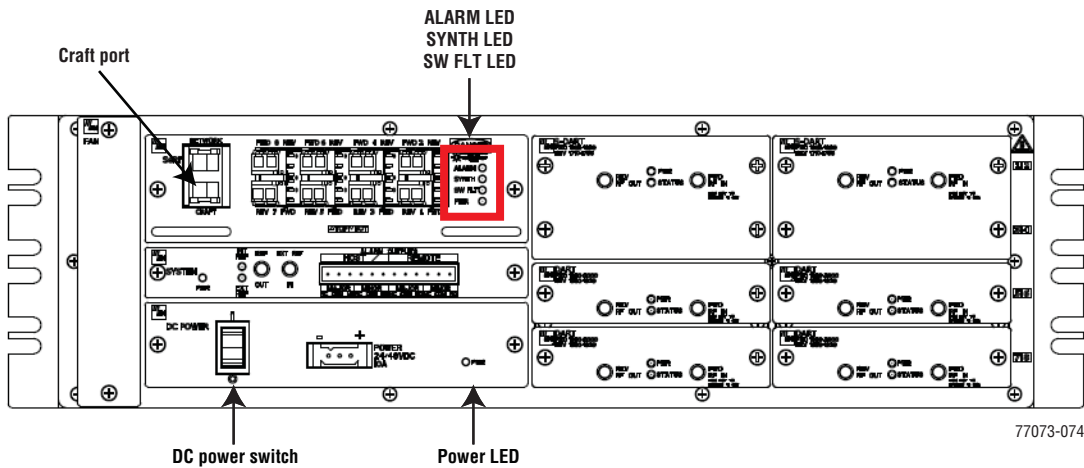
3.4   INSTALLING THE WDM HOST MODULE MOUNTING SHELF AND WDM HOST MODULE

A bi-directional wavelength division multiplexer (WDM) system is available as an accessory item for the Prism system.

If the Prism configuration does not require the use of a WDM system, skip this section and proceed to "Install Host in Equipment Rack" on page 66.

3.4.1   Wavelength Division Multiplexer System Overview

The Wavelength Division Multiplexer (WDM) system is an accessory product that is used when it is desirable or necessary to combine the forward and reverse path optical signals from one Prism system onto a single optical fiber. Each WDM system consists of a Host and a Remote. At the Host there is a WDM chassis that contains the WDM modules, and there is a WDM cable assembly within the Remote. Both the Host WDM module and the Remote WDM cable assembly consist of a bi-directional wavelength division multiplexer, as shown in Figure 3-4. Note that the WDM enables up to three Prism RF bands to operate on a single OSP fiber.
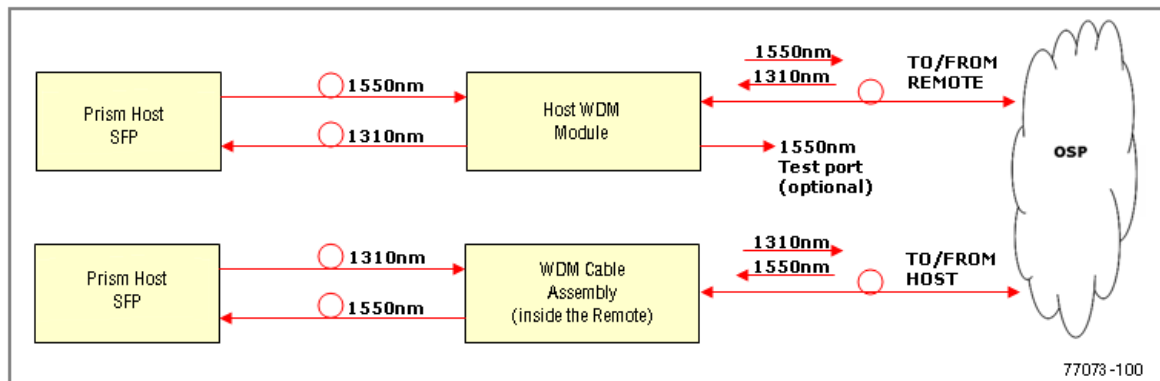

Figure 3-4. WDM System

The Host WDM module is mounted within a powder-paint coated sheet metal enclosure. A straight LC-type optical connector port is provided for connecting the forward/reverse path optical fiber to the WDM module. A pair of fiber patch cord leads with LC-type connectors are provided for connecting the WDM module to the forward and reverse path optical ports on the Host SeRF card. The WDM Host module mounting shelf and Host module are shown in Figure 3-5.
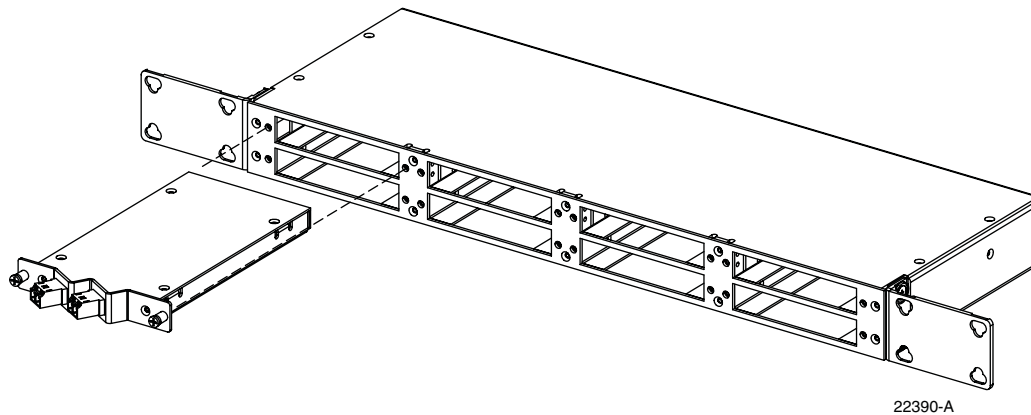

22390-A

Figure 3-5. WDM Host Module and Host Module Mounting Shelf

Figure 3-6 provides WDM port information.

Ports

1
2

Port 1: 1550nm IN (FWD)
Port 2: 1310nm OUT (REV)

3
4

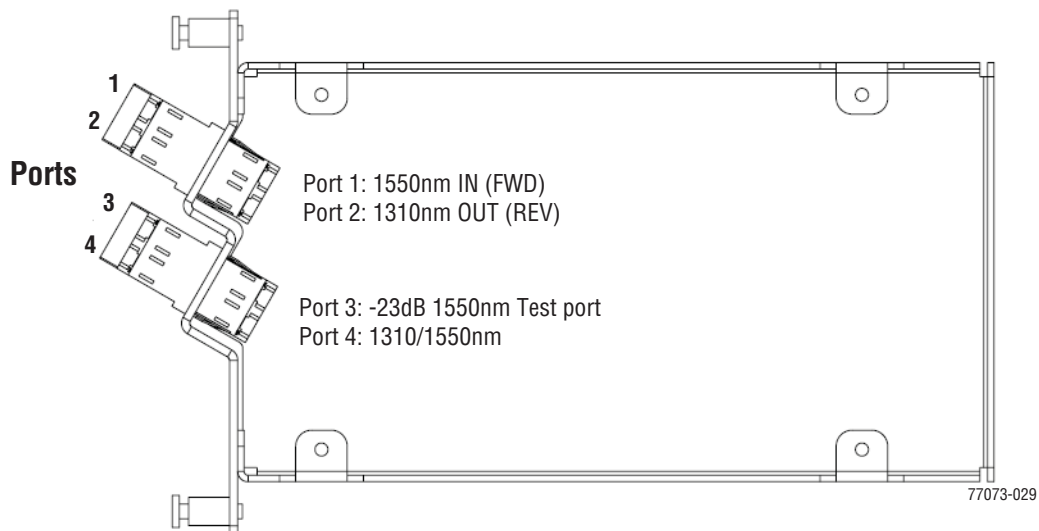Port 3: -23dB 1550nm Test port
Port 4: 1310/1550nm

77073-029

Figure 3-6. WDM Ports

The WDM Test port (Port 3 shown in Figure 3-6) is a monitor or trap port. When taking a reading at this port, the signal power is 23 dB less than the input power going into Port 1. The wavelength of light measured is 1550 nm.

Each WDM module supports a single Small Form-Factor Pluggable (SFP) port on the Host, but a WDM chassis can support up to 8 WDM modules, which allows it to be shared among multiple Hosts depending on the SFP port counts and system configuration. That is, the 8 modules allows a fully loaded Host with 8 SFP modules or multiple partially-loaded Hosts (for a maximum of 8 total SFPs). The WDM Host module mounting shelf installs in the equipment rack with the Host. Figure 3-7 shows a one Host WDM system.
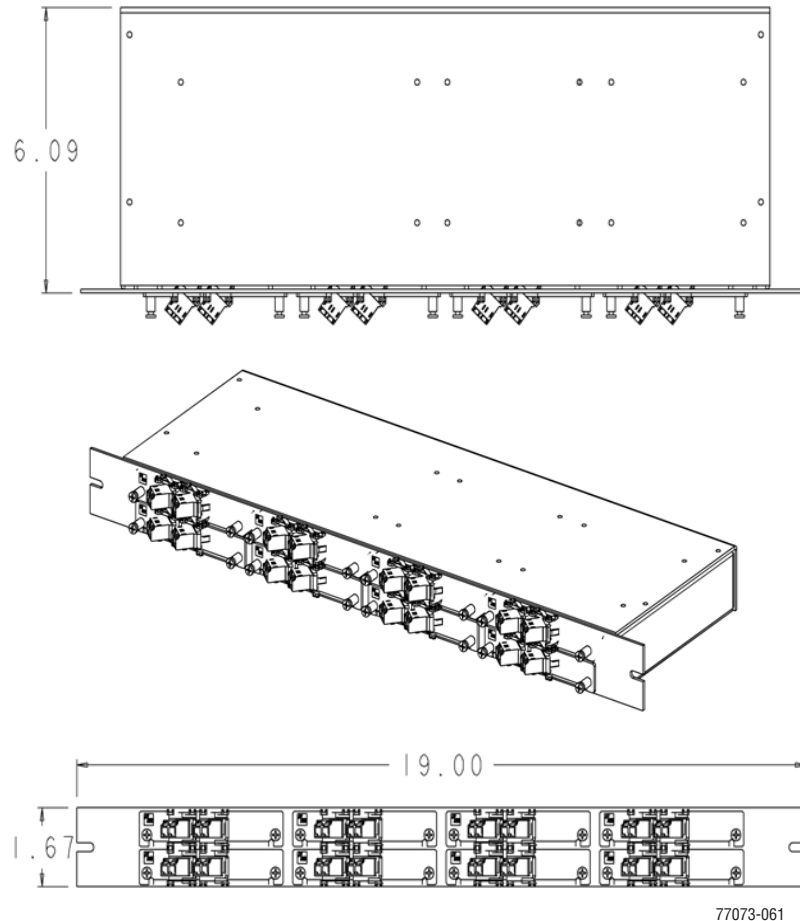

Figure 3-7. One Host WDM System

When multiple Hosts require connection to a WDM system, the Host module mounting shelf and the Hosts should be mounted in the equipment rack as shown in Figure 3-8. This configuration allows the fiber patch cord leads from the two Host modules to be connected directly to the optical ports on any one of the four Hosts.
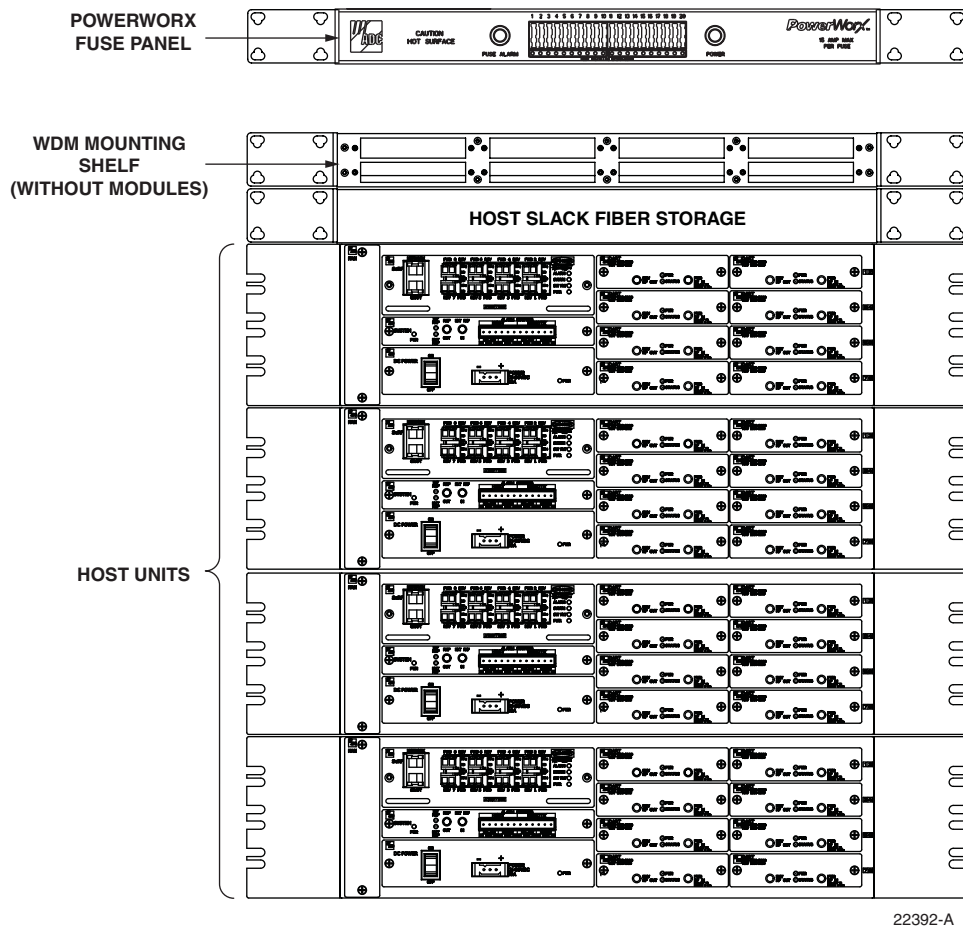

Figure 3-8. Typical WDM and Host Configuration

3.4.2   Install WDM Host Components

The WDM Host module mounting shelf may be mounted in either a 19-inch or 23-inch EIA or WECO equipment rack. Four #12-24 screws are provided for securing the mounting shelf to the rack.

Use the following procedure 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   The WDM Host module mounting shelf is shipped with the mounting brackets installed for 23-inch rack installations. If installing the mounting shelf in a 23-inch rack, proceed to Step 4. If installing the mounting shelf in a 19-inch rack proceed to Step 2.

2   Remove both mounting brackets from the mounting shelf (requires Phillips screwdriver) and save screws for reuse.

3   Reinstall both mounting brackets so the short side of the bracket is flush with the front panel as shown below. Use the screws removed in Step 2 to attach the new brackets to the mounting shelf.

22393-A
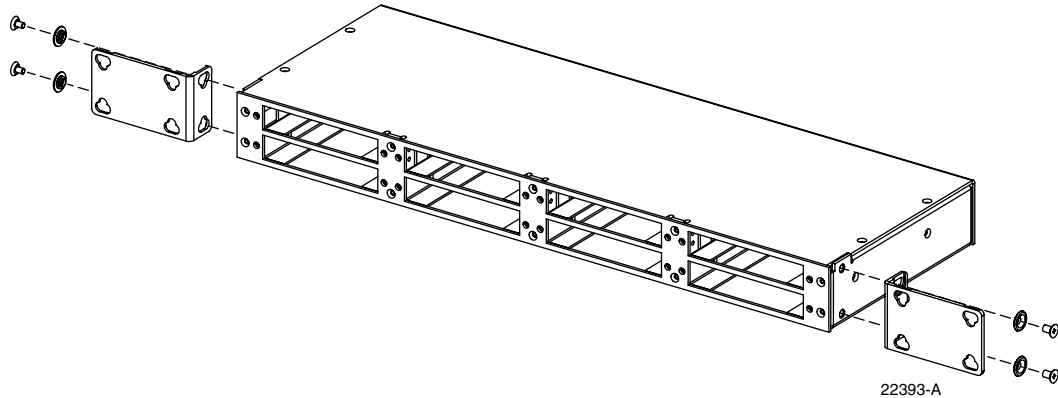
4   Position the mounting shelf in the designated mounting space in the rack (per system design plan) and then secure the mounting brackets to the rack using the four #12-24 machine screws provided.

5   Install each WDM Host module in the mounting shelf. A rail on the side of the module fits into a guide within the mounting.

6   Secure each Host module to the mounting shelf by twisting the handle on each quarter-turn fastener 90º.

7   Carefully store the fiber patch cord leads from each Host module. At the Remote end, the ProAx fiber used in WDM deployments is Fiber Number 1. The routing and connection procedures for the fiber patch cords are provided in "Optical Connections For Systems With a WDM" on page 76. Or, after connecting the fiber patch cord, correctly store the slack cable.

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