are followed by the action or information required. A text string response is received from the specified system or systems to confirm the requested action or to report the requested information. Examples of several typical NOC-NEM interface commands and the responses received are shown in Figure 2-18. The NOC/NEM interface requires only a VT100 terminal/ emulator or a PC-type computer that is loaded with a communication software such as Procomm Plus. While primarily intended for use at the NOC, the NOC/NEM interface commands may also be input from the EMS computer.

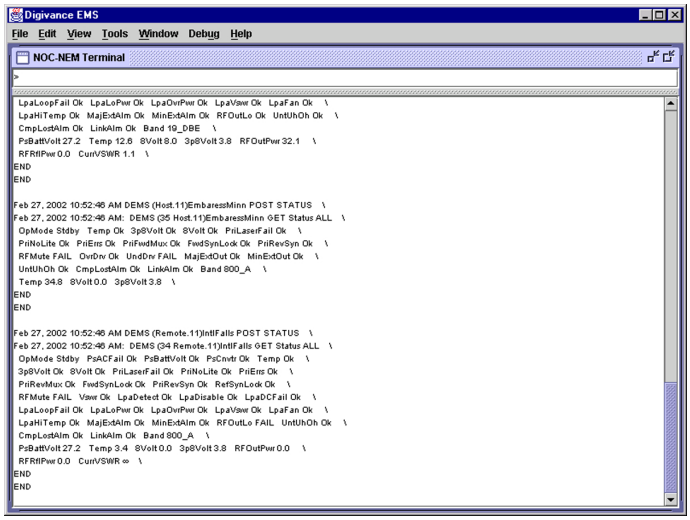

Figure 2-18. NOC/NEM Interface Typical Commands

11 SPECIFICATIONS

Refer to Table 2-6 for the Digivance SMR 20 Watt System nominal specifications. All specifications apply after a five minute warm-up period.

Table 2-6. SMR 20 Watt System Nominal Specifications

PARAMETER	SPECIFICATION	REMARKS
Optical - Host and Remote Unit Fiber type	 9/125, single-mode	
Number of fibers required Direct With WDM	 2 1	 The wavelength division multi-plexer (WDM) is an accessory.
Forward path wavelength	1550 nm	
Reverse path wavelength	1310 nm	
Optical transmit power output Host Unit Remote Unit	 0 dBm –3 dBm	
Optical budget	17 dB	For optical BER of 10^{-6}

Table 2-6. SMR 20 Watt System Nominal Specifications, continued

PARAMETER	SPECIFICATION	REMARKS
Optical receive input	–7 dBm maximum	
Optical connectors	Industry standard SC	Host, remote, and WDM
Optical - Host and Remote 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
RF Forward Path - SMR 800 MHz		
System bandwidth	15 MHz	
Frequency range	851 to 866 MHz	SMR band
Gain of forward path (Host input to Remote antenna port)	80.5 dB at band center, room temperature, and 0 dB attenuation setting	Includes power amplifier.
Gain flatness	± 1.5 dB across freq. range 1 dB variation across any 1.25 MHz channel	
Gain variation	± 3 dB over temperature and unit-to-unit	
Propagation delay	6 µs maximum	Excludes fiber delay
Configurable propagation delay Range Step size	 Up to 63 µs 1 µs	Plus standard propagation delay
Spurious In-band self generated Dynamic range	 –13 dBm at remote output –65 dBc	
Transmit peak-to-average	10 dB	
Intermodulation products	–65 dBc	
Nominal composite RF input signal level	–40 dBm at 0 dB attenuation –20 dBm at max. attenuation	An input signal level of –40 dBm provides maximum output power
Configurable input level Range Step size	 20 dB 1 ± 0.5 dB ±10% of step value	
Composite RF output power	40.5 dBm (11 Watts) at remote antenna port with –40 dBm input	20 Watts at power amplifier output

Table 2-6. SMR 20 Watt System Nominal Specifications, continued

PARAMETER	SPECIFICATION	REMARKS
Configurable RF output Range Step size	 20 dB at remote unit 1 ±0.5 dB ±10% of step value	
Transmit path insertion loss	2.5 dB	
RF Reverse Path - SMR 800 MHz System bandwidth	 15 MHz	
Frequency range	806–821 MHz	SMR band
Propagation delay	6 µs maximum	Excludes fiber delay
Configurable propagation delay Range Step size	 Up to 63 µs 1 µs	Plus standard propagation delay
Gain	30 dB ± 2 dB at band center	
Gain flatness	± 1.5 dB across frequency range 1 dB variation across any 1.25 MHz channel	
Gain variation	± 3 dB over temperature and unit to unit	
Out-of-band rejection	–40 dB bandwidth ≤ 30 MHz	
Spurious	–110 dBm referred to input	
Intermodulation	–62 dBc	
System noise figure	8 dB	
Configurable RF output Range Step size	 20 dB 1 ± 0.5 dB ± 10% of step value	
Blocking dynamic range	70 dB	
Level limiting ALC threshold	–40 dBm dB ± 3 dB	
Level limiting ALC range	30 dB	
Physical/Environmental/ Electrical - Host Unit Dimensions (H×W×D)	 3.5 × 17.2 × 15.3 inches (89 × 437 × 389 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	18 lbs. (8.2 kg)	
Weather resistance	Indoor installation only	
Operating temperature	0º to 50º C (32º to 122º F)	
Storage temperature	–40º to 70º C (–40º to 158ºF)	
Humidity	10% to 90%	No condensation

Table 2-6. SMR 20 Watt System Nominal Specifications, continued

PARAMETER	SPECIFICATION	REMARKS
External alarm connector	Screw-type terminals	NO and NC relay contacts
DC power connector	Screw-type terminal strip	
RF coaxial cable connectors	N-type (female)	
Service connector	DB-9 (female)	RS-232 DTE interface
CAN connectors	RJ-45 jack	
Power input	± 24 or ± 48 VDC	± 21 to ± 60 VDC
Power consumption	55 watts	
Current rating	1 Amp at –48 VDC	
Reliability at 25ºC	MTBF 80,000 hours	Excluding fans
Physical/Environmental/ Electrical - Remote Unit Outdoor Cabinet		
Cabinet dimensions (H×W×D)	25.6 × 10.13 × 20.75 inches (674 × 257 × 527 mm)	
Mounting	Wall, pole, or pedestal	Pedestal mounting requires pedestal mount kit. (accessory)
Weight	80 lbs (36.3 kg)	Includes modules
Weather resistance	NEMA-3R, removable dust filter	
Operating temperature	–30º to 50º C (–22º to 122º F)	
Storage temperature	–40º to 70º C (–40º to 158ºF)	
Humidity	10% to 90%	No condensation
External alarm connector	Screw-type terminals	External alarm inputs
AC power connection	3/4- or 1/2-inch conduit	Per local code or practice.
Antenna cable connector	N-type female	
Fiber optic cable size	0.375 to 0.875 inch (10 to 22 mm) diameter cable	9/125, single-mode
Lightning protection	20 kA IEC 1000-4-5 8/20 µs waveform	
Service connector	DB-9 female (on STM)	RS-232 DTE interface
Power input	120 or 240 VAC, 50 or 60 Hz	
Power consumption	360 Watts	
Current rating	5 Amps maximum at 120 VAC	
Reliability at 25ºC	MTBF 50,000 hours	Excluding fans and air filter

Table 2-6. SMR 20 Watt System Nominal Specifications, continued

PARAMETER	SPECIFICATION	REMARKS
Physical/Environmental/ Electrical - Remote Unit Indoor Mounting Shelf		
Mounting Shelf dimensions (H×W×D)	14.15 × 17.39 × 15.6 inches (359 × 442 × 396 mm)	
Mounting	19-inch equipment rack	WECO or EIA
Weight	50 lbs. (22.7 kg)	Includes modules
Operating temperature	–30º to 50º C (–22º to 122º F)	
Storage temperature	–40º to 70º C (–40º to 158ºF)	
Humidity	10% to 90%	No condensation
External alarm connector	Screw-type terminals (on STM)	External alarm inputs
AC power connection	AC power cord with standard 3-prong 120 VAC plug.	
Antenna cable connector	N-type female (on STM)	
Fiber optic cable connector	SC-type (on STM)	
Service connector	DB-9 female (on STM)	RS-232 DTE interface
Power input	120 or 240 VAC, 50 or 60 Hz	Operation on 240 VAC requires power cord with 240 VAC plug.
Power consumption	360 Watts	
Current rating	3 Amps maximum at 120 VAC	
Reliability at 25ºC	MTBF 50,000 hours	Excluding fans and air filters

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SECTION 3: HOST UNIT INSTALLATION

Content Page

1 BEFORE STARTING INSTALLATION

This section provides the installation procedures for the HU and the WDM host module (accessory). Installation of the RU outdoor cabinet or RU indoor mounting shelf and the RU electronic modules may proceed separately from installation of the HU. The mounting procedures for the outdoor remote cabinet are provided in the 20 Watt Outdoor Remote Cabinet Mounting Instructions (ADCP-75-147) which are shipped with the cabinet. The installation procedures for the STM and LPA electronic modules are provided in the 20 Watt Indoor Remote Unit Installation Instructions (ADCP-75-149) and the 20 Watt Outdoor Remote Unit Installation Instructions (ADCP-75-148) which are shipped respectively with the outdoor cabinet and indoor mounting shelf. When all units of the Digivance system have been installed, refer to Section 4 of this manual for the system turn-up and test procedures.

Before beginning the installation, review the system design plan with the system engineer. Make sure each equipment installation site is identified and located and all cable runs are mapped out.

1.1 Tools and Materials

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

- Box cutter
- Pencil or scribe
- Medium size flat-bladed screwdriver
- Phillips screwdriver (#2)

- TORX screwdriver (T20 bit)
- Pliers
- Wire cutters
- Wire stripper
- Tool kit for attaching N-type male connectors to coaxial cable
- Multimeter
- Optical power meter

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)
- #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 SC connectors (1 or 2 depending on the application)
- High performance, flexible, low-loss 50-ohm coaxial cable
- N-type male connectors
- Wire ties

1.2 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. Use the following procedure to unpack and inspect the HU and any accessories:

1. Open the shipping cartons and carefully unpack each component from the protective packing material.
2. Check each component for broken or missing parts. If there are damages, contact ADC (see section 6 at the end of this manual) for an RMA (Return Material Authorization) and to reorder if replacement is required.

2 FIBER OPTIC CABLE ROUTING AND INSTALLATION GUIDELINES

The outside plant (OSP) fiber optic cables should be routed between the HU and RU and terminated before the equipment is installed. A diagram of a typical fiber optic cable routing is shown in Figure 3-1. At the HU, the OSP cable should be terminated at a fiber distribution panel and spliced to pigtails. Patch cords may then be used to link the HU 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 HU is provided in Section 7.

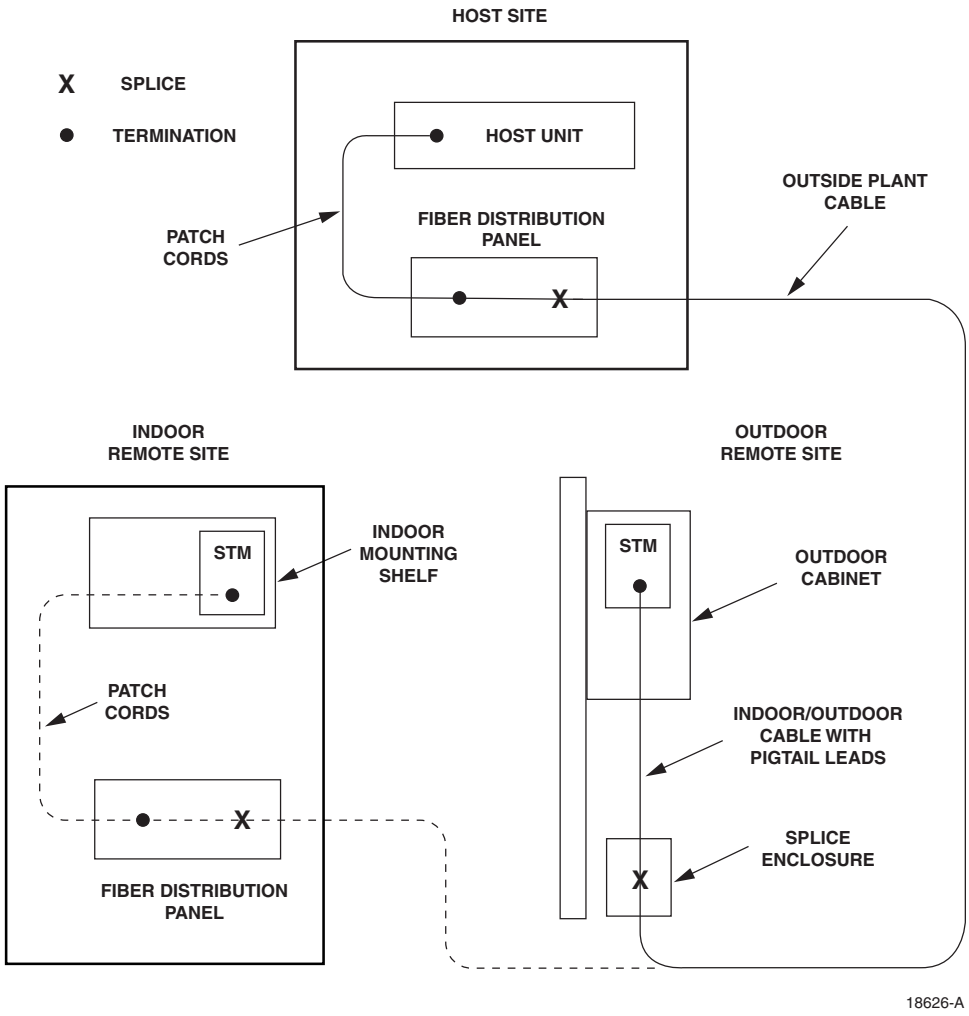

Figure 3-1. Typical Fiber Optic Cable Routing

When routed to the RU **outdoor cabinet**, the OSP fiber optic cable should be spliced to a connectorized outdoor-rated cable (consisting of individual jacketed pigtails) which is then routed into the outdoor cabinet. The individual pigtails can then be connected directly to the STM optical ports. A connector is provided on the bottom of the RU outdoor cabinet to seal the cable entry point and provide strain relief. The procedure for routing the fiber cable into an outdoor cabinet and for connecting the pigtail leads to the STM is provided in the Digivance 20 Watt Outdoor Remote Unit Installation Instructions (ADCP-75-148).

When routed to RU **indoor mounting shelf**, the OSP cable should be terminated at a fiber distribution panel and spliced to pigtails. Jumper patch cords may then be used to link the STM 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 procedure for connecting the OSP optical fibers to an STM mounted in the indoor mounting shelf is provided in the Digivance 20 Watt System Indoor Remote Unit Mounting Shelf Installation Instructions (ADCP-75-149).

3 HU MOUNTING PROCEDURE

The HU may be mounted in either a 19-inch or 23-inch EIA or WECO equipment rack. Both US standard and metric machine screws are included for rack mounting the HU. When loading the HU in a rack, make sure the mechanical loading of the rack is even to avoid a hazardous condition such as a severely unbalanced rack. The rack should safety support the combined weight of all the equipment it holds. In addition, maximum recommended ambient temperature for the HU is 50º C (122º F). Allow sufficient air circulation or space between units when the HU is installed in a multi-rack assembly because the operating ambient temperature of the rack environment might be greater than room ambient.

Warning: *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.*

Note: 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 HU in the equipment rack:

1. The HU is shipped with the mounting brackets installed for 19-inch rack installations. If mounting the HU in a 19-inch rack, proceed to step 4. If mounting the HU in a 23-inch rack, proceed to step 2.
2. Remove both mounting brackets from the HU (requires TORX screwdriver with T20 bit) and save screws for reuse.
3. Reinstall both mounting brackets so the long side of the bracket is flush with the HU front panel as shown in Figure 3-2. Use the screws removed in step 2 to re-attach the brackets to the HU chassis.

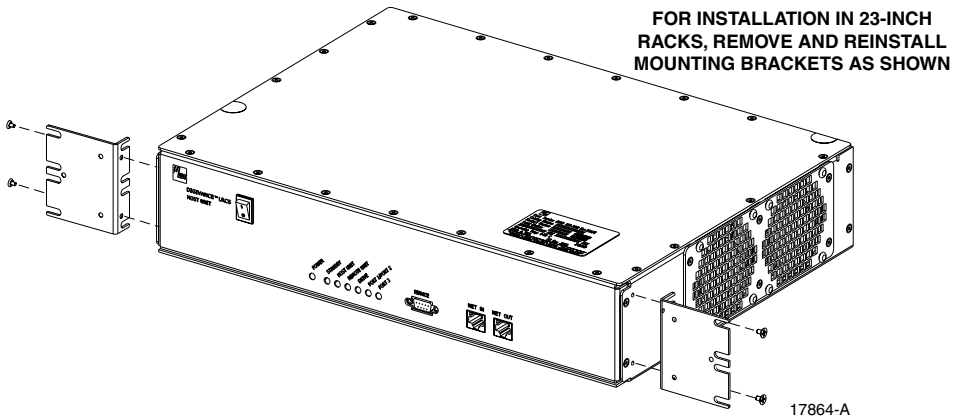

Figure 3-2. Installing the Mounting Brackets for 23-Inch Rack Installations

4. Position the HU in the designated mounting space in the rack (per system design plan) and then secure the mounting brackets to the rack using the four machine screws provided (use #12-24 or M6 x 10 screws, whichever is appropriate) as shown in Figure 3-3.

Note: Provide a minimum of 3 inches (76 mm) of clearance space on both the left and right sides of the HU for air intake and exhaust.

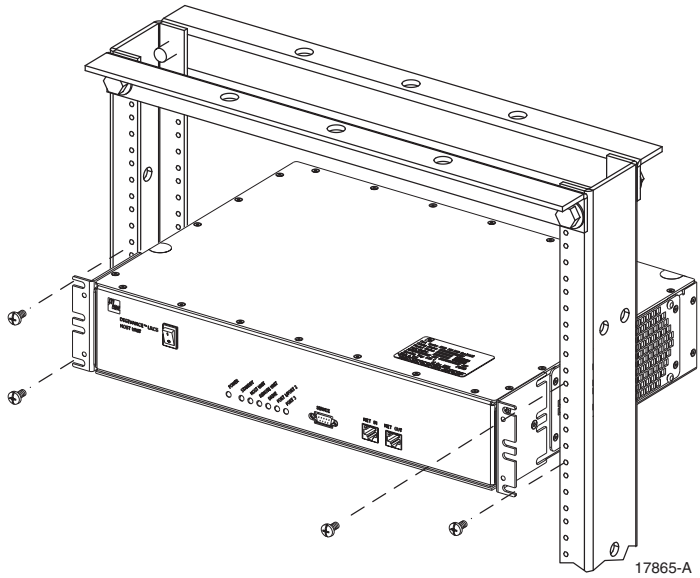

Figure 3-3. HU Rack Mount Installation

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.

1. Obtain a length of #18 AWG (1.00 mm) insulated **stranded** copper wire for use as a chassis grounding wire.
2. Terminate one end of the wire with a ring terminal.
3. Locate the chassis ground stud at the rear of the HU as shown in Figure 3-4.
4. Attach the ring end of the wire to the chassis ground stud (see Figure 3-4).
5. Route the free end of the chassis grounding wire to an approved (per local code or practice) earth ground source.
6. Cut the chassis grounding wire to length and connect it to the approved ground source as required by local code or practice.

Note: Be sure to maintain reliable grounding. Pay particular attention to ground source connections.

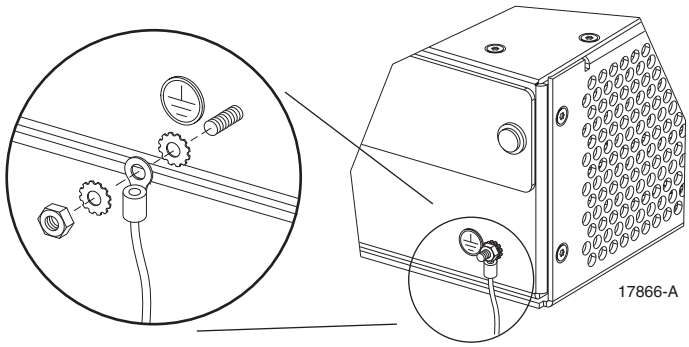

Figure 3-4. Chassis Ground Stud

5 COAXIAL CABLE CONNECTIONS

The RF interface between the HU and the EBTS is supported through two N-type female connectors mounted on the HU rear 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 some attenuation in the forward path link between the HU and the EBTS. A signal level that is greater than –20 dBm will overdrive and possibly damage the HU receiver. Refer to Section 4, Subsection 2.3, before completing the forward path connection at the EBTS. If the Primary Interface Panel and Expansion Panel are required, refer to the Digivance Long Range Coverage Solution SMR Interface Panels User Manual (ADCP-75-143) for the installation procedures. The HU should be mounted as close as possible to the EBTS to minimize cable losses. Use the following procedure to route and connect the forward and reverse path coaxial cables to the HU:

1. Obtain the required lengths of high performance, flexible, low loss 50-ohm coaxial communications cable (RG-400 or equivalent) for all coaxial connections.
2. Route the forward and reverse path coaxial cables between the HU and the EBTS interface (per system design plan) and cut to the required length. Allow sufficient slack for dressing and organizing cables at the HU and for installing an external attenuator in the forward path link.
3. Terminate each cable with an N-type male connector following the connector supplier's recommendations.
4. Connect the forward path cable to the **FORWARD RF IN** connector on the HU front panel as shown in Figure 3-5.

Note: Do not connect the forward path cable at the EBTS until the composite forward path RF signal level is measured and the amount of attenuation required is determined.

5. Connect the reverse path cable to the **REVERSE RF OUT** connector on the HU front panel (see Figure 3-5).

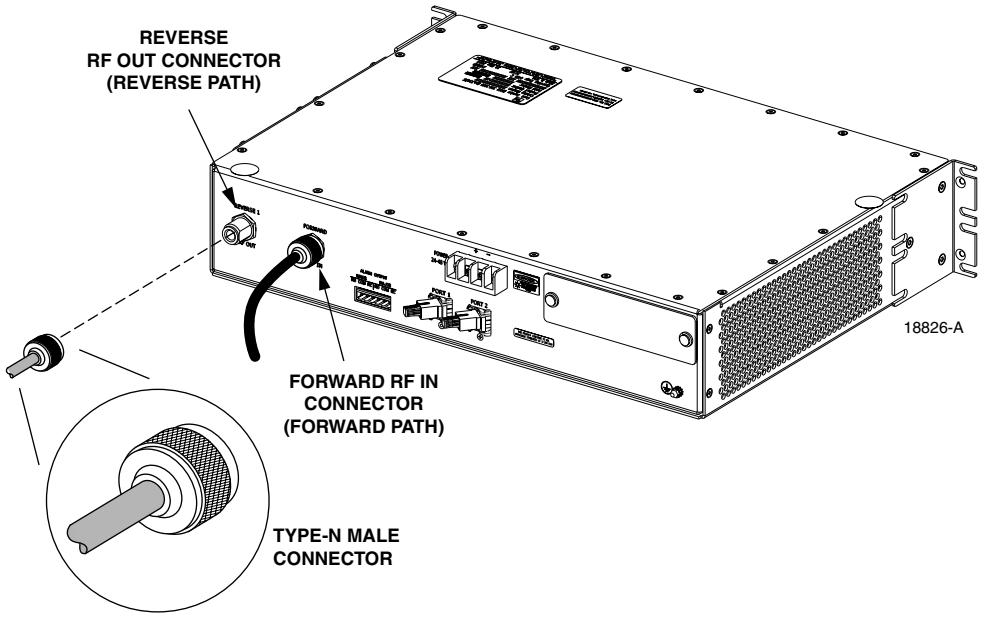

Figure 3-5. Forward and Reverse Path Coaxial Cable Connections

6. Dress and secure cables at the HU.
7. Complete all remaining coaxial connections as specified in the system design plan.

6 WDM MOUNTING PROCEDURE (OPTIONAL ACCESSORY)

A bi-directional wavelength division multiplexer (WDM) module is available as an accessory item for the Digivance system. If the application does not require the use of a WDM system, skip this section and proceed to Section 7.

The WDM mounts in a slot that is provided at the rear side of the HU. Use the following procedure to install the WDM:

1. Remove the cover plate from the WDM mounting slot located on the rear side of the HU as shown in Figure 3-6.
2. Slide the WDM into the mounting slot.
3. Push inward on the two Push/Pull fasteners to secure the WDM to the HU.
4. Carefully coil up the two WDM pigtails to protect them from damage prior to connection to the HU optical ports.

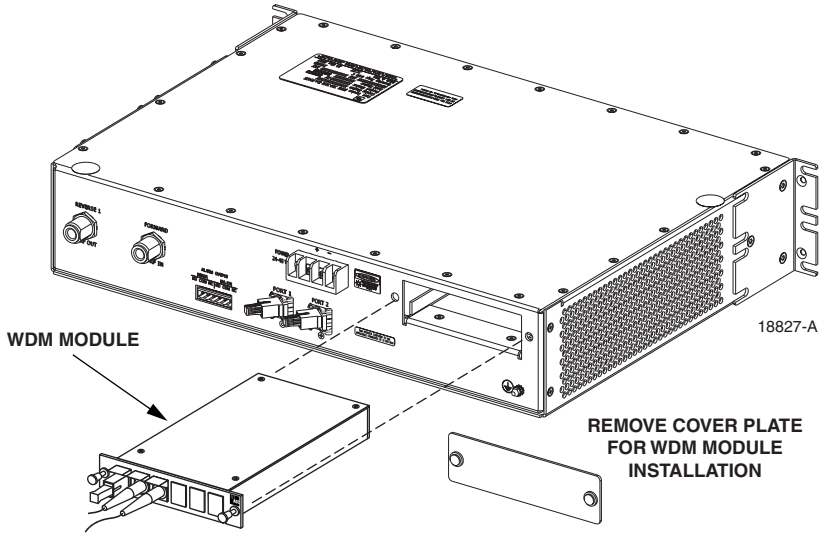

Figure 3-6. WDM Installation

7 OPTICAL CONNECTIONS

The optical interface between the HU and the RU is supported by two optical ports. Each optical port consists of an SC optical adapter which is mounted on the HU rear panel. Port 1 provides the optical fiber connection for the forward path (downlink) signal. Port 2 provides the optical fiber connection for the reverse path (uplink) signal.

The optical connections are dependent on whether or not a WDM host module (accessory) or CWDM host module (accessory) is installed. If the installation **does not** include either a WDM or CWDM module, proceed to Section 7.1 for the optical connections procedure. If the installation **includes** a WDM module, proceed to Section 7.2 for the optical connections procedure. If the installation **includes** a CWDM module, refer to the Digivance System Coarse Wavelength Division Multiplexer User Manual (ADCP-75-142) for the optical connection procedure.

⚠ **Danger:** *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.*

7.1 Optical Connections Without WDM or CWDM system

Use the following procedure to connect the optical fibers when a WDM or CWDM host module is not installed with the HU:

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

2. 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 each connector.
3. Remove the dust caps from the HU optical ports and from the patch cord connectors that will be connected to the HU.
4. Clean each patch cord connector (follow patch cord supplier's recommendations).

Note: To protect the optical receivers, insert a 10 dB attenuator in each optical path. After the optical power has been measured, the attenuator may be resized or removed.

5. Insert the connector into the appropriate optical port as shown in Figure 3-7.

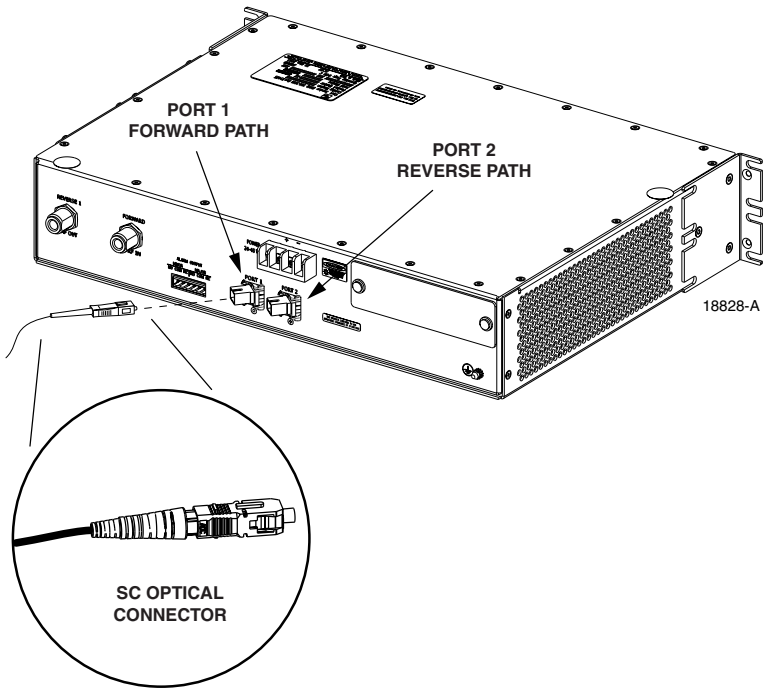

Figure 3-7. Fiber Optic Cable Connections To Host Unit

6. Route the patch cords from the HU to the fiber distribution panel.

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

7. At the fiber distribution panel, identify the OSP optical fiber terminations that correspond to the forward and reverse path.
8. Remove the dust caps from the from the patch cord connectors.
9. Clean each patch cord connector (follow patch cord supplier's recommendations) and then mate the connector with the appropriate OSP optical fiber termination.
10. Store any excess patch cord slack at the fiber distribution panel.

7.2 Optical Connections With WDM System

Use the following procedure to connect the optical fibers when a WDM module is installed with the HU:

1. Obtain a patch cord that is of sufficient length to reach from the WDM host module to the fiber distribution panel.
2. Remove the dust cap from the optical port on the WDM module and from the patch cord connector that will be connected to the WDM module.
3. Clean the patch cord connector (follow connector supplier's recommendations).
4. Insert the connector into the WDM module's optical port (port 1).
5. Route the patch cord from the WDM to the fiber distribution panel.
6. Identify the OSP cable optical fiber termination that corresponds to the RU.
7. Remove the dust cap from the OSP cable optical adapter and from the patch cord connector.
8. Clean the patch cord connector (follow connector supplier's recommendations) and then mate the connector with the appropriate OSP cable adapter.
9. Store any excess patch cord slack at the fiber distribution panel.
10. Remove the dust caps from the PORT 1 and PORT 2 optical ports on the HU and from the WDM pigtails that will be connected to the HU.
11. Clean each pigtail connector (follow connector supplier's recommendations) and then insert the connector into the appropriate optical port on the HU as shown in Figure 3-8.

Note: To protect the optical receiver(s), insert a 10 dB attenuator in the optical path. After the optical power has been measured, the attenuator may be resized or removed.

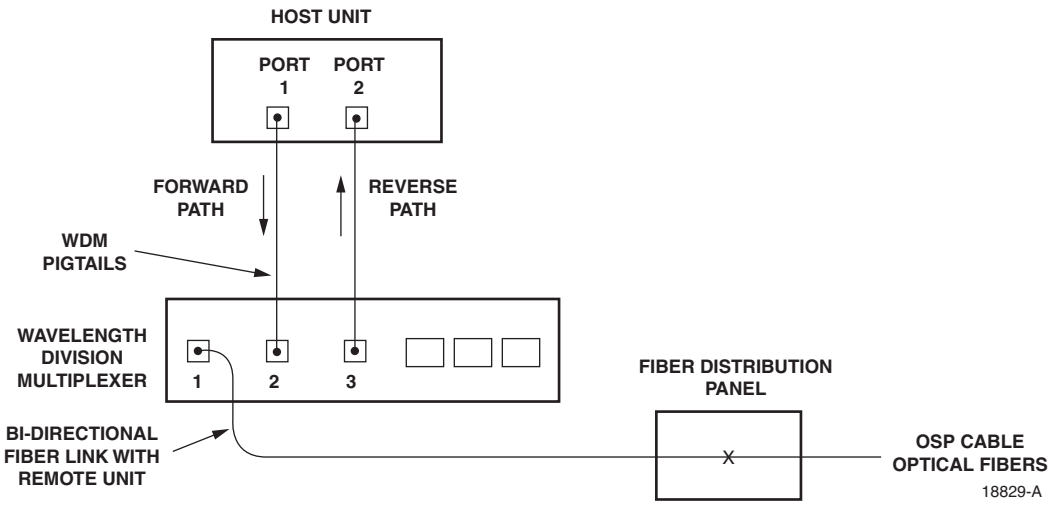

Figure 3-8. Fiber Optic Connections To WDM Module

8 CONTROLLER AREA NETWORK CONNECTIONS

Controller Area Network (CAN) interface connections between multiple HU's are supported by a pair of RJ-45 jacks. One of the jacks is designated as the NET IN port and the other jack is designated as the NET OUT port. The CAN interface allows up to 24 HU's to be connected together (in daisy-chain fashion) and controlled through a single Digivance EMS computer. A one meter long cable is available (accessory) for CAN connections. Use the following procedure to connect CAN interface cables between multiple HU's:

1. Connect one end of the CAN interface cable (accessory) to either the NET IN or NET OUT port on HU #1 as shown in Figure 3-9.

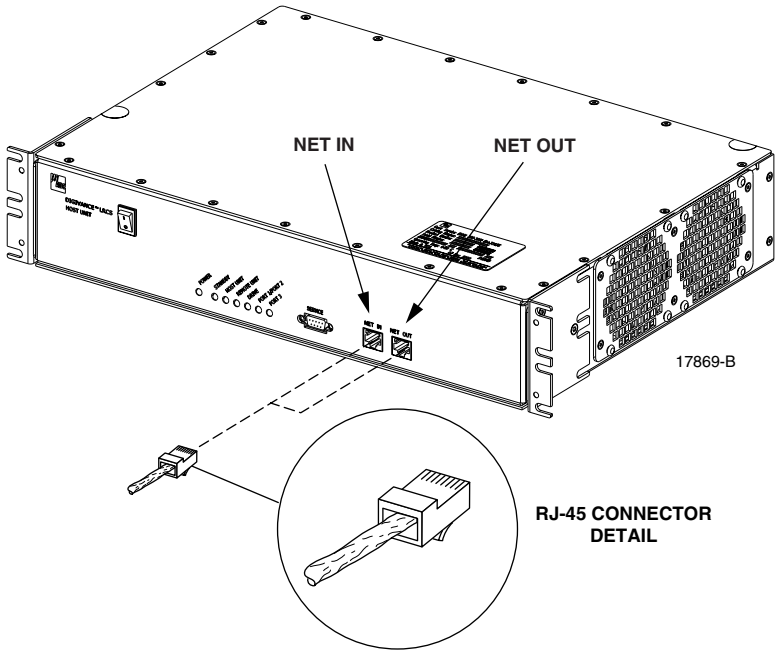

Figure 3-9. Controller Area Network Connections

2. Route the CAN interface cable to HU #2 and connect the cable's free end to the port that is the **logical opposite** of the CAN interface connection at HU #1.

Note: Always connect OUT to IN and IN to OUT. If connected to the NET OUT port at HU #1, connect to the NET IN port at HU #2. If connected to the NET IN port at HU #1, connect to the NET OUT port at HU #2.

3. If a third HU will be connected to the network, connect a second CAN interface cable to the remaining network port on HU #2.
4. Route the second CAN interface cable to HU #3 and connect the cable's free end to the port that is the logical opposite of the CAN interface connection at HU #2.
5. Repeat steps 3 and 4 for each additional HU that is added to the network up to a total of 24 HU's. A diagram of typical CAN interface connections is shown in Figure 3-10.