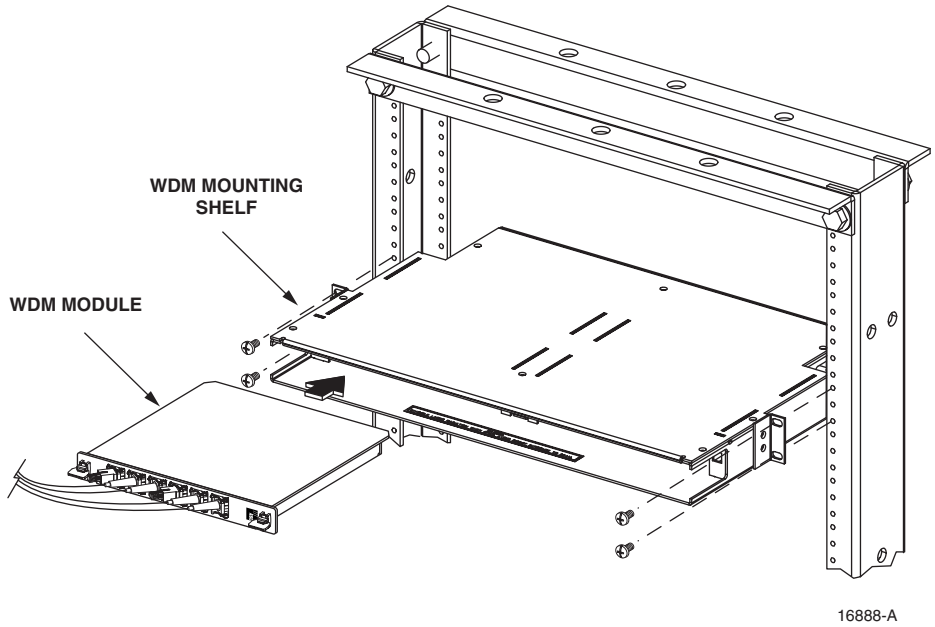

Figure 3-4. WDM Mounting Shelf and WDM Module Installation

4 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 3-5. Use the screws removed in step 2 to re-attach the brackets to the HU chassis.

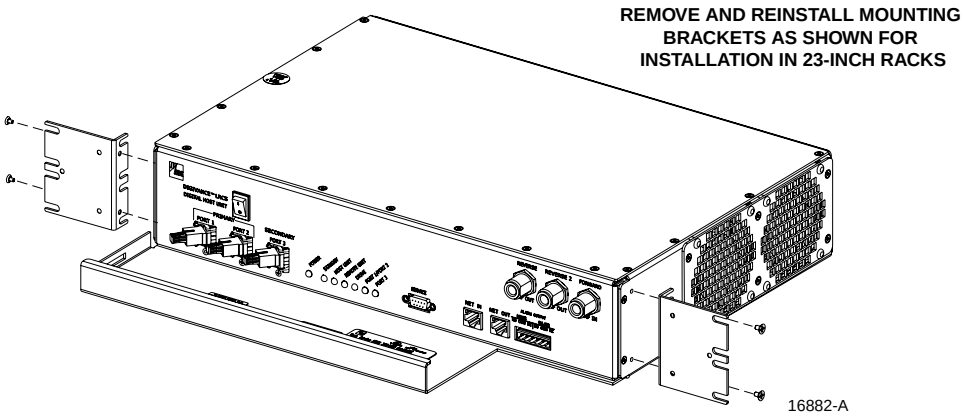

Figure 3-5. Installing the Mounting Brackets for 23-Inch Rack Installations

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 3-6.

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.

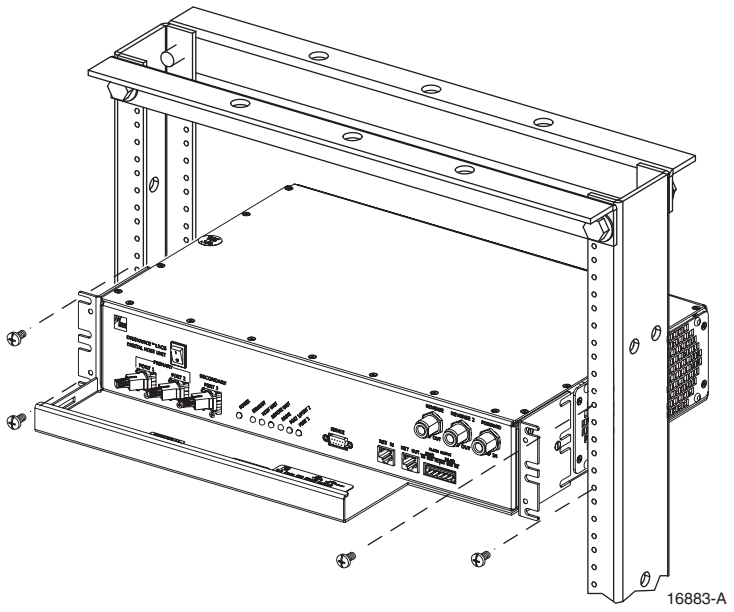

Figure 3-6. HU Rack Mount Installation

5 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 3-7.

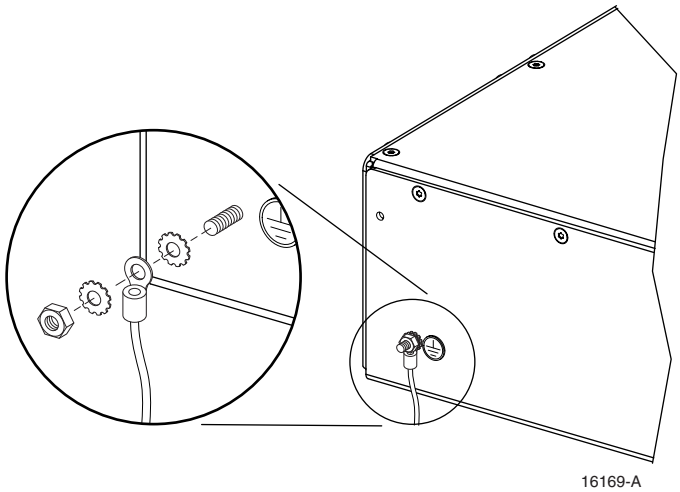

Figure 3-7. Chassis Ground Stud

4. Attach the ring end of the wire to the chassis ground stud (see Figure 3-7).
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.

6 COAXIAL CABLE CONNECTIONS

The RF interface between the HU and the BTS is supported through either two (non-diversity) or three (diversity) type N female connectors mounted on the HU front panel. On non-diversity units, 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. On diversity units, a third connector provides the coaxial cable connection for the diversity reverse path (uplink) signal.

In many installations, it is usually necessary to install an external attenuator in the forward path link between the HU and the BTS. The procedure for determining the value of the external attenuator is provided in SECTION 4: OPERATION. The HU should be mounted as close as possible to the BTS to minimize cable losses. Use the following procedure to route the forward and reverse path coaxial cables and connect them 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 and the diversity reverse path cable (if the HU supports diversity) between the HU and the BTS 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 a type N 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 3-8.

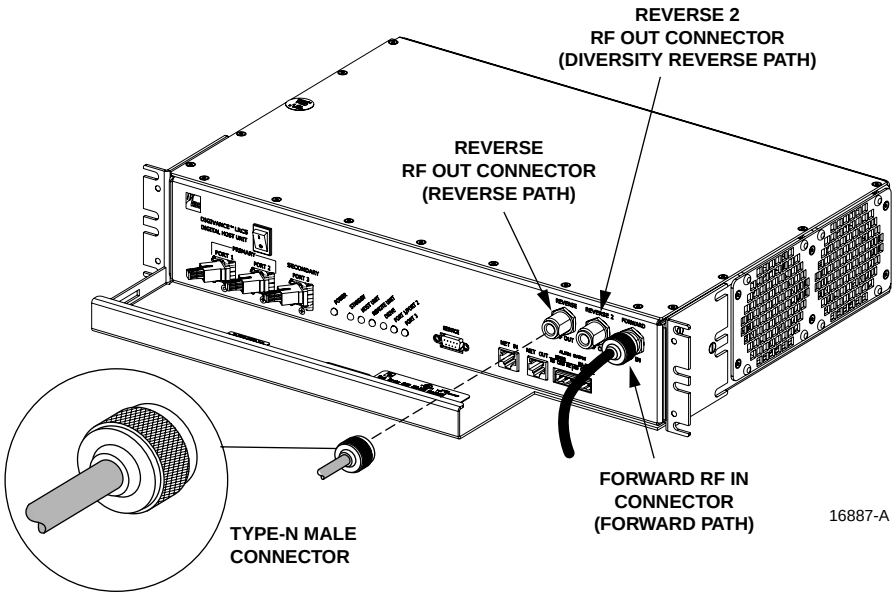

Figure 3-8. Forward and Reverse Path Coaxial Cable Connections

5. Connect the reverse path cable to the **REVERSE RF OUT** connector on the HU front panel (see Figure 3-8).
6. If the HU supports diversity, connect the diversity reverse path cable to the **REVERSE 2 RF OUT** connector on the HU front panel (see Figure 3-8).
7. Dress and secure cables at the HU.
8. Complete all remaining coaxial connections at the BTS interface as specified in the system design plan.

7 OPTICAL CONNECTIONS

The optical interface between the HU and the RU is supported by either two (non-diversity) or three (diversity) optical ports. Each optical port consists of an SC optical adapter which is mounted on the HU front 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. Port 3 provides the optical fiber connection for the diversity reverse path (uplink) signal.

The optical connections are dependent on whether or not a WDM (optional accessory) is installed. If the installation **does not** include a WDM, proceed to Section 7.1 for the optical connections procedure. If the installation **does include** a WDM, proceed to Section 7.2 for the optical connections 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

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

1. Obtain two (non-diversity) or three (diversity) 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 the connector. For diversity systems, designate and label or tag a third patch cord as the **diversity reverse path** link.
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 connector supplier's recommendations) and then insert the connector into the appropriate optical port as shown in Figure 3-9 and as specified by the following:

   Port 1 - Forward path patch cord

   Port 2 - Reverse path patch cord

   Port 3 - Diversity reverse path patch cord

5. 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.

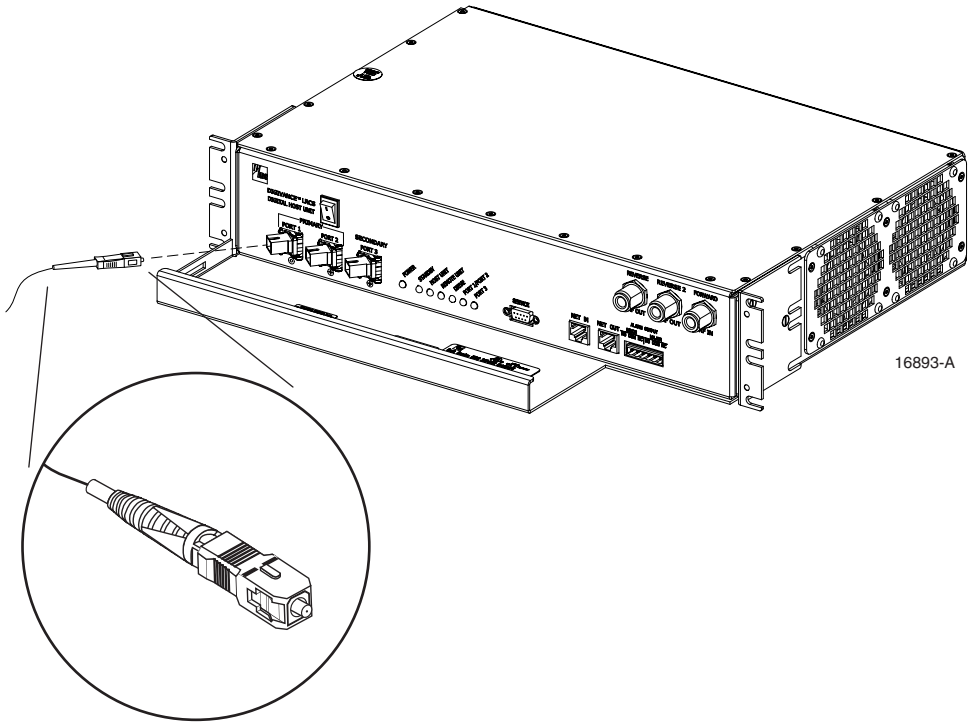

Figure 3-9. Fiber Optic Cable Connections To Host Unit

6. Identify the OSP cable optical fiber terminations that correspond to the RU.
7. Designate one of the OSP fibers as the **forward path** link and the other as the **reverse path** link and attach an identification label or tag next to the connector. For diversity systems, designate and label or tag a third fiber as the **diversity reverse path** link.
8. Remove the dust caps from the OSP cable optical fiber adapters and from the patch cord connectors.
9. Clean each patch cord connector (follow connector supplier's recommendations) and then mate the connector with the appropriate OSP cable adapter.
10. Store any excess patch cord slack at the fiber distribution panel.

7.2 Optical Connections With WDM

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 module to the fiber distribution panel.
2. Remove the dust cap from one of the two optical ports on the WDM module and from the patch cord connector that will be connected to the WDM module.

Note: Each WDM module can support two separate HU's. The WDM module ports are numbered from 1 through 6 as shown in Figure 3-10. Ports 1 through 3 are used for HU #1 and Ports 4 through 6 are used for HU #2.

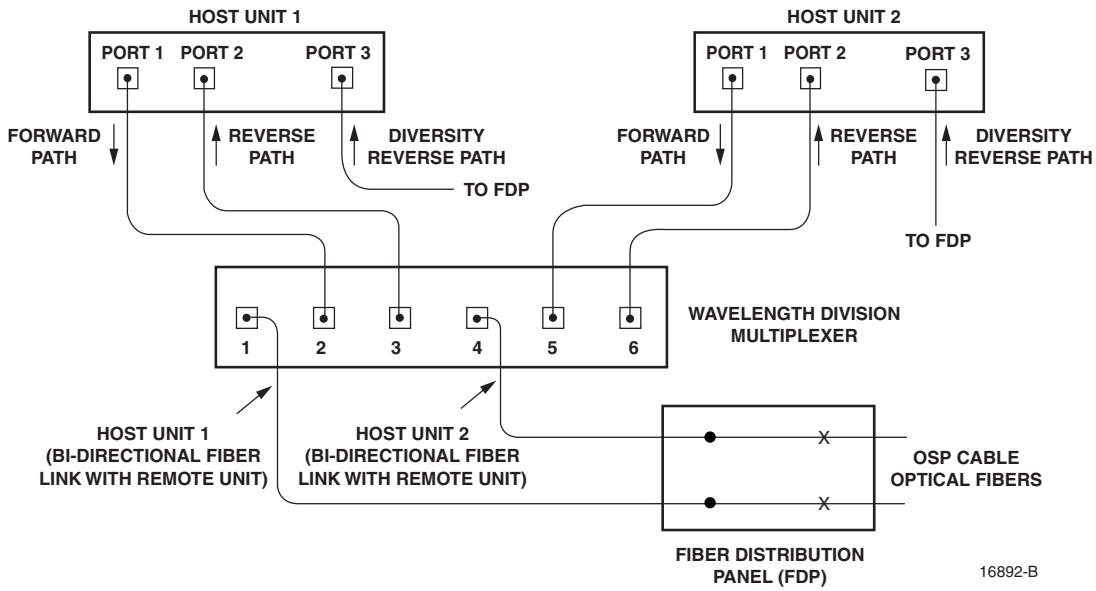

Figure 3-10. Fiber Optic Connections To WDM Module

3. Clean the patch cord connector (follow connector supplier's recommendations) and then insert the connector into one of the WDM module's optical ports (port 1 or 4).
4. Route the patch cord from the WDM to the fiber distribution panel.
5. Identify the OSP cable optical fiber termination that corresponds to the RU.
6. Remove the dust cap from the OSP cable optical adapter and from the patch cord connector.
7. Clean the patch cord connector (follow connector supplier's recommendations) and then mate the connector with the appropriate OSP cable adapter.
8. Store any excess patch cord slack at the fiber distribution panel.
9. Remove the dust caps from the HU optical ports and from the WDM pigtails that will be connected to the HU.
10. 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 3-9 and as diagramed in Figure 3-10.

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

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 provided with each HU 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 (provided with the HU) to either the NET IN or NET OUT port on HU #1 as shown in Figure 3-11.

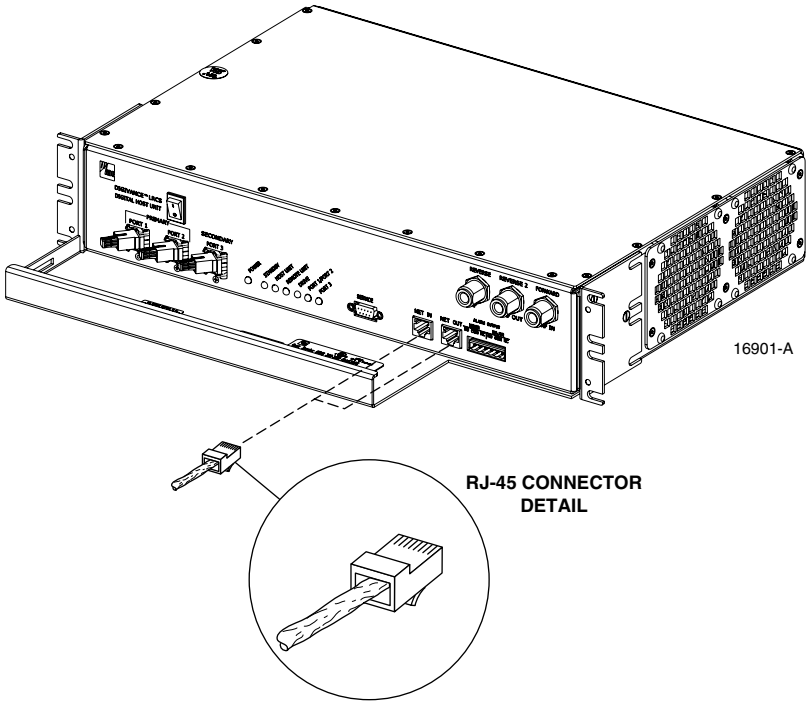

Figure 3-11. Controller Area Network Connections

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 network port the cable was connected to at HU #1.

Note: If connected to a NET OUT port at HU #1, connect to the NET IN port at HU #2. If connected to a NET IN port at HU #1, connect to a 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 port that the cable is connected to 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 3-12.

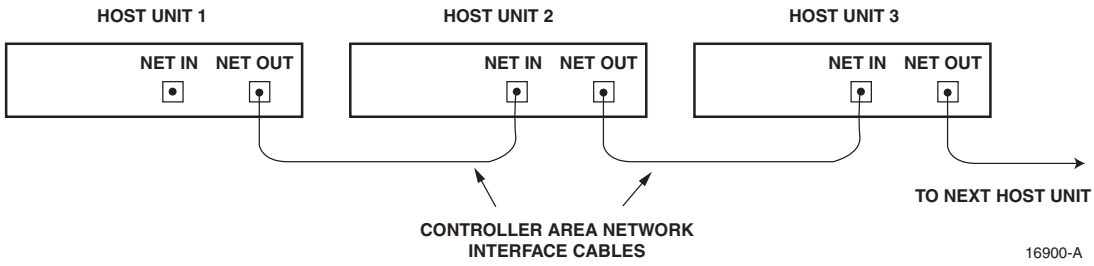

Figure 3-12. Configuring CAN Connections with Multiple Host Units

9 SERVICE INTERFACE CONNECTION

The service interface connection between the HU and the Digivance EMS computer is supported by a single DB-9 female connector. The service connector provides an RS-232 DTE interface. A three meter long straight-through RS-232 interface cable is provided with the HU for connecting the EMS computer to the HU. Use the following procedure to install the service interface cable:

1. Connect one end of the service interface cable (provided with HU) to the SERVICE port as shown in Figure 3-13.
2. Route the service interface cable to the EMS computer and connect the free end of the cable to the computer's RS-232 DCE port. Refer to the user manual provided with the computer to locate the required port.

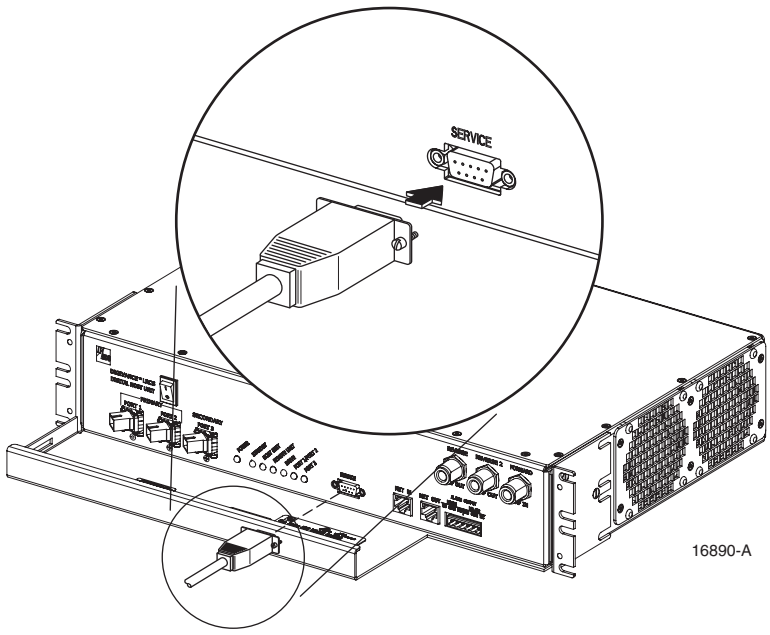

Figure 3-13. Service Interface Connection

10 EXTERNAL ALARM SYSTEM CONNECTIONS

The alarm interface between the HU and an external alarm system is supported by a six-terminal plug (with screw-type terminals) that connects to a receptacle mounted on the HU 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 HU to the external alarm system. Use the following procedure to install the alarm wiring and connect it to the HU:

1. Obtain the required length of category 3 or 5 cable.
2. Route the cable between the HU and the external alarm system (if not already routed) and then cut to the required length. Allow sufficient slack for dressing and organizing the cable at the HU.
3. Strip back the outer cable sheath and insulation to expose the wires at both ends of the cable and strip back 0.2 inches (5 mm) of insulation from each wire.
4. Connect the Major alarm wire pair to the MAJOR COM/NC or MAJOR COM/NO terminals (whichever is required by the external alarm system) on the HU alarm terminal connector (supplied with HU) as shown in Figure 3-14.

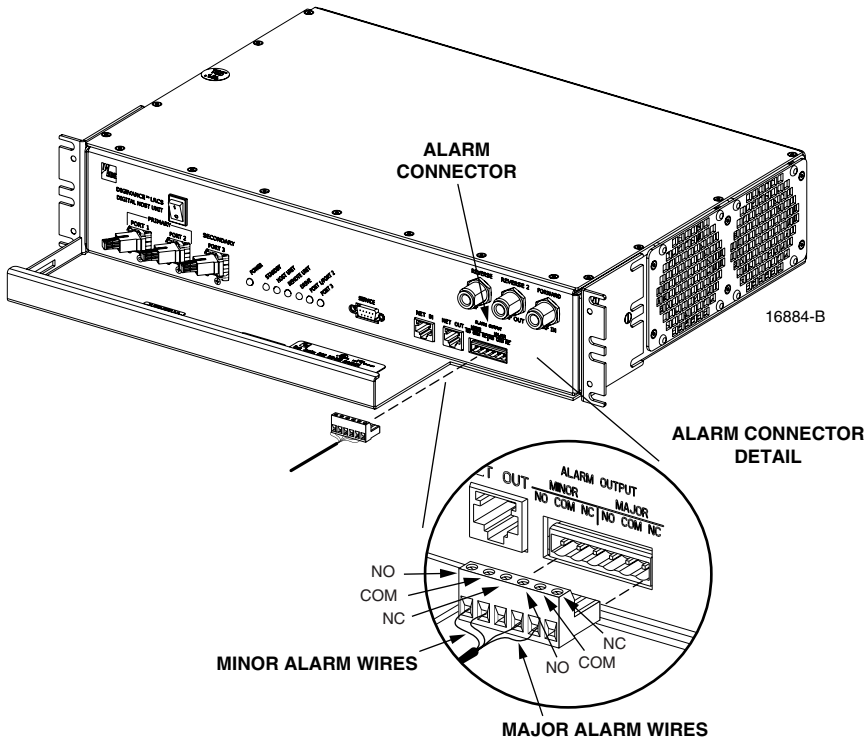

Figure 3-14. External Alarm System Connections

5. Connect the Minor alarm wire pair to the MINOR COM/NC or MINOR COM/NO terminals (whichever is required by the external alarm system) on the HU alarm terminal connector (see Figure 3-14).

6. Connect the Major and Minor alarm wire pairs to the appropriate terminals on the external alarm system.
7. Dress and secure cable per standard industry practice.

11 DC POWER CONNECTIONS

The HU is powered by ± 24 or ± 48 Vdc power. The power is fed to the HU through a screw-down type terminal strip located on the rear side of the unit. Power to the HU must be supplied through a fuse panel such as the 20 position PowerWorx fuse panel (available separately) and the power must be protected with a 3 Amp GMT fuse. Use the following procedure to install the power wiring:

1. Obtain one pair of #18 AWG (1.00 mm) red and black insulated copper wire for use as the power wiring.
2. Terminate one end of each wire with a fork terminal as shown in Figure 3-15.
3. Connect the power wires to the power terminal strip at the rear of the HU.

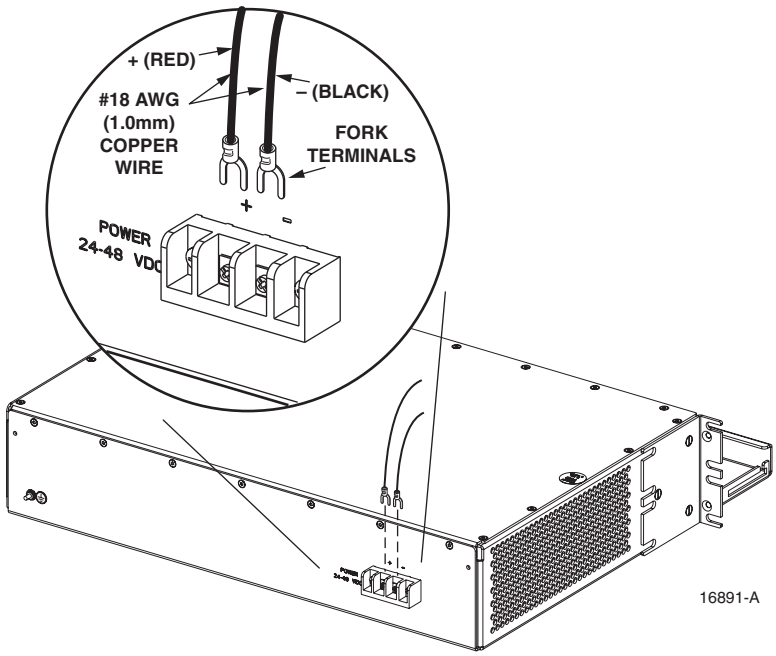

Figure 3-15. DC Power Connections

4. Route the free ends of the wires to the fuse panel and locate the terminals that will be used for the power feed. Refer to the user manual provided with the fuse panel for specific information.
5. Remove the fuse from the circuit that will power the HU.

6. Connect the power wires to the appropriate terminals as specified in the fuse panel user manual.
7. Dress and secure the power wiring at the fuse panel and the HU. The procedure for checking the voltage level and verifying that the HU is ready to power up is provided in SECTION 4: OPERATION.

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SECTION 4: OPERATION

1 BEFORE STARTING OPERATION

This section provides guidelines for turning-up the Digivance LRCS, verifying that all units are operating properly, testing to ensure that all performance requirements are satisfied, and correcting any installation problems. This process assumes that the various units have been installed in accordance with the system design plan.

1.1 Tools and Materials

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

- Portable spectrum analyzer or RF power meter
- AC/DC voltmeter
- External attenuators (if specified in system design plan)
- PC-type computer with Digivance Element Management System (EMS) software installed
- Straight-through RS-232 DB-9 interface cable (ADC part # 1192835)
- Handset
- Pencil or pen
- Writing pad

1.2 Readiness Check

Before starting the turn-up process, inspect the complete LRCS system to verify that all components of the system are ready to be powered-up. This will ensure that no units of the system will be damaged during turn-up and that all existing systems will continue to function properly.

1.2.1 Host Unit Installation Checks

Complete the following checks at the HU prior to starting the turn-up process:

1. Verify that the ON/OFF switch on the HU is in the **OFF** position (press **O**).
2. At the fuse panel, install a 3 Amp GMT fuse in the circuit that supplies DC power to the HU.
3. Using a DC voltmeter, verify that the DC voltage level at the HU power terminals is between ± 24 or ± 48 Vdc (can be either polarity).
4. Verify that all electrical and optical connections have been completed and that all optical fibers, coaxial cables, and wires are properly routed and secured.

1.2.2 Remote Unit Installation Checks

Complete the following checks at the RU prior to starting the turn-up process:

1. Verify that the ON/OFF switch on the STM is in the **OFF** position (press **O**).
2. Verify that the RF ON/OF switch on the LPA in the **OFF** position.
3. At the AC breaker box, close the circuit breaker for the circuit that supplies AC power to the RU.
4. Using an AC voltmeter, verify that the AC voltage level at the AC outlet is between 110 and 120 Vac (for 120 Vac powered systems) or between 220 and 240 Vac (for 240 Vac powered systems).
5. Verify that all electrical and optical connections have been completed and that all optical fibers, coaxial cables, and wires are properly routed and secured.

2 TURN-UP SYSTEM AND VERIFY OPERATION

The process of turning-up the system and verifying operation involves powering up the various system components, verifying that the LED indicators show normal operation, setting the site number and name, adjusting the RF signal levels, and adjusting the path delay.