**Table 2-6. 1900 MHz 20 Watt System Nominal Specifications, continued**

| PARAMETER | SPECIFICATION | REMARKS |
|---|---|---|
| Optical transmit power output<br>   Host Unit<br>   Remote Unit | 0 dBm<br>+2 dBm | |
| Optical budget | 25 dB | For optical BER of $10^{-6}$ |
| Optical receive input | −15 dBm maximum | |
| Optical connectors | Industry standard SC | Host, remote, and WDM |
| **Optical - Host and Remote WDM** | | |
| Passband | 1310 nm ± 20 nm<br>1550 nm ± 20 nm | |
| Forward path insertion loss<br>   Host WDM<br>   Remote WDM | 0.7 dB<br>0.3 dB | Does not include connector loss |
| Reverse path insertion loss<br>   Host WDM<br>   Remote WDM | 0.3 dB<br>0.7 dB | Does not include connector loss |
| Isolation | > 30 dB minimum | |
| Return loss (Reflectance) | < −50 dB | All input ports |
| **RF Forward Path - 1900 MHz** | | |
| System bandwidth | 20 MHz AD band, 25 MHz DBE, BEF, and EFC bands | |
| Frequency range<br>   AD<br>   DBE<br>   BEF<br>   EFC | 1930 to 1950 MHz<br>1945 to 1970 MHz<br>1950 to 1975 MHz<br>1965 to 1990 MHz | |
| Out-of-band emissions<br>   Primary<br><br>   Secondary (see Note 1) | −13 dBm per 1 MHz bandwidth from 10 kHz to 20 GHz<br>−98 dBm per 100 kHz from 824 to 849 MHz and from 1850 to 1910 MHz | |
| Gain of forward path<br>(Host input to Remote antenna port) | 80.5 dB at band center, room temperature, and 0 dB attenuation setting | Includes power amplifier. |
| Gain flatness<br>   Band flatness<br>   Channel flatness | ± 1.5 dB across freq. range<br>±1 dB variation across any 1.25 MHz channel | |
| Gain variation | ± 3 dB over temp and unit-to-unit | |
| Out-of-band rejection | −40 dB at $\geq$ ±17.5 MHz from 881.5 MHz | |
| Propagation delay | 6 μs | Excludes fiber delay |

**Table 2-6. 1900 MHz 20 Watt System Nominal Specifications, continued**

| PARAMETER | SPECIFICATION | REMARKS |
|---|---|---|
| Configurable propagation delay<br>  Range<br>  Step size | Up to 63 µs<br>0.1µs | Plus standard propagation delay |
| Spurious<br>  In-band self generated<br>  Free dynamic range | –13 dBm at remote output<br>60 dB at 30 kHz bandwidth | |
| Transmit peak-to-average | 10 dB | |
| Two-tone Intermodulation | –55 dBc at remote output | Two CW tones at 5 Watts each |
| CDMA Intermodulation<br>  885 kHz to 1.25 MHz<br>  1.25 to 1.98 MHz<br>  1.98 to 2.25 MHz | –45 dBc per 30 kHz<br>–8 dBm per 30 kHz<br>–55 dBc per 30 kHz | Absolute level |
| Nominal composite RF input signal level | –40 dBm at 0 dB attenuation<br>–9 dBm at max. attenuation | An input signal level of –40 dBm provides maximum output power |
| Configurable input level<br>  Range<br>  Step size | 31 dB<br>1 ± 0.5 dB ±10% of attenuation monotonic | |
| Composite RF Output power | 40.5 dBm (11 Watts) at remote antenna port with –40 dBm input | 20 Watts at power amplifier output |
| Configurable RF Output<br>  Range<br>  Step size | 31 dB at remote unit<br>1 ±0.5 dB ±10% of attenuation monotonic | |
| Transmit path insertion loss | 2.5 dB | |
| **RF Reverse Path - 1900 MHz**<br><br>System bandwidth<br>  A band<br>  B band | 20 MHz AD band, 25 MHz DBE, BEF, and EFC bands | |
| Frequency range<br>  AD<br>  DBE<br>  BEF<br>   EFC | 1850 to 1870 MHz<br>1865 to 1890 MHz<br>1870 to 1895 MHz<br>1885 to 1910 MHz | |
| In band spurs (caused by an individual out-of-band signal) | –75 dBc (1 MHz to 20 GHz and > 10 MHz out-of-band)<br>–120 dBc (1930 to 1990 MHz)<br>–120 dBc (869 to 894 MHz) | Required for dual band |
| Propagation delay | 6 µs | Excludes fiber delay |
| Configurable propagation delay<br>  Range<br>  Step size | Up to 63 µs<br>0.1µs | Plus standard propagation delay |

**Table 2-6. 1900 MHz 20 Watt System Nominal Specifications, continued**

| PARAMETER | SPECIFICATION | REMARKS |
|---|---|---|
| Gain flatness<br>   Band flatness<br>   Channel flatness | ±1.5 dB across frequency range<br>±1 dB variation across any 1.25 MHz channel | |
| Gain of reverse path<br>   Overall gain<br><br>   Gain variation | 30 dB at band center at room temperature<br>3 dB over temperature | ALC not invoked<br><br>ALC not invoked |
| Out-of-band rejection | –40 dB at ≥ ±17.5 MHz from 836.6 MHz | ALC not invoked |
| Spurious (in-band self generated) | –110 dBm referred to input | ALC not invoked |
| Intermodulation | –62 dBc two tones at –50 dBm | |
| System noise figure | 8 dB at mid-band | ALC not invoked |
| Configurable RF output<br>   Range<br>   Step size | 31 dB<br>1 ±0.5 dB ±10% of attenuation monotonic | |
| Blocking dynamic range | 70 dB | |
| Level limiting ALC threshold | –40 dBm dB instantaneous | |
| Level limiting ALC range | 30 dB | |
| **RF Forward and Reverse Path Modulation Accuracy**<br><br>Service/Mod Type/Parameter<br>   TDMA/n/4-DQSK/rms EVM<br>   GSM/GMSK/rms phase error<br>   EDGE/8PSK/rms EVM<br>   EIA-97D/CDMA/rho factor | 7%<br>4°<br>7%<br>.97% | |
| **Physical/Environmental/ Electrical - Host Unit**<br><br>Dimensions (H×W×D) | 3.5 × 17.2 × 15.3 inches<br>(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 | 0° to 50° C (32° to 122° F) | |
| Storage temperature | –40° to 70° C (–40° to 158°F) | |
| Humidity | 10% to 90% | No condensation |
| External alarm connector | Screw-type terminals | NO and NC relay contacts |

**Table 2-6. 1900 MHz 20 Watt System Nominal Specifications, continued**

| PARAMETER | SPECIFICATION | REMARKS |
|---|---|---|
| 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**<br><br>Cabinet dimensions (H×W×D) | $25.6 \times 10.13 \times 20.75$ inches ($674 \times 257 \times 527$ 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 |
| **Physical/Environmental/ Electrical - Remote Unit Indoor Mounting Shelf**<br><br>Mounting Shelf dimensions (H×W×D) | $14.15 \times 17.39 \times 15.6$ inches ($359 \times 442 \times 396$ mm) | |

**Table 2-6. 1900 MHz 20 Watt System Nominal Specifications, continued**

| PARAMETER | SPECIFICATION | REMARKS |
|---|---|---|
| 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 |

Note 1: Required for co-located sites such as dual band. Otherwise, the emissions from one unit can limit the sensitivity of the other.

# SECTION 3: HOST UNIT INSTALLATION

_____

## 1 BEFORE STARTING INSTALLATION

This section provides the installation procedures for the HU, the WDM host module mounting shelf (accessory), 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, 2 or 3 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.
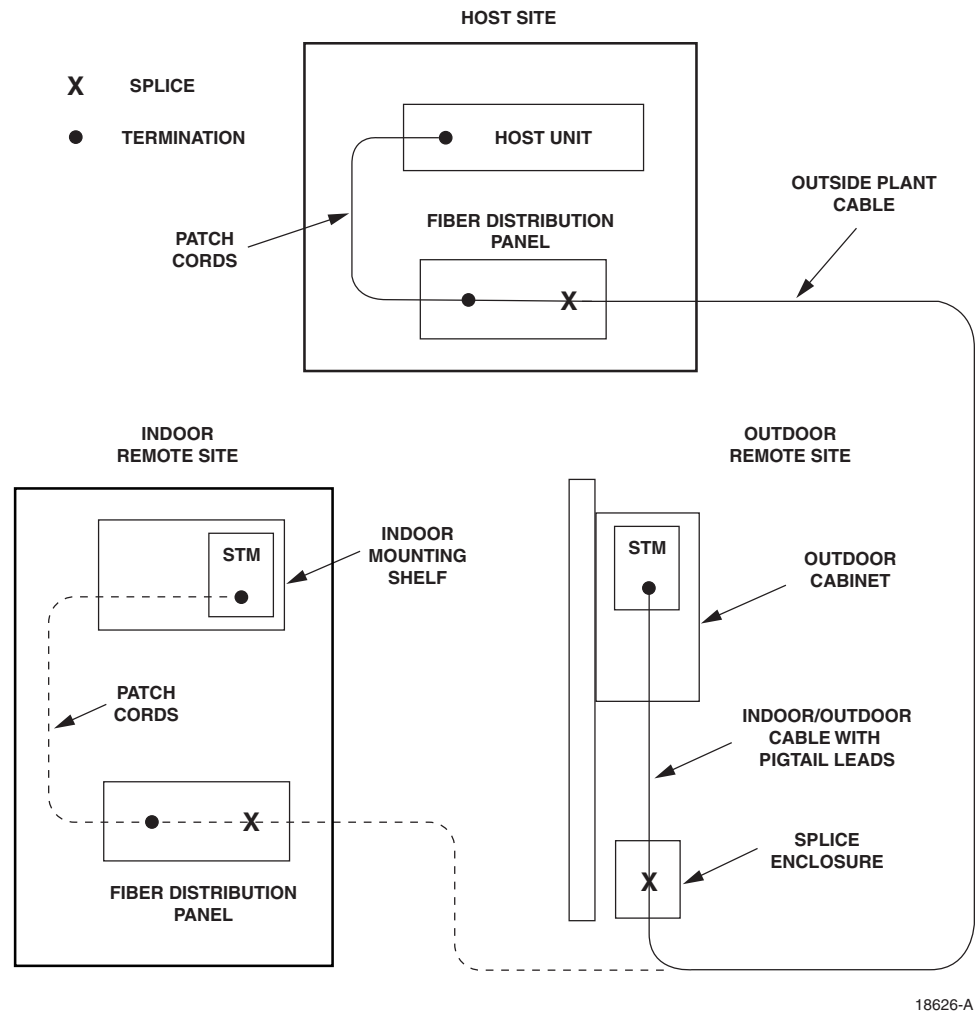
**Figure 3-1. Typical Fiber Optic Cable Routing**

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   WDM MOUNTING PROCEDURE (OPTIONAL ACCESSORY)

A bi-directional wavelength division multiplexer (WDM) system 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 4.

At the HU, the WDM system consists of a WDM host module and a WDM host module mounting shelf. Each host module can support two HU's and each host module mounting shelf can hold two host modules. A fully loaded host module mounting shelf can therefore support four HU's.

When multiple HU's require connection to a WDM system, the host module mounting shelf and the HU's should be mounted in the equipment rack as shown in Figure 3-2. This configuration allows the pigtail leads from the two host modules to be connected directly to the optical ports on any one of the four HU's.
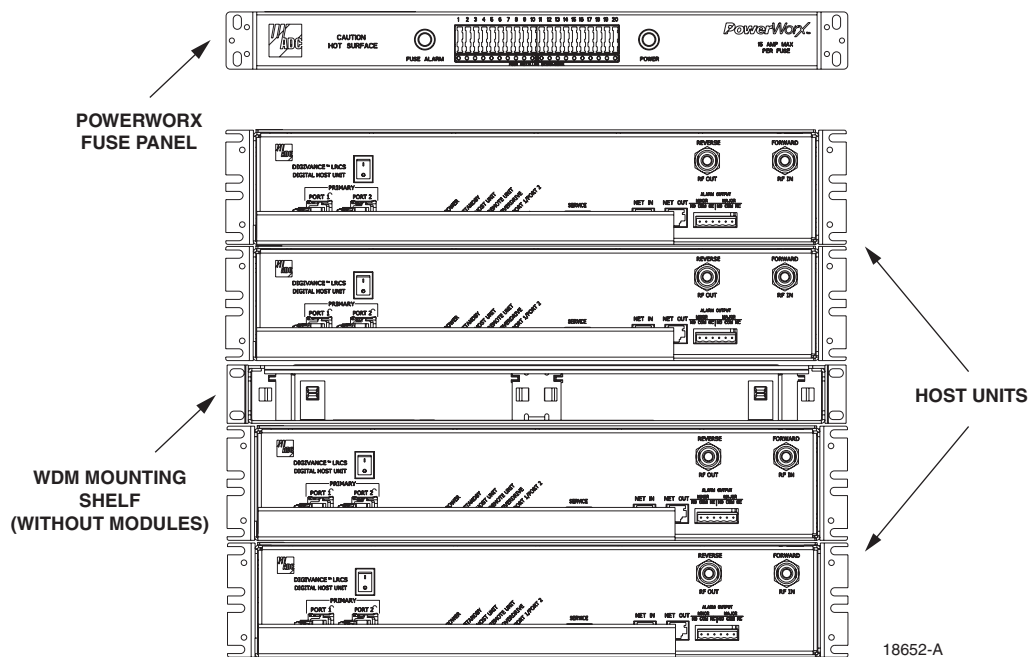


**Figure 3-2. Typical WDM and HU Configuration**

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 host module mounting shelf in the equipment rack and to mount the host modules in the host module mounting shelf:

1.  The host module mounting shelf is shipped with the mounting brackets installed for 19-inch EIA rack installations. If installing the mounting shelf in a 19-inch EIA rack, proceed to step 5. If installing the mounting shelf in a 19-inch WECO rack, a 23-inch EIA rack, or a 23-inch WECO rack, proceed to step 2.

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

3. Locate the extra mounting brackets that are provided with the mounting shelf and select the brackets that correspond to the rack type. Each mounting shelf includes extra brackets for installing the mounting shelf in the following rack types:

- 19-inch EIA
- 19-inch WECO
- 23-inch EIA
- 23-inch WECO

4. Install the replacement mounting brackets as shown in Figure 3-3. Use the screws removed in step 2 to attach the new brackets to the mounting shelf.



16885-A
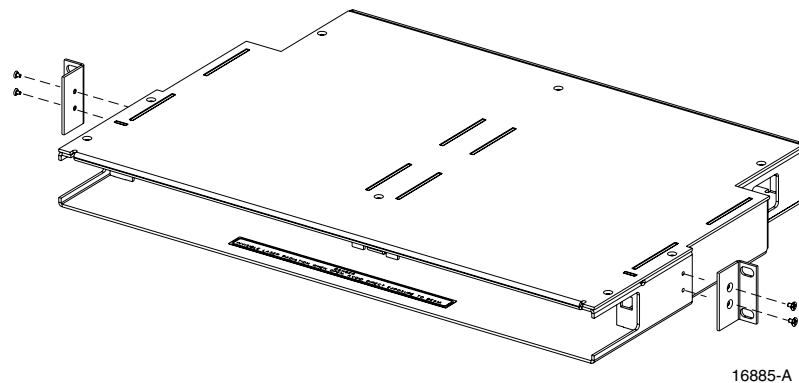
**Figure 3-3. Installing the Replacement Mounting Brackets**

5. 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 as shown in Figure 3-4.

6. Install each host module in the mounting shelf (see Figure 3-4). A rail on the side of the module fits into a guide within the mounting.

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

8. Carefully store the pigtail leads from each host module. The routing and connection procedures for the pigtails are provided in Section 7.
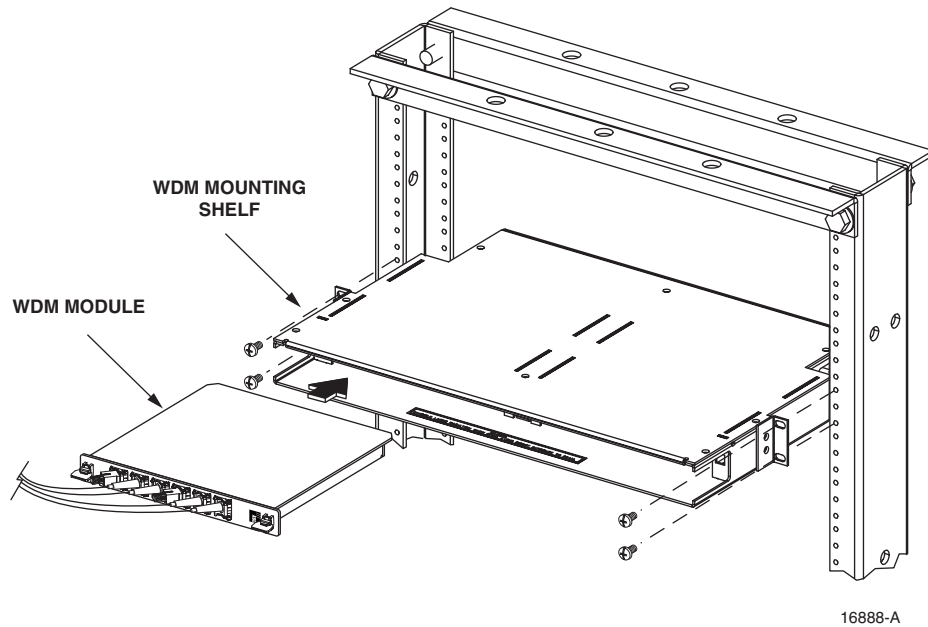
**Figure 3-4. WDM Host Module Mounting Shelf and WDM Host Module Installation**

## 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.



**REMOVE AND REINSTALL MOUNTING BRACKETS AS SHOWN FOR INSTALLATION IN 23-INCH RACKS**

18653-A
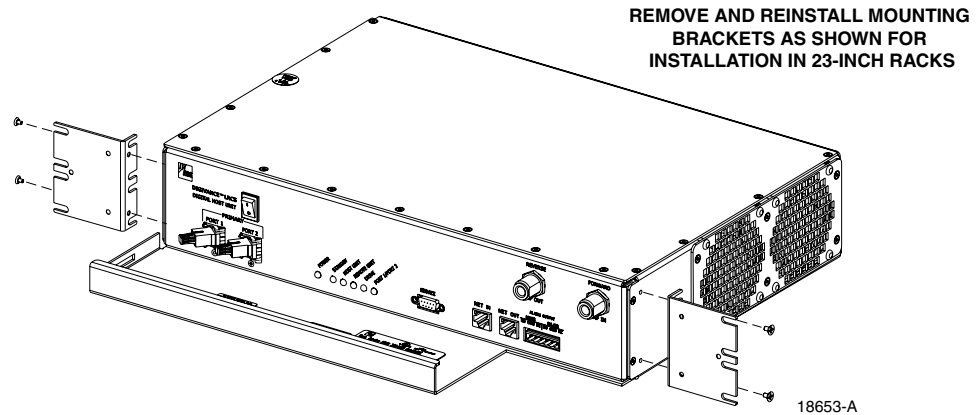
**Figure 3-5. Installing the Mounting Brackets for 23-Inch Rack Installations**

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.



18654-A
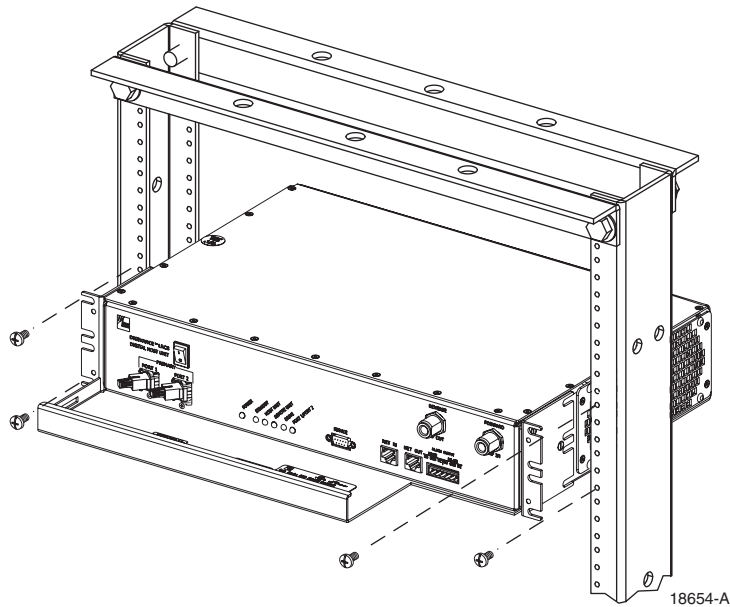
**Figure 3-6. HU Rack Mount Installation**

## 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.



16169-A
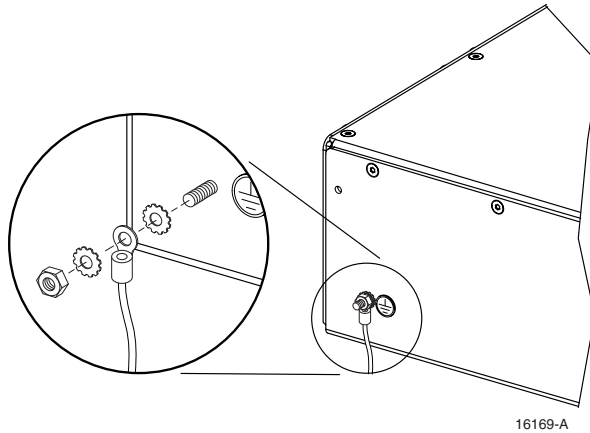
**Figure 3-7. Chassis Ground Stud**

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.

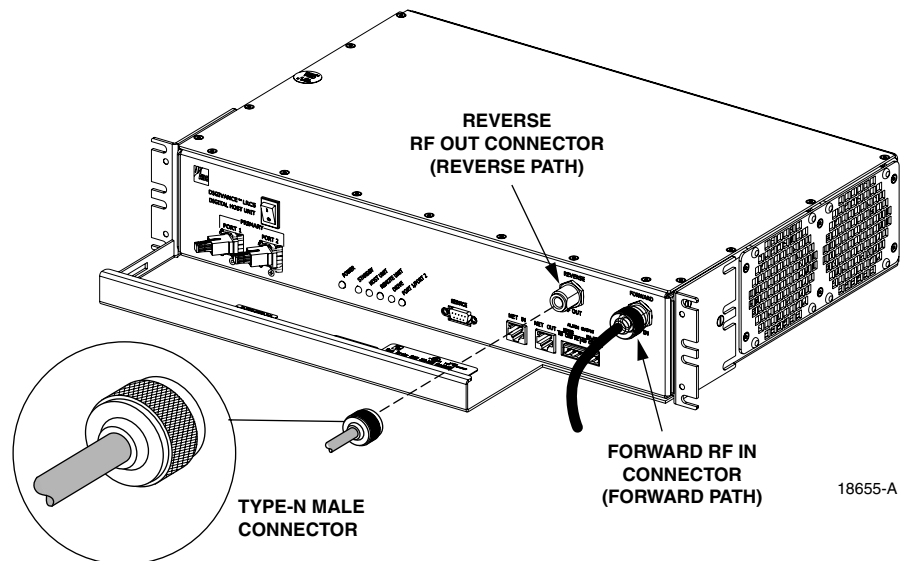## 6   COAXIAL CABLE CONNECTIONS

The RF interface between the HU and the BTS is supported through two N-type female connectors mounted on the HU 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 some attenuation in the forward path link between the HU and the BTS. A signal level that is greater than –9 dBm will overdrive and

possibly damage the HU receiver. Refer to Section 4, Subsection 2.3, before completing the forward path connection at the BTS. If the Conditioning Panel or Duplexing Panel is required, refer to the Digivance 800 and 1900 MHz Interface Panels User Manual (ADCP-75-147) for the installation procedures. The HU should be mounted as close as possible to the BTS 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 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 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 3-8.

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



**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.  Dress and secure cables at the HU.

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

## 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 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.

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.*

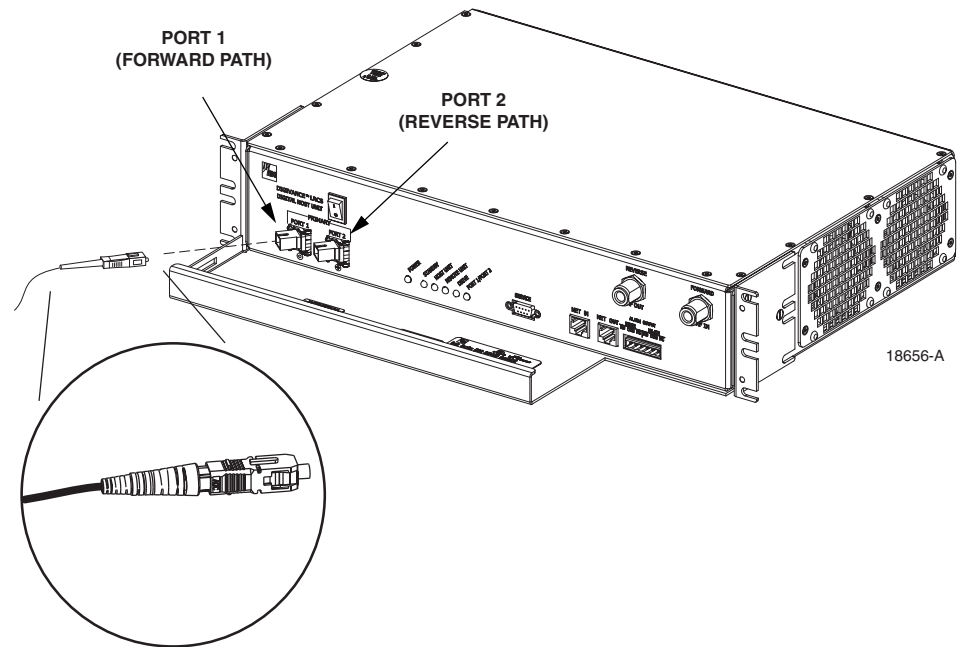### 7.1   Optical Connections Without WDM or CWDM system

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 15 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 3-9.

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.

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

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 Port 1 or Port 4 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.
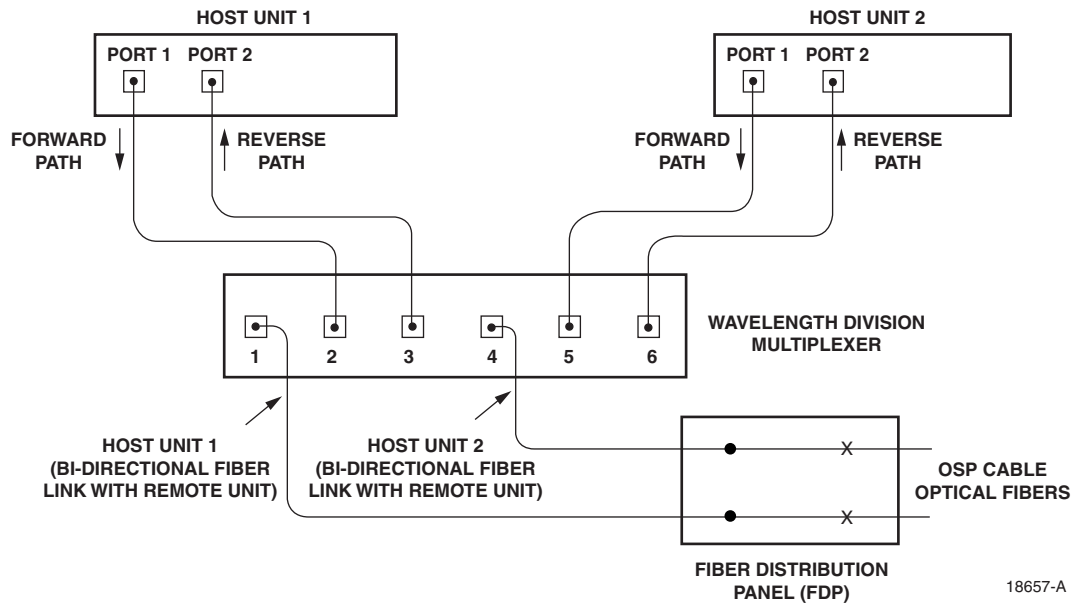
**Figure 3-10. Fiber Optic Connections To WDM Module**

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

▶ **Note:** To protect the optical receivers, insert a 15 dB attenuator in each optical path. After the optical power has been measured, the attenuator may be resized or removed.

4. Insert the connector into one of the WDM module's optical ports (port 1 or 4).

5. Route the patch cord from the WDM module to the fiber distribution panel.

6. Identify the OSP 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 patch cord supplier's recommendations) and then mate the connector with the appropriate OSP optical fiber termination.

9. Store any excess patch cord slack at the fiber distribution panel.

10. Remove the dust caps from the HU optical ports and from the WDM pigtails that will be connected to the HU.

11. Clean each pigtail connector (follow the procedures provided with the WDM module) 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 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 3-11.
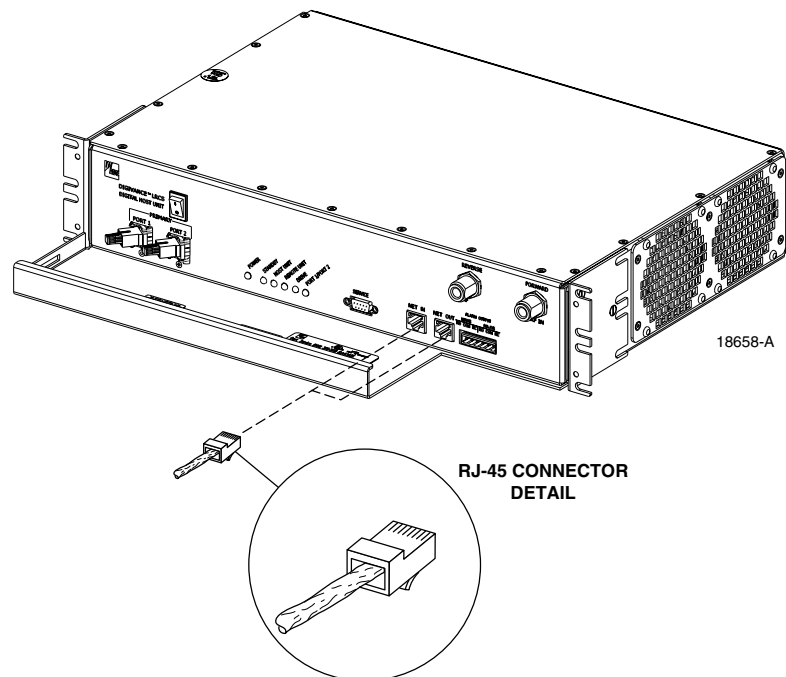


**Figure 3-11. Controller Area Network Connections**

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 CAN interface connection at HU #1.

▶   **Note:** 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 3-12.
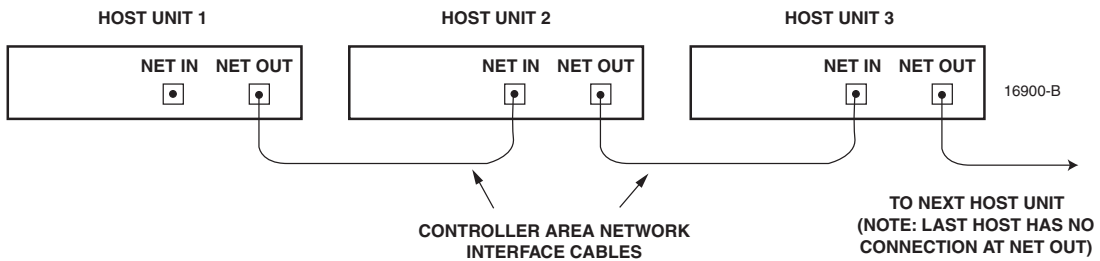
**Figure 3-12. Configuring CAN Connections with Multiple Host Units**

## 9 EMS COMPUTER CONNECTION

The service interface connection between the HU and the 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 available (accessory) 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 (accessory) 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 and configure the specified port.
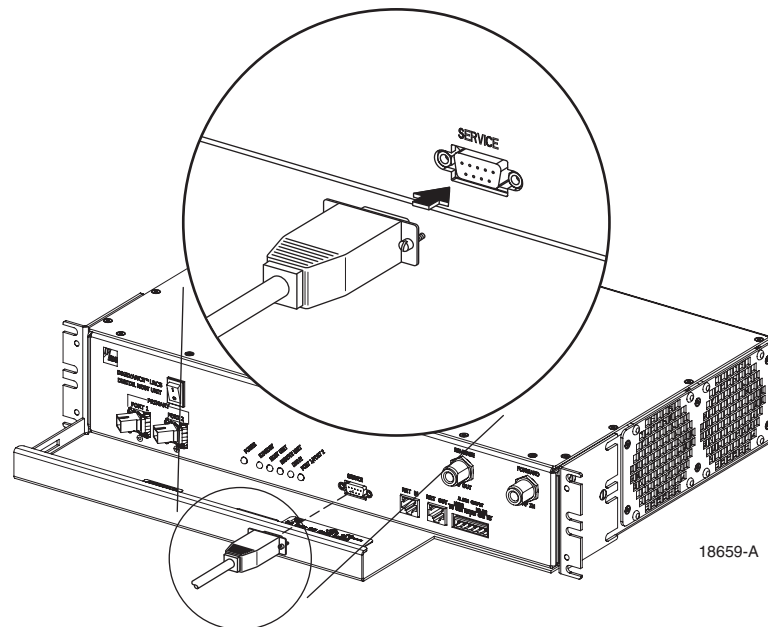
**Figure 3-13. Service Interface Connection**

## 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.
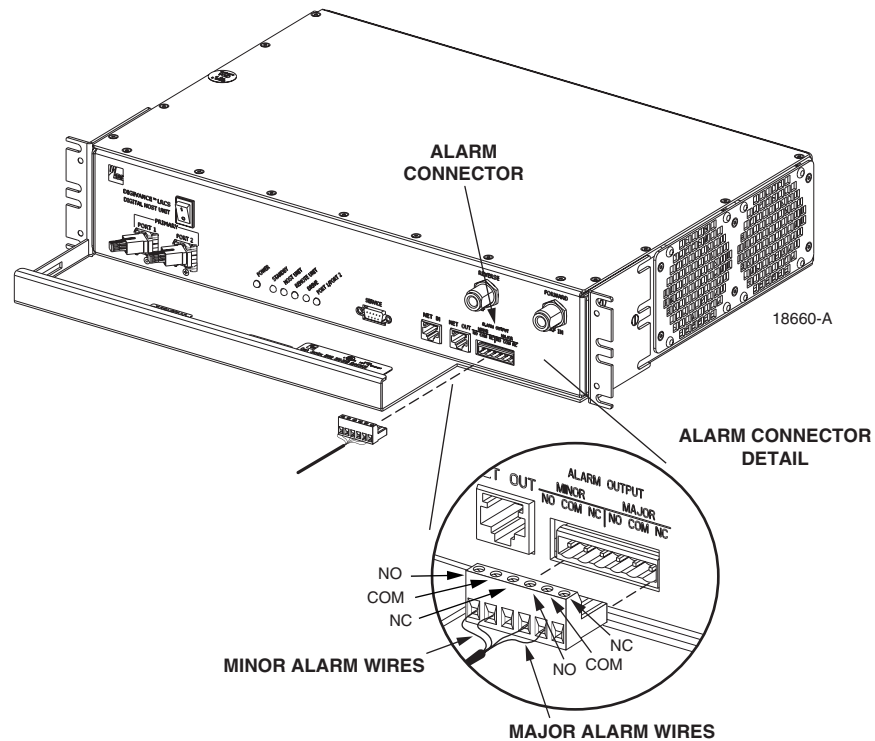


**Figure 3-14. External Alarm System Connections**

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 ± 21 to ± 60 VDC power (nominal ± 24 or ± 48 VDC). 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 GMT 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.
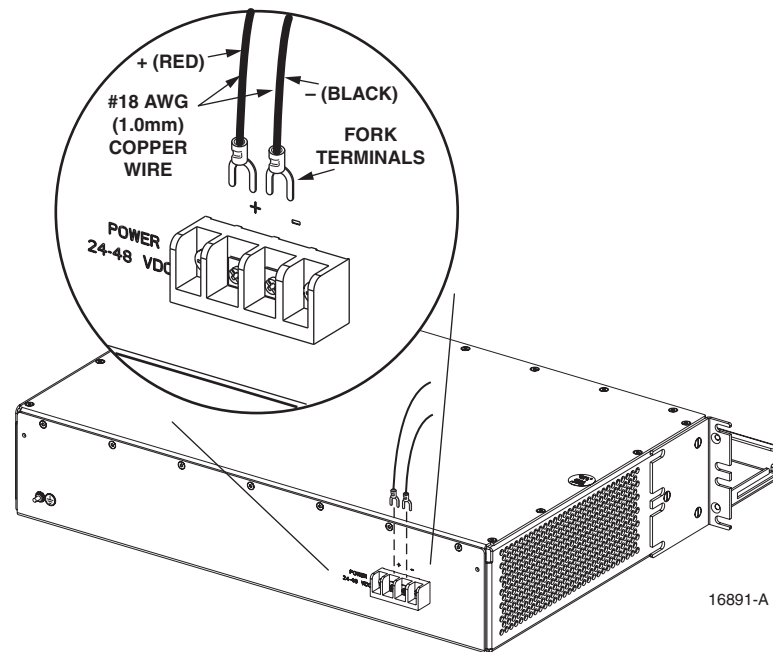


**Figure 3-15. DC Power Connections**

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

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## 1 BEFORE STARTING OPERATION

This section provides guidelines for turning-up the Digivance system, 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) Version 2.0 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 Digivance 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 **0**).

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 ± 21 to ± 60 VDC power (nominal ± 24 or ± 48 VDC). The DC power provided to the HU 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 **0**).

2.  Verify that the MUTE/NORM/RESET switch on the LPA in the **MUTE** 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.

## 2.1    Turn-Up Procedure

Each Digivance system should be turned-up separately before being networked together with multiple systems through the CAN interface. Use the following procedure to turn-up each Digivance system:

1.  Temporarily disconnect the external alarm system or notify the alarm system provider that testing is in progress.

2.  If the HU is networked together with multiple HU's, temporarily disconnect the CAN cables from the NET IN and NET OUT ports of each HU.

   ▶   **Note:** By default, all HU's and RU's are programmed with the same site number and name. This can cause problems for the EMS if multiple HU's with the same site number and site name are networked together through the CAN interface. It is therefore necessary to temporarily disconnect the CAN interface cables from the HU when configuring the system for operation until a unique site number and name can be assigned.

3.  Determine if the forward path composite input signal level at the Host Unit FORWARD RF IN port is appropriate for the required RF output signal level and adjust by installing an **external attenuator** if necessary. Refer to Section 2.3 for the calculation and adjustment procedure.

4.  Connect the EMS computer (if not already connected) to the SERVICE connector on the HU or STM front panel. If necessary, a separate laptop computer loaded with the EMS Version 2.0 software can be temporarily connected and used to initially configure the system.

5.  Place the ON/OFF switch on the HU in the **ON** position (press **I**).

6.  Make sure the switch on the LPA is in the **MUTE** position and then place the ON/OFF switch on the STM in the **ON** position (press **I**).

7.  Wait 6 to 8 seconds for the HU and the RU modules to initialize and then observe the LED indicators on the HU, STM and LPA. Refer to Section 5 for the troubleshooting procedures if the indicators do not respond as specified.

| HOST UNIT | SPECTRUM TRANSPORT MODULE | LINEAR POWER AMPLIFIER |
|---|---|---|
| POWER – Green | AC POWER – Green | STATUS – Steady green |
| STANDBY – Off | STANDBY – Off | |
| HOST UNIT – Green | HOST UNIT – Green | |
| REMOTE UNIT – Green | STM – Green | |
| DRIVE – Green, Yellow, or Red | PA – Green | |
| PORT 1/PORT 2 – Green | VSWR – Green | |
| | PORT 1/PORT 2 – Green | |

8.  Start up the EMS Version 2.0 software program. The EMS main window will open as shown in Figure 4-1. Note: The EMS software should be installed on a PC-type computer and the PC's COM port should be configured to interface with the HU. For information about installing the EMS software and configuring the PC's COM port, refer to the Digivance Element Management System Software User Manual (ADCP-75-125).