

### 3 DIGITAL HOST UNIT INSTALLATION PROCEDURE

This section provides the installation procedures for the DHU. Installation of the DEU(s) and DRU(s) may proceed separately from the installation of the DHU. The installation procedures for the DEU are provided in the Digital Expansion Unit Installation Instructions (ADCP -75-111) which are shipped with the DEU. The installation procedures for the DRU, the DRU antennas, and the ac/dc converter (optional DRU accessory) are provided in the Digital Remote Unit Installation Instructions (ADCP-75-112) which are shipped with the DRU. When all units of the Digivance ICS have been installed, refer to Section 4 of this manual for the system power up and test procedures.

#### 3.1 System Plan Review and Pre-Installation Cable Routing

Before beginning the installation, review the system plan with the system engineer. Make sure each equipment installation site is identified and located and all cable runs are mapped out. The coaxial, DC power, and fiber optic cables may be routed between the various equipment locations before the equipment is installed. Whenever possible, route fiber optic cables through conduit or a guideway such as the FiberGuide system. Avoid routing fibers through ladder type cable racks or troughs that do not provide sufficient support to limit bending or prevent accidental damage. Tie-wrapping is not recommended as a means of securing fiber optic cables. Make sure to leave sufficient slack at each equipment location for connectorizing and cable management. The procedures for terminating the cables and for connecting the cables to the DHU are provided in the sections that follow.

#### 3.2 Tools and Materials

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

- Box cutter
- Pencil or scribe
- Medium and small size flat-bladed screwdrivers
- TORX screwdriver (T20 bit)
- Pliers
- Wire cutters
- Wire stripper
- Non-conductive probe (1900 MHz units only)
- Tool kit for attaching RJ-45 male connectors to category 3 or 5 cable
- Tool kit for attaching N-type male connectors to coaxial cable
- Tool kit for attaching LC connectors to multimode fiber optic cable
- Drill and assorted drill bits (wall-mount installations only)
- Multimeter
- Optical power meter
- Laser light source

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

- Wall-mount fasteners (wall-mount applications only)
- #22 AWG (0.40 mm) category 3 or 5 cable (for power cable and external alarm connections)
- RJ-45 male connectors (for power cable)
- #18 AWG (1.00 mm) insulated stranded copper wire (for chassis grounding wire)
- Ring terminal for #18 wire (for chassis ground wire connection)
- 50 or 62.5 micron core multi-mode fiber optic cable
- LC-type field installable connectors
- High performance, flexible, low loss 50-ohm coaxial cable
- N-type male connectors
- Wire ties

### 3.3 Unpacking and Inspection

This subsection 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 DHU:

1. Open the shipping carton and carefully unpack the DHU from the protective packing material.
2. Check the DHU for broken or missing parts. If there are any 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.

### 3.4 Frequency Band Selection Procedure (1900 MHz DHU only)

The 1900 MHz version of the DHU may be configured to operate at any one of four frequency bands. A DIP switch is provided on the underside of the DHU for selecting the required frequency band. Use the following procedure to set the DIP switch to provide the required 1900 MHz frequency band:

1. Determine the required frequency band for the DHU (AD, DBE, BEF, or EFC) as specified in the system design plan.
2. Orient the DHU as shown in Figure 14 and then locate the small hole in the bottom of the DHU that provides access to the band select DIP switch.
3. Use a non-conductive probe to align the DIP switch sliding handles to provide the required frequency band (see Figure 14).
4. Place the copper sticker provided with the DHU over the small opening that provides access to the DIP switch.

► **Note:** The copper sticker provides EMI/RFI shielding. Do not use some other type of material to cover the DIP switch access hole.

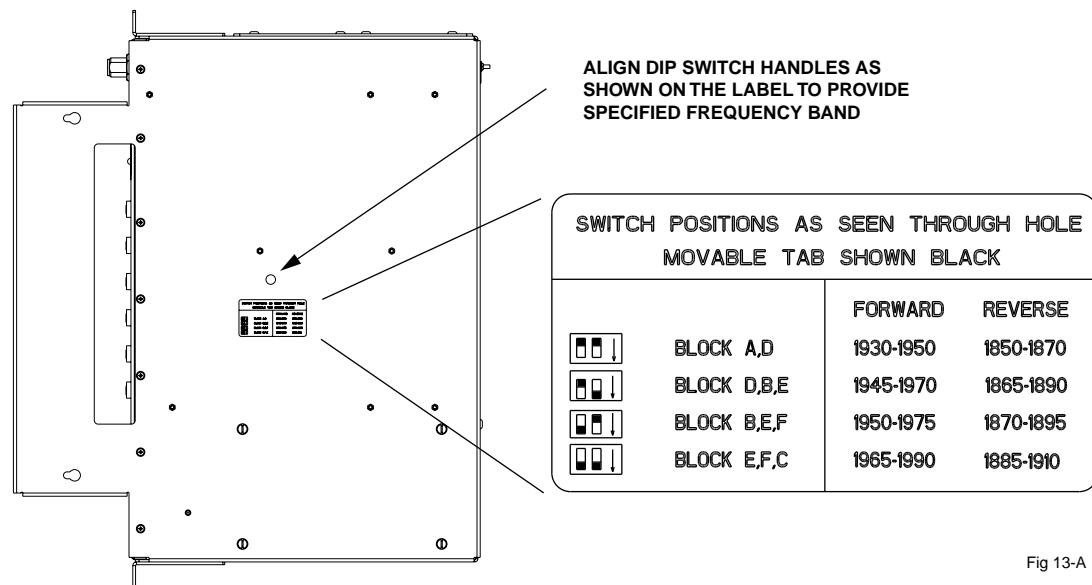


Fig 13-A

Figure 14. 1900 MHz DHU Frequency Band Selection

### 3.5 Mounting Procedure

The DHU may be either rack-mounted or wall-mounted. Of the procedures that follow, use which ever procedure is appropriate for the installation:

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

#### 3.5.1 Rack Mount Installation

The DHU 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 DHU. When loading the DHU 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 safely support the combined weight of all the equipment it holds. In addition, the maximum recommended ambient temperature for the DHU is 50° C (122° F). Allow sufficient air circulation or space between units when the DHU is installed in a multi-unit 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.*

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

1. The DHU is shipped with the mounting brackets installed for 19-inch rack installations. If mounting the DHU in a 19-inch rack, proceed to step 4. If mounting the DHU in a 23-inch rack, proceed to step 2.
2. Remove both mounting brackets from the DHU (requires TORX screwdriver with T20 bit)

3. Reinstall both mounting brackets so the long side of the bracket is flush with the DHU front panel as shown in Figure 15. Use the screws removed in step 2 to re-attach the brackets to the DHU enclosure.

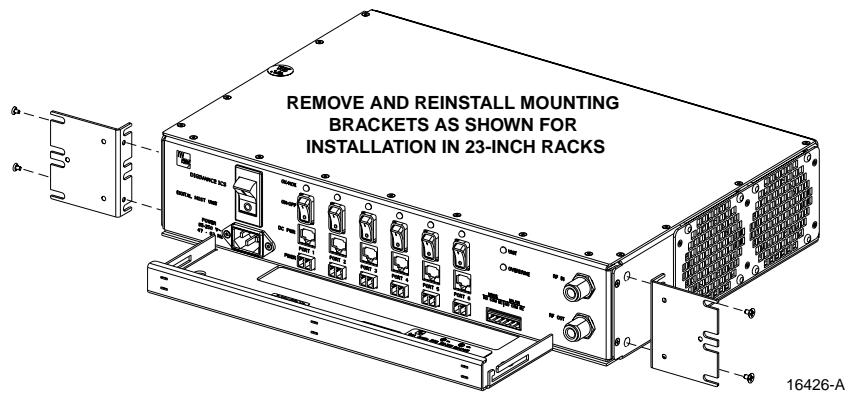


Figure 15. Installing the Mounting Brackets for 23-Inch Rack Installations

4. Position the DHU in the designated mounting space in the rack (per system design) and then secure the mounting brackets to the rack using the four machine screws provided (use #12-24 screws or M6 x 10 screws, whichever is appropriate) as shown in Figure 16.

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

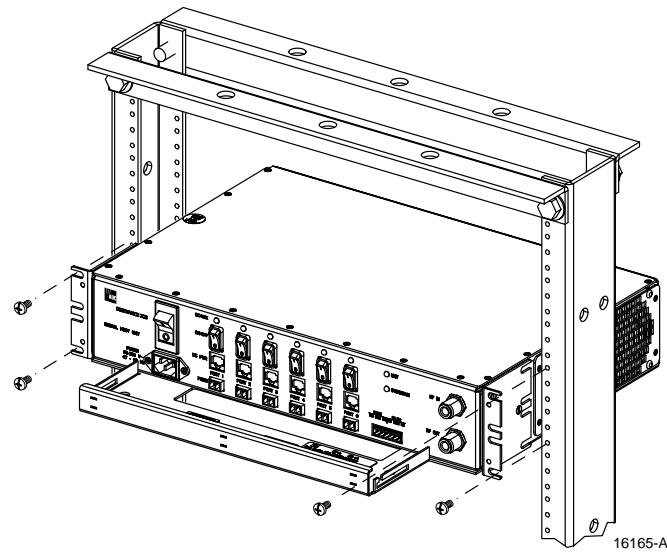


Figure 16. DHU Rack Mount Installation

### 3.5.2 Wall-Mount Installation

The DHU may be mounted from any flat vertical surface. It is recommended that a backer board such as 3/4-inch plywood be applied over the mounting surface to provide a secure base for attaching the DHU. Two mounting holes are provided in the cable management tray for securing the DHU to the mounting surface. The fasteners must be provided by the installer. Use the following procedure to wall-mount the DHU:



**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.*

1. Obtain the appropriate fasteners (lag bolts, screw anchors, etc.) for securing the DHU to the mounting surface.
2. Position the DHU on the mounting surface in the specified location (per the system design) with the front panel facing up as shown in Figure 17.

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

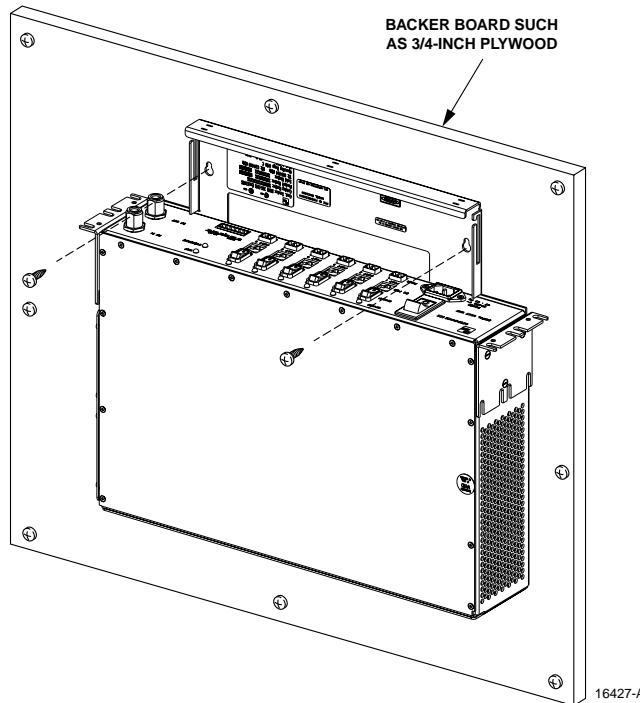


Figure 17. DHU Wall-Mount Installation

3. Using the DHU as a template, mark the location of the mounting holes on the mounting surface.

► **Note:** The mounting holes in the DHU cable management tray are spaced 11-21/32 inches (296 mm) center to center.

4. Set the DHU aside and then drill appropriately sized holes in the mounting surface for the fasteners.
5. Partially install the fasteners in the drilled holes. Leave the head of each fastener protruding about 1/4 inch (6 mm) from the mounting surface.
6. Hang the DHU from the fasteners and then securely tighten each fastener.

### 3.6 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 DHU as shown in Figure 18.

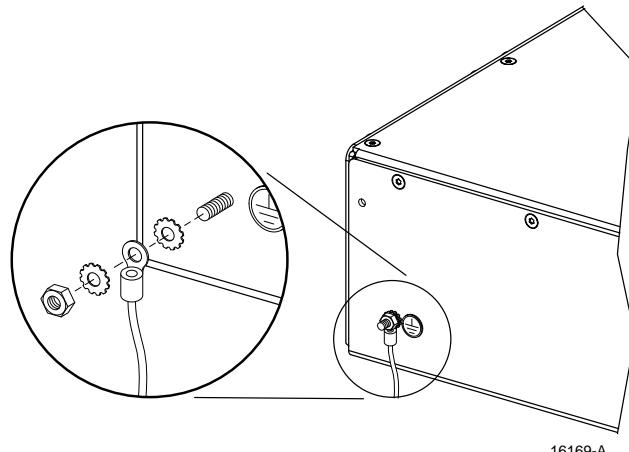


Figure 18. Chassis Ground Stud

4. Attach the ring end of the wire to the chassis ground stud (see Figure 18).
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 for rack and wall mounted equipment. Pay particular attention to ground source connections.

### 3.7 Coaxial Cable Connections

The RF interface between DHU and the BTS is supported through a pair of type N female connectors mounted on the DHU front panel. One connector provides the coaxial cable connection for the forward path (downlink) signal. The other connector provides the coaxial cable connection for the reverse path (uplink) signal. Coaxial cables link the DHU to the BTS through an interface device such as the LIU or the RIU. Use the following procedure to install the forward and reverse path coaxial cables and connect them to the DHU:

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 path and reverse path coaxial cables (if not already routed) between the DHU and the specified BTS interface device (per system design) and cut to the required length. Allow sufficient slack for dressing and organizing cables at the DHU.
3. Terminate each cable with a type N male connector following the connector supplier's recommendations.
4. Connect the forward path cable to the **RF IN** connector on the DHU front panel as shown in Figure 19.
5. Connect the reverse path cable to the **RF OUT** connector on the DHU front panel as shown in Figure 19.

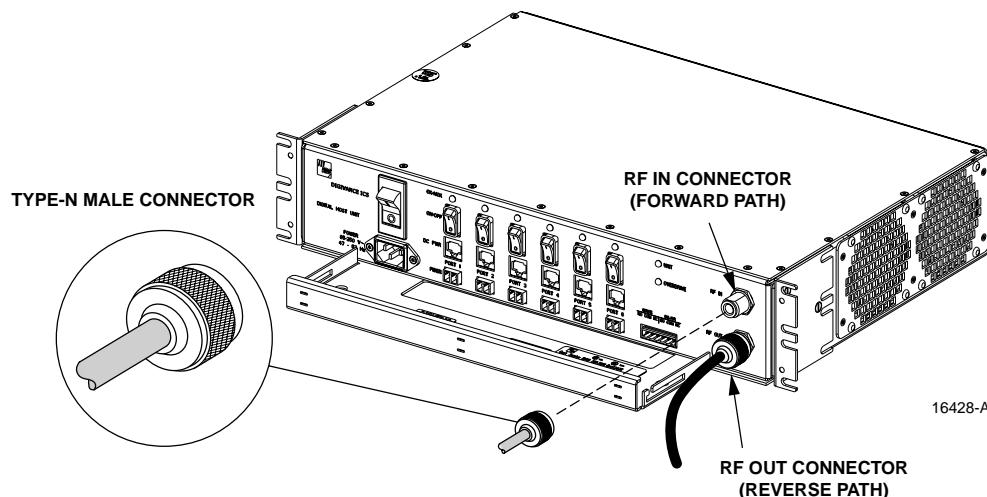


Figure 19. Forward and Reverse Path Coaxial Cable Connections

6. Dress and secure cables at the DHU per standard industry practice.
7. Connect the forward and reverse path cables to the LIU (microcell) or the RIU (donor antenna) as specified in the instructions provided with that unit.
8. Complete all remaining coaxial cable connections between the LIU and the BTS or between the RIU and the donor antenna as specified in the instructions provided with the interface unit.

### 3.8 Ports 1–6 Optical Connections

The optical interface between the DHU and each DEU or DRU is supported by six optical ports. Each of the six optical ports provides a duplex LC type optical transceiver which is mounted on the DHU front panel. One side of the transceiver provides the optical fiber connection for the forward path (downlink) signal. The other side of the transceiver provides the optical fiber connection for the reverse path (uplink) signal. Use the following procedure to install the forward and reverse path optical fibers and to connect them to the DHU:



**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 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 transceiver or connector.*

1. Obtain the required lengths of 50 or 62.5 micron core multi-mode fiber optic cable.
2. Route the fiber optic cable between the DHU and the DEU or DRU (if not already routed) and cut to required length. Allow sufficient slack for dressing and organizing the cables at each unit. Maintain a minimum bend radius of 2 inches (50 mm).
  - **Note:** The maximum distance for routing 50 micron core fiber optic cable is 750 meters (2,461 feet). The maximum distance for routing 62.5 micron core fiber optic cable is 500 meters (1,641 feet).
3. Terminate each optical fiber with a field-installable LC type fiber optic connector as shown in Figure 20. Follow the instructions provided by the connector manufacturer for installing the connector.
4. Test each fiber for optical loss as described in Subsection 5.4.2 of this manual.
5. Designate one of the fibers as the forward path link and the other as the reverse path link and attach an identification tag to each fiber end next to the connector.
6. Use the plastic joiner provided with the LC connectors to join the DHU Port 1 forward and reverse path connectors together (see Figure 20). Make sure the **forward path** and **reverse path** connectors are oriented as shown.
  - **Note:** When viewing any **Port 1-6** optical transceiver from the front, the forward path port is on the left and the reverse path port is on the right.
7. Remove the dust caps from the optical fiber connectors and the port 1 optical transceiver.
  - **Note:** Leave the dust cap in place on any unused optical port.
8. Clean each connector (follow connector supplier's recommendations) and then insert the optical link connector pair into DHU optical port 1 (see Figure 20).

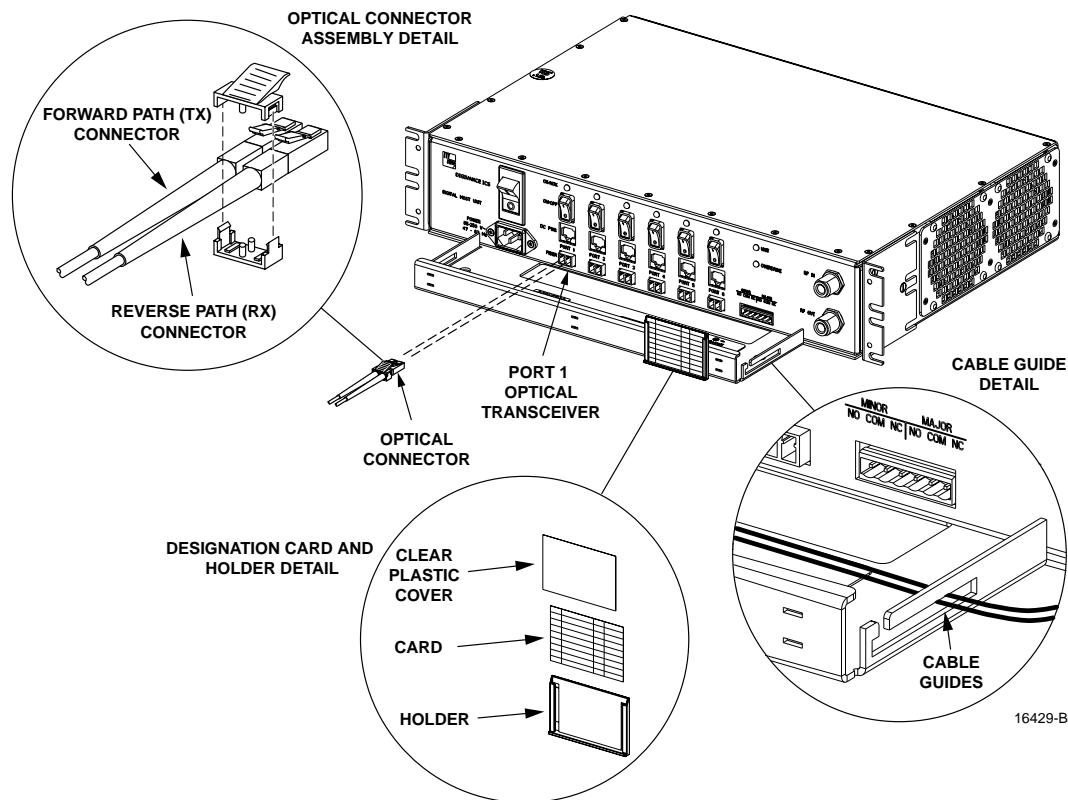


Figure 20. Ports 1–6 Fiber Optic Cable Connections

9. Place the optical fibers within the cable guides provided on the cable management tray (see Figure 20) and then dress and secure the fibers at the DHU per standard industry practice.
10. Connect the forward and reverse path optical fibers to the DEU or the DRU as specified in the instructions provided with that unit.
11. Use the designation card provided (see Figure 20) to indicate the location and name of the DRU or DEU that is connected to the optical fibers. The designation card holder may be attached to any convenient flat surface such as the DHU cable management tray
12. Repeat steps 1–11 for each remaining optical port.

### 3.9 DC Power Connections

The DC power interface between the DHU and each DRU is supported by six RJ-45 female connectors. Each DHU RJ-45 connector provides nominal 48 Vdc power for the associated DRU except when the DRU is powered with an ac/dc converter. A category 3 or 5 twisted pair cable is used to feed the power from the DHU to the DRU. Use the following procedure to install the DC power cable and to connect it to the DHU.

1. Obtain the required length of category 3 or 5 twisted pair cable.
2. Route the cable between the DHU and the DRU (unless already routed) and then cut to required length. Allow sufficient slack for dressing and organizing the cable at the DHU.

► **Note:** The maximum distance for routing power cable is 500 meters (1,641 feet).

3. Terminate each end of the cable with a male RJ-45 connector. Match the wire color to the connector pin as specified in Table 6.



**Caution:** *The DRU will be damaged if the RJ-45 connector is wired incorrectly.*

Table 6. RJ-45 Connector Pin Designations

PIN NUMBER	WIRE COLOR	CONNECTOR PINS
1	White/Green	
2	Green	
3	White/Orange	
4	Orange	
5	White/Blue	
6	Blue	
7	White/Brown	
8	Brown	

4. Perform a continuity test to verify that each wire is properly connected to the terminating RJ-45 connector and check the connector for correct polarity (see diagram in Table 6).
5. Connect the DC power cable to the DHU port 1 DC PWR jack as shown in Figure 21.

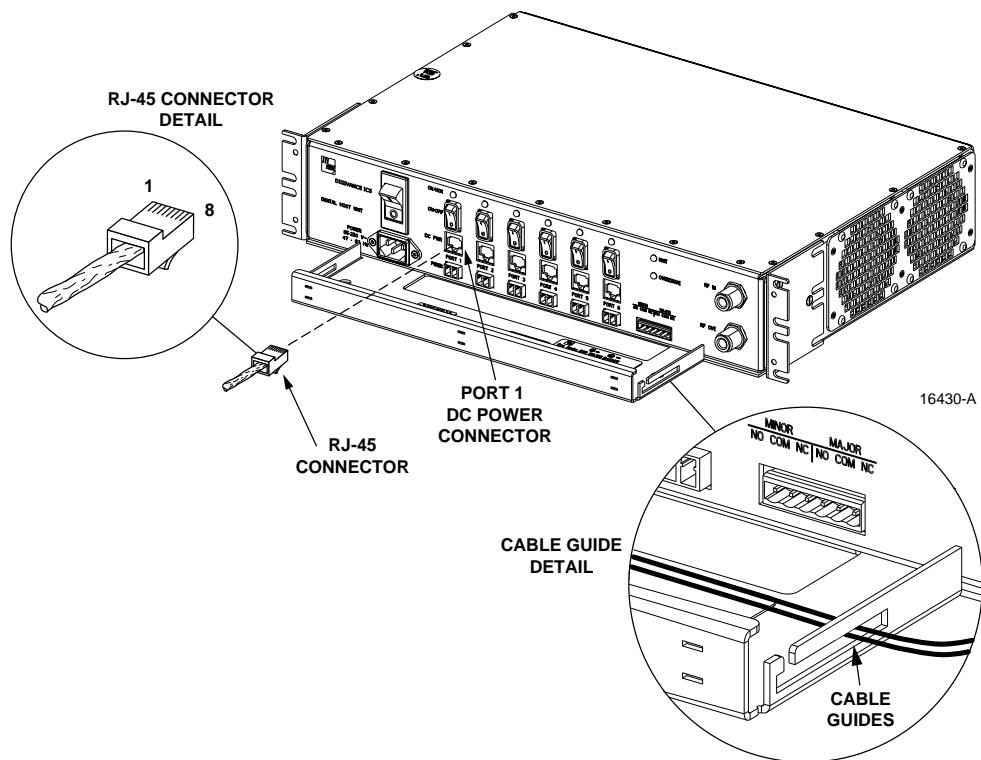


Figure 21. 48 Vdc Power Cable Connection

6. Place the DC power cable within the cable guides provided (see Figure 21) and then dress and secure the cable at the DHU per standard industry practice.
7. Connect the DC power cable to the DRU as specified in the instructions provided with that unit.
8. Repeat steps 1–7 for each remaining DRU that will be powered by the DHU.

### 3.10 External Alarm System Connections

The alarm interface between the DHU and an external alarm system is supported by a six-terminal plug (with screw-type terminals) that connects to a receptacle mounted on the DHU front panel. The terminal plug provides connections to normally open (NO) and normally closed (NC) dry type alarm contacts for both minor and major alarms. A category 3 or 5 cable is typically used to connect the DHU to the external alarm system. Use the following procedure to install the alarm wiring and connect it to the DHU:

1. Obtain the required length of category 3 or 5 cable.
2. Route the cable between the DHU and the external alarm system (if not already routed) and then cut to required length. Allow sufficient slack for dressing and organizing the cable at the DHU.
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 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 DHU alarm terminal connector (supplied with DHU) as shown in Figure 22.

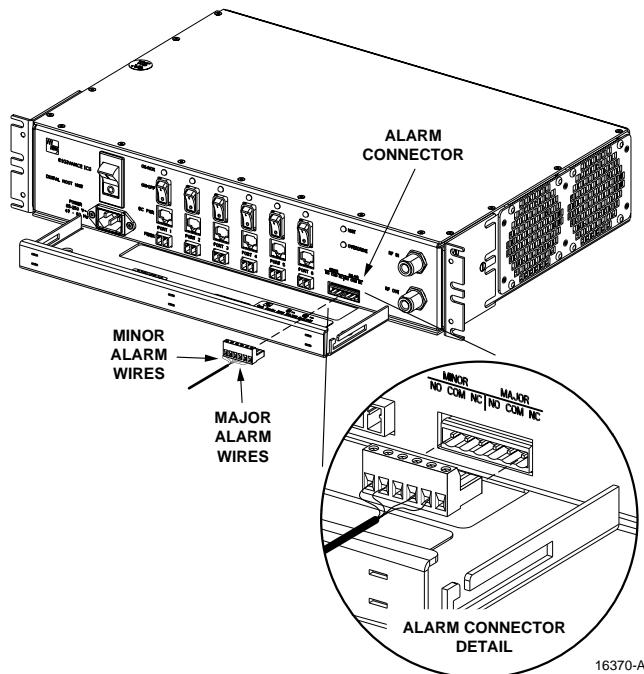


Figure 22. External Alarm System Connections

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 DHU alarm terminal connector as shown in Figure 22.
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.

### 3.11 AC Power Connections

The AC power interface between the DHU and the AC power source is supported by a 3-wire AC power cord connector located on the DHU front panel. The AC connector provides a connection point for the power cord which is provided separately with the DHU. Use the following procedure to install the AC power cord:

1. Locate the AC power cord which is provided separately with the DHU. Use only the AC power cord provided with the DHU or an equivalent UL/CUL listed 3-conductor, 18 AWG cord terminated in a molded-on plug cap rated 125 V, 15 A with a maximum length of 6 feet (1.8 m).
2. Place the DHU AC power ON/OFF switch, shown in Figure 23, in the **OFF** position (press **0**).

► **Note:** The DHU is intended to be used with a 3-wire grounding type plug which has a grounding pin. Equipment grounding is required to ensure safe operation. Do not defeat the grounding means. Verify DHU is reliably grounded when installed.

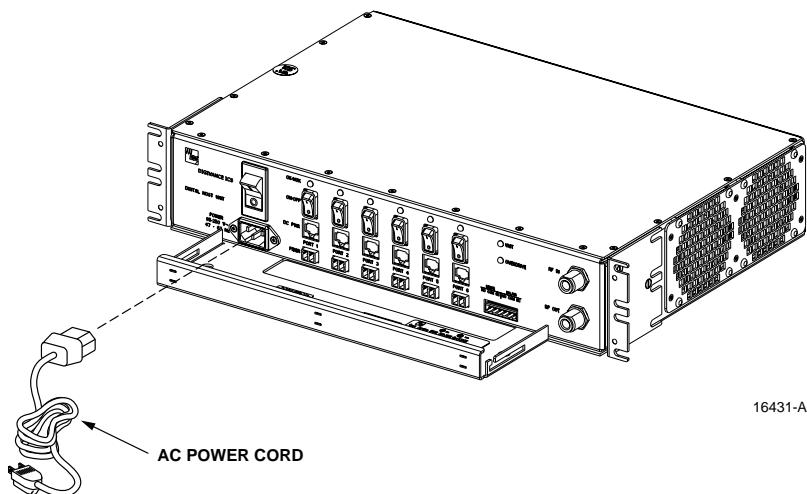


Figure 23. AC Power Connection

3. Connect the receptacle end of the power cord to the AC connector on the DHU.
4. Route the plug end of the power cord to the specified AC outlet (per the system design) and connect plug to outlet.



**Warning:** *The current rating of the DHU is 2.0 Amps at 120 Vac. Avoid overloading circuits which may cause damage to over-current protection devices and supply wiring.*

5. Dress and secure cable per standard industry practice.
6. When all units of the Digivance ICS have been installed, refer to Section 4 of this manual for the system power up and test procedures.

### **3.12 Create As-Built Drawing**

Following installation, create an “as-built” drawing of the complete Digivance ICS system. Using a drawing of the building floor plan, show the installed location of each piece of equipment including the various Digivance electronic units, the antennas, the interface units, and the microcell (if used). In addition, show the location and routing of all copper, coaxial, and fiber optic cable runs used with the system. Retain the as-built drawing for reference when troubleshooting or when planning for system expansion.

## 4 SYSTEM OPERATION

This section provides guidelines for turning-up the Digivance ICS, 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 that comprise the Digivance ICS have been installed in accordance with the system design plan and the BTS interface unit (LIU or RIU) has been installed and tested. The procedures for installing and testing the LIU or RIU are provided in the user manual that is shipped with the unit.

### 4.1 Tools and Materials

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

- Portable spectrum analyzer
- Portable test transmitter
- Cell phone
- Pencil or pen
- Writing pad

### 4.2 Turn-Up System and Verify Operation

The process of turning-up the system and verifying operation involves powering up the various system components and then verifying that the LED indicators show normal operation. Refer to Tables 7, 8, and 9 as needed for a complete description of the unit LED indicators. Use the following procedure to power-up the system. If any unit does not respond as described, refer to Subsection 4.3 for the correction procedures.

1. Temporarily disconnect the alarm system or notify alarm system provider that testing is in progress.
2. Verify that each AC powered unit is connected to the appropriate outlet.
3. Place the ON/OFF switch on the DHU in the **ON** position (press I).
4. Verify that the UNIT LED and the OVERDRIVE LED on the DHU turn yellow (for approximately 6 seconds) and then green.
5. Place the **PORT 1** ON/OFF switch on the DHU in the **ON** position (press I).
6. If a DEU is connected to port 1, proceed to step 7. If a DRU is connected to port 1, skip steps 7 and 8 and proceed to step 9.
7. Place the ON/OFF switch on the DEU in the **ON** position (press I).
8. Verify that the UNIT LED on the DEU turns yellow (for approximately 6 seconds) and then green.
9. Verify that the PORT 1 OK/NOK LED on the DHU turns yellow (for approximately 6 seconds) and then green.

10. If a DEU is connected to PORT 1, proceed to step 11. If a DRU is connected to PORT 1, skip steps 11 through 13 and proceed to step 14.
11. Verify that the HOST PORT LED on the DEU turns green.
12. Place the **PORT 1** ON/OFF switch on the DEU in the **ON** position (press **I**).
13. Verify that the PORT 1 OK/NOK LED on the DEU turns yellow (for approximately six seconds) and then green.
14. Verify that the STATUS LED on the DRU connected to PORT 1 turns yellow (for approximately six seconds) and then green.
15. Repeat the procedure covered in steps 5 through 14 for each of the remaining DHU optical ports (ports 2 through 6) that is connected to a DEU or a DRU.
16. Reconnect the alarm system and notify alarm system provider that system is operational.

Table 7. Digital Host Unit LED Indicators

INDICATOR	COLOR	DESCRIPTION
UNIT LED	Green Yellow Red Off	<b>Indicates when the DHU is normal or faulty.</b> DHU in normal state, no faults detected. DHU in power-up state or DHU high temperature fault detected. (see Note) DHU fault detected (see Note). AC power off to DHU or DHU internal fault.
POR T1-6 OK/NOK LEDs	Green Yellow Red Red (blinking) Off	<b>Indicates if any connected DEU or DRU is normal or faulty or if the optical inputs from any connected DEU or DRU are normal or lost.</b> All connected units in normal state, no faults detected. DHU in power-up state or high temperature fault detected in DEU. (see Note) Fault detected in any connected DEU or DRU, *no reverse path optical signal from any connected DEU or DRU detected, or excessive reverse path errors detected from any connected DEU or DRU. (see Note) *No reverse path optical signal from any connected DEU or DRU detected, Port disabled (via front panel switch) or DHU internal fault. *Early versions of the DHU use a steady red LED to indicate all major fault conditions. Later versions of the DHU use a blinking red LED to indicate no optical signal received from the connected DRU or DEU.
OVERDRIVE LED	Green Yellow Red	<b>Indicates when the forward path RF input is below or above the overdrive threshold.</b> RF input signal level at DHU below overdrive threshold. DHU in power-up state. RF input signal level at DHU above overdrive threshold.

**Note:** Detection of any fault will generate an alarm. A high temperature fault will generate a **minor** alarm (yellow LED). All other types of faults will generate a **major** alarm (red LED).

Table 8. Digital Expansion Unit LED Indicators

INDICATOR	COLOR	DESCRIPTION
UNIT LED	Green Yellow Red Off	<b>Indicates when the DEU is normal or faulty.</b> DEU in normal state, no faults detected. DEU in power-up state or DEU high temperature fault detected. (see Note) DEU internal fault detected. (see Note) AC power off to DEU or DEU internal fault.
HOST PORT LED	Green Red (steady or blinking) Off	<b>Indicates when the optical inputs from the DHU or supporting DEU are normal or lost.</b> DHU or supporting DEU in normal state, no faults detected. No forward path optical signal from DHU or supporting DEU detected or excessive forward path errors detected. (see Note). DEU internal fault.
PORT 1–6 OK/NOK LEDs	Green Yellow Red Red (blinking) Off	<b>Indicates if any connected DEU or DRU is normal or faulty or if the optical inputs from any connected DEU or DRU are normal or lost.</b> DRU or remote DEU in normal state, no faults detected. DEU in power-up state. Fault detected in any connected DEU or DRU, *no reverse path optical signal from any connected DEU or DRU detected, or excessive reverse path errors detected from any connected DEU or DRU. (see Note) *No reverse path optical signal from any connected DEU or DRU detected. Port disabled (via front panel switch) or DEU internal fault. *Early versions of the DEU use a steady red LED to indicate all major fault conditions. Later versions of the DEU use a blinking red LED to indicate no optical signal received from the connected DRU or DEU.

**Note:** Detection of any fault will generate an alarm. A high temperature fault will generate a **minor** alarm (yellow LED). All other types of faults will generate a **major** alarm (red LED).

Table 9. Digital Remote Unit LED Indicator

INDICATOR	COLOR	DESCRIPTION
STATUS LED	Green Yellow Red Red (blinking) Off	<b>Indicates if the DRU is normal or faulty or if the forward path optical inputs to the DRU are normal or lost.</b> DRU in normal state, no faults detected. DRU in power-up state. DRU internal fault detected, *no forward path optical signal detected, or excessive forward path errors detected. (See Note) *No forward path optical signal from the DHU or DEU detected. DC power off to DRU or DRU internal fault. *Early versions of the DRU use a steady red LED to indicate all major fault conditions. Later versions of the DRU use a blinking red LED to indicate no optical signal received from the DHU or DEU.

**Note:** Detection of any fault will generate an alarm. A high temperature fault will generate a **minor** alarm (yellow LED). All other types of faults will generate a **major** alarm (red LED).

### 4.3 Correct Installation Problems

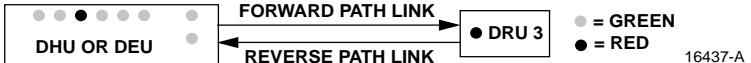
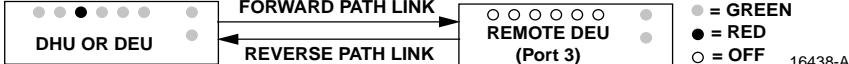
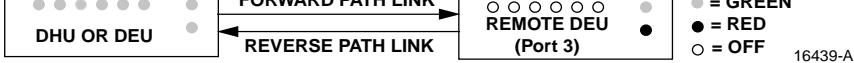
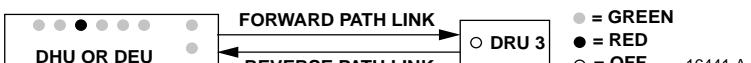
Use the procedures outlined in Table 10 to troubleshoot various installation problems.

Table 10. Troubleshooting Installation Problems

<b>PROBLEM 1</b> All LED indicators on the DHU or DEU stay off when the ON/OFF switch is placed in the ON position.	
 DHU OR DEU	<span style="color: gray;">●</span> = GREEN <span style="color: black;">●</span> = RED <span style="color: white;">○</span> = OFF 16432-A
<b>POSSIBLE CAUSE</b>	<b>CORRECTIVE ACTION/COMMENTS</b>
1. AC power source is turned off. 2. Faulty AC power cord. 3. Faulty DHU or DEU.	1. Verify that the AC circuit breaker is turned on or that a functional fuse is installed. 2. Test AC power cord and repair/replace as required. 3. Replace faulty DHU or DEU
<b>PROBLEM 2</b> The UNIT LED indicator on the DHU or DEU is RED.	
 DHU OR DEU	<span style="color: gray;">●</span> = GREEN <span style="color: black;">●</span> = RED <span style="color: white;">○</span> = OFF 16433-A
<b>POSSIBLE CAUSE</b>	<b>CORRECTIVE ACTION/COMMENTS</b>
1. Faulty DHU or DEU.	1. Replace faulty DHU or DEU
<b>PROBLEM 3</b> The OVERDRIVE LED indicator on the DHU is RED.	
 DHU	<span style="color: gray;">●</span> = GREEN <span style="color: black;">●</span> = RED 16434-A
<b>POSSIBLE CAUSE</b>	<b>CORRECTIVE ACTION/COMMENTS</b>
1. Forward path RF input level at the DHU is too high	1. Reduce forward path gain by inserting additional attenuation in the forward path signal.
<b>PROBLEM 4</b> The OK/NOK LED indicator on the DHU or DEU is steady RED or blinking RED and the STATUS indicator on the corresponding DRU is GREEN.	
 DHU OR DEU      DRU 3	<span style="color: gray;">●</span> = GREEN <span style="color: black;">●</span> = RED 16435-A
<b>POSSIBLE CAUSE</b>	<b>CORRECTIVE ACTION/COMMENTS</b>
1. Faulty reverse path optical link. 2. Faulty optical transmit port at DRU. 3. Faulty optical receive port at DHU or DEU.	1. Test optical link and repair or replace as required. 2. Test DRU with optical loopback. Replace if faulty. 3. Connect optical link to another optical port at the DHU or DEU. If problem is corrected, replace the DHU or DEU.
<b>PROBLEM 5</b> The OK/NOK LED indicator on the DHU or DEU is GREEN and the STATUS indicator on the corresponding DRU is RED.	
 DHU OR DEU      DRU 3	<span style="color: gray;">●</span> = GREEN <span style="color: black;">●</span> = RED 16436-A
<b>POSSIBLE CAUSE</b>	<b>CORRECTIVE ACTION/COMMENTS</b>
1. Faulty forward path optical link. (Early version of DHU only) 2. Faulty optical receive port at DRU. 3. Faulty optical transmit port at DHU or DEU.	1. Test optical link and repair or replace as required. 2. Replace DRU. 3. Connect optical link to another optical port at the DHU or DEU. If problem is corrected, replace the DHU or DEU.

(continued)

Table 10. Troubleshooting Installation Problems, continued

<b>PROBLEM 6</b>	The OK/NOK LED indicator on the DHU or DEU is RED or blinking RED and the STATUS indicator on the corresponding DRU is RED or blinking RED.
	 <p>16437-A</p>
<b>POSSIBLE CAUSE</b>	<b>CORRECTIVE ACTION/COMMENTS</b>
<ol style="list-style-type: none"> <li>1. Forward and reverse path optical links reversed.</li> <li>2. Faulty forward and reverse path optical links.</li> <li>3. Faulty DHU, DEU, or DRU.</li> </ol>	<ol style="list-style-type: none"> <li>1. Verify forward and reverse path optical connections at the DHU or DEU are correct.</li> <li>2. Test optical links and repair or replace as required.</li> <li>3. Replace defective unit.</li> </ol>
<b>PROBLEM 7</b>	The OK/NOK LED indicator on the DHU or DEU is RED or blinking RED and the HOST PORT LED indicator on the corresponding remote DEU is GREEN.
	 <p>16438-A</p>
<b>POSSIBLE CAUSE</b>	<b>CORRECTIVE ACTION/COMMENTS</b>
<ol style="list-style-type: none"> <li>1. Faulty reverse path optical link.</li> <li>2. Faulty optical transmit port at remote DEU.</li> <li>3. Faulty optical receive port at DHU or DEU.</li> </ol>	<ol style="list-style-type: none"> <li>1. Test optical link and repair or replace as required.</li> <li>2. Replace remote DEU.</li> <li>3. Replace DHU or DEU.</li> </ol>
<b>PROBLEM 8</b>	The OK/NOK LED indicator on the DHU or DEU is GREEN and the HOST PORT LED indicator on the corresponding remote DEU is RED or blinking RED.
	 <p>16439-A</p>
<b>POSSIBLE CAUSE</b>	<b>CORRECTIVE ACTION/COMMENTS</b>
<ol style="list-style-type: none"> <li>1. Faulty forward path optical link.</li> <li>2. Faulty optical receive port at remote DEU.</li> <li>3. Faulty optical transmit port at DHU or DEU.</li> </ol>	<ol style="list-style-type: none"> <li>1. Test optical link and repair or replace as required.</li> <li>2. Replace remote DEU.</li> <li>3. Replace DHU or DEU.</li> </ol>
<b>PROBLEM 9</b>	The OK/NOK LED indicator on the DHU or DEU is RED or blinking RED and the HOST PORT LED indicator on the corresponding remote DEU is RED or blinking RED.
	 <p>16440-A</p>
<b>POSSIBLE CAUSE</b>	<b>CORRECTIVE ACTION/COMMENTS</b>
<ol style="list-style-type: none"> <li>1. Forward and reverse path optical links reversed.</li> <li>2. Faulty forward and reverse path optical links.</li> </ol>	<ol style="list-style-type: none"> <li>1. Switch forward and reverse path optical connections at the DHU or DEU.</li> <li>2. Test optical links and repair or replace as required.</li> </ol>
<b>PROBLEM 10</b>	The STATUS LED indicator on the DRU stays OFF when the PORT 1-6 ON/OFF switch at the DHU or DEU is placed in the ON position or when the ac/dc converter is connected.
	 <p>16441-A</p>
<b>POSSIBLE CAUSE</b>	<b>CORRECTIVE ACTION/COMMENTS</b>
<ol style="list-style-type: none"> <li>1. Faulty DC power cord or plug not seated.</li> <li>2. DC power cord too long.</li> <li>3. Insufficient DC power output from DHU, DEU, or ac/dc converter.</li> </ol>	<ol style="list-style-type: none"> <li>1. Test DC power cord and plug. Correct as required.</li> <li>2. Verify power cord does not exceed 500 meters.</li> <li>3. Verify DC voltage level at DRU is between 34 and 48 Vdc. Replace DHU, DEU, or ac/dc converter if voltage is outside specified range.</li> </ol>

## 4.4 Test System Performance

Testing the performance of the system involves completing various RF tests and telephone service tests that verify if the system is functioning properly. Use the following procedure to test the system performance:

1. Verify that the forward path (downlink) input signal level at the DHU is optimized. The peak **COMPOSITE** forward path input signal level at the DHU should be set at **-20 dBm**.
- **Note:** In a CDMA system, the power level is dependent on the traffic. For optimum operation in a CDMA system, the input signal level should be set below the level of the pilot signal. **Adjust level based upon observation of overload indicator during traffic peaks (busy hour).**
2. Verify that the reverse path (uplink) signal level at the local BTS or donor antenna is optimized. Note that the reverse path output signal level required is dependent on service provider signal to noise requirements, ICS system noise floor, the service provider equipment, and the system configuration.
3. Check and record the Received Signal Strength Indication (RSSI) and any spurious emission levels at and between all DRU antennas. Analyze all DRUs and the DHU interface using a spectrum analyzer.
4. Plot the RSSI levels on a floor plan of the building and check against the pre-installation RSSI levels to determine the overall and average RSSI improvement attributed to the Digivance ICS. Check the entire Digivance coverage area.
5. Verify call processing and voice quality within the coverage areas. Initiate and receive multiple long and short duration calls. Document the performance and address any issues as calls are processed within the entire coverage area. Assuming a properly functioning server RF link and BTS and a properly designed and optimized ICS system, there should be no clicks, mutes, clipping, or crackles within the coverage area. In a wireless office application, hand off will not occur.
6. If the DHU interfaces with a local BTS (microcell), verify the handoff function by placing a call and confirming handoffs between the Digivance/microcell coverage area and the outdoor macrocell coverage area (macro system) and vice versa. The handoff should take place without any noticeable call quality or performance issues.
7. If the DHU interfaces with a remote BTS through a donor antenna, verify call quality by placing a call and then walking between the Digivance coverage area and an area receiving good coverage directly from the cell site base station. There should be no noticeable difference in call quality.
8. Following service provider guidelines, test the 411 and 911 links to verify the routing of emergency and special services calls on local BTS configurations.
9. Verify that the alarm reporting system functions properly by turning the DHU off. This should generate a major alarm and operate a set of alarm contacts. Check for alarm confirmation from the service provider's local switch and Network Operations Center (NOC). A minor alarm (high temperature fault condition) can be checked by opening or closing (which ever applies) the minor alarm lead wires at the DHU. Note that this tests only the external alarm system and does not verify operation of the Digivance alarm reporting system.

## 5 SYSTEM MAINTENANCE PROCEDURES

This section explains the alarm reporting system, provides a method for isolating and troubleshooting faults, and provides procedures for replacing the DHU or DEU cooling fans.

The Digivance ICS requires no regular maintenance to insure continuous and satisfactory operation. Maintenance, as it applies to the Digivance ICS, primarily involves diagnosing and correcting service problems as they occur. When an alarm is reported, it will be necessary to follow a systematic troubleshooting procedure to locate the problem. Once the source of the problem is isolated, the appropriate corrective action can be taken to restore service. The only unit components that can be replaced are the cooling fans which mount in the DHU and DEU. The failure of any other component within a unit will require replacement of that unit.

### 5.1 Tools and Materials

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

- ESD wrist strap
- IR filtering safety glasses
- Optical loopback device (such as Stratos Lightwave LC5-103-03) and LC duplex adapter
- Optical power meter
- Magnification device for inspecting LC connectors
- Laser light source
- Multimeter
- Cell phone
- RJ-45 circuit access tool (such as the Harris 8-wire Banjo Adapter)
- Medium and small size flat-bladed screwdrivers
- TORX screwdriver (T10)

### 5.2 Fault Detection and Alarm Reporting

Detection of a fault by the Digivance ICS will generate an external alarm response. LED indicators are provided on the front panel of the various units to indicate when a fault is detected. In addition to LED indicators, the DHU also provides normally open (NO) and normally closed (NC) dry alarm contacts for reporting **minor** and **major** alarms to an **external** alarm system. A minor alarm is defined as a high temperature condition. A major alarm is defined as any fault condition except high temperature.

When the DHU alarm contacts are connected to an external alarm system, detection of a fault will generate an alarm at the Network Operations Center (NOC). However, various types of faults may not generate an alarm response. In this case, the first indication of a problem will probably be from cell phone users reporting a loss of service or poor service. Whenever a problem is reported, whether by a external alarm system or by a call from a user, refer to Subsection 5.3 to isolate and correct the fault.

### 5.3 Fault Isolation and Troubleshooting

Table 11 provides fault isolation and troubleshooting guidelines. When a problem is reported, note the type of alarm generated (minor, major, or none) and any problems that may be observed. Then check the LED indicators on the DHU and note any that are **red**, **yellow**, or **off**. If a Port 1–6 OK/NOK LED indicator is any color but green, check the LED indicators on the connected DEUs and/or DRUs. When the required information has been obtained, locate the problem in Table 11, check out the suggested possible causes, and take corrective action as required.

**Table 11. Fault Isolation and Troubleshooting**

Alarm Type	Minor	
LED Indicators	DHU or DEU:	UNIT - Yellow - All other LEDs are green
Problem	The DHU or DEU is overheating.	
<b>POSSIBLE CAUSE</b>		<b>CORRECTIVE ACTION/COMMENTS</b>
1.	Air intake or exhaust openings to DHU or DEU chassis blocked.	1. Remove cause of air-flow blockage.
2.	Ambient temperature > 50° C/122° F.	2. Reduce ambient temperature.
3.	Faulty fan.	3. Replace fan (see Subsection 5.5).
Alarm Type	Major	
LED Indicators	DHU or DEU:	UNIT - Red
Problem	The DHU or DEU detects an internal circuitry fault.	
<b>POSSIBLE CAUSE</b>		<b>CORRECTIVE ACTION/COMMENTS</b>
1.	Faulty DHU or DEU.	1. Replace DHU or DEU.
Alarm Type	Major	
LED Indicators	DHU or DEU:	OK/NOK - Red or blinking Red - All other LEDs are green
	DRU:	STATUS - Off
Problem	The DRU is not powered.	
<b>POSSIBLE CAUSE</b>		<b>CORRECTIVE ACTION/COMMENTS</b>
1.	DC power cable open.	1. Test cable for continuity and repair or replace if faulty.
2.	No power or insufficient power output from ac/dc power converter, DHU, or DEU.	2. Check DC voltage level at the DRU (see Subsection 5.4.3). Replace converter, DHU, or DEU (whichever applies) if voltage is not within 34 to 48 Vdc.
3.	Faulty DRU.	3. Replace DRU.
Alarm Type	Major	
LED Indicators	DHU or DEU:	All LEDs are green
	DRU:	STATUS - Red or blinking Red
Problem	The DRU is not receiving an optical signal from the DHU or DEU.	
<b>POSSIBLE CAUSE</b>		<b>CORRECTIVE ACTION/COMMENTS</b>
1.	Faulty forward path optical link between DHU or DEU and DRU	1. Test optical link and repair or replace if faulty (see Subsection 5.4.2).
2.	Faulty optical transmit port at DHU or DEU; or faulty optical receive port at DRU.	2. Test optical ports. Replace DHU, DEU, or DRU if port is faulty (see Subsection 5.4.1).

(continued)

Table 11. Fault Isolation and Troubleshooting, continued

<b>Alarm Type</b>	<b>Major</b>	
<b>LED Indicators</b>	<b>DHU or DEU:</b> OK/NOK - Red or blinking Red - All other LEDs are green <b>DRU:</b> STATUS - Green	
<b>Problem</b>	<b>The DHU or DEU is not receiving an optical signal from the DRU.</b>	
<b>POSSIBLE CAUSE</b>		<b>CORRECTIVE ACTION/COMMENTS</b>
1. Faulty reverse path optical link between DHU or DEU and DRU.	1. Test optical link and repair or replace if faulty (see Subsection 5.4.2).	
2. Faulty optical receive port at DHU or DEU; or faulty optical transmit port at DRU.	2. Test optical ports. Replace DHU, DEU, or DRU if port is faulty (see Subsection 5.4.1).	
<b>Alarm Type</b>	<b>Major</b>	
<b>LED Indicators</b>	<b>DHU or DEU:</b> OK/NOK - Red or blinking Red - All other LEDs are green <b>DRU:</b> STATUS - Red or Blinking Red	
<b>Problem</b>	<b>The DHU or DEU is not receiving an optical signal from the DRU and the DRU is not receiving an optical signal from the DHU or DEU; or the DRU detects an internal circuitry fault.</b>	
<b>POSSIBLE CAUSE</b>		<b>CORRECTIVE ACTION/COMMENTS</b>
1. Faulty forward and reverse path optical link between the DHU or DEU and DRU	1. Test optical link and repair or replace if faulty (see Subsection 5.4.2)	
2. Faulty DRU.	2. Replace DRU.	
<b>Alarm Type</b>	<b>Major</b>	
<b>LED Indicators</b>	<b>DHU or DEU:</b> All LEDs are green <b>Supported DEU:</b> HOST PORT - Red or blinking Red - All other LEDs are green	
<b>Problem</b>	<b>The supported DEU is not receiving an optical signal from the DHU or DEU.</b>	
<b>POSSIBLE CAUSE</b>		<b>CORRECTIVE ACTION/COMMENTS</b>
1. Faulty forward path optical link between DEU or DHU and supported DEU.	1. Test optical link and repair or replace if faulty (see and 5.4.2).	
2. Faulty optical transmit port at DHU or DEU or faulty optical receive port at supported DEU.	2. Test optical ports. Replace DHU, DEU, or supported DEU if port is faulty (see Subsection 5.4.1).	
<b>Alarm Type</b>	<b>Major</b>	
<b>LED Indicators</b>	<b>DHU or DEU:</b> OK/NOK - Red or blinking Red - All other LEDs are green <b>Supported DEU:</b> All LEDs are green	
<b>Problem</b>	<b>The DHU or DEU is not receiving an optical signal from the supported DEU.</b>	
<b>POSSIBLE CAUSE</b>		<b>CORRECTIVE ACTION/COMMENTS</b>
1. Faulty reverse path optical link between DEU or DHU and supported DEU.	1. Test optical link and repair or replace if faulty (see and 5.4.2).	
2. Faulty optical receive port at DHU or DEU or faulty optical transmit port at supported DEU.	2. Test optical ports. Replace DHU, DEU, or supported DEU if port is faulty (see Subsection 5.4.1).	
<b>Alarm Type</b>	<b>Major</b>	
<b>LED Indicators</b>	<b>DHU or DEU:</b> OK/NOK - Red or blinking Red - All other LEDs are green <b>Supported DEU:</b> HOST PORT - Red or blinking Red - All other LEDs are green	
<b>Problem</b>	<b>The DHU or DEU is not receiving an optical signal from the supported DEU and the supported DEU is not receiving an optical signal from the DHU or DEU.</b>	
<b>POSSIBLE CAUSE</b>		<b>CORRECTIVE ACTION/COMMENTS</b>
1. Faulty forward and reverse path optical link between DEU or DHU and supported DEU.	1. Test optical link and repair or replace if faulty (see and 5.4.2).	

(continued)

Table 11. Fault Isolation and Troubleshooting, continued

Alarm Type	None	CORRECTIVE ACTION/COMMENTS
LED Indicators	DHU, DEU, and DRU: All LEDs are green.	
Problem	Loss of phone service from one DRU. Service normal at all other DRUs.	
POSSIBLE CAUSE		CORRECTIVE ACTION/COMMENTS
1. DRU antenna cable disconnected.	1. Re-connect DRU antenna cable to DRU.	
2. DRU antenna obstructed or misdirected.	2. Remove antenna obstruction or re-orient antenna.	
3. DRU antenna faulty.	3. Replace antenna.	
4. DRU faulty.	4. Replace DRU.	
Alarm Type	None	CORRECTIVE ACTION/COMMENTS
LED Indicators	DHU, DEU, and DRU: All LEDs are green	
Problem	Loss of phone service from all DRUs.	
POSSIBLE CAUSE		CORRECTIVE ACTION/COMMENTS
1. Faulty coaxial connection between DHU and the LIU or RIU.	1. Check forward path signals at the DHU. Check reverse path signals at the LIU or RIU.	
2. Faulty coaxial connection between LIU and the BTS or RIU and donor antenna.	2. Check forward path signals at the LIU or RIU. Check reverse path signals at the BTS or antenna.	
3. Faulty LIU or RIU.	3. Adjust or replace LIU or RIU.	
4. Faulty DHU	4. Replace DHU.	
5. Fault with cellular network or equipment.	5. Contact cell service provider and verify that cellular network and equipment is operational.	
Alarm Type	None	CORRECTIVE ACTION/COMMENTS
LED Indicators	DHU, DEU, and DRU: All LEDs indicate normal operation.	
Problem	Calls may be originated and terminated but service is noisy.	
POSSIBLE CAUSE		CORRECTIVE ACTION/COMMENTS
1. Some electrical device in the immediate vicinity is creating interference.	1. Try turning off each device that may be causing interference and see if problem corrects itself.	
Alarm Type	None	CORRECTIVE ACTION/COMMENTS
LED Indicators	DHU, DEU, and DRU: All LEDs indicate normal operation.	
Problem	Sudden high rate of blocked calls (delay dial tone).	
POSSIBLE CAUSE		CORRECTIVE ACTION/COMMENTS
1. Too many users for the number of channels available.	1. Wait a few minutes and try dialing again. Upgrade service if additional channels are required.	
2. Faulty DHU, DEU, or DRU.	2. Replace defective unit.	
Alarm Type	None	CORRECTIVE ACTION/COMMENTS
LED Indicators	DHU: OVERDRIVE - Red	
Problem	Forward path RF input level too high.	
POSSIBLE CAUSE		CORRECTIVE ACTION/COMMENTS
1. Incorrect attenuation in forward path RF coaxial link.	1. Adjust attenuation at RIU or LIU.	

## 5.4 Test Procedures

### 5.4.1 Optical Loopback Test Procedure

A faulty optical port, a break in an optical fiber, or a fault in an optical connector will interrupt communications between fiber linked components. Use the following procedure to determine if a fault exists with an optical port or with an optical link:



**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 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 transceiver or connector.*

1. Put on the IR filtering safety glasses.
2. At the DHU or supporting DEU, place the PORT ON/OFF switch for the fiber port or link to be tested in the **OFF** position (press **0**).
3. Disconnect the optical connectors at the DHU or supporting DEU optical port (near end of fiber) and place a dust cap over each connector.
4. Plug a loopback into the optical port to be tested as shown in Figure 24.

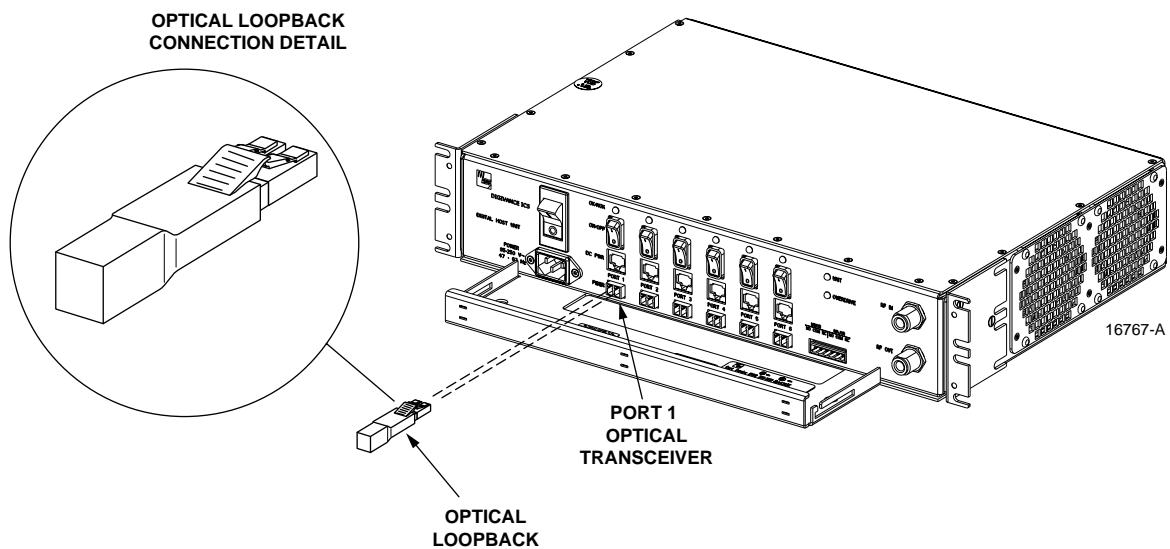


Figure 24. DHU/DEU Loopback Test

5. At the DHU or supporting DEU, place the PORT ON/OFF switch in the **ON** position (press **1**).
6. The PORT OK/NOK LED will turn either red or green. If the LED turns red, the optical port is faulty. Replace the DHU or DEU and then recheck system operation. If the LED turns green, the optical port is good. Proceed to step 7 to continue the test procedure.

7. Place the PORT ON/OFF switch in the **OFF** position (press **O**).
8. Disconnect the loopback from the DHU or supporting DEU and reconnect the optical fiber connectors (remove dust caps) to the optical port.
9. Disconnect the optical connectors at the DRU optical port or remote DEU host port (far end of fiber).
10. Connect the loopback (requires LC adapters) to the optical fiber connectors.

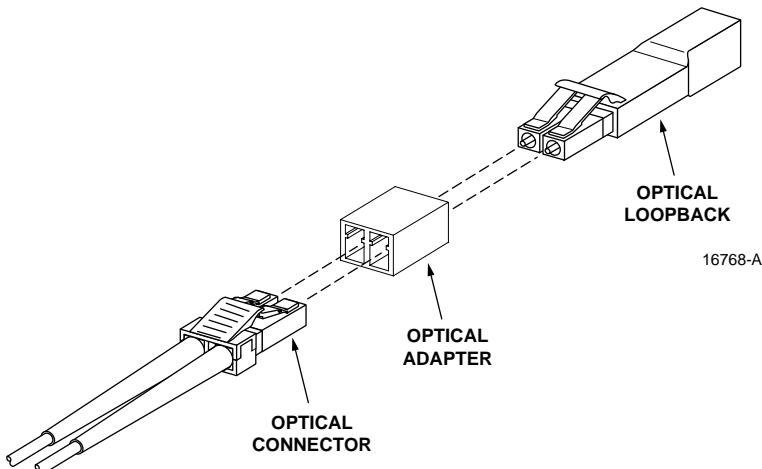


Figure 25. Optical Fiber Loopback Test

11. Insert a dust plug into the DRU optical port or remote DEU host port.
12. At the DHU or supporting DEU, place the PORT ON/OFF switch in the **ON** position (press **I**).
13. The PORT OK/NOK LED will turn either red or green. If the LED turns red, one of the optical fibers is faulty. Refer to Subsection 5.4.2 to isolate which fiber is at fault. If the LED turns green, the optical fibers are good. Proceed to step 14 to finish the test procedure.
14. At the DHU or supporting DEU, place the PORT ON/OFF switch in the **OFF** position (press **O**).
15. Disconnect the loopback and the optical adapters from the optical fiber connectors.
16. Place a dust cap over the connector for each optical fiber
17. Remove the dust plug from the DRU optical port or remote DEU host port.
18. Plug the loopback into the DRU optical port or DEU host port.
19. If testing a DRU that is powered by the DHU or by a supporting DEU, place the PORT ON/OFF switch in the **ON** position (press **I**).
20. The DRU STATUS LED or DEU HOST LED will turn either red or green. If the LED turns red, the optical port is faulty and the unit must be replaced. If the LED turns green, the optical port is good.

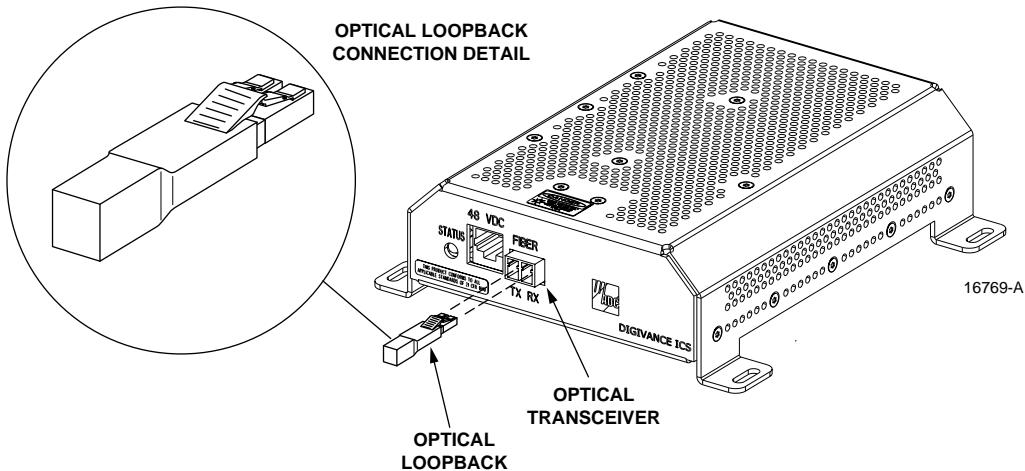


Figure 26. DRU Loopback Test

21. At the DHU or supporting DEU, place the PORT ON/OFF switch in the **OFF** position (press **0**).
22. Remove the loopback and reconnect the optical fiber connectors (remove dust caps) to the DRU optical port or remote DEU host port.
23. At the DHU or supporting DEU, place the PORT ON/OFF switch in the **ON** position (press **1**).
24. Verify that the PORT OK/NOK LED turns green.

#### 5.4.2 Optical Loss Test Procedure

A break in an optical fiber or a fault with the optical connector will interrupt communications between linked components. Use the following procedure to isolate a problem with an optical fiber or optical connector:



**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 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 transceiver or connector.*

1. Put on the IR filtering safety glasses.
2. At the DHU or supporting DEU, place the PORT ON/OFF switch for the fiber link to be tested in the **OFF** position (press **0**) if not already off.
3. Disconnect the optical connectors at the DHU or supporting DEU and at the corresponding DRU or remote DEU.

4. Inspect the optical connectors. Verify that each connector is clean and that no scratches or imperfections are visible on the fiber end. Clean and polish the optical connector if necessary.
5. Connect a laser light source to one end of the first optical fiber and an optical power meter to the other end.
6. Verify that the power loss is within specifications (8 dB loss) for the length of the fiber installed. If the power loss is not within specifications, repair or replace the optical fiber and/or connector per local practice.
7. Repeat steps 5 and 6 for the second optical fiber.
8. Reconnect the optical connectors at the DHU or supporting DEU and the corresponding DRU or remote DEU.
9. At the DHU or supporting DEU, place the PORT ON/OFF switch for the fiber link that was tested in the **ON** position (press I).

#### 5.4.3 DC Power Test Procedure

The DRU is powered by 34–48 Vdc power which is supplied through the RJ-45 connector. Power to the DRU may be supplied by the DHU, DEU, or by a 120 Vac to 48 Vdc power converter (available separately as an accessory item) plugged into a properly grounded 120 Vac outlet. Use the following procedure to test the DC power cable:

1. Disconnect the DC power cable from the DRU.
2. Connect the RJ-45 circuit access tool to the DRU as shown in Figure 27.
3. Connect the DC power cable to the RJ-45 circuit access tool (see Figure 27).

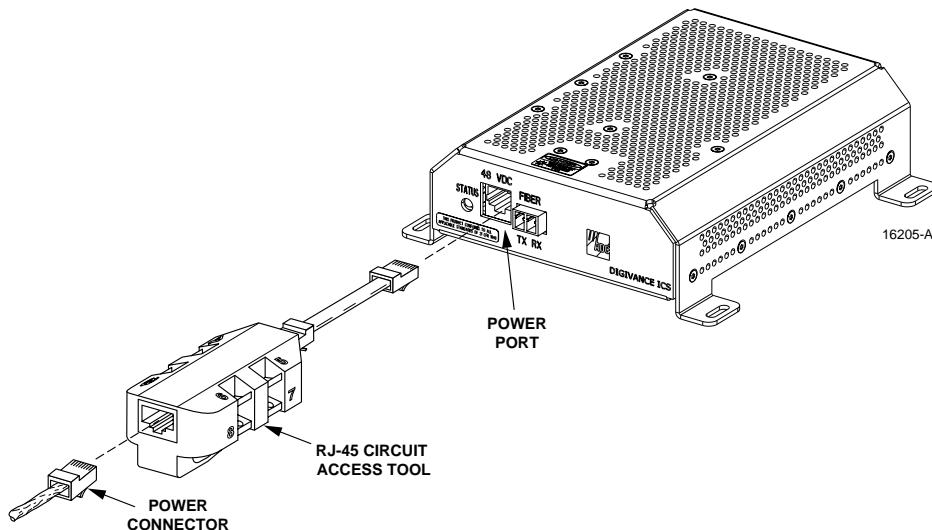


Figure 27. Connect RJ-45 Circuit Access Tool

4. Using a DC voltmeter, verify that the DC voltage level is between 34 and 48 Vdc between any set of positive and negative (+/-) terminals at the RJ-45 circuit access tool as shown in Figure 28. Due to source current limiting at the DHU or DEU, low voltage can mean excess wire resistance, low source voltage, or excess remote current.



**Warning:** *The DRU uses 48 Vdc power. To avoid electric shock or burns, use extreme care when working near exposed terminals or uninsulated cables. Be careful not to touch exposed terminals or to cause a short between terminals when checking voltage levels.*

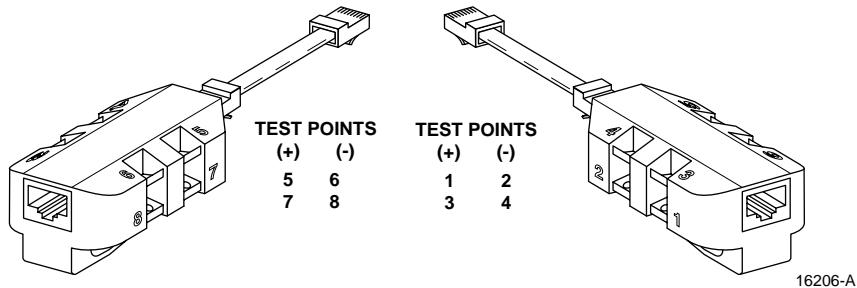


Figure 28. RJ-45 Circuit Access Tool Pin/Wire Designations

5. Disconnect RJ-45 circuit access tool from the DRU.
6. Use the DC voltmeter to check for open pin connections by checking for voltage between the +/- pairs on the RJ-45 circuit access tool (see Figure 28).
7. Disconnect the DC power cable from the RJ-45 circuit access tool.
8. Re-connect DC power cable to the DRU.

## 5.5 DHU or DEU Fan Replacement Procedure

It is recommended that the fans (catalog # DGVI-100000FAN) be replaced every five years. Replacement of a fan requires that the DHU or DEU be turned off for a short period of time. This will drop all existing calls, cause a temporary loss of service, and generate a major alarm. Use the following procedure to replace the cooling fans within the DHU or the DEU:

1. Before touching the DHU or DEU or handling a fan, slip on an Electro-Static Discharge (ESD) wrist strap and connect the ground wire to an earth ground source. Wear the ESD wrist strap while completing each section of the fan installation procedure.



**Warning:** *Electronic components can be damaged by static electrical discharge. To prevent ESD damage, always wear an ESD wrist strap when working on the DHU or DEU and when handling electronic components.*

2. Observe the fans (located on right side of enclosure) to determine which fan requires replacement. The faulty fan may be stopped, running at a reduced speed, or the fan bearing may be noisy.
3. **Note:** Because the Mean Time Between Failures (MTBF) is the same for both fans, it may be more efficient to replace both fans at the same time.
4. Notify the NOC or alarm monitoring system operator that the system is going offline.

4. Place the DHU or DEU AC power On/Off switch (see Figure 3 or Figure 7) in the OFF position (press **O**).
5. Remove the six flat-head screws (requires TORX screwdriver with T15 bit) that secure the fan/grill assembly to the side of the enclosure as shown in Figure 29 and save for reuse.
6. Carefully withdraw the fan/grill assembly from the enclosure until the wiring harness is exposed and the connectors are accessible.
7. Lift the small latch on each wiring harness connector (see Figure 29) and carefully unplug each connector from the circuit board connector.

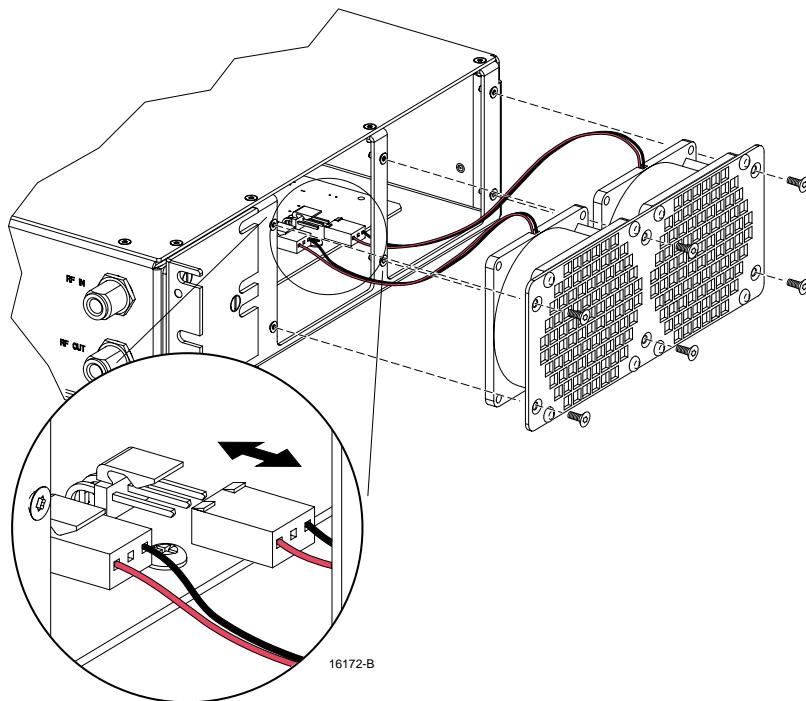


Figure 29. Fan/Grill Assembly Removal

8. Remove the four plastic rivets that secure the faulty fan to the grill by pushing outward on rivet center post until the rivet can be withdrawn from the grill as shown in Figure 30.
9. Remove the faulty fan(s) from the grill and then locate the replacement fan(s).
10. Use the rivets removed in step 8 to secure the replacement fan to the grill. Orient the fan so the wiring harness is on the top and the arrow on the fan housing faces into the enclosure.
11. Connect the two wiring harness connectors to the circuit board connectors.
12. Secure the fan/grill assembly to the side of the enclosure (see Figure 29) using the six flat-head screws removed in step 5.

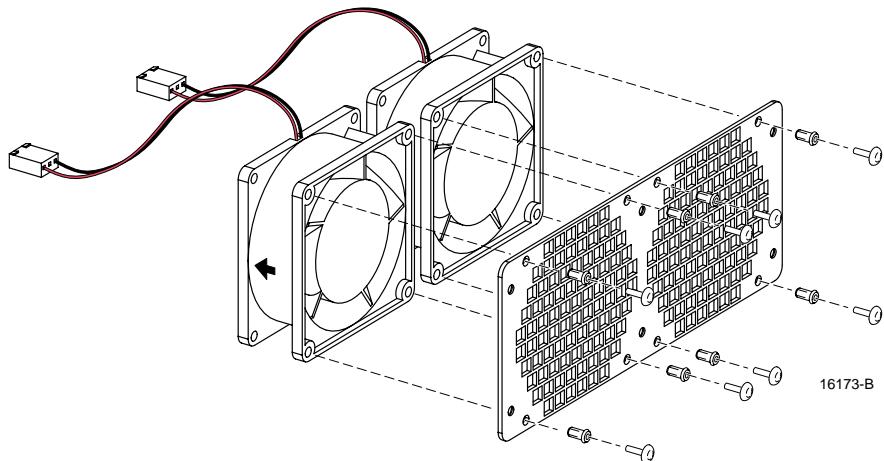


Figure 30. Removing Fan From Grill

13. Place the DHU or DEU AC power On/Off switch in the ON position (press **I**).
14. Verify that the fans run properly following power up.
15. Notify the NOC or alarm monitoring system operator that the system is going back online.

## 6 GENERAL INFORMATION

### 6.1 Warranty/Software

The Product and Software warranty policy and warranty period for all ADC products is published in ADC's Warranty/Software Handbook. Contact the Broadband Connections Group (BCG) Technical Assistance Center at 1-800-366-3891, extension 63475 (in U.S.A. or Canada) or 952-946-3000 (outside U.S.A. and Canada) for warranty or software information or for a copy of the Warranty/Software Handbook.

### 6.2 Software Service Agreement

ADC software service agreements for some ADC Products are available at a nominal fee. Contact the BCG Technical Assistance Center at 1-800-366-3891, extension 63475 (in U.S.A. or Canada) or 952-946-3000 (outside U.S.A. and Canada) for software service agreement information.

### 6.3 Repair/Exchange Policy

All repairs of ADC Products must be done by ADC or an authorized representative. Any attempt to repair or modify ADC Products without authorization from ADC voids the warranty.

If a malfunction cannot be resolved by the normal troubleshooting procedures, contact BCG Technical Assistance Center at 1-800-366-3891, extension 63475 (in U.S.A. or Canada) or 952-946-3000 (outside U.S.A. and Canada). A telephone consultation can sometimes resolve a problem without the need to repair or replace the ADC Product.

If, during a telephone consultation, ADC determines the ADC Product needs repair, ADC will authorize the return of the affected Product for repair and provide a Return Material Authorization number and complete shipping instructions. If time is critical, ADC can arrange to ship the replacement Product immediately. In all cases, the defective Product must be carefully packed and returned to ADC.

### 6.4 Repair Charges

If the defect and the necessary repairs are covered by the warranty, and the applicable warranty period has not expired, the Buyer's only payment obligation is to pay the shipping cost to return the defective Product. ADC will repair or replace the Product at no charge and pay the return shipping charges.

Otherwise, ADC will charge a percentage of the current Customer Product price for the repair or NTF (No Trouble Found). If an advance replacement is requested, the full price of a new unit will be charged initially. Upon receipt of the defective Product, ADC will credit Buyer with 20 percent of full price charged for any Product to be Out-of-Warranty. Products must be returned within (30) days to be eligible for any advance replacement credit. If repairs necessitate a visit by an ADC representative, ADC will charge the current price of a field visit plus round trip transportation charges from Minneapolis to the Buyer's site.

## 6.5 Replacement/Spare Products

Replacement parts, including, but not limited to, button caps and lenses, lamps, fuses, and patch cords, are available from ADC on a special order basis. Contact BCG Technical Assistance Center at 1-800-366-3891, extension 63475 (in U.S.A. or Canada) or 952-946-3475 (outside U.S.A. and Canada) for additional information.

Spare Products and accessories can be purchased from ADC. Contact Sales Administration at 1-800-366-3891, extension 63000 (in U.S.A. or Canada) or 952-946-3000 (outside U.S.A. and Canada) for a price quote and to place your order.

## 6.6 Returned Material

Contact the ADC Product Return Department at 1-800-366-3891, extension 63748 (in U.S.A. or Canada) or 952-946-3748 (outside U.S.A. and Canada) to obtain a Return Material Authorization number prior to returning an ADC Product.

All returned Products must have a Return Material Authorization (RMA) number clearly marked on the outside of the package. The Return Material Authorization number is valid for 90 days from authorization.

## 6.7 Customer Information and Assistance

For customers wanting information on ADC products or help in using them, ADC offers the services listed below. To obtain any of these services by telephone, first dial the central ADC telephone number, then dial the extension provided below.

The central number for calls originating in the U.S.A. or Canada is **1-800-366-3891**. For calls originating outside the U.S.A. or Canada, dial country code “1” then dial **952-946-3000**.

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<b>Sales Assistance</b> <b>Extension 63000</b>	<ul style="list-style-type: none"><li>• Quotation Proposals</li><li>• Ordering and Delivery</li><li>• General Product Information</li></ul>
<b>Systems Integration</b> <b>Extension 63000</b>	<ul style="list-style-type: none"><li>• Complete Solutions (from Concept to Installation)</li><li>• Network Design and Integration Testing</li><li>• System Turn-Up and Testing</li><li>• Network Monitoring (Upstream or Downstream)</li><li>• Power Monitoring and Remote Surveillance</li><li>• Service/Maintenance Agreements</li><li>• Systems Operation</li></ul>
<b>BCG Technical Assistance</b> <b>Center</b> <b>Extension 63475</b> <b>E-Mail: <a href="mailto:bcg_tac@adc.com">bcg_tac@adc.com</a></b>	<ul style="list-style-type: none"><li>• Technical Information</li><li>• System/Network Configuration</li><li>• Product Specification and Application</li><li>• Training (Product-Specific)</li><li>• Installation and Operation Assistance</li><li>• Troubleshooting and Repair</li></ul>
<b>Product Return Department</b> <b>Extension 63748</b> <b>E-Mail: <a href="mailto:repair&amp;return@adc.com">repair&amp;return@adc.com</a></b>	<ul style="list-style-type: none"><li>• ADC Return Authorization number and instructions must be obtained before returning products.</li></ul>

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Product information may also be obtained using the ADC web site at [www.adc.com](http://www.adc.com) or by writing ADC Telecommunications, Inc., P.O. Box 1101, Minneapolis, MN 55440-1101, U.S.A.

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