

4 SPECTRUM TRANSPORT MODULE

The Spectrum Transport Module (STM), shown in [Figure 2-5](#), serves as the handset servicing device for the Digivance LRCS. The STM provides the following basic functions:

- Provides an RF interface (antenna ports) to the remote antenna(s).
- Provides an optical interface to the HU.
- Converts the digitized forward path optical signal to a digitized RF signal.
- Converts the digitized RF signal to a composite RF signal.
- Digitizes the reverse path composite RF signal.
- Converts the digitized reverse path RF signal to a digitized optical signal.
- Provides an RS-232 interface for connecting a local EMS computer.
- Transports alarm, control, and monitoring information via the optical link.
- Provides AC power input and battery power input.
- Provides external alarm input.

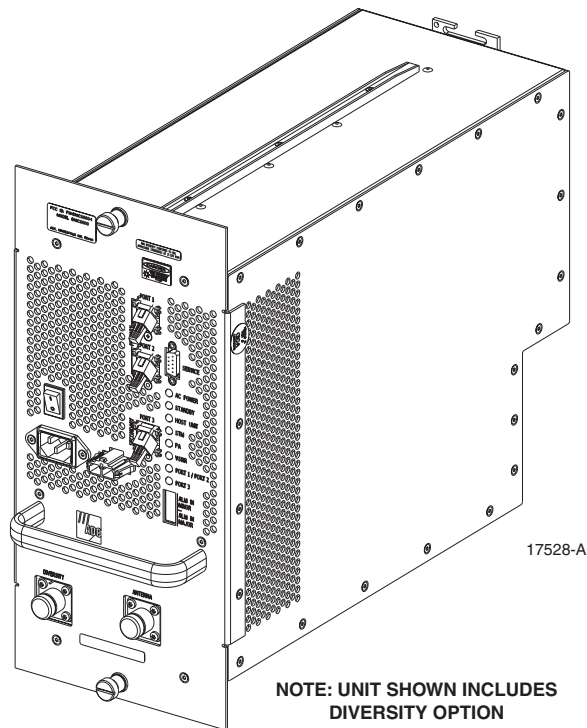


Figure 2-5. Spectrum Transport Module

4.1 Primary Components

The STM consists of an electronic circuit board assembly, power supply, duplexer, and fan assembly that are mounted within a powder-coated sheet metal enclosure. The metal enclosure provides a mounting point for the electronic components and controls RF emissions. Except for the fan unit, the electronic components are not user replaceable. The STM is designed for use within the RU cabinet. Except for the LPA interface connector, all controls, connectors, indicators, and switches are mounted on the STM front panel for easy access. A carrying handle is provided on the front of the STM to facilitate installation and transport.

4.2 Mounting

The STM mounts on a shelf within the RU cabinet. A runner on the bottom of the STM meshes with a track on the mounting shelf. The runner and track guide the STM into the installed position. The electrical interface between the STM and LPA is supported by a D-sub female connector located on the rear side of the STM. A corresponding D-sub male connector mounted at the rear of the RU cabinet mounting shelf mates with the STM connector. Captive screws are provided for securing the STM to the mounting shelf.

4.3 Fault Detection and Alarm Reporting

The STM detects and reports various faults including remote unit fault, optical fault, power fault, temperature fault, power amplifier fault, and external (door open) fault. Various front panel Light Emitting Diode (LED) indicators turn from green to red or yellow if a fault is detected. The status of the STM, the alarm state (major or minor), and other alarm information is summarized and reported over the optical fiber to the HU and also over the service interface. In addition, the alarm state of the HU is received over the optical fiber and reported to the service interface. This information may be accessed remotely through the NOC/NEM interface or locally through the EMS software GUI.

4.4 Antenna Cable Connection

The antenna cable connections between the STM and the antenna are supported through either one (non-diversity unit) or two (diversity unit) N-type female connectors. On non-diversity units, a single connector is used for the antenna cable which carries both the forward and primary reverse path RF signals. On diversity units, a second connector is used for the diversity antenna cable which carries only the diversity reverse path RF signals. The STM does not connect directly to the antenna but instead connects to a lightning protector that is mounted on the bottom of the RU cabinet (see [Section 3.5](#)). A coaxial jumper cable is provided (included with the enclosure) for connecting the STM connector to the lightning protector.

4.5 RF Signal Level Adjustment

The STM is equipped with a digital attenuator for adjusting the signal level of the forward path RF **output** signal. The **remote forward path** attenuator adjusts the level of the output RF signal at the RU antenna port and will add from 0 to 30 dB of attenuation to the output signal level.

The attenuator can be set in 1 dB increments. The attenuator is software controlled and is adjusted through the NOC/NEM interface or the EMS software GUI.

4.6 Optical Connection

Fiber optic connections between the STM and the HU are supported through either two (non-diversity unit) or three (diversity unit) SC-type optical connector ports. On non-diversity units, one port is used for connecting the forward path optical signal and the other port is used for connecting the primary reverse path optical signal. On diversity units, a third optical port is used for connecting the diversity reverse path optical signal.

4.7 Service Interface Connection

The service interface connection between the STM and a local laptop computer loaded with the EMS software is supported by a single DB-9 female connector. The service interface connector provides an RS-232 DTE interface. The STM service interface connector supports local communications with both the STM and the corresponding HU.

4.8 Powering

The STM is powered by 120 or 240 Vac (50 or 60 Hz) power which is supplied through a three-conductor AC power cord. The power cord is provided with the RU cabinet. One end of the cord is hard-wired to the AC power outlet box and the other end is terminated with a molded-on plug cap. The power cord connects to a 3-wire AC cord connector mounted on the STM front panel. A switch on the STM front panel provides AC power On/Off control.

The STM (and the connected LPA) may be powered by a 24 Vdc back-up battery system which is available as an accessory kit. A connector is provided on the STM front panel for connecting the wiring harness for the back-up battery system.

4.9 Cooling

Continuous air-flow for cooling is provided by a single fan mounted on the rear side of the STM housing. An alarm is provided that indicates if a high temperature condition ($>50^{\circ}\text{C}/122^{\circ}\text{F}$) occurs. If the temperature falls below 32°F (0°C), the fan automatically shuts off. The fan may be field replaced if it fails.

4.10 User Interface

The STM user interface consists of the various connectors, switches, and LEDs that are provided on the STM front panel. The STM user interface points are indicated in [Figure 2-6](#) and described in [Table 2-3](#).

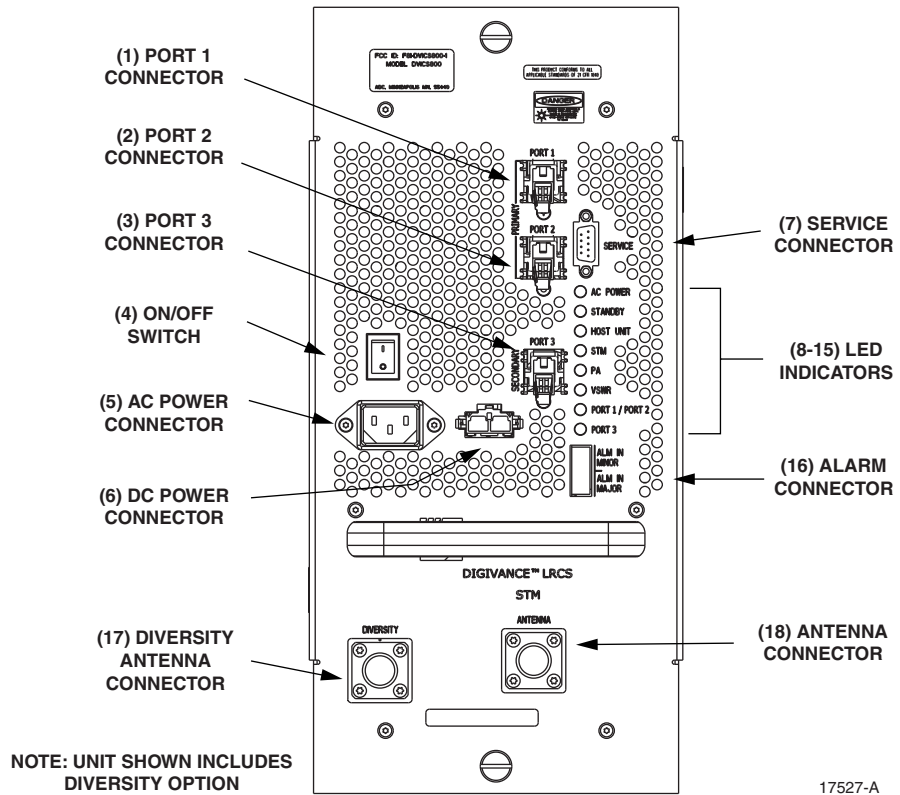


Figure 2-6. Spectrum Transport Module User Interface

Table 2-3. Spectrum Transport Module User Interface

REF NO	USER INTERFACE DESIGNATION	DEVICE	FUNCTIONAL DESCRIPTION
1	PORT 1	SC connector (single-mode)	Connection point for the forward path optical fiber.
2	PORT 2	SC connector (single-mode)	Connection point for the reverse path primary optical fiber.
3	PORT 3 (diversity unit only)	SC connector (single-mode)	Connection point for the reverse path diversity optical fiber.
4	1/0	On/Off rocker switch	Provides AC power on/off control.
5	No designation	3-wire AC power cord connector	Connection point for the AC power cord.
6	No designation	2-wire DC power cord connector	Connection point for the back-up battery power cord.
7	SERVICE	DB-9 connector (female)	Connection point for the RS-232 service interface cable.

Table 2-3. Spectrum Transport Module User Interface, continued

REF NO	USER INTERFACE DESIGNATION	DEVICE	FUNCTIONAL DESCRIPTION
8	AC POWER	Multi-colored LED (green/red)	Indicates if the STM is powered by the AC power source (green) or the back-up battery system (red). See Note.
9	STANDBY	Multi-colored LED (green/yellow/red)	Indicates if the system is in the Normal state (off) Standby state (blinking green), Test state (blinking red), or Program Load state (blinking yellow). See Note.
10	HOST UNIT	Multi-colored LED (green/yellow/red)	Indicates if no alarms (green), a minor alarm (yellow), or a major alarm (red) is detected at the HU. See Note.
11	STM	Multi-colored LED (green/yellow/red)	Indicates if the STM is normal (green) or faulty (red). See Note.
12	PA	Multi-colored LED (green/yellow/red)	Indicates if the power amplifier is normal (green), over temperature (yellow), has a fan failure (yellow), or is faulty (red). See Note.
13	VSWR	Multi-colored LED (green/yellow/red)	Indicates if the forward path VSWR is above (red) or below (green) the fault threshold.
14	PORT 1/PORT 2	Multi-colored LED (green/yellow/red)	Indicates if the forward path optical signal received from the HU is normal (green), if no signal is detected (red), or if errors are detected (red). See Note.
15	PORT 3 (diversity unit only)	Multi-colored LED (green/yellow)	Indicates if the diversity reverse path optical signal received by the HU is normal (green), if no signal is detected (yellow), or if errors are detected (yellow). See Note.
16	ALARM IN MINOR ALARM IN MAJOR	Screw-type terminal connector (14–26 AWG)	Connection point for two external alarm inputs. The door-open switch lead wires are typically connected to the major alarm terminals.
17	DIVERSITY (diversity unit only)	N-type female RF coaxial connector	Connection point for the diversity antenna.
18	ANTENNA	N-type female RF coaxial connector	Connection point for the primary antenna.
Note: A more detailed description of LED operation is provided in Section 5.			

5 LINEAR POWER AMPLIFIER

The Linear Power Amplifier (LPA), shown in [Figure 2-7](#), works in conjunction with the STM to amplify the forward path RF output signal. The STM is interfaced with the LPA through the D-sub connectors and wiring harness located at the rear of the RU cabinet. The RF signal is passed to the LPA for amplification and then passed back to the STM for output via the STM's ANTENNA port. The STM also supplies DC power to the LPA through the same interface.

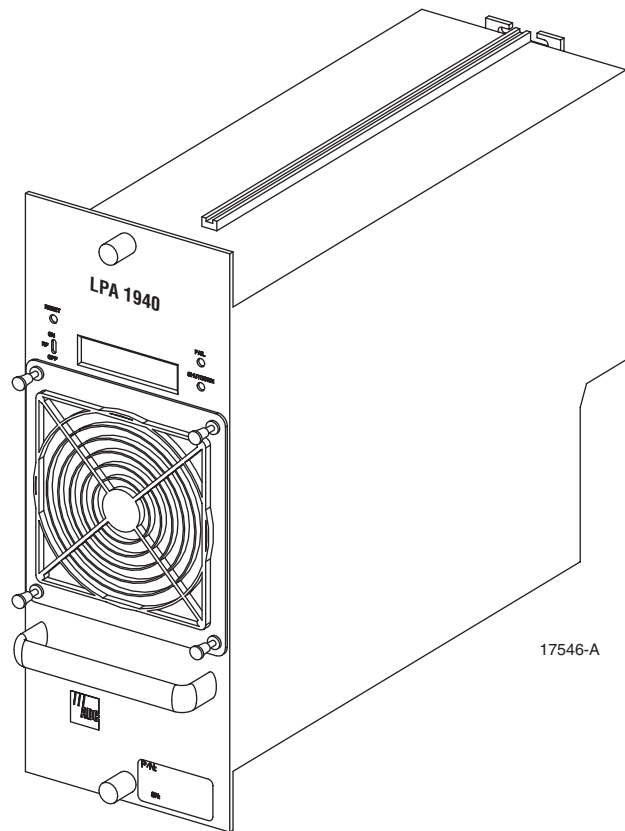


Figure 2-7. Linear Power Amplifier

5.1 Primary Components

The LPA consists of several electronic circuit board assemblies and two fan assemblies that are mounted within a powder-coated sheet metal enclosure. The metal enclosure provides a mounting point for the electronic components and controls RF emissions. Except for the fan units, the electronic components are not user replaceable. The LPA is designed for use within the RU cabinet. Except for the STM interface connector, all controls, indicators, and switches are mounted on the LPA front panel for easy access. A carrying handle is provided on the front of the LPA to facilitate installation and transport.

5.2 Mounting

The LPA mounts on a shelf within the RU cabinet. Runners on the top and bottom of the LPA mesh with tracks on the mounting shelf. The runners and tracks guide the LPA into the installed position. The electrical interface between the STM and LPA is supported by a D-sub female connector located on the rear side of the LPA. A corresponding D-sub male connector mounted at the rear of the RU cabinet mounting shelf mates with the LPA connector. Captive screws are provided for securing the LPA to the mounting shelf.

5.3 Fault Detection and Alarm Reporting

The LPA in conjunction with the STM detects and reports various faults including power amplifier fault, output power fault, temperature fault, and fan fault. Various Light Emitting Diode (LED) indicators, located on the front panels of both the STM and LPA, turn from green to red or yellow if an LPA fault is detected. In addition, a digital display located on the LPA front panel provides various fault messages. The status of the LPA, the alarm state (major or minor), and other more detailed information is summarized and reported (by the STM) over the optical fiber to the HU and also to the service interface. This detailed information may be accessed remotely through the NOC/NEM interface or locally through the EMU software GUI.

5.4 Powering

The LPA is powered by various DC voltages which are supplied by the STM over the electrical interface provided by the D-sub connectors and wiring harness mounted within the RU cabinet.

5.5 Cooling

Continuous air-flow for cooling is provided by a pair of fans mounted at the front and the rear side of the LPA housing. The front fan pulls cool air into the module and the rear fan exhausts heated air out of the module. An alarm is provided that indicates if a high temperature condition (>50° C/122° F) occurs or if a fan failure occurs. Either fan may be field replaced if it fails.

5.6 User Interface

The LPA user interface consists of the various LEDs, message displays, and switches that are provided on the LPA front panel. The LPA user interface points are described in [Table 2-4](#) and indicated in [Figure 2-8](#).

Table 2-4. Linear Power Amplifier User Interface

REF NO	USER INTERFACE DESIGNATION	DEVICE	FUNCTIONAL DESCRIPTION
1	RESET	Momentary contact push button switch	Momentarily pressing the switch push button clears all alarms and restarts the amplifier
2	RF ON OFF	2-position switch	Placing the switch in the OFF position puts the LPA in a standby state with RF output disabled. Placing the switch in the ON position puts the LPA in the normal state with RF output enabled.
3	FAIL	LED indicator (yellow)	Indicates the LPA is normal (off) or faulty (yellow).
4	SHUTDOWN	LED indicator (red)	Indicates the LPA is in service (off) or shutdown (red).
5	No designation	Digital display	Provides status and alarm messages. See Note.
Note: A more detailed description of the digital display messages is provided in Section 5.			

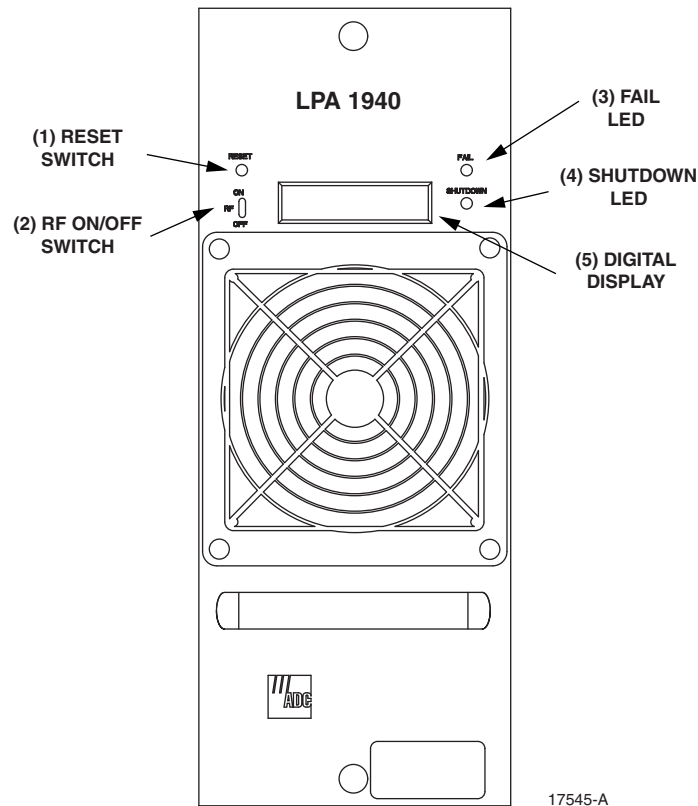


Figure 2-8. Linear Power Amplifier User Interface

6 DIGIVANCE ELEMENT MANAGEMENT SYSTEM

The Digivance Element Management System (EMS) is a network management tool that provides control and monitoring functions for the Digivance LRCS system. The EMS is used to provision and configure new systems for operation, set system operating parameters, get system alarm and status messages, and upgrade the system software. The EMS supports both local control by an on-site service technician and remote control by a Network Operations Center (NOC).

6.1 Primary Components

The EMS, shown in [Figure 2-9](#), consists of a PC-type desk-top computer (not provided) that is loaded with the EMS software. The EMS software is stored on a CD-ROM that is shipped with the HU. The EMS software must be installed on the EMS computer along with the Java 2 Version 1.3.1 Runtime Environment software which is also provided. Installation consists of inserting the CD-ROM into the computer's CD-ROM drive and then running the software install programs. This places the Java 2 Runtime Environment and EMS software files in assigned folders on the computer's hard drive.

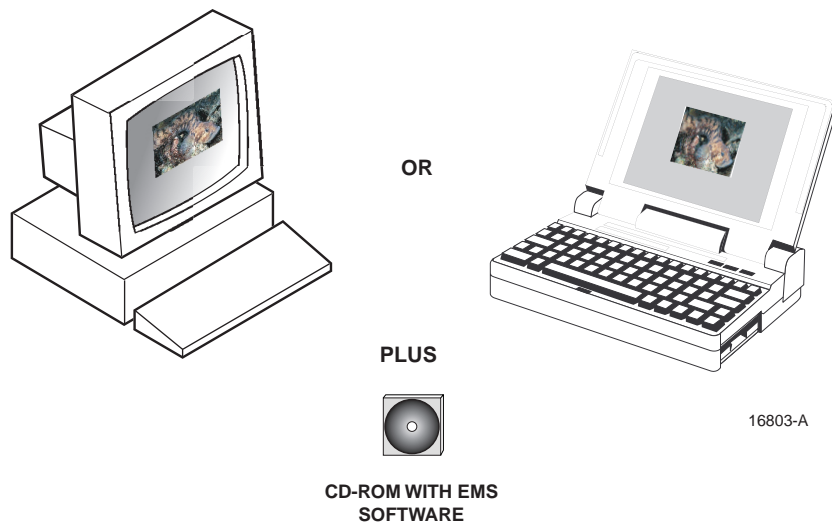


Figure 2-9. Alarm Network Unit

The EMS software may also be installed on a PC-type lap-top computer (not provided). A lap-top version of the EMS computer can be used as a portable network management tool for service and maintenance purposes. A laptop EMS can be connected temporarily to a system to enter the initial configuration data or to trouble-shoot problems and then removed when the task is completed. Permanent control and monitoring functions would be provided by the desk-top EMS computer.

6.2 Service Interface Connection

The service interface connection between the EMS computer and the HU or RU requires that the EMS computer be equipped with a DB-9 connector that is configured to provide an RS-232 DCE interface. A straight-through RS-232 interface cable (accessory item) equipped with a male DB-9 connector on one end and a PC-compatible connector on the other end is required to link the EMS computer to the HU. When multiple HUs are networked together, the EMS computer may be connected to the service connector on any one of the networked HUs.

6.3 NOC Interface Connection

The NOC interface connection between the EMS computer and the NOC requires that the EMS computer be equipped with a connector that is configured to provide an RS-232 ASCII interface. The link between the EMS computer and the NOC would generally be supported by a data network or dial-up modem. Cables and equipment (not provided) to support the RS-232 interface connection between the EMS computer and the data network or dial-up modem are required.

6.4 EMS Software User Interface

The EMS software provides two user interfaces: the Graphical User Interface (GUI) and the Network Operation Center-Network Element Manager (NOC/NEM) interface. Both interfaces provide essentially the same functionality except only the GUI can upgrade the LRCS system with new system software. In addition, only the NOC/NEM interface can record and playback alarm data.

The GUI is presented at the EMS computer or on a laptop computer. The GUI is used for **local** control and monitoring operations. The GUI consists of a series of displays and screens, such as the one shown in [Figure 2-10](#), that provide the user with alarm and status information and that allow the user to set various operating parameters.

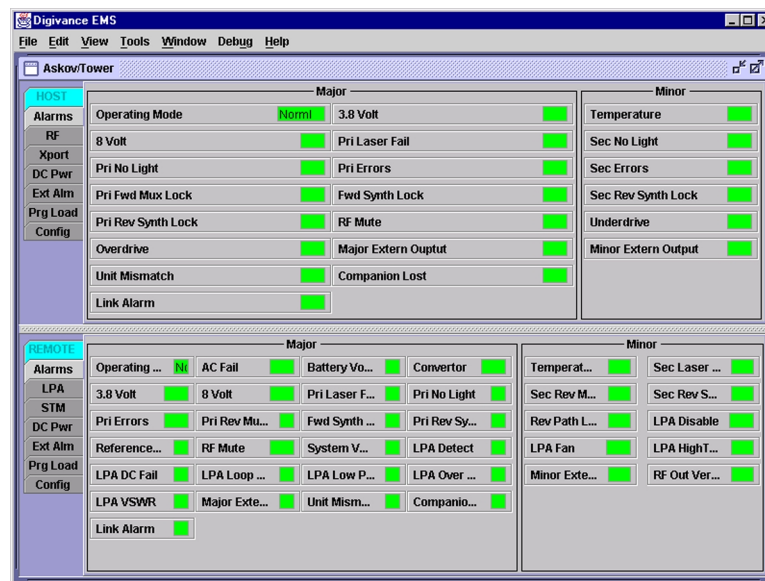


Figure 2-10. EMS Graphical User Interface Host/Remote Display

The NOC/NEM interface is a command line interface that is presented at an NOC terminal. The NOC/NEM interface is used for **remote** control and monitoring operations. The NOC/NEM interface consists of ASCII text strings that are input as SET or GET commands which are followed by the action or information required. A text string response is received from the specified LRCS system or systems to confirm the requested action or to report the requested information. Examples of several typical NOC-NEM interface commands and the responses received are shown in [Figure 2-11](#). The NOC/NEM interface requires only a VT100 terminal/emulator or a PC-type computer that is loaded with a communication software such as Procomm Plus. While primarily intended for use at the NOC, the NOC/NEM interface commands may also be input from the EMS computer.

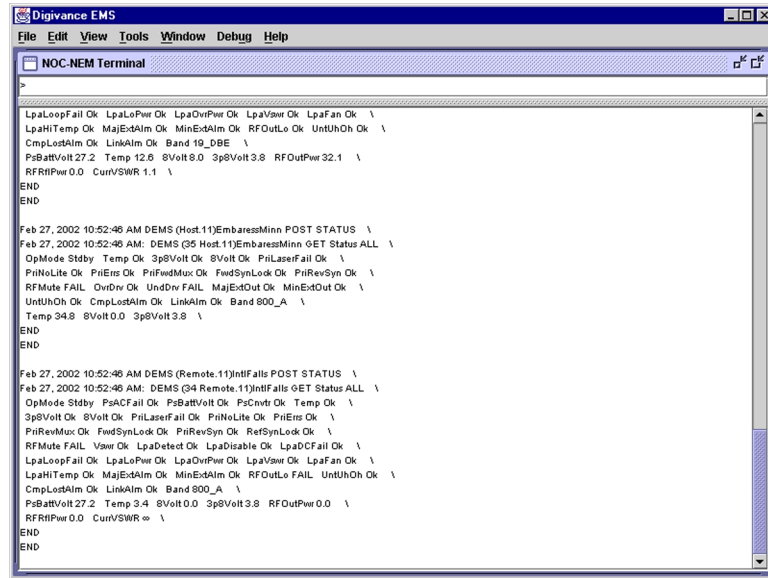


Figure 2-11. NOC/NEM Interface Typical Commands

7 SPECIFICATIONS

Refer to [Table 2-5](#) for the Digivance 1900 MHz LRCS system nominal specifications. All specifications apply after a five minute warm-up period.

Table 2-5. 1900 MHz System Nominal Specifications

PARAMETER	SPECIFICATION	REMARKS
Optical - Host and Remote Unit		
Fiber type	9/125, single-mode	
Number of fibers required		The wavelength division multiplexer (WDM) is an accessory item.
Non-diversity with WDM	1	
Diversity with WDM	2	
Non-diversity without WDM	2	
Diversity without WDM	3	
Forward path wavelength	1550 nm	
Reverse path wavelength	1310 nm	
Diversity path wavelength	1310 nm	
Optical transmit power output		
Host Unit	0 dBm	
Remote Unit	+2 dBm	
Optical budget	25 dB	For optical BER of 10 ⁻⁶
Optical Receive Input	-15 dBm	
Optical connectors	Industry standard SC	Host, remote, and WDM

Table 2-5. 1900 MHz System Nominal Specifications, continued

PARAMETER	SPECIFICATION	REMARKS
RF Forward Path - 1900 MHz System bandwidth	20 MHz AD band, 25 MHz DBE, BEF, and EFC bands	
Frequency range AD DBE BEF EFC	1930 to 1950 MHz 1945 to 1970 MHz 1950 to 1975 MHz 1965 to 1990 MHz	
Out-of-band emissions Primary Secondary (see Note 1)	-13 dBm per 1 MHz bandwidth from 10 kHz to 20 GHz -98 dBm per 100 kHz from 824 to 849 MHz and from 1850 to 1910 MHz	
Gain of forward path (Host input to Remote primary antenna port)	83.5 dB at band center, room temperature, and 0 dB attenuation setting	Includes power amplifier.
Gain flatness Band flatness Channel flatness	±1.5 dB across freq. range ±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 ≥ ±17.5 MHz from 881.5 MHz	
Propagation delay	2.2 μs	Excludes fiber delay
Configurable propagation delay Range Step size	Up to 63 μs 1 μs ± 100 ns	Plus standard propagation delay
Spurious In-band self generated Free dynamic range	-13 dBm at remote output 60 dB at 30 kHz bandwidth	
Transmit peak-to-average	10 dB	
Two-tone Intermodulation	-55 dBc at remote output	Two tones at 5 Watts each
CDMA Intermodulation 885 kHz to 1.25 MHz 1.25 to 1.98 MHz 1.98 to 2.25 MHz	-45 dBc per 30 kHz -8 dBm per 30 kHz -55 dBc per 30 kHz	Absolute level
Nominal composite RF input signal level	-40 dBm at 0 dB attenuation -10 dBm at max. attenuation	An input signal level of -40 dBm provides maximum output power
Configurable input level Range Step size	30 dB 1 ± 0.5 dB ±10% of attenuation monotonic	

Table 2-5. 1900 MHz System Nominal Specifications, continued

PARAMETER	SPECIFICATION	REMARKS
Composite RF Output power	43.5 dBm (22.4 Watts) at remote antenna port with -40 dBm input	40 Watts at power amplifier output
Configurable RF Output Range Step size	30 dB at remote unit 1 ±0.5 dB ±10% of attenuation monotonic	
Transmit path insertion loss	2.5 dB	
RF Reverse Path - 1900 MHz		
System bandwidth	20 MHz AD band, 25 MHz DBE, BEF, and EFC bands	
Frequency range AD DBE BEF EFC	1850 to 1870 MHz 1865 to 1890 MHz 1870 to 1895 MHz 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) -120 dBc (1930 to 1990 MHz) -120 dBc (869 to 894 MHz)	Required for dual band
Propagation delay	2.2 µs	Excludes fiber delay
Configurable propagation delay Range Step size	Up to 60 µs 1µs	Plus standard propagation delay
Gain flatness Band flatness Channel flatness	1.5 dB across frequency range ±1 dB variation across any 1.25 MHz channel	
Gain of reverse path Overall gain Gain variation	30 dB at band center at room temperature 3 dB over temperature	ALC not invoked 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	ALC not invoked
Configurable RF output Range Step size	30 dB 1 ±0.5 dB ±10% of attenuation monotonic	
Blocking dynamic range	70 dB	
Level limiting ALC threshold	-40 dBm instantaneous	
Level limiting ALC range	30 dB	

Table 2-5. 1900 MHz System Nominal Specifications, continued

PARAMETER	SPECIFICATION	REMARKS
Physical/Environmental/ Electrical - Host Unit Dimensions (H×W×D)	3.5 × 17.2 × 15.3 inches (89 × 437 × 389 mm)	Dimension for width does not include the mounting brackets which can be installed for either 19- or 23-inch racks.
Mounting	19- or 23-inch rack	EIA or WECO
Weight	18 lbs. (8.2 kg)	
Weather resistance	Indoor installation only	
Operating temperature	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
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	
Power consumption	55 watts	
Current rating	1 Amp at -48 Vdc	
Reliability at 25°C	MTBF 80,000 hours	Excluding fans
Physical/Environmental/ Electrical - Remote Unit Cabinet dimensions (H×W×D)	28.4 × 17.4 × 24.9 inches (721 × 442 × 632 mm)	
Mounting	Wall or pole	Pole mounting requires the pole mount kit. (accessory)
Weight	120 lbs (54.4 kg)	Includes modules but not battery
Weather resistance	NEMA-3R, removable dust filter	
Operating temperature	-30° to 50° C (-22° 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	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

Table 2-5. 1900 MHz System Nominal Specifications, continued

PARAMETER	SPECIFICATION	REMARKS
Lightning protection	20 kA IEC 1000-4-5 8/20 μ s waveform	
Service connector	DB-9 (female)	RS-232 DTE interface
Battery backup operation	1 hour	
Power input	120 or 240 VAC, 50 or 60 Hz	Operation on 240 VAC requires removal of the 120 VAC outlet.
Power consumption	1200 watts	
Current rating	9 Amps at 120 Vac	
Reliability at 25°C	MTBF 50,000 hours	Excluding fans, battery, and air filter

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

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1 BEFORE STARTING INSTALLATION

This section provides the installation procedures for the HU, the WDM mounting shelf (accessory item), and the WDM (accessory item). Installation of the RU cabinet and RU electronic modules may proceed separately from installation of the HU. The installation procedures for the single band remote cabinet are provided in the Digivance Long-Range Coverage Solution Single Band Remote Cabinet Mounting Instructions (ADCP-75-117) which are shipped with the cabinet. The installation procedures for the STM and LPA electronic modules are provided in the Digivance Long-Range Coverage Solution Remote Unit Installation Instructions which are shipped with the STM. When all units of the Digivance LRCS 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
- Laser light source

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 OSP FIBER CABLE 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 OSP 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. Jumper 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](#).

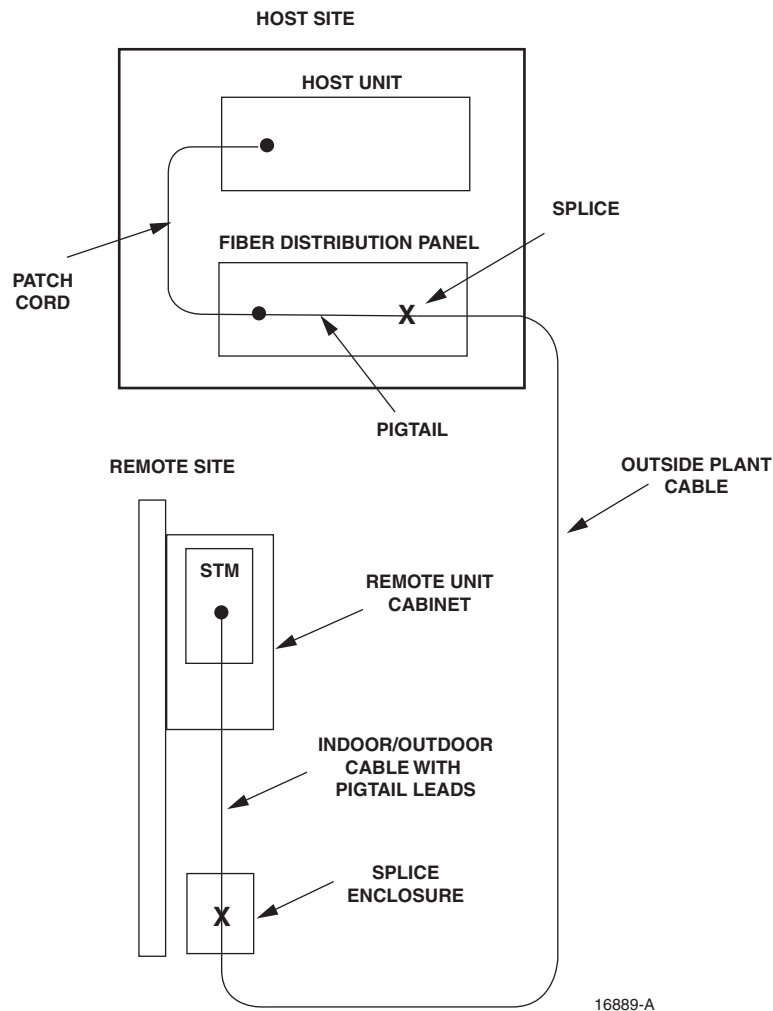


Figure 3-1. Typical OSP Cable Routing

At the RU, the OSP fiber optic cable should be spliced to a connectorized outdoor-rated cable (consisting of individual jacketed pigtails) which is routed into the RU cabinet. The individual pigtails can then be connected directly to the STM optical ports. A connector is provided on the bottom of the RU cabinet to seal the cable entry point and provide strain relief. The procedure for routing the fiber cable into the RU cabinet and for connecting the pigtail leads to the STM is provided in the Digivance LRCS Single Band SMR Remote Unit Installation Instructions (ADCP-75-122).

When all splices and terminations are completed, test each fiber for optical loss as described in Section 5 of this document. The optical loss budget for 9/125, single-mode fiber is **25 dB** minimum for an optical BER of 10^{-6} . The power level of the received optical signal should not exceed **-15 dBm** to avoid overdriving the optical receiver. If necessary, use an in-line optical attenuator to adjust the signal level.

3 WDM MOUNTING PROCEDURE (OPTIONAL ACCESSORY)

A bi-directional wavelength division multiplexer (WDM) is available as an accessory item for non-diversity versions of the Digivance LRCS. If the application does not require the use of a WDM, skip this section and proceed to [Section 4](#).

The version of the WDM that is used with the HU consists of one or two WDM modules and a WDM mounting shelf. Each WDM module can support two HU's and each WDM mounting shelf can hold two WDM modules. A fully loaded WDM mounting shelf can therefore support four HU's.

When multiple HU's require connection to a WDM, the WDM 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 WDM modules to be connected directly to the optical ports on any one of the four HU's.

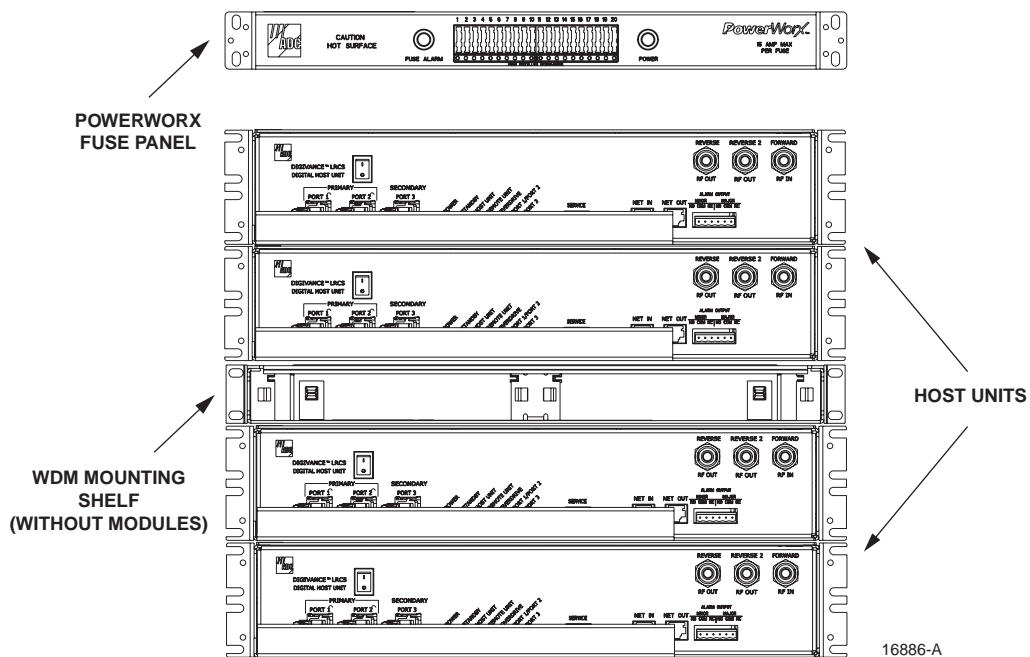


Figure 3-2. Typical WDM and HU Configuration

The WDM mounting shelf may be mounted in either a 19-inch or 23-inch EIA or WECCO equipment rack. Four #12-24 screws are provided for securing the mounting shelf to the rack. Use the following procedure to install the WDM mounting shelf in the equipment rack and to mount the WDM modules in the WDM mounting shelf:

1. The WDM 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 WECCO rack, a 23-inch EIA rack, or a 23-inch WECCO 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 rack types specified in step 1.
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.

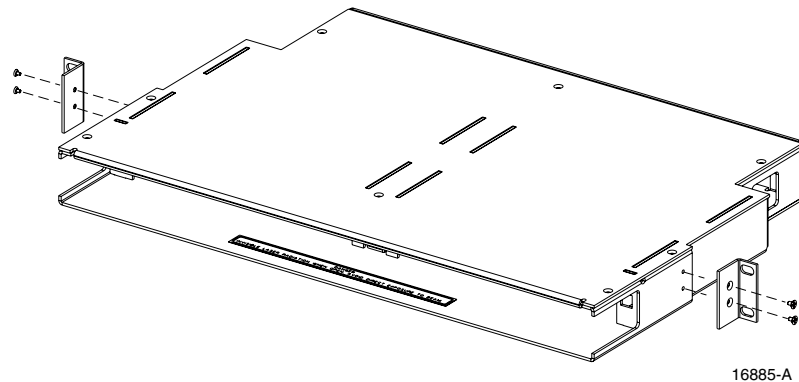


Figure 3-3. Installing the Replacement Mounting Brackets

5. Position the WDM 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 WDM 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 WDM module to the mounting shelf by twisting the handle on each quarter-turn fastener 90°.
8. Carefully store the pigtail leads from each WDM module. The routing and connection procedures for the pigtails are provided in [Section 7](#).