Digivance™ Long-Range Coverage Solution Single Band SMR Dual Transmit System Installation and Operation Manual
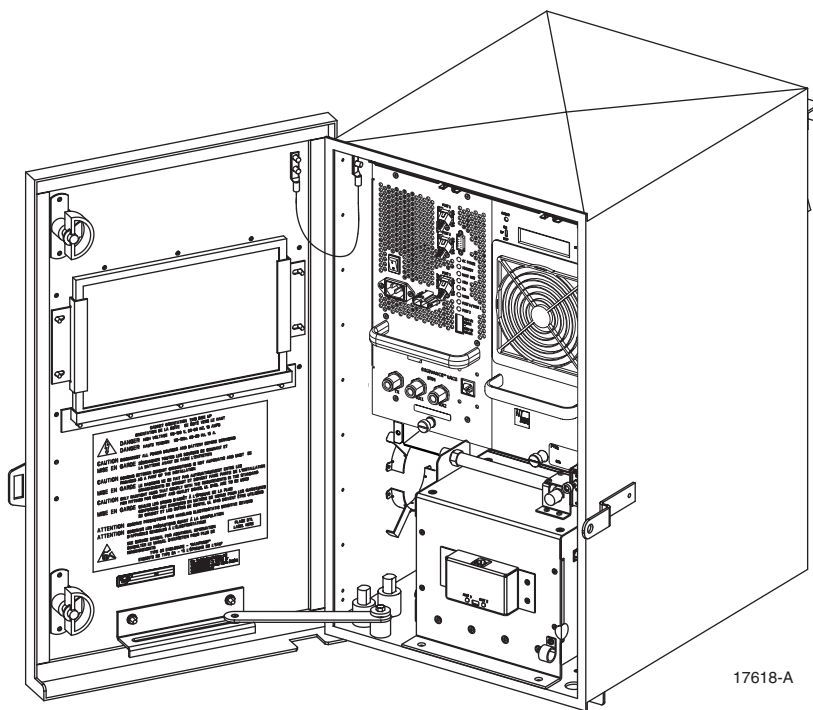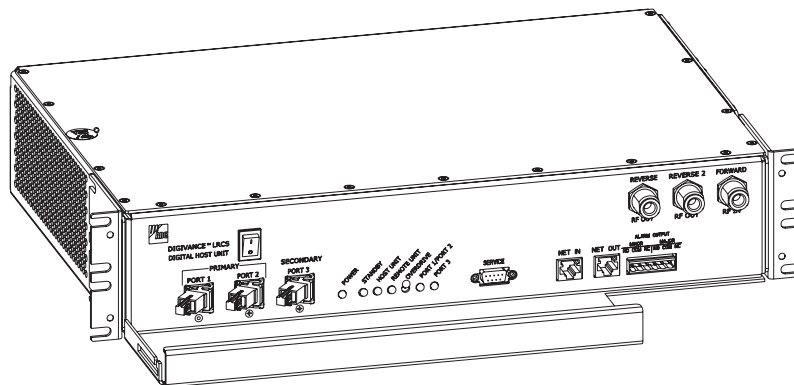

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Digivance™ Long-Range Coverage Solution Single Band SMR Dual Transmit System Installation and Operation Manual

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REVISION HISTORY

ISSUE	DATE	REASON FOR CHANGE
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ABOUT THIS MANUAL

This installation and operation manual provides the following information:

- An overview of the Digivance Long-Range Coverage Solution (LRCS).
- A description of the basic system components including the Host Unit (HU), Spectrum Transport Module (STM), Linear Power Amplifier (LPA), Dual Duplexer/Splitter (DDS) Remote Unit (RU) cabinet, and Digivance Element Management System (EMS).
- Installation procedures for the HU.
- Procedures for tuning-up the system and verifying that the system in functioning properly.
- Procedures for maintaining the system including troubleshooting problems and replacing faulty components.
- Product warranty, repair, return, and replacement information.

The procedures for installing the remote unit and for installing and using the EMS software are provided in other publications which are referenced in the Related Publications section and at appropriate points within this manual.

RELATED PUBLICATIONS

Listed below are all the related manuals, their content, and their publication numbers. Copies of these publications can be ordered by contacting the ADC Technical Assistance Center at 1-800-366-3891 (in U.S.A. or Canada) or 952-946-3000, extension 63475 (outside U.S.A. and Canada).

Title/Description	ADCP Number
Digivance LRCS Single Band SMR Dual Transmit Remote Unit Installation Instructions	**75-135**
Provides instructions for installing the STM, LPA, DDS, and optional battery in the remote unit cabinet and for installing and connecting the fiber optic, coaxial, and AC power cables.	
Digivance LRCS Single Band Remote Unit Cabinet Installation Instructions	**75-117**
Provides instructions for locating and mounting the remote unit cabinet.	
Digivance Element Management System User Manual	**75-118**
Provides instructions for installing the Digivance EMS software and for using both the Graphical User Interface (GUI) and the Network Operations Center (NOC) versions of the software.	

ADMONISHMENTS

Important safety admonishments are used throughout this manual to warn of possible hazards to persons or equipment. An admonishment identifies a possible hazard and then explains what may happen if the hazard is not avoided. The admonishments — in the form of Dangers, Warnings, and Cautions — must be followed at all times. These warnings are flagged by use of the triangular alert icon (seen below), and are listed in descending order of severity of injury or damage and likelihood of occurrence.

Danger: *Danger is used to indicate the presence of a hazard that **will** cause severe personal injury, death, or substantial property damage if the hazard is not avoided.*

Warning: *Warning is used to indicate the presence of a hazard that **can** cause severe personal injury, death, or substantial property damage if the hazard is not avoided.*

Caution: *Caution is used to indicate the presence of a hazard that **will** or **can** cause minor personal injury or property damage if the hazard is not avoided.*

GENERAL SAFETY PRECAUTIONS

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 adapter or connector.*

Danger: *Do not look into the ends of any optical fiber. Exposure to laser radiation may result. Do not assume laser power is turned-off or the fiber is disconnected at the other end.*

Danger: *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.*

Warning: *The HU is powered by 48 VDC power which is supplied over customer-provided wiring. To prevent electrical shock when installing or modifying the HU power wiring, disconnect the wiring at the power source before working with uninsulated wires or terminals.*

Caution: *Always allow sufficient fiber length to permit routing of patch cords and pigtails without severe bends. Fiber optic patch cords or pigtails may be permanently damaged if bent or curved to a radius of less than 2 inches (50 mm).*

STANDARDS CERTIFICATION

FCC: This equipment complies with the applicable sections of Title 47 CFR Part 90.

UL/CUL: This equipment complies with UL and CUL 50 Standard for Enclosures for Electrical Equipment. This equipment provides the degree of protection specified by IP43 as defined in IEC Publication 529.

FDA/CDRH: This equipment uses a Class 1 LASER according to FDA/CDRH Rules. This product conforms to all applicable standards of 21 CFR Part 1040.

IC: This equipment complies with the applicable sections of RSS-131.

LIST OF ACRONYMS AND ABBREVIATIONS

The acronyms and abbreviations used in this manual are detailed in the following list:

AC	Alternating Current
ASCII	American Standard Code for Information Interchange
Att	Attenuation
AWG	American Wire Gauge
BER	Bit Error Rate
C	Centigrade
CAN	Controller Area Network
CDRH	Center for Devices and Radiological Health
CD-ROM	Compact Disk Read Only Memory
COM	Common
Config	Configuration
CUL	Canadian Underwriters Laboratories
DC	Direct Current
DCE	Data Communications Equipment
DDS	Dual Duplexer/Splitter
Div	Diversity
DTE	Data Terminal Equipment
EBTS	Extended Base Transceiver Station
EIA	Electronic Industries Association
EMS	Element Management System
ESD	Electrostatic Discharge
F	Fahrenheit
FCC	Federal Communications Commission
FDA	Food and Drug Administration
FSO	Free Space Optics
Fwd	Forward
GFCI	Ground Fault Circuit Interrupter

GUI	Graphical User Interface
HU	Host Unit
IC	Industry Canada
LED	Light Emitting Diode
LPA	Linear Power Amplifier
LRCS	Long-Range Coverage Solution
MHz	Mega Hertz
MI	Maintenance Interface
MPE	Maximum Permissible Exposure
MTBF	Mean Time Between Failure
NC	Normally Closed
NEM	Network Element Manager
NO	Normally Open
NOC	Network Operations Center
NPT	National Pipe Tapered
OSP	Outside Plant
PA	Power Amplifier
PC	Personal Computer
PCS	Personal Communications System
Prg	Program
Pwr	Power
Rev	Reverse
RF	Radio Frequency
RIM	Radio Interface Module
RMA	Return Material Authorization
RU	Remote Unit
RX	Receive or Receiver
SMR	Specialized Mobile Radio
STM	Spectrum Transport Module
TX	Transmit or Transmitter
UL	Underwriters Laboratories
ULC	Underwriters' Laboratories of Canada
VAC	Volts Alternating Current
VDC	Volts Direct Current
VSWR	Voltage Standing Wave Ratio
WECO	Western Electric Company
WDM	Wave Division Multiplexer

SECTION 1: OVERVIEW

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1   INTRODUCTION

This section provides basic description, application, and configuration information about the Digivance single band SMR Dual Transmit Long-Range Coverage Solution (LRCS). Throughout this publication, all items referenced as "accessory items" are not furnished with the basic product and must be purchased separately.

2   SYSTEM OVERVIEW

The Digivance single band SMR Dual Transmit LRCS is an RF signal transport system that provides long-range RF coverage in areas where it is impractical to place an Extended Base Transceiver Station (EBTS) at the antenna site. High real estate costs and community restrictions on tower and equipment locations often make it difficult to install the EBTS at the same location as the antenna. The Digivance LRCS is designed to overcome equipment placement problems by allowing base stations to be hubbed at a central location while placing remote antennas at optimum locations with minimal real estate requirements. With the Digivance LRCS, RF signals can be transported to one or more remote locations to expand coverage into areas not receiving service or to extend coverage into difficult to reach areas such as canyons, tunnels, or underground roadways.

2.1   Basic Components

The basic components of a Digivance LRCS system and their functions are shown in Figure 1-1. A single band LRCS system consists of the Host Unit (HU) and the Remote Unit (RU). Control and monitoring functions are provided by the Digivance Element Management System (EMS). In addition, various accessory items including a back-up battery kit (for the RU), a Wave Division Multiplexer (WDM) module (for the HU and RU), network cables (for connecting multiple HU's together), and EMS cable (for connecting the EMS computer to the HU) are available separately.
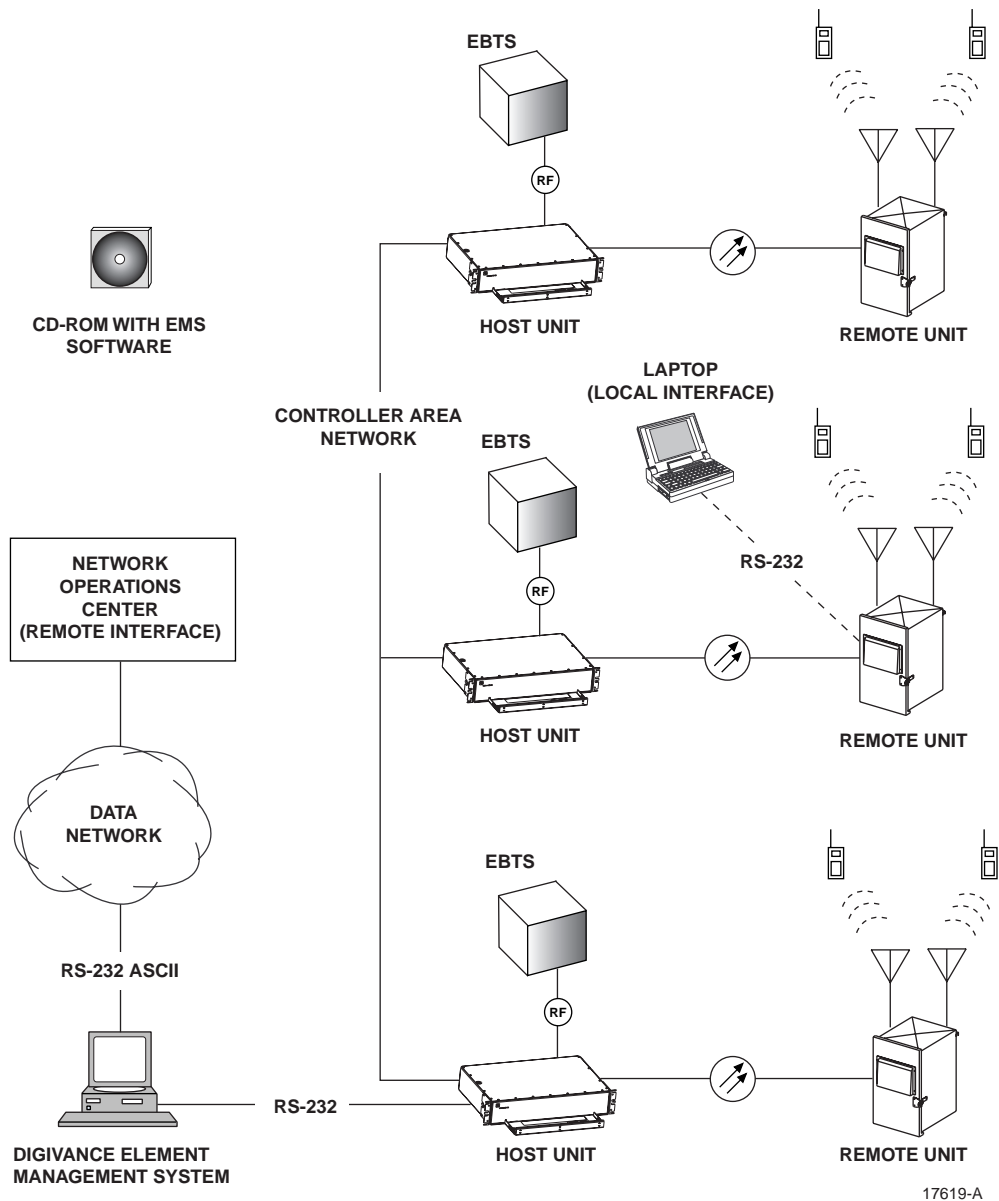
Figure 1-1. System Overview Diagram

2.2 Extended Base Transceiver Station Interface

The HU is co-located with the EBTS and interfaces directly with the EBTS over coaxial cables. In the forward path, the HU receives RF signals from the EBTS. The HU digitizes the RF signals and then converts them to digital optical signals for transport to the RU. In the reverse path, the HU receives digital optical signals from the RU. The HU converts the digital optical signals back to RF signals for transmission to the EBTS.

2.3   Handset Interface

The RU interfaces with the handsets through a pair of antennas. In the reverse path, the RU receives RF signals from each handset. The RU digitizes the RF signals and then converts them to digital optical signals for transport to the HU. In the forward path, the RU receives digital optical signals from the HU. The RU converts the optical signals to RF signals for transmission to the handsets. The RU is connected to a pair of antennas which transmit and receive the handset RF signals.

2.4   Local Service Interface

Local communications with an individual Digivance LRCS system is supported through a local service interface capability. The primary component of the local interface is a PC-type laptop computer loaded with the Digivance Element Management System (EMS) software. The EMS provides the various control and monitoring functions required for **local** management of each LRSC system. The EMS computer can be directly connected to either the HU or RU through the computer's RS-232 port. Operation is effected through the EMS Maintenance Interface (MI). The MI is a graphical user interface that consists of a series of screens from which the user selects the desired option or function. An RS-232 service port is provided on both the HU and the RU for connecting the EMS computer.

2.5   Remote NOC Interface

Remote communications between a Network Operations Center (NOC) and a networked system of multiple Digivance LRCS systems is supported by a remote NOC interface capability. The primary component of the remote NOC interface is a PC-type desktop computer loaded with the Digivance Element Management System (EMS) software. In addition to the local management functions described in the previous section, the EMS also provides the various control and monitoring functions required for **remote** management of multiple LRSC systems through a NOC.

A Controller Area Network (CAN) port is provided on each HU so that up to fifteen HU's can be networked together in daisy-chain fashion and controlled though the same EMS computer. The EMS computer connects to the networked HU's through the computer's RS-232 port #1. All HU's can then be controlled through the same EMS computer.

The NOC is connected to the EMS computer through a data network or dial-up modem. The EMS computer's RS-232 port #2 interfaces with the data network equipment. The network or dial-up modem equipment must be capable of interfacing with an RS-232 ASCII interface port.

At the NOC, control and monitoring of the networked LRCS systems are effected through a Network Element Manager (NEM) interface which requires only a VT100 terminal/emulator for operation. The NEM interface language consists of simple ASCII text strings. All communications are input as either SET or GET commands which result in ASCII text string responses from the specified system or systems. The EMS computer may also be used locally to manage the networked LRCS systems. Local operation is through the EMS software MI.

3   SYSTEM FUNCTIONS AND FEATURES

This section describes various system level functions and features of the Digivance LRCS.

3.1   Fiber Optic Transport

In a typical LRCS system, the HU is connected to the RU over three single-mode optical fibers. One fiber is used to transport the forward path optical signal. A second fiber is used to transport the reverse path optical signal. The third fiber is used to transport the diversity reverse path optical signal. Because the optical signal is digital, the input and output RF signal levels at the HU or the RU are not dependent on the level of the optical signal or the length of the optical fiber. A diagram of the fiber optic transport system for a typical SMR LRCS system is shown in Figure 1-2.
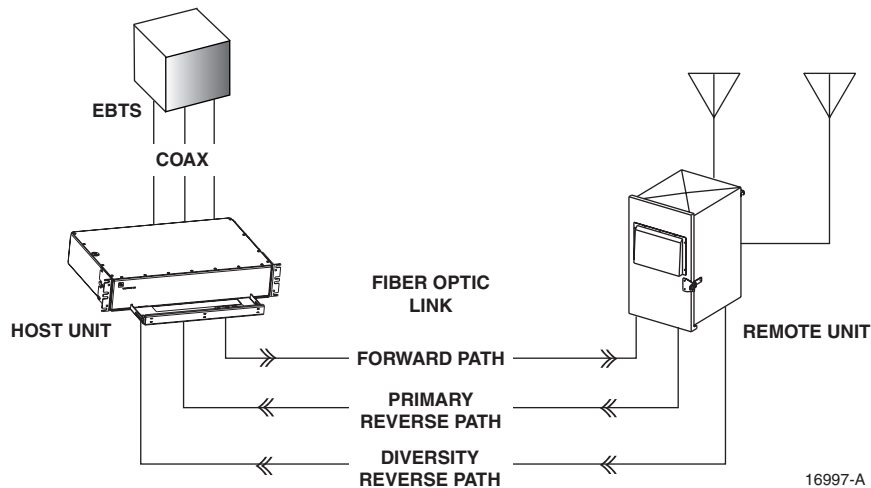
Figure 1-2. Typical Fiber Optic Transport System

The maximum length of the optical fibers is dependent on the loss specifications of the optical fiber and the losses imposed by the various connectors and splices. The SMR LRCS system provides an optical budget of **17 dB** (typical) when used with 9/125 single-mode fiber.

The optical wavelengths used in the system are 1550 nm for the forward path and 1310 nm for the reverse path. Because different wavelengths are used for the forward and reverse paths, a pair of bi-directional wavelength division multiplexers (WDM) may be used in applications where it is desirable to combine the forward path and primary reverse path optical signals on a single optical fiber. One WDM may be mounted with the HU and the other WDM mounted with the RU. A diagram of a fiber optic transport system that uses WDM's is shown in Figure 1-3. The WDMs are available as accessory items.
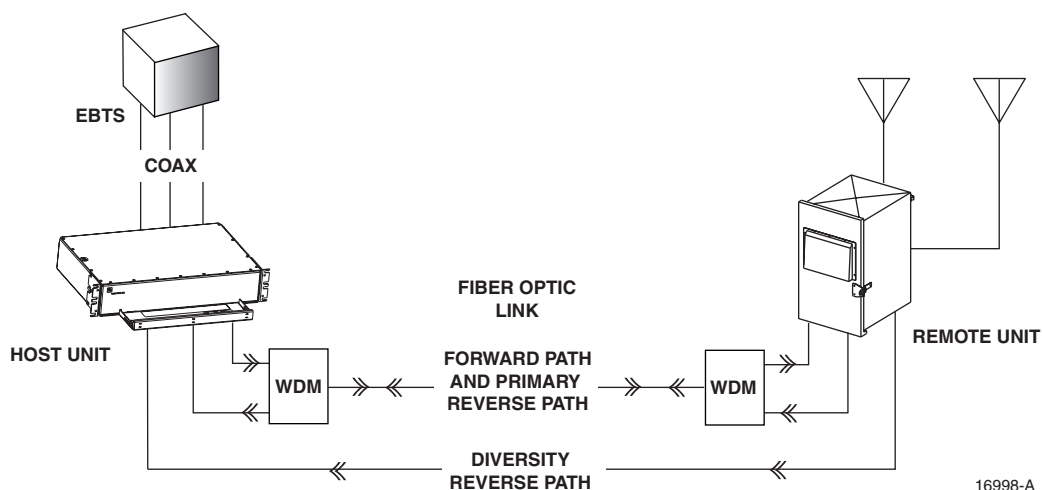
Figure 1-3. Wavelength Division Multiplexer Application

3.2 Control and Monitoring Software

The Digivance EMS software supports system control and monitoring functions for both the local and remote service interfaces. The EMS software is stored on a CD-ROM and shipped separately with each HU. Software installation consists of copying the software files from the CD-ROM to a designated directory on the hard-drive of the EMS computer. The EMS software may also be copied to the hard-drive of a laptop computer when a local service interface connection with a specific HU or RU is required.

The EMS software is used to provision and configure the system for operation. This includes selecting a sitename, setting alarm thresholds, and setting forward and reverse path RF gain adjustments. The EMS software is also used to get alarm messages (individual or summary), data measurements, or to upgrade the HU/RU system software. All control and monitor functions (except software upgrade which can only be done using the EMS software MI) can be effected using either the NOC/NEM interface or the EMS software MI.

3.3 Fault Detection and Alarm Reporting

LED indicators are provided on the front panel of the HU and on the front panels of the RU modules to indicate if the system is normal or if a fault is detected. In addition, normally open and normally closed alarm contacts (for both major and minor alarms) are provided at the HU for connection to a customer-provided external alarm system. All alarms can also be accessed through the NOC/NEM interface or the EMS software MI.

3.4 Powering

The HU is powered by ±24 or ±48 Vdc and must be hard-wired to a local office battery power source through a fuse panel. The RU is powered by 120 or 240 Vac (50 or 60 Hz) and must be hard-wired to the AC power source through a 20 Amp breaker box. The RU is pre-wired for 120

Vac operation but can be converted to 240 Vac operation if required. The RU is equipped with a surge protector to prevent equipment damage from AC power spikes and a lighting protector to prevent equipment damage from lighting surges. A 120 Vac outlet is provided within the RU cabinet for powering for test equipment or power tools. On an optional basis, a back-up battery kit is available for the RU. The battery-backup system powers the RU if the AC power source is disconnected or fails.

3.5   Equipment Mounting and Configuration

The HU is designed for mounting in a **non-condensing indoor** environment such as inside a wiring closet or within an environmentally-controlled cabinet. The HU is intended for rack-mount applications and may mounted in either a 19- or 23-inch WECO or EIA equipment rack, usually within 20 feet of the EBTS.

The RU is designed for mounting in either an **indoor or outdoor** environment. The RU consists of a Spectrum Transport Module (STM), a Linear Power Amplifier (LPA) module, Dual Duplexer/Splitter (DDS), and a self-contained cabinet which houses the various RU components and protects them from the elements. The RU cabinet is weather-tight but contact with salt-air mist should be avoided as it may degrade the MTBF of the product. The cabinet can be mounted from a flat-vertical surface or a utility pole (requires pole-mount kit). Slots are provided within the cabinet for mounting the STM and LPA modules. A mounting bracket is included with the DDS for securing it to the bottom of the cabinet. A storage spool is provided for storing short lengths of excess fiber slack. A bracket is provided for mounting a WDM module (accessory item). A tray with a heated base is provided for mounting the back-up battery (accessory item).

SECTION 2: DESCRIPTION

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1   INTRODUCTION

This section describes the basic components of the Digivance LRCS including the Host Unit (HU), the Remote Unit (RU), and the Element Management System (EMS). Note that the RU is actually an assembly that consists of a cabinet, a Spectrum Transport Module (STM), and a Linear Power Amplifier (LPA) module. For clarity, the various components that comprise the RU are described separately.

2   HOST UNIT

The HU, shown in Figure 2-1, serves as the EBTS servicing unit for the Digivance LRCS. The HU provides the following basic functions:

- Provides an adjustable RF interface with the EBTS.
- Provides a fiber optic interface with the RU.
- Digitizes the forward path composite RF signal.
- Converts the digitized forward path RF signal to a digital optical signal.
- Converts the digitized reverse path optical signal to a digitized RF signal.
- Converts the digitized reverse path RF signal to a composite RF signal.
- Signals alarm information to an external alarm system through relay contact closures
- Provides an RS-232 interface for connecting the EMS computer.
- Provides a CAN interface for networking multiple HUs.

2.1   Primary Components

The HU consists of an electronic circuit board assembly and a fan assembly that are mounted within a powder-coated sheet metal enclosure. The enclosure provides a mounting point for the circuit board and fan assemblies and controls RF emissions. The only user-replaceable component is the fan assembly. The HU is designed for use within a non-condensing indoor environment such as inside a wiring closet or cabinet. All controls, connectors, and indicators (except the power terminal strip) are mounted on the HU front panel for convenient access. Cable management functions for the coaxial cables and copper wiring are provided by a cable management tray that extends outward from the HU front panel.
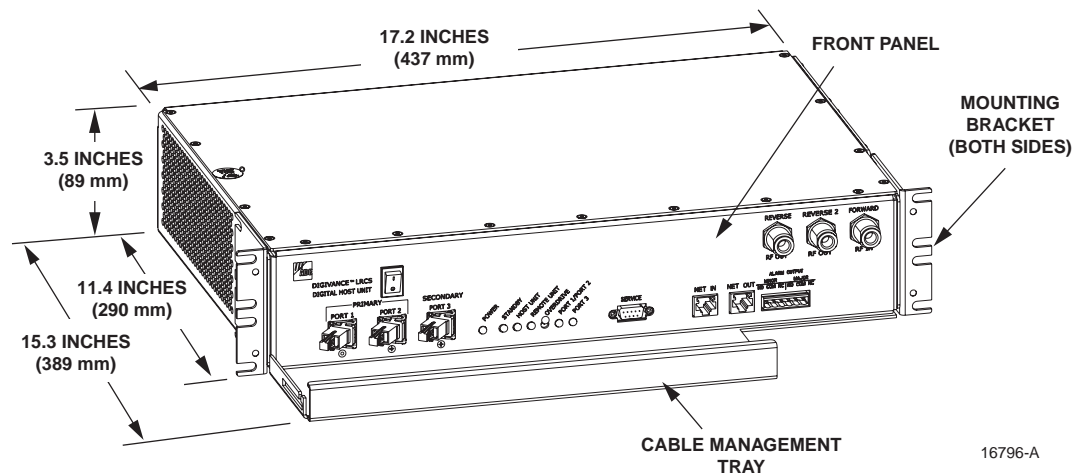
Figure 2-1. Host Unit

2.2   Mounting

The HU is intended for rack-mount applications. A pair of reversible mounting brackets is provided that allow the HU to be mounted in either a 19-inch or 23-inch EIA or WECO equipment rack. When installed, the front panel of the HU is flush with the front of the rack. The cable management tray extends 3.9 inches (99 mm) beyond the front panel. Fasteners are provided for securing the HU to the equipment rack.

2.3   Fault Detection and Alarm Reporting

The HU detects and reports the following faults: host unit fault, optical fault, power fault, temperature fault, and RF fault. Various front panel Light Emitting Diode (LED) indicators turn from green to red or yellow if a fault is detected. A set of alarm contacts (normally open and normally closed) are provided for reporting an alarm to an external alarm system when a fault is detected. Both major alarm (system operation seriously affected) and minor alarm (system operation not affected or only slightly degraded) contacts are provided.

The status of the HU, the alarm state (major or minor), and other more detailed alarm information is summarized and reported over the service interface, the CAN interface, and also

over the fiber optic link to the RU. In addition, the state of the RU is received over the fiber link and reported over the service interface and the CAN interface. This detailed information may be accessed remotely through the NOC/NEM interface or locally through the EMS software MI.

2.4   RF Signal Connections

The RF signal connections between the HU and the EBTS are supported through either two (non-diversity unit) or three (diversity unit) N-type female connectors. On non-diversity units, one connector is used for the forward path RF signal. The other connector is used for the reverse path RF signal. On diversity units, a third connector is used for the diversity path RF signal. In SMR installations, it is usually necessary to install an external attenuator in the forward path link between the HU and the EBTS. The HU should be as close as possible to the EBTS to minimize cable losses.

2.5   RF Signal Level Adjustments

The HU is equipped with several attenuators for adjusting the signal levels of the forward and reverse path RF signals. The attenuators provide an attenuation adjustment range of 0 to 20 dB and can be set in 1 dB increments. The attenuators are software controlled and are adjusted through the NOC/NEM interface or the EMS software MI.

The **host forward path** attenuator adjusts the level of the **input** RF signal to the HU. Any input signal with a level of –20 dBm to –40 dBm can be adjusted to the required maximum input level using the forward path attenuator. An external attenuator is required if more than 20 dB of attenuation is required to adjust the input RF signal to the required level.

The **host reverse path** attenuator adjusts the level of the **output** RF signal and will add from 10 dB of gain (attenuator set to 20 dB) to 30 dB of gain (attenuator set to 0 dB) to the output signal at the HU. The **host diversity reverse** path attenuator provides the same function as the host reverse path attenuator but for the diversity reverse path.

2.6   Propagation Delay

The HU forward, reverse, and diversity reverse path propagation delays may be adjusted in 1 µs increments within a range of 0–63 µs. The propagation delay is software controlled and may be adjusted through the NOC/NEM interface or the EMS software MI.

2.7   Optical Link Connection

Optical link connections between the HU and the RU (STM) 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.

2.8   Controller Area Network Interface Connection

Controller Area Network (CAN) interface connections between multiple HUs are supported by a pair of RJ-45 jacks. One of the jacks is designated as the network IN port and the other jack is

designated as the network OUT port. The CAN interface allows up to 15 HUs to be connected together (in daisy-chain fashion) and controlled through a single Digivance EMS computer.

2.9 Service Interface Connection

The service interface connection between the HU and the Digivance EMS computer is supported by a single DB-9 female connector. The service connector provides an RS-232 DTE interface. When multiple HUs are networked together, the supporting EMS computer may be connected to the service connector on any one of the networked HUs.

2.10 Powering

The HU is powered by 24 to 48 Vdc power. The power is fed to the HU through a screw-down type terminal strip located on the rear side of the unit. Power to the HU must be supplied through a fuse panel such as the 20 position PowerWorx fuse panel (available separately). The power circuit for each HU must be protected with a 3 Amp GMT fuse. An On/Off switch is provided on the HU front panel.

2.11 Cooling

Continuous airflow for cooling is provided by dual fans mounted on the right side of the HU housing. A minimum of 3 inches (76 mm) of clearance space must be provided on both the left and right sides of the HU for air intake and exhaust. An alarm is provided if a high temperature condition (>50º C/122º F) occurs. The fans may be field-replaced if either fan fails.

2.12 User Interface

The HU user interface consists of the various connectors, switches, terminals, and LEDs that are provided on the HU front and rear panels. The HU user interface points are indicated in Figure 2-2 and described in Table 2-1.
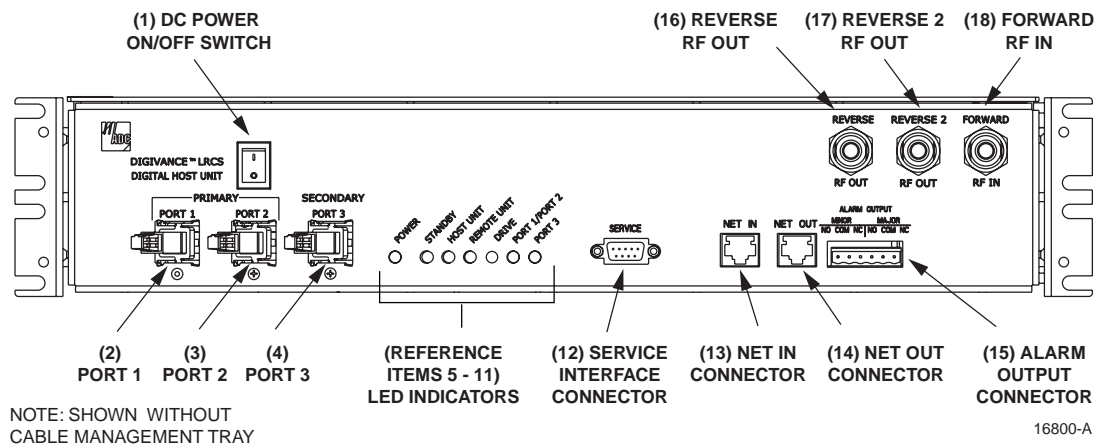

Figure 2-2. Host Unit User Interface

Table 2-1. Host Unit User Interface

REF NO	USER INTERFACE DESIGNATION	DEVICE	FUNCTIONAL DESCRIPTION
1	1/0	On/Off rocker switch	Provides DC power on/off control.
2	PORT 1	SC connector (single-mode)	Connection point for the forward path fiber optic link.
3	PORT 2	SC connector (single-mode)	Connection point for the reverse path primary fiber optic link.
4	PORT 3 (diversity unit only)	SC connector (single-mode)	Connection point for the reverse path diversity fiber optic link.
5	POWER	Multi-colored LED (green/yellow)	Indicates if the HU is powered (green) or unpowered (off). See Note.
6	STANDBY	Multi-colored LED (green/yellow/red)	Indicates if the system is in the Normal (off), Standby (blinking green), Test (blinking red), or Program Load (blinking yellow) state. See Note.
7	HOST UNIT	Multi-colored LED (green/yellow/red)	Indicates if the HU is normal (green), overheated (yellow), or faulty (red). See Note.
8	REMOTE 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 RU. See Note.
9	DRIVE	Multi-colored LED (green/yellow/red)	Indicates if the level of the RF input signal to the HU is normal (green), low (yellow), or high (red). See Note.
10	PORT 1/PORT 2	Multi-colored LED (green/yellow/red)	Indicates if the reverse path optical signal received from the RU is normal (green), if no signal is detected (red), or if errors are detected (red). See Note.
11	PORT 3 (diversity unit only)	Multi-colored LED (green/yellow)	Indicates if the diversity reverse path optical signal received from the RU is normal (green), if no signal is detected (yellow), or if errors are detected (yellow). See Note.
12	SERVICE	DB-9 connector (female)	Connection point for the RS-232 service interface cable.
13	NET IN	RJ-45 jack (female)	Connection point for the CAN interface input cable.
14	NET OUT	RJ-45 jack (female)	Connection point for the CAN interface output cable.
15	ALARM OUTPUT	Screw-type terminal connector (14–26 AWG)	Connection point for an external alarm system. Includes normally open (NO), normally closed (NC), and common (COM) wiring connections.
16	REVERSE RF OUT	N-type female RF coaxial connector	Connection point for the primary reverse path RF coaxial cable.
17	REVERSE 2 RF OUT	N-type female RF coaxial connector	Connection point for the diversity reverse path RF coaxial cable.

Table 2-1. Host Unit User Interface, continued

REF NO	USER INTERFACE DESIGNATION	DEVICE	FUNCTIONAL DESCRIPTION
18	FORWARD RF IN	N-type female RF coaxial connector	Connection point for the forward path RF coaxial cable.
	POWER 24–48 VDC (Rear side - not shown)	Screw-type terminal strip	Connection point for the DC power wiring.
Note: A more detailed description of LED operation is provided in Section 5.			

3 REMOTE UNIT CABINET

The RU cabinet, shown in Figure 2-3, is a NEMA-3R enclosure (with removable dust filter) that provides the following basic functions:

- Houses the STM, LPA, DDS, and accessories (back-up battery kit and WDM kit) and protects them from the weather.

- Provides electrical interface connections for the STM and LPA modules.

- Provides ventilation openings to allow the entry of cool air and the escape of heated air.

- Provides a point for terminating the coaxial antenna cables, the fiber optic cable, the AC power cable, and ground cable.

- Provides AC power surge protection

- Provides lightning protection

- Provides access to an AC power outlet for test equipment and power tools.

- Provides limited storage for fiber optic pigtails.

- Provides a warming pad for the battery

3.1 Primary Components

The RU cabinet consists of the enclosure, a mounting shelf for the STM and LPA modules, attachment points for the DDS bracket, an AC power interface, a lightning protector, a mounting shelf for the back-up battery accessory, a fiber storage spool, and a mounting bracket for the WDM accessory. The RU cabinet is designed for use in either an outdoor or indoor environment. Opening the hinged door provides full height and width access to the interior of the enclosure to facilitate module and cable installation.
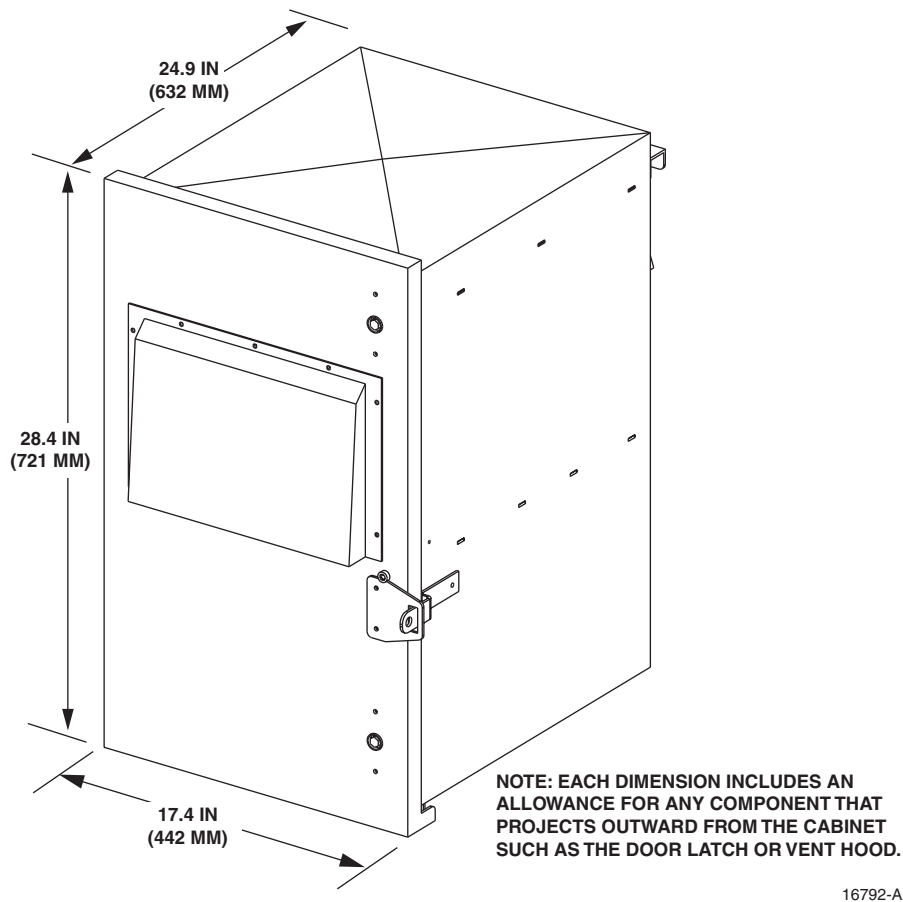
24.9 IN (632 MM)

28.4 IN (721 MM)

17.4 IN (442 MM)

NOTE: EACH DIMENSION INCLUDES AN ALLOWANCE FOR ANY COMPONENT THAT PROJECTS OUTWARD FROM THE CABINET SUCH AS THE DOOR LATCH OR VENT HOOD.

16792-A

Figure 2-3. Remote Unit Cabinet

The enclosure is constructed of heavy gauge aluminum and is painted putty white for corrosion protection. Connection and entry points are provided in the bottom of the enclosure for the antenna coaxial cable, fiber optic cable, and AC power cable. Vent openings are provided in the door and the rear side of the enclosure to permit air exchange for cooling. The RU cabinet is weather-tight but contact with salt-air mist should be avoided as it may degrade the MTBF of the product. Drain holes in the bottom of the cabinet allow any moisture that does enter the cabinet to drain out. The cabinet door is equipped with a sturdy latch so that the enclosure may be padlocked to prevent unauthorized entry. A door open switch is provided so that a major alarm is generated whenever the cabinet door is opened.

3.2   Mounting

The RU cabinet may be mounted on a flat vertical surface (such as the side of building) or on a utility pole. A special mounting bracket is provided with each enclosure. Installation consists of securing the bracket to the mounting surface and then hanging the enclosure from the bracket. The mounting bracket may be attached to a variety of surfaces such as wood, concrete, or

masonry. Various fasteners including hex-head capscrews, tee-nuts, and concrete anchors are provided. A separate pole-mounting kit (accessory item) is available for attaching the mounting bracket to a utility pole.

3.3 STM and LPA Installation

A mounting shelf is provided within the RU cabinet for installing the STM and LPA modules. The mounting shelf includes tracks that guide each module into the installed position. Separate mounting locations are provided for each type of module. Two D-sub connectors (one male, one female) are located at the rear of the mounting shelf. Each mounting shelf connector mates with a corresponding D-sub connector located on the rear side of each module. A wiring harness links the mounting shelf connectors together. The connectors and the attached wiring harness provide the electrical interface between the STM and LPA modules. The modules are held in the installed position with captive screws.

3.4 Fiber Optic Cable Entry

A plastic cord connector is provided in the exterior bottom side of the RU cabinet for routing a fiber optic cable into the enclosure. The cord connector provides cable strain relief and a watertight seal at the fiber optic cable entry point. As the connector nut is tightened, a soft neoprene bushing compresses to tightly grip the cable without applying excessive force to the fibers. The cord connector can accommodate cables that range from 0.375 to 0.875 inches (10 to 23 mm) in diameter. A spool is provided directly above the fiber optic cable entry hole for storing excess pigtail slack.

In a typical installation, the connectorized end of a mulit-fiber outside plant cable is routed into the enclosure through the cord connector and the individual fibers are broken out into pigtails. The pigtails are connected to the optical ports on the STM and the excess pigtail slack is stored on the fiber storage spool. The stub end of the cable is routed to an external splice enclosure (not provided) for splicing to the fiber optic link cable.

3.5 Antenna Cable Connections

An N-type female connector is provided on the exterior bottom side of the RU cabinet for connecting the primary antenna coaxial cable. The exterior connector is on the surge side of a lightning protector that is mounted on the interior bottom side of the enclosure. On the inside of the enclosure, a second N-type female connector is provided on the protected side of the lightning protector. A coaxial jumper cable (included with the DDS) is used for connecting the protected side N-type connector to the ANTENNA 1 port on the DDS.

A lightning protector for the diversity antenna is provided separately with the DDS. A hole is provided in the bottom of the enclosure for mounting the diversity lightning protector. The installer must mount the diversity antenna lightning protector in the cabinet when the STM, LPA, and DDS are installed and connect it to the ANTENNA 2 port on the DDS.

3.6   AC Power Wiring Entry and Grounding

A 3/4-inch NPT threaded hole is provided in the exterior bottom side of the RU cabinet for connecting a standard 3/4-inch AC conduit fitting to the enclosure. A 3/4-inch to 1/2-inch reducer is also included with the enclosure if 1/2-inch conduit is preferred over 3/4-inch conduit. The conduit should be installed between the enclosure and an external 20 Amp breaker box (not provided) and all AC power wiring (three wires required) should be run within the conduit. Three lead wires (Hot, Neutral, and Ground) are provided within the enclosure for connection to the AC wiring. Three wire nuts are included with the enclosure for completing the connection. A grounding lug is provided on the underside of the enclosure for connecting the RU cabinet to an earth ground source.

The standard RU cabinet is equipped with a 120 VAC Ground Fault Circuit Interrupter (GFCI) outlet and should only be wired for operation on 120 VAC current. The cabinet may be re-wired for 240 VAC if required.

3.7   Back-up Battery Kit

A back-up battery kit (accessory item) is available when the application requires that the system remain operational during an AC power outage. A tray is provided within the enclosure for mounting the battery. The battery tray includes a heating pad that keeps the battery warm during cold weather. A temperature sensor regulates the operation of the heating pad and a circuit breaker provides overcurrent protection. The back-up battery kit includes a wiring harness for connecting the battery to the STM. During normal operation, the STM provides charging current to maintain the battery charge level. During an AC power outage, the battery provides DC power to the STM to maintain system operation. The battery can maintain operation of the RU for approximately 1 hour at 50 Watts.

3.8   Ventilation

Vent openings are provided in the door and the rear side of the RU cabinet to permit air exchange for cooling. Air enters the enclosure through the opening in the door. A filter on the inside of the door removes dirt particles so that only clean air enters the enclosure. Both modules have cooling fans. The STM has a rear mounted fan that pulls air through the module and exhausts it toward the rear of the enclosure. The heated air exits through an opening in the rear side of the enclosure. The LPA works in a similar manner except it also has a fan on the front to help draw air into the module.

3.9   User Interface

The RU cabinet user interface consists of the various connectors, fittings, outlets, and switches that are provided on both the interior and exterior of the enclosure. The RU cabinet user interface points are indicated in Figure 2-4 and described in Table 2-2.