DXL5000

Digital Microwave System

User and Technical Manual

VISLINK

MRC

General Safety Information The following safety requirements, as well as local site requirements and regulations, must be observed by personnel operating and maintaining the equipment covered by this manual to ensure awareness of potential hazards. This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

About this Manual This manual is intended for use by qualified operators, installers, and service personnel. Users of this manual should already be familiar with basic concepts of radio, video, and audio. For information about terms in this manual, see *Glossary of Terms and Abbreviations* (Part No. 400576-1). Pay special attention to Notes, Cautions, and Warnings.

Read **Notes** for important information to assist you in using and maintaining the equipment.

Follow **CAUTIONS** to prevent damage to the equipment.

Follow **WARNINGS** to prevent personal injury or death.

Symbols The following symbols may be on the equipment or in this manual:

WARNING: General Warning. Risk of Danger.

WARNING: Risk of Electric Shock.

CAUTION: Electrostatic Discharge. Possible Damage to Equipment.

Protective Earth Ground: Identifies any terminal intended for connection to an external conductor for protection against electric shock in case of a fault, or the terminal on a protective earth electrode.

Frame or Chassis Ground: Identifies the frame or chassis terminal.

Earth Ground: Identifies the earth ground terminal.

Fuse (either icon): Identifies fuses or their location.

Waste Electrical and Electronic Equipment (WEEE): The product must not be disposed of with other waste. You must dispose of the waste equipment by handing it over to a designated collection point for recycling.

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A DXL5000 Specifications

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1 *About the DXL5000*

The DXL5000 consists of a digital microwave transmitter and a digital microwave receiver and is a cost-effective, highly reliable, flexible, and compact microwave link for the following long-haul and medium-haul applications, such as:

Studio-to-Transmitter Links (STL)
Transmitter-to-Studio Links (TSL)
Multi-hop and multi-channel broadcast,
Community Antenna Television (CATV)
Standard Definition Television (SDTV)
High Definition Television (HDTV)
Analog Television (ATV) video system networks.

The DXL5000 provides high-quality digital-format transmission under a Single Carrier Modulation (SCM) scheme. You can control the DXL5000 locally or remotely using a Windows-based PC. The DXL5000 transmitter and receiver each are 1RU high and operate on 120/240 VAC, 50/60 Hz AC power sources. The DXL5000 can be configured as follows:

- Simplex

- Duplex

- Non-protected

- TX, RX, Diplex

- Space Diversity RX

- Protected Hot Standby

You can order the DXL5000 to cover the following frequency bands. You also can order a high-power option for severe fading transmission environments.

6.425 GHz—6.525 GHz	(25 MHz Channel) (High power option available)
6.525 GHz—6.875 GHz	(10 MHz Channel) (High power option available)
6.875 GHz—7.125 GHz	(25 MHz Channel) (High power option available)
12.2 GHz—12.7 GHz	(25 MHz Channel)
12.7 GHz—13.25 GHz	(25 MHz Channel)

1.1 DXL5000 Transmitter Displays and Connections

The following figure and associated table shows the DXL5000 transmitter displays and connectors.

1	**TX POWER** LCD display	Indicates the current transmitter output power level in dBm.
2	**ALARM** LEDs	• **MAJOR ALARM**—Indicates a condition that can interrupt service. • **MINOR ALARM**—Indicates a condition that should be remedied but does not interrupt service. • **SCM ALARM**—Indicates a problem with the single carrier modulator. See Section 3.6, *Managing Alarms* on page 3-10.
3	**POWER IN** AC power connector	Provides AC power to the unit.
4	AC power fuse	Provides input power overload protection.
5	**MGMT** RJ-45 connector	Provides 10 Base T Ethernet connection to a PC via your web browser at a local or remote location for control of the unit.
6	**IF IN** 75 Ohm BNC female connector	Provides 70 MHz IF input to the unit.
7	**SUMMARY ALARM** 15-pin female D connector	Provides summary alarm data for common faults and events.
8	**CHAN1 and CHAN2 DATA** RJ-45 connector	Provides 10/100 Base T Ethernet connections to the unit. **CHAN1** is the customer connection; **CHAN2** is the inter-unit connection.
9	**CHAN1** and **CHAN2 T1/E1** RJ-45 connector	Provides 2 channels of either T1 or E1 inputs to the unit.
10	**ASI/DS3/E3 1** and **2** 75 Ohm BNC female connector	Provides 2 ASI or 2 DS3/E2 service inputs to the unit.
11	Ground	Provides grounding for the DXL5000.
12	**IF MON** 75 Ohm BNC female connector	The **IF MON** connector provides a 70 MHz IF output for external signal monitoring purposes.

13	**IMC BUS** 9-pin male D connector	(Reserved for future use.)
14	**WAYSIDE DATA** 9-pin male D connector	Provides RS-232 input for wayside data transmission via the SCM modem.
15	**ASI 3/SMPTE310** 75 Ohm BNC female connector	Provides a third ASI input or SMPTE310 service input to the unit.
16	**RESET** Switch	When pressed and held for about 5 seconds, the 4-digit **TX POWER** display flashes and resets the IP address, subnet mask, and default gateway addresses to the factory default addresses. It does not affect other password or configuration settings.
17	**RF OUT** SMA 50 Ohm female connector	Provides RF connection to branching from the RF circulator to the external antenna.

See Appendix A, *DXL5000 Specifications* for information about connector pin assignments.

1.2 DXL5000 Receiver Displays and Connections

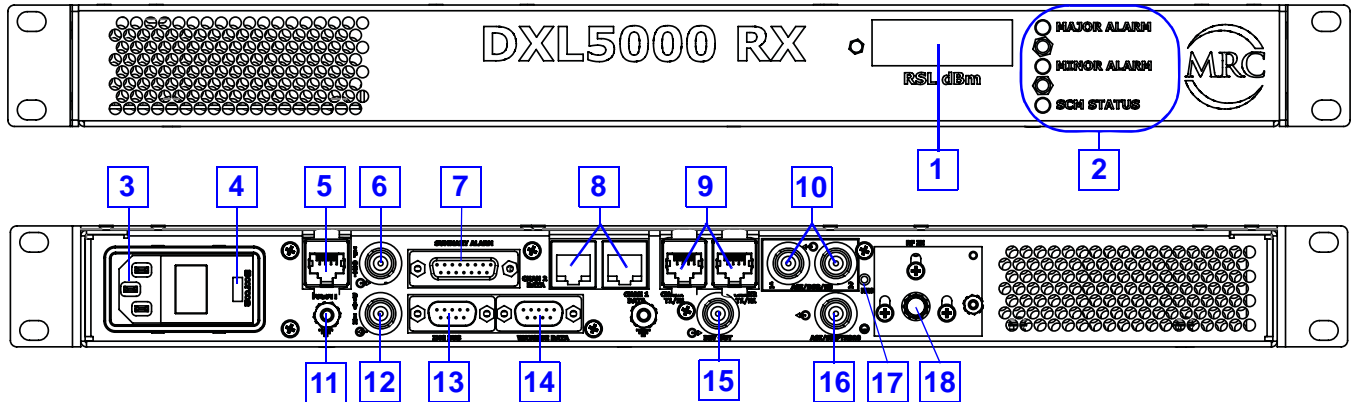The following figure and associated table shows the DXL5000 receiver displays and connections.

1	**RSL dBm** LCD display	Indicates the current receiver signal power level in dBm.
2	**ALARM** LEDs	• **MAJOR ALARM**—Indicates a condition that can interrupt service. • **MINOR ALARM**—Indicates a condition that should be remedied but does not interrupt service. • **SCM ALARM**—Indicates a problem with the single carrier modulator. See Section 3.6, *Managing Alarms* on page 3-10.
3	**POWER IN** AC power connector	Provides AC power to the unit.
4	AC power fuse	Provides input power overload protection.
5	**MGMT** RJ-45 connector	Provides 10 Base T Ethernet connection via your web browser to a PC at a local or remote location for control of the unit.
6	**IF OUT** 75 Ohm BNC female connector	The **IF OUT** connector provides the 70 MHz IF output from the unit.
7	**SUMMARY ALARM** 15-pin male D connector	Provides summary alarm data for common faults and events.
8	**CHAN 1** and **2 DATA** RJ-45 connector	Provides 10/100 Base T Ethernet connections to the unit. **CHAN1** is the customer connection; **CHAN2** is the inter-unit connection.
9	**CHAN1** and **CHAN2 T1/E1** RJ-45 connector	Provides 2 channels of either T1 or E1 outputs from the unit.
10	**ASI/DS3/E3 1** and **2** 75 Ohm BNC female connector	Provides 2 ASI or 2 DS3/E2 outputs from the unit.
11	Ground	Provides grounding for the DXL5000.
12	**DIV IN** 75 Ohm BNC female connector	Provides the diversity receive input to the unit.

13	**IMC BUS** 9-pin male D connector	(Reserved for future use.)
14	**WAYSIDE DATA** 9-pin male D connector	Provides RS-232 output for wayside data transmission via the SCM modem.
15	**DIV OUT** 75 Ohm BNC female connector	Provides the diversity receive output from the unit.
16	**ASI 3/SMPTE310** 75 Ohm BNC female connector	Provides a third ASI service output or SMPTE310 service output from the unit.
17	**RESET** Switch	When pressed and held for about 5 seconds, the 4-digit **dBm** display flashes and resets the IP address, subnet mask, and default gateway addresses to the factory default addresses. It does not affect other password or configuration settings.
18	**RF IN** SMA 50 Ohm female connector	Provides RF input to the unit.

See Appendix A, *DXL5000 Specifications* for information about connector pin assignments.

1.3 Getting Support for Your DXL5000

You can contact the Vislink Technical Support staff as follows:

24-hour Worldwide Customer Support

E-mail: support@mrcbroadcast.com
Telephone: +1 978-671-5929 or
                  888-777-9221

Customer Service

E-mail: customerservice@mrcbroadcast.com
Telephone: +1 978-671-5700 Press **3**
                  Monday-Friday, 8AM-5PM EST USA

When you contact Technical Support, include the following information:

- Model number and serial number of the unit (located on a label on the bottom of each unit).

- Approximate purchase date.

- The system information that is contained on the **Status—Firmware Revisions** screen of the transmitter or receiver. For information about obtaining this information, see Section 3.2, *Monitoring Radio Status (Status Tab)* on page 3-2.

1.3.1   Supported Repairs

There are no supported field repairs to the DXL5000 without contacting Technical Support.

CAUTION	***If you attempt field repair without contacting Technical Support, you risk damaging your equipment.*** *If your equipment is under warranty, you may also affect your warranty coverage. The DXL5000 requires specialized test equipment and software to calibrate operating characteristics after repair.*

1.3.2   Replacement Parts

The parts available are as follows:

- External AC Power Cable (120/240 VAC) that connects AC power to the DXL5000 IDU.

- AC Power Fuses as described in Section 2.2.6, *Power Requirements* on page 2-5.

2 *Installing the DXL5000*

This chapter describes how to install *DXL5000 Digital Microwave System* (DXL5000).

CAUTION   *If you modify the product without authorization from Vislink, you will void the warranty.*

2.1 Unpacking the DXL5000

Carefully unpack your new equipment to avoid damage.

Note   DO NOT discard the container or packing material until you have inspected the equipment and are sure there is no shipping damage. The container and packing must be available in case you need to file a damage claim with the shipping carrier.

- Inspect the equipment for damage and that it is clean and dry.
- Inspect the cables, connectors, switches, and displays to ensure that they are not broken, damaged, or loose.

If you discover damage after unpacking the system, report the damage as follows:

- Immediately file a claim with the shipping carrier.
- Forward a copy of the damage report to Vislink Customer Service.
- Contact Vislink Customer Service to determine the disposition of the equipment. See Section 1.3, *Getting Support for Your DXL5000* on page 1-6.

2.2 Preparing to Install the DXL5000

The following sections describe the things you should consider before installing the DXL5000.

2.2.1 Operating in Safety

CAUTION   *Ensure that the power being supplied matches the power required by the equipment. You can find power ratings for equipment on a rating plate, usually on the rear panel. Ensure that the electrical supply is protected by over-current protection devices as required by the applicable electrical codes. If necessary, consult a licensed electrician.*

WARNING—RF Power Hazard

WARNING	*The unit has high levels of RF power. Exposure to RF or microwave power can cause burns and may be harmful to health.*

- Remove power from the unit before disconnecting any RF cables and before inspecting damaged cables and/or antennas.

- Avoid standing in front of high gain antennas (such as a dish antenna) and never look into the open end of a waveguide or cable where RF power may be present.

The following guidelines for safe operation were derived from OET bulletin 65, August 1997, as recommended by the Federal Communications Commission (FCC).

The DXL5000 was designed to provide services to broadcast ENG users under CFR 74 subpart F and 74.601 TV pickup stations. This unit, operated without an antenna, will not create RF energy exceeding 1.0 mW/cm^2, the FCC limit for exposure. Once connected to an antenna, the potential for harmful exposure will be greatly enhanced.

In this situation, a certain distance from the radiator is to be maintained. Calculations need to be performed to understand what that safe margin for exposure is. This is known as the Maximum Permissible Exposure (MPE) limit.

Calculations provided are for common antennas often utilized in the ENG environment. The following formula used is that suggested by OET 65.

Calculating MPE

EIRP = P * (10 ^ (G / 10)) = (antilog of G/10) * P

P = RF power delivered to the antenna in mW
G = Power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna in centimeters
S = MPE in mW/cm² (milliwatts per square centimeters)

Conversions

dBi to numeric gain = Antilog (dBi/10)
Feet to centimeters = Feet * 30.48
Centimeters to Feet = cm * .0328
4 π = 12.57

User Input

RF power delivered to the antenna = Watts
Antenna gain (referenced to isotropic antenna) = dBi
Distance from the center of radiation = Feet

Calculation steps:

1. [P] RF power input. Watts to milliwatts = Watts * 1000
2. [G] Antenna gain dBi. Numeric gain = Antilog (dBi/10)
3. [EIRP] Multiply P * G
4. [R] Centimeters to feet = Centimeters * .0328
5. Square R
6. Multiply R^2 * 4π
7. [S] Divide (R^2 * 4π) into EIRP

     S = Power Density in milliwatts per square centimeters.

Note   At frequencies above 1500 MHz, S must not be greater than 1.


Reference

FCC OET Bulletin 65, August 1997 - Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields

The following graphs and associated tables show the permissible exposure distance for various antennas. Graphs and data will vary, based on the actual transmitter, output power, frequency, and antenna utilized. One plot provides the permissible output of the transmitter for digital modulation, and the other plot for analog modulation.

This information is provided, in accordance with the requirements set forth by the FCC, as a guide for you assuming that users of this equipment are licensed and qualified to operate the equipment per the guidelines and recommendations contained within the product user guides and in accordance with any FCC rules that may apply.

Low Power

Antenna Gain (dBi)	Minimum Safe Distance from Antenna (cm)	Minimum Safe Distance from Antenna (inch)
0	9	3.54
29	252	99.19
36	563	221.60
40	893	351.48
43	1261	496.33

Maximum Permissible Exposure
All Bands, Standard Power 1 Watt (+30dBm)
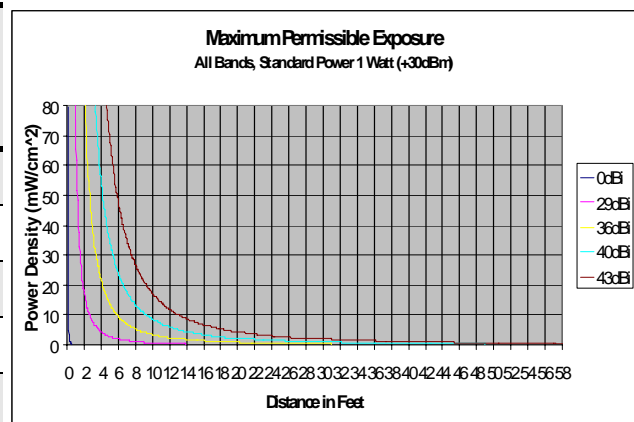
High Power

Antenna Gain (dBi)	Minimum Safe Distance from Antenna (cm)	Minimum Safe Distance from Antenna (inch)
0	13	5.12
29	356	140.12
36	797	313.70
40	1262	496.72
43	1783	701.79

Maximum Permissible Exposure
All Bands, High Power 2 Watts (+33dBm)
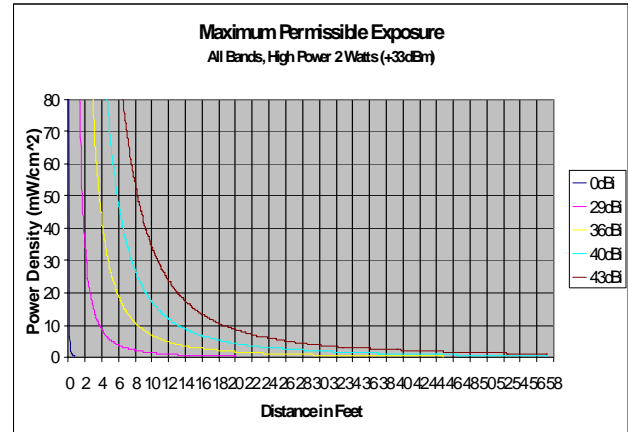
2.2.2   Grounding the DXL5000

CAUTION   *Be sure the equipment grounding follows applicable electrical codes. Never modify a grounded power plug to connect to an ungrounded receptacle.*

For safe operation, all equipment must be properly grounded.

- Connect all equipment on a rack to a common ground.
- Connect the common ground to a site ground.
- Make the ground wire as short and straight as possible.

2.2.3   Ventilating the DXL5000

CAUTION   *Temperatures inside a closed mounting area can be significantly higher than the ambient temperature. Always allow adequate ventilation.*

If possible, install components in a climate-controlled area. Allow adequate airflow around the equipment. Exhaust air from the rack should be circulated and not trapped in a closed space.

2.2.4   Protecting the DXL5000 from Moisture

Locate the equipment in an area protected from dripping water or excessive humidity.

WARNING   *If water penetrates the chassis, it could cause equipment damage and create a safety hazard.*

2.2.5 Routing Cables

Wiring is affected by temperature, humidity, and vibration extremes. You should do the following installation.

CAUTION   *Power supply cords and cables must be protected. Do not run cords where they can be stepped on. Protect cables against pinching and chafing. Pay special attention to locations where the cables enter or exit an enclosure or make a sharp bend.*

- Secure all cables at close intervals along their entire lengths.
- Protect cabling with added sheathing or padding anywhere cabling passes through a hole or lies against an obstruction.
- Provide flex relief at any location where the cable must change direction sharply, to maintain a smooth bend and prevent kinking.
- Provide strain relief at each connector to absorb any pulling forces on the cable and prevent damage to the connector.
- If long lengths of cable are required, you may need a UHF amplifier or gain block.

Contact Vislink for specific cable types and lengths to use in your application. (See *Section 1.3, Getting Support for Your DXL5000* on page 1-6.)

2.2.6 Power Requirements

The DXL5000 has the following power requirements. AC power fuses are located on the rear panel next to the power outlet.

Unit	Supply Voltage	Fuse Rating	Power Consumption
Transmitter	120 VAC, 50/60 Hz	3.0A, 250V AGC, Slow Blow	130W nominal
	240 VAC, 50/60 Hz		
Receiver	120 VAC, 50/60 Hz	1.0A, 250V AGC, Slow Blow	50W nominal
	240 VAC, 50/60 Hz		

CAUTION   *Ensure that the power being supplied matches the power required by the equipment. You can find power ratings for equipment on a rating plate, usually on the rear panel. Ensure that the electrical supply is protected by over-current protection devices as required by the applicable electrical codes. If necessary, consult a licensed electrician.*

2.3 Installing the DXL5000

This section describes typical mounting and cabling for the DXL5000. Your installation may vary. The DXL5000 is typically mounted in a standard rack. Each unit occupies 1 rack unit (1RU) of height.The cabling is permanently installed and power comes from the facility or site power source.

| **WARNING** | *Follow instructions carefully. Do not place the equipment on an unstable support such as a cart, stand, or table. The equipment could fall and cause equipment damage or cause personal injury.* |

⚠️

- Position the rack to allow easy access to the front and rear of the equipment.

- Be sure to allow room behind the equipment rack for the cables required. Do not press the cables against the rear of the equipment when closing doors because it stresses the cables and may shorten their life.

- Do not overload the rack or load it unevenly. Secure the rack to a solid surface. Make certain that the rack and mounting rails are strong and rigid enough to support all the equipment in the rack.

Do the following to set up the components at each receive site. (Mounting the DXL5000 into an equipment rack is easier if one person holds the unit while another person installs the mounting screws.)

1. Line up the mounting holes on the receiver front panel with the mounting holes on the rack as shown in the following figure.
2. Install the two bottom screws first. Use lock washers to prevent loosening. Tighten securely.
3. Install the top two screws. Use lock washers to prevent loosening. Tighten securely.

| **Note** | For non-US applications, you must replace the 3-prong male connector. |

The DXL5000 does not have a power switch but powers up when plugged into a power source.

When you power up the DXL5000, it uses the settings that were used when the unit was powered down, and automatically resumes transmitting if no major alarm conditions exist.
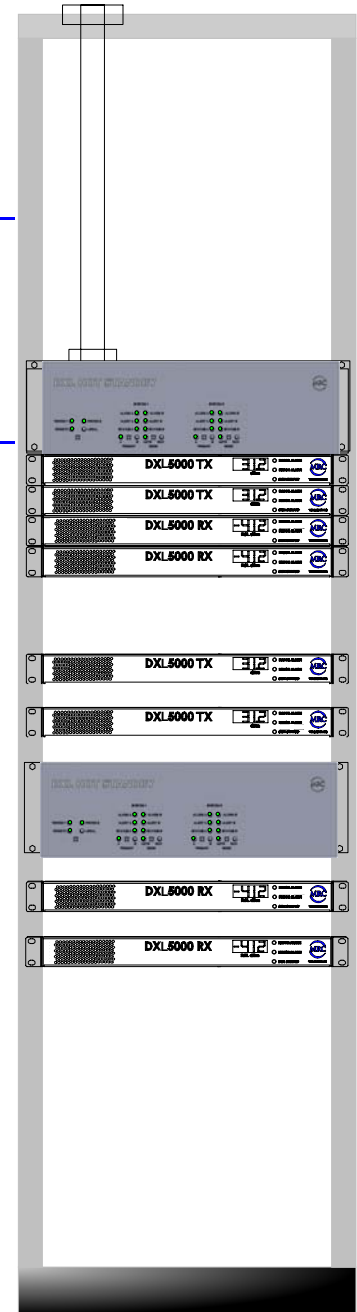
If you are transporting 10/100 Base T Ethernet data over the microwave link, the following figure shows how to connect the units together and to the network. See Section A.1.6, *CHAN1 and CHAN2 DATA Connections* on page A-3 for more information.
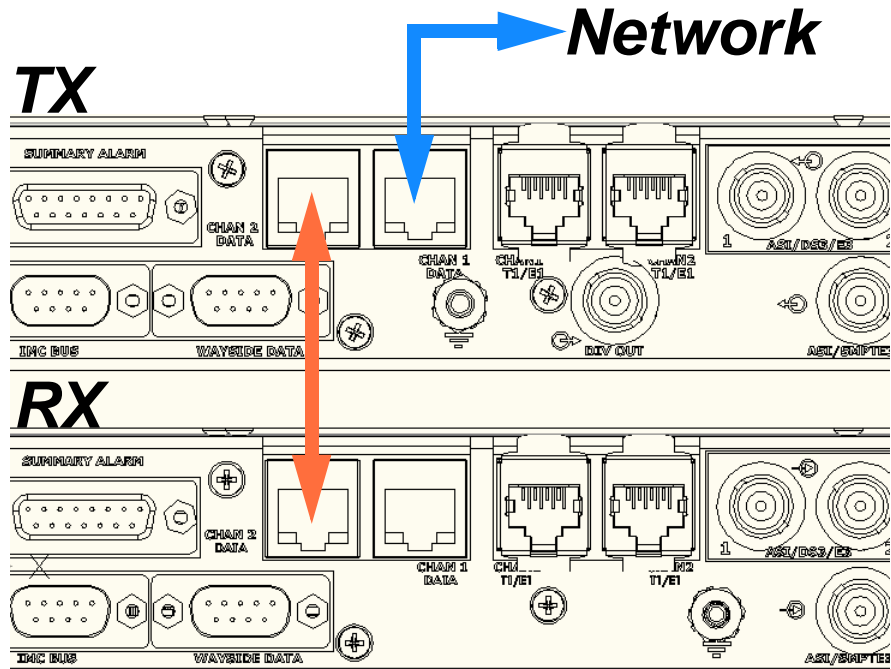
3 *Operating the DXL5000*

Although it is likely that your system was set up to your specifications at the Vislink factory, you may not need to change anything, this chapter describes how to set up the *DXL5000 Digital Microwave System* (DXL5000).

3.1 Setting Up the DXL5000 with a PC

Prior to using either the DXL5000 transmitter or receiver, the system administrator must set up the IP, Subnet Mask, and Default Gateway addresses. Unless otherwise requested, the DXL5000 is shipped with the following default addresses:

IP address: 192.168.0.10
Subnet mask: 255.255.255.0
Gateway: 192.168.0.1

Note   Vislink recommends that you change the IP address to a unique value. If you retain the default IP address, take care to avoid network address conflict issues. Devices with the same IP address should not be placed on the same local network.

If you configure multiple devices individually using a crossover cable from the unit to a PC, be sure to refresh the Address Resolution Protocol (ARP) table between configurations. The ARP table stores the physical network locations (MAC addresses) of the network (IP) addresses of the devices with which it communicates. You can view the ARP table by typing `arp -a` in a Windows command prompt. To refresh the ARP table, type `arp -d` which forces the PC to get the IP and MAC addresses again.

To set up these values, do the following:

1. Ensure that the unit is connected to the PC or network through the **MGMT** connector on the back of the unit.
2. Type `192.168.0.10` in the URL address field of a Windows Internet Explorer browser. The login screen displays.
3. Type `admin` (factory default) in the *User Name* and *Password* fields and click **Log In**.
4. Select the *Setup* tab and the *Identification* screen.
   a. Enter a new value in the *IP Address* field.
   b. Enter a new value in the *Subnet Mask* field.
   c. Enter a new value in the *Default Gateway* address field.
5. Click **Submit**.
6. Remove power from the unit and wait at least 10 seconds after the unit is completely shut down.
7. Return power to the unit for the new values to take effect.

The DXL5000 transmitter and receiver have nearly identical status and setup screens. This section describes the graphical user interface (GUI) that applies to either the transmitter or receiver unless otherwise explicitly unique to one or the other.

The following table shows the DXL5000 GUI tabs, which are described in the following sections.

Tab	Description
Status	Displays information about general settings and the status of the system.
Setup	Lets you change or edit system parameters.
Administration	Lets the system administrator change user names and passwords.
Alarms	Displays system alarm status and lets you customize the severity of errors.
Downloads	Lets the system administrator download updated software into the radio.
Logout	Logs you out of the web interface.

3.2 Monitoring Radio Status (Status Tab)

The *Status* tab displays the following informational screens when you select them.

3.2.1   Status–Help

The *Help* screen displays information about the other Status tab screens.

3.2.2   Status–Identification

The *Identification* screen displays the following information.

IP Address	Displays the unique network address of the DXL5000.
Subnet Mask	Displays the IP address range of the local network.
Default Gateway	Displays the IP address of the router that the DXL5000 uses to communicate with remote systems.
Serial Number	Displays the serial number of the DXL5000.
Software Version	Displays the software version (needed when calling for service; see also Section 3.2.4, *Status–Monitor Radio (Receiver Only)* on page 3-3).
Site Name	Displays the user-defined name of where the DXL5000 is located.
Call Sign	Displays the user-defined call sign for the DXL5000 transmitter.
Date Installed	Displays the user-defined date the DXL5000 was installed.
User Information 1, 2, and 3	Displays any type of information that the system administrator wants to associate with the radio.

3.2.3   Status–Monitor Radio (Transmitter Only)

The transmitter *Monitor Radio* screen displays the following information.

Operating Frequency	Displays the frequency of the transmitter in MHz.
RF Output Power	Displays the output power in dBm.
PA Voltage	Displays the power amplifier voltage.
+15V	Displays the +15V system voltage in the DXL5000.
−15V	Displays the −15V system voltage in the DXL5000.
+5V	Displays the +5V system voltage in the DXL5000.
System Temp	Displays the degrees in Celsius of the DXL5000 operating temperature.
Power Amplifier	Displays whether the power amplifier is ON or OFF.
Test Tone	Available only with an internal SCM, displays whether the Test Tone is ON or OFF. Test Tone should be on only for antenna alignment purposes.

3.2.4   Status–Monitor Radio (Receiver Only)

The receiver *Monitor Radio* screen displays the following information.

Operating Frequency	Displays the frequency of the receiver in MHz.
RSL Input Power	Displays the receive signal level (RSL) input power in dBm.
+12V	Displays the +12V voltage in the DXL5000.
+15V	Displays the +15V system voltage in the DXL5000.
−15V	Displays the −15V system voltage in the DXL5000.
+5V	Displays the +5V system voltage in the DXL5000.
System Temp	Displays the degrees in Celsius of the DXL5000 operating temperature.
RSL Min	Displays the minimum RSL.
RSL Max	Displays the maximum RSL.

3.2.5 Status–Firmware Revisions

The *Firmware Revision* screen displays identifying information for the DXL5000. Have this information ready for customer service as described in Section 1.3, *Getting Support for Your DXL5000* on page 1-6.

System Software
SCM PC FPGA (single carrier modulator PC field programmable gate array)
SCM PC uP (single carrier modulator PC microprocessor)
SCD PC FPGA (single carrier demodulator PC field programmable gate array)
SCD PC uP (single carrier demodulator PC microprocessor)
Radio Type

3.2.6 Status–Monitor Monitor Mod (Transmitter) and Demod (Receiver)

The *Monitor Mod and Monitor Demod* screens displays the following information.

Symbol Rate	Displays 3.0 to 33 mega-symbols per second (Msps).
Modulation	Displays the modulation type (**QPSK**, **16QAM**, **32QAM**, **64QAM**).
Percent Utilization	Displays a capacity value based on calculations derived from the *Symbol Rate*, *Modulation*, and the combined *Data Rates* for each *Core Channel*. If this number is over 100%, you should adjust the values described in Section 3.3.5, *Determining Optimal System Utilization* on page 3-8.
Core Channel 1, 2, 3, and 4	Displays one of the following the data inputs or outputs and its speed at megabits per second (Mbps). <table><tr><td>**ASI BNC-1** **ASI BNC-2** **ASI BNC-3** **E3 BNC-1** **ASI BNC-1**</td><td>**DS3 BNC-1** **DS3 BNC-2** **DS3 BNC-3** **E3 BNC-2** **DS3 BNC-1**</td><td>**E1RJ45-1** **E1RJ45-2** **T1RJ45-1** **T1RJ45-2** **E1RJ45-1**</td><td>**Ethernet RJ45-1** **RS232** **RS485** **SMPTE BNC-3** **Ethernet RJ45-1**</td></tr></table>
Invert Spectrum	Displays **On** or **Off** for the Invert Spectrum.
PRBS	Displays **On** or **Off** (default) for the Pseudo Random Bit Sequence (PRBS). PRBS is used for link testing purposes; turning PRBS **On** causes a data service override.
The following fields apply only to the receiver.	
SNR	Displays the number of dB for the signal-to-noise ratio (SNR) that measures the signal strength and signal quality.
EVM	Displays a percentage of the error vector magnitude (EVM) that measures the performance of the radio.
BER	Active only when the transmitter has PRBS **On**, BER displays the bit error ratio (BER), which is the percentage of bits that have errors relative to the total number of bits in the signal, and indicates how often a packet or data unit has to be retransmitted because of an error. You can click **Reset BER** to start a new ratio.

3.3 Setting Radio Parameters (Setup Tab)

The *Setup* tab lets you define the Identification, Radio and Modulator parameters.

3.3.1   Setup–Identification Screen

IP Address:	192.168.0.10
Subnet Mask:	255.255.255.0
Default Gateway:	192.168.0.1
Site Name:	SITE NAME
Call Sign:	WXYZ
Date Installed:	8-26-09
User Information 1:	Info 1
User Information 2:	Info 2
User Information 3:	Info 3

IP Address	Enter the unique network address of the DXL5000 and click **Submit**. You must reboot the system to effect the change.
Subnet Mask	Enter the IP address range of the local network and click **Submit**. You must reboot the system to effect the change.
Default Gateway	Enter the IP address of the router that the system uses to communicate with remote system addresses and click **Submit**. You must reboot the system to effect the change.
Site Name	Optionally enter a name to identify the location of the DXL5000, which is displayed on the login screen.
Call Sign	Optionally enter a call sign for the DXL5000 transmitter.
Date Installed	Optionally enter the date the DXL5000 was installed for later reference.
User Information 1, 2, and 3	Optionally enter any type of information that you want to associate with the radio.

3.3.2 Setup–Radio Screen (Transmitter Only)

Power Amplifier	**On**=Enable the power amplifier. **Off**=Do not enable the power amplifier.
Test Tone	**On**=Used only during antenna alignment, enable to send a test signal to the antenna for aligning the antenna to transmit the best signal. **Off**=Normal operation.
IF input	**Internal**=Normal operation. **External**=An external device provides input to the DXL5000.

3.3.3 Setup–Radio Screen (Receiver Only)

Reset RSL Check this box and click **Submit** to reset the minimum and maximum receive signal level (RSL) measurements that the radio experiences, which tend to fluctuate due to daily cycles, weather, and other intermittent degradations.

RSL Min: -95.0 dBm
RSL Max: -95.0 dBm   ☐ Reset RSL

3.3.4 Setup–Modulator (Transmitter) and Demodulator (Receiver) Screen

Symbol Rate: 20.0 Msps   Sys BW: 36.1927 Mbps

Modulation: QPSK   Utilization: 82.88 %

Tip	When setting **Modulation**, **Core Channels 1** through **4** and **Symbol Rates**, check the Utilization value in the upper right of the screen. If you exceed 100% of utilization, use the instructions in Section 3.3.5, Determining Optimal System Utilization on page 3-8 to modify the values for optimal system utilization.
Note	The figure to the right shows the Setup-Modulator (transmitter) screen. The Setup-Demodulator screen is very similar.

Core Channel 1: ASI BNC-1
Data Rate: 10.000 Mbps

Core Channel 2: ASI BNC-2
Data Rate: 10.000 Mbps

Core Channel 3: ASI BNC-3
Data Rate: 10.000 Mbps

Core Channel 4: none
Data Rate: 0.000 Mbps

Invert Spectrum   ○ On ● Off   PRBS   ○ On ● Off

Symbol Rate	Enter the number of mega-symbols per second (Msps) from **3.0**—**20.0**. **Note:** *You can purchase an optional high-speed license that increases the range to **33.0** Mbps (although it will require more bandwidth).*
Modulation	Select the modulation scheme from one of the following: **QPSK** **QPSK 3/4** **16QAM** **32QAM** **64QAM 3/4** **QPSK 1/2** **QPSK 5/6** **16QAM 1/2** **64QAM** **64QAM 5/6** **QPSK 2/3** **QPSK 7/8** **16QAM 3/4** **64QAM 2/3** **64QAM 7/8** **QPSK** **QPSK 3/4** **16QAM** **32QAM** **64QAM 3/4**
Core Channel 1, 2, 3, and 4	See table below.
Invert Spectrum	**On**=Select **On** if the radio system that you are using requires it. **Off**=Default. **Note:** *Set this to **On** only when an incoming signal needs to be inverted due to a different conversion technique or compatibility with other equipment.*
Diversity (Receiver only—not shown in previous figure)	**On**=Select **On** if you have multi-antenna reception. **Off**=Select **Off** (default) if you have single-antenna reception.
PRBS (Transmitter only— shown in the previous figure)	**On**=Generate a Pseudo Random Bit Sequence (PRBS) for a system test. **Off**=Default. **Caution:** *You should set PRBS to **On** only when setting up the system or for troubleshooting because it will result in the loss of the broadcast signal.*

Core Channel 1, *2*, *3*, and *4*—Select the core channel input using the following table.

Data I/O	Data Rate	Additional Parameters
ASI BNC-1, **ASI BNC-2**, **ASI-BNC-3**	`0.064—90.0`	**Variable Rate ON** or **Variable Rate OFF**
DS3 BNC-1, **DS3 BNC-2**	`44.7360` (fixed)	*Cable Length*: **Under 255 feet** or **Over 255 feet.**
E3 BNC-1, **E3 BNC-2**	`34.3680` (fixed)	*Cable Length*: **Under 255 feet** or **Over 255 feet.**

Data I/O	Data Rate	Additional Parameters
SMPTE BNC-3	`19.392658` (fixed)	(No additional parameters.)
T1 RJ45-1, **T1 RJ45-2**	`1.544` (fixed)	*LBO*: **–30** or **–36** *Channel Coding*: **Enabled** (B8ZS) or **Disabled** (AMI)
E1 RJ45-1, **E1 RJ45-2**	`2.048` (fixed)	*LBO*: **–12** or **–43** *Channel Coding*: **Enabled** (HDB3) or **Disabled** (AMI)
Ethernet RJ45-1	`0.064—90.0`	*Mode*: **10 Mb/s**, **100 Mb/s**, or **Auto** *Duplex*: **Full** or **Half**
RS232, **RS485** (Data rate and Baud rate must match)	`600, 1200, 2400, 4800, 9600, 19200, 28822, 38600, 52600, 115200, 230400`	*Baud Rate*： `600, 1200, 2400, 4800, 9600, 19200, 28822, 38600, 52600, 115200, 230400`

3.3.5 Determining Optimal System Utilization

Referring to the figure in Section 3.3.4, *Setup–Modulator (Transmitter) and Demodulator (Receiver) Screen* on page 3-6, your system throughput (*Sys TP*) is calculated by the values that you specify in the *Symbol Rate* and *Modulation* fields.

Use the following table to determine the maximum allowed symbol rate to match the allowed channel bandwidth. For example, if you choose a *Symbol Rate* of `20.5` and a modulation of `16QAM`, *Sys TP* shows `74.83` **Mbps**.

Channel Bandwidth (MHz)	Maximum Symbol Rate (Msps)	Maximum Net Data Rate (Mbps) for Each Modulation Scheme (*Sys TP*)			
		QPSK	16QAM	32QAM	64QAM
10	8.2	15.01	29.93	37.39	44.94
12	9.8	17.93	35.77	44.69	53.70
17	13.9	25.44	50.74	63.38	76.17
19	15.6	28.55	56.94	71.14	85.49
20	16.4	30.01	59.86	74.78	89.87
25	20.5	37.52	74.83	93.48	112.34
30	24.6	45.02	89.79	112.18	134.81
40	32.8	60.02	119.72	149.57	179.74

For optimal performance, utilization should not exceed 100%; if it does, the number turns red to indicate an overload that you should correct. You can use the following formula to calculate the utilization of the DXL5000:

Utilization % = total of the 4 Data Rates ÷ Sys TP x 100

Carefully select the *Symbol Rate*, *Modulation* scheme and required transmission *Data Rate*s. For example, if you have a *Sys TP* of 40 Mbps and choose a *Data Rate* of 20 Mbps for the type of input in *Core Channel 1*, the *Utilization %* displays 50%, meaning that you can add another channel as long as the combined data rates do not cause the *Utilization %* to exceed 98%.

3.4 Creating User Accounts (Administration Tab)

Administrator   User Name: admin

Password: admin

Submit   Reset

User 1   User Name: guest

Password: guest

Submit   Reset   Delete

The *Administration—User Accounts* screen lets the system administrator define user accounts for up to 4 additional users, as described in the following table:

Administrator User Name	Enter the user name of the DXL5000 administrator.
Administrator Password	Enter the administrator's password.
User 1, 2, 3, and 4 User Name	Enter a user name for up to four other users of the DXL5000.
User 1, 2, 3, and 4 Password	Enter a password for each user you define.

3.5 Upgrading Software (Downloads Tab)

The Software screen on the Downloads tab lets the system administrator load a valid upgrade file from Vislink.

Firmware File: Browse...   Upgrade

CAUTION   *Upgrades should only be performed using uninterrupted power sources because the software can be erased in the event of a power failure during the upgrade process. Use only a valid upgrade file from Vislink. Loading another file can damage the unit.*

3.6 Managing Alarms

You can monitor alarms from the front panel or from the GUI on the Alarms Tab, as described in this section.

3.6.1   Interpreting the Front Panel LEDs

The following figure and table describes how to interpret the LEDs on the front panel.
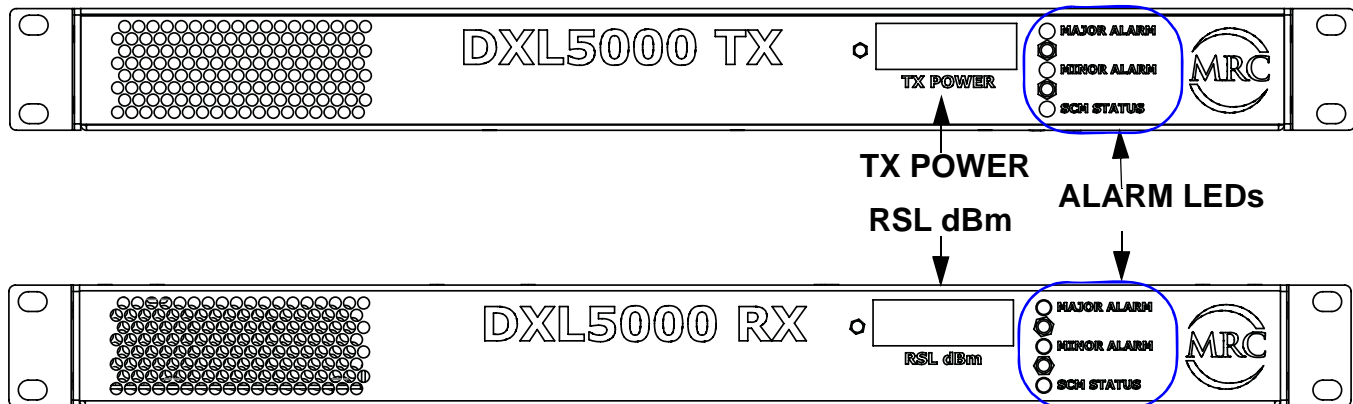
The LEDs on the front panel alert you to alarm conditions for the DXL5000.

The following table describes how to interpret the front panel alarms.

TX POWER LCD display	Indicates the current transmitter output power level in dBm.
RSL dBm LCD display	Indicates the current receiver signal power level in dBm.
MAJOR ALARM LED	• **Green**=No alarm detected. • **Red**=Indicates a major problem; a flashing light indicates that service is lost.
MINOR ALARM LED	• **Green**=No alarm detected. • **Amber**=Indicates an alert relay has been triggered; a minor problem exists but service is not lost.
SCM STATUS LED	• **Dark**=No alarm detected. • **Amber**=Indicates a minor SCM problem exists but service is not lost. • **Red**=Indicates a major SCM problem exists causing the system to lose service.

3.6.2 Modifying Alarm Settings (Alarms Tab)

Alarms have a default severity and type, but you can modify the severity and type of alarm by clicking on the **Configure** button next to any alarm on the *Alarms—Information* screen. Clicking the **Configure** button displays a settings window similar to the following figure.

Severity

Trigger Relay	Causes a summary alarm to occur, a front-panel LED to light, and in the case of a transmitter, disables the power amplifier (PA).
Indication	Causes a front-panel LED to light when an alarm condition exists.
Disabled	Ignores the alarm condition.

CAUTION   *Disabling an alarm can have serious consequences to the system and performance.*

Type

Major Alarm	Flashing red LED indicates a Trigger Relay condition; steady red LED indicates an indication condition.
Minor Alarm	Solid Amber indicates an alert condition is present; green indicates no alert.

Latch

On	Hold the alarm until you acknowledge it by manually resetting it.
Off	Do not hold the alarm; if the condition is corrected, the alarm resets itself.

3.6.3 Troubleshooting GUI Alarms

You can review individual alarms on the *Alarms—Information* tab of the DXL5000 Configurator GUI. The following figure shows the demodulator (receiver) *Alarms—Information* screen; the modulator (transmitter) alarms screen is similar.
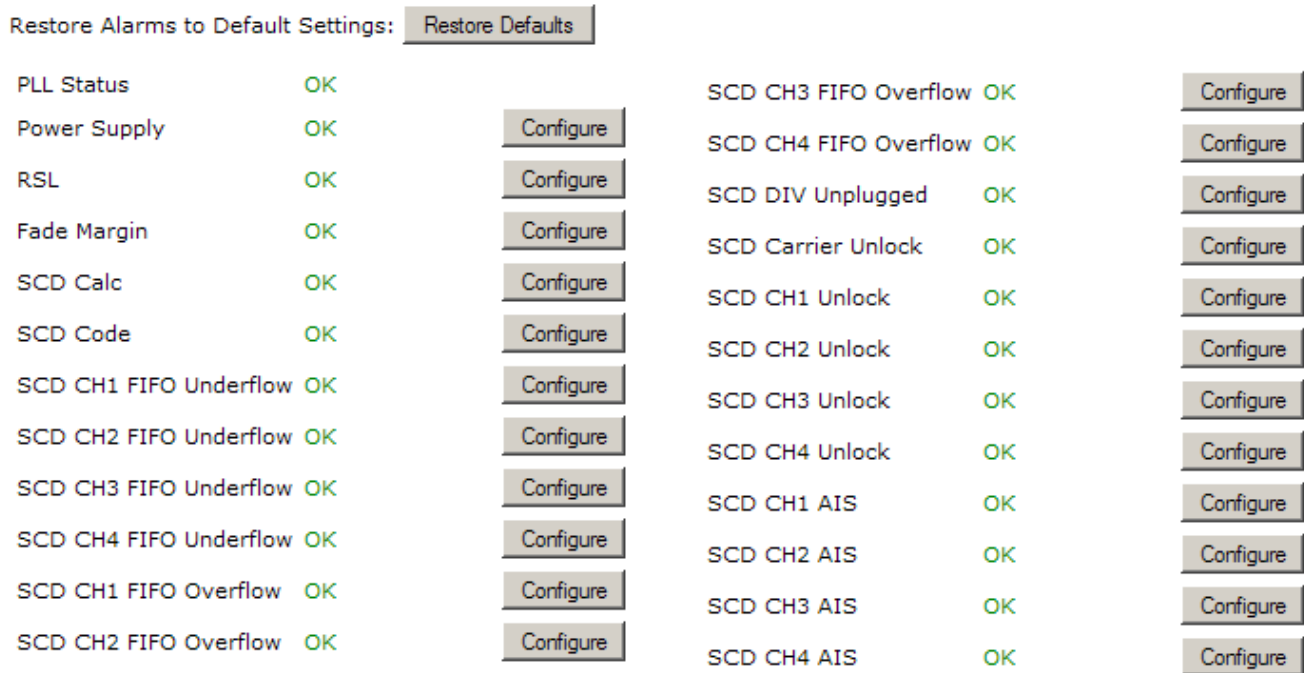
Note	GUI-based alarms presented in this chapter reflect the factory default alarm *Severity* and *Type* settings. You can change the alarm *Severity* level and *Type* settings as described in Section 3.5, *Upgrading Software (Downloads Tab)* on page 3-9.

If you set the *Latch* option to **On** option, you are alerted when error occurs, even if the fault has been corrected; you must use the **Summary Alarm** option button to clear the alarm. If you set the *Latch* option to **Off**, the alarm automatically resets when you correct the fault.

The following sections pertain to troubleshooting alarms in the GUI.

- Section 3.6.4, *Troubleshooting Transmitter Alarms* on page 3-13
- Section 3.6.5, *Troubleshooting Receiver Alarms* on page 3-13

3.6.4　Troubleshooting Transmitter Alarms

The description in the table indicates the alarm LED and its color on the front panel of the DXL5000 transmitter.

Alarm	Description
PLL Status	**Major–Flashing Red**: The Phase Lock Loop (PLL) is unlocked.
Fan	**Major–Red**: Indicates that the fan is not working.
Power Supply	**Major–Red**: Indicates internal power supply and potential unstable operation. Verify input power is correct.
SCM Calc	**Minor & SCM–Amber**: Single carrier modulator (SCM) internal error.
SCM Code	**Minor & SCM–Amber**: Invalid license in SCM.
CH1-4 FIFO Overflow	**Minor & SCM–Amber**: Data FIFO error.
CH1-4 FIFO Underflow	**Minor & SCM–Amber**: Data FIFO error.
RF Out	**Major & SCM–Red**: RF power output is too low.
IF Input	**Major–Red**: IF Input is outside nominal usage.
PA Voltage	**Major–Red**: Power amplifier voltage is out of range.
ASI BNC1, 2, 3	**Major–Red**: ASI interface error

3.6.5　Troubleshooting Receiver Alarms

The description in the table indicates the alarm LED and its color on the front panel of the DXL5000 receiver.

Alarm	Description
PLL Status	**Major–Red**: The Phase Lock Loop (PLL) is unlocked.
Power Supply	**Major–Red**: Indicates internal power supply and potential unstable operation. Verify input power is correct.
RSL	**Major–Red**: Receive signal level is below the user-defined threshold. Default value is -80 dBm.
Fade Margin	**Major–Red**: Approaching threshold.
SCD Calc	**Minor & SCM–Amber**: Single carrier demodulator (SCD) internal error.
SCD Code	**Minor & SCM–Amber**: Invalid license in SCD (single carrier demodulator).
SCD CH1-4 FIFO Underflow	**Minor & SCM–Amber**: Data FIFO error.
SCD CH1-4 FIFO Overflow	**Minor & SCM–Amber**: Data FIFO error.
SCD DIV unplugged	**Minor & SCM–Amber**: Diversity error.
SCD Carrier Unlock	**Major & SCM–Red**: Input unlocked.
SCD CH1-4 Unlock	**Minor & SCM–Amber**: SCD channel error.
SCD CH1-4 AIS	**Minor & SCM–Amber**: SCD channel error.

A   *DXL5000 Specifications*

This appendix contains specifications for your DXL5000 *Digital Microwave System* (DXL5000).

A.1 DXL5000 Connectors

The following figure shows the connectors on the DXL5000 TX (top) and RX (bottom). The enlarged picture shows how to connect the units together and to the network. See for more information.

A.1.1   AC Power Connection

 The unit has a standard IEC connector. The AC receptacle is protected by a pair of 3-amp fuses. The power supply accepts a range of AC input voltages from 120—240 VAC at 50—60 Hz.

A.1.2   MGMT Connections

The following table shows the rear panel **MGMT** RJ-45 connector, which provides 10 Base T Ethernet connection via your web browser to a PC at a local or remote location for control of the unit.

Connector	Pin	Signal	Pin	Signal
	1	TX + (out)	5	N/C
	2	TX – (out)	6	RX – (in)
	3	RX + (in)	7	N/C
	4	N/C	8	N/C
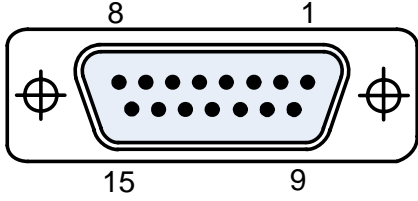
A.1.3   IF IN, IF MON, ASI/DS3/E3, ASI3/SMPTE310 BNC Connectors

The following table shows a BNC connector. The signal carries on the center contact, and voltage to the BNC carries on the outer ring.

Connector	Pin	Description
	Pin	Signal
	Ring	Ground
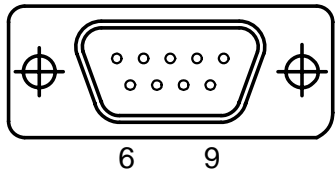
A.1.4 SUMMARY ALARM Connections

The following table shows the 15-pin **SUMMARY ALARM** female D connector, which provides summary alarm data for common faults and events.

Connector Information	Pin	Signal	Pin	Signal
8 1 15 9	1	MAJOR1_NO	9	MAJOR1_NC
	2	MAJOR1_COM	10	MAJOR2_NO
	3	MAJOR2_NC	11	MAJOR2_COM
	4	MINOR_NO	12	MINOR_NC
	5	MINOR_COM	13	GND
	6	EXTERNAL_NO	14	N/C
	7	N/C	15	N/C
	8	N/C		
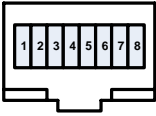
A.1.5 WAYSIDE DATA Connections

The following table shows the **WAYSIDE DATA** DB-9 male connector, which provides RS-232 connections for SCM operations.

Connector	Pin	Signal (Transmitter)	Signal (Receiver)
1 5 6 9	1	NC	NC
	2	SCM_RS232_RX	N/C
	3	N/C	SCM_RS232_TX
	4	N/C	N/C
	5	N/C	N/C
	6	N/C	N/C
	7	RS485_SIG–	RS485_SIG–
	8	RS485_SIG+	RS485_SIG+
	9	N/C	N/C
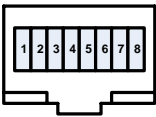
A.1.6 CHAN1 and CHAN2 DATA Connections

The following table shows the **CHAN1** (customer connection) and **CHAN2** (inter-unit connection that requires a cross-over cable) **DATA** RJ-45 connectors, which provides 10/100 Base T Ethernet connections to the unit. The cable you use for **CHAN1** depends on the device to which you connect. For example, use a cross-over cable for a PC, and a straight-through cable for a switch or a router. Section 2.3, *Installing the DXL5000* includes a diagram that shows the connections.

Connector	Pin	Signal	Pin	Signal
	1	ETH_TX + (out)	5	N/C
	2	ETH_TX – (out)	6	ETH_RX – (in)
	3	ETH_RX + (in)	7	N/C
	4	N/C	8	N/C

A.1.7 CHAN1 and CHAN2 T1/E1 Connections

The following table shows the **CHAN1 T1/E1** and **CHAN2 T1/E1** RJ-45 connectors, which provide Channel 1 and Channel 2 T1/E inputs to the unit.

Connector	Pin	Signal	Pin	Signal
	1	T1/E1CH_OUT_N	5	T1/E1CH_IN_P
	2	T1/E1CH_OUT_P	6	N/C
	3	NC	7	N/C
	4	T1/E1CH_IN_N	8	N/C

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