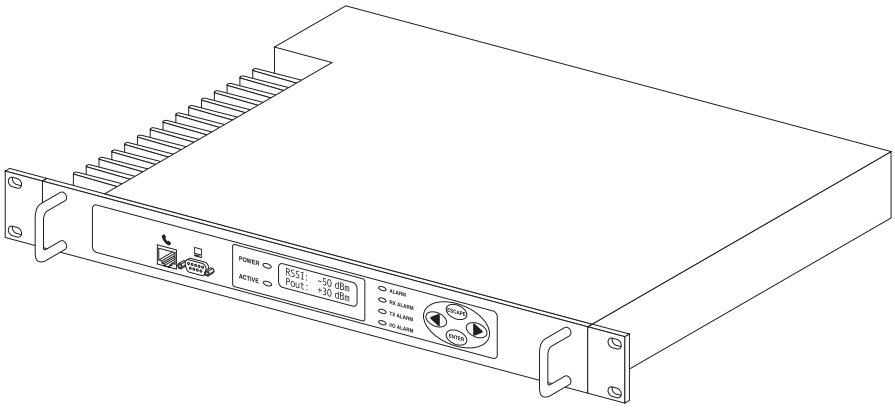
LEDR DIGITAL MICROWAVE RADIOS



LEDR 400S/F, 900S/F, 1400S/F Series

Including Protected (1+1) and Space Diversity Versions

Installation and Operation Guide

P/N 05-3627A01, Rev. C
MARCH 2001

Microwave Data Systems Inc.

QUICK START GUIDE

LEDR Series radios are supplied from the factory in matched pairs and will be configured to user's specifications. There are a few steps necessary to place the pair on-the-air communicating with each other. Once this is done, system-specific parameters will need to be reviewed and changed to match your requirements. Below are the basic steps for installing the LEDR radio. For a more detailed installation procedure, please see "INITIAL STARTUP AND CONFIGURATION" on page 24. When making cable connections, refer to Section 3.6, Rear Panel Connectors, on page 16 for a rear panel view of the radio.

1. Install and connect the antenna system to the radio

- Ensure a path study has been conducted and that the radio path is acceptable.
- Use good quality, low loss coaxial cable. Keep the feedline as short as possible.
- Preset directional antennas in the direction of desired transmission/reception.

2. Connect the data equipment to the rear panel data interface

- The data interface should be an RJ-45 connector for Fractional-T1, Fractional-E1, or E1, and DB-25 for EIA-530.
- Verify the customer premises data equipment is configured as DTE. (By default, the LEDR radio is configured as DCE.)

3. Apply DC power to the radio

- Verify that the line voltage matches the power supply input range (24 Vdc or 48 Vdc).
- The power connector is a three-pin keyed connector. The power source can be connected with either polarity. The center conductor is *not* connected.

4. Change SUPER password and set up user access

- Login to Network Management System as **SUPER**, using password **SUPER**. (See "login" on page 68.)
- Change the password using the **PASSWD** command. (See "passwd" on page 73)
- Set up required users, passwords and access levels using the **USER** command, as required. (See "user" on page 86)

5. Set the radio's basic configuration using front panel or Console interface

- Set the transmit/receive frequencies (**TX xxx.xxxx/RX xxx.xxxx**) if they need to be changed from the factory settings. (See "freq" on page 58.)
- Refer to this manual for other configuration settings.

6. Verify and set as necessary the following parameters to allow data throughput and interconnection with the network.

- RF transmit and receive frequencies. (See "freq" on page 58.)
- Radio modulation type and data rate parameters. (See "modem" on page 72).
- Data interface clocking. (See "clkmode" on page 54).
- Data framing. (See "fstruct" on page 59).

The Quick Start Guide is continued on the rear cover of this manual.

TABLE OF CONTENTS

Copyright Notice

Antenna Installation Warning

RF Exposure

1. All antenna installation and servicing is to be performed by **qualified technical personnel** only. When servicing the antenna, or working at distances closer than those listed below, *ensure the transmitter has been disabled.*

2. Typically, the antenna connected to the transmitter is a directional (high gain) antenna, fixed-mounted on the side or top of a building, or on a tower. Depending upon the application and the gain of the antenna, the total composite power could exceed 20 to 50 watts EIRP. The antenna location should be such that only qualified technical personnel can access it, and that under normal operating conditions no other person can touch the antenna or approach within **2.68 meters** of the antenna.

Antenna Gain vs. Recommended Safety Distance
(LEDR 400 Series)

	Station Antenna Gain (LEDR 400 Series)			
	0–5 dBi	**5–10 dBi**	**10–20 dBi**	**20–30 dBi**
Minimum RF Safety Distance	0.15 meter	0.26 meter	0.85 meter	2.68 meters

Antenna Gain vs. Recommended Safety Distance
(LEDR 900 Series)

	Antenna Gain (LEDR 900 Series)			
	0–5 dBi	**5–10 dBi**	**10–20 dBi**	**20–30 dBi**
Minimum RF Safety Distance	0.1 meter	0.17 meter	0.54 meter	1.71 meters

Antenna Gain vs. Recommended Safety Distance
(LEDR 1400 Series)

	Antenna Gain (LEDR 1400 Series)			
	0–5 dBi	**5–10 dBi**	**10–20 dBi**	**20–30 dBi**
Minimum RF Safety Distance	0.1 meter	0.13 meter	0.42 meter	1.32 meter

Accuracy of Documentation

While every reasonable effort has been made to ensure the accuracy of this manual, product improvements may result in minor differences between the manual and the product shipped to you. If you have additional questions or need an exact specification for a product, please contact our Technical Services group using the information at the back of this guide. Microwave Data Systems reserves its right to correct any errors and omissions. Updated information may also be available on our Web site at **www.microwavedata.com**.

Distress Beacon Warning

In the U.S.A., the 406 to 406.1 MHz band is reserved for use by distress beacons. Since the LEDR 400 radio is capable of transmitting in this band, take precautions to prevent the radio from transmitting between 406 to 406.1 MHz.

RF Emissions

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 or ETSI specification ETS 300 385, as appropriate. 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 and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area may to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

1.0 INTRODUCTION

This manual is intended to help an experienced technician install, configure, and operate one of the digital radios in the MDS LEDR Series: 400S/F, 900S/F or 1400S/F. The manual begins with an overall description of product features and is followed by the steps required to mount the radio and place it into normal operation.

After installation, we suggest keeping this guide near the radio for future reference.

1.1 Product Description

The LEDR radio (Figure 1) is a full-duplex, point-to-point digital radio operating in one of three radio frequency bands and at several bandwidths as summarized in Table 1.

Table 1. Key LEDR Radio Characteristics

MODEL(S)	BANDWIDTH(S)	FREQ. RANGE	INTERFACE
LEDR 400S	25/50/100/200 kHz	330-512 MHz	EIA-530
LEDR 400F	0.5/1/2 MHz	330-512 MHz	E1/G.703
LEDR 900S	25/50/100/200 kHz	800-960 MHz	EIA-530 or FT1/G.703
LEDR 900F	0.5/1/2 MHz	800–960 MHz	E1/G.703
LEDR 1400S	25/50/100/200 kHz	1350–1535 MHz	EIA-530
LEDR 1400F	0.5/1/2 MHz	1350–1535 MHz	E1/G.703

With the addition of an optional Fractional-T1 Interface card, a LEDR 900S Series radio can be connected to industry-standard G.703 T1 data interface equipment. See Page 117 for a complete description of the Fractional-T1, Fractional-E1 and Full Rate E1 options.

All LEDR Series radios are available in a protected “1+1” configuration (Figure 2). The protected configuration consists of two identical LEDR radios and a Protected Switch Chassis. The protected configuration is designed to perform automatic switchover to a secondary radio in the event of a failure in the primary unit. See *PROTECTED CONFIGURATION* on Page 103 for detailed information on the protected version.

In addition, the LEDR Series is available in a space-diversity configuration to allow dual receive paths to improve system availability.

1.2 LEDR Features

- General—*Common to all models*
  - Network Management via SNMPc version 1
  - Protected Operation (1+1) Compatible
  - 1.0 Watt Transmit Power
  - Space-Efficient Rack Size (1RU)
  - Rugged, Reliable Design
  - Voice Orderwire (DTMF compliant)
  - Service Channel (Data)
- Subrate Models—LEDR 400S/900S/1400S
  - 64, 128, 256, 384, 512 and 768 kbps Data Rates
  - 12 x 64 kbps Data Rate with the FT1 or FE1 Interface Board (LEDR radio with optional PCB installed)
- Fullrate Models—LEDR 400F/900F/1400F
  - 1 x E1 to 4 x E1 data rates

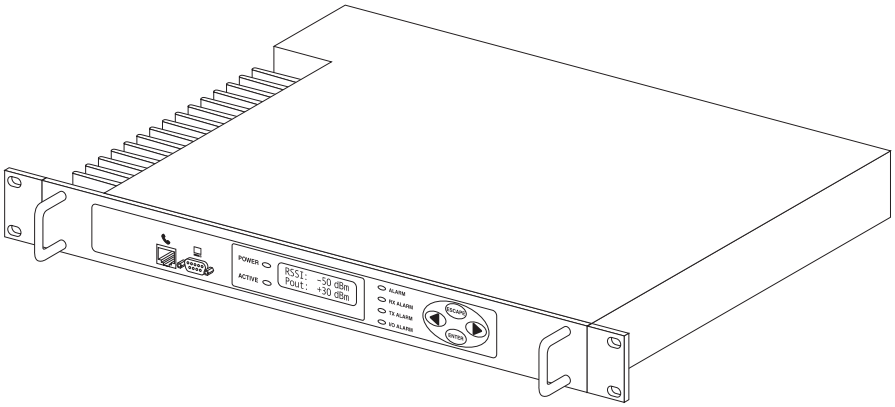


Figure 1. The LEDR Digital Radio (Non-Protected Version)

1.3 Typical Applications

- Point-to-point transmission applications
- Cost-effective, “thin route” applications
- Long haul telecommunications links
- Cellular backhaul
- Last-mile links
- Trunked radio links
- SCADA systems

1.4 Protected Configuration

A second configuration of the LEDR Series radios is the protected configuration in which two LEDR radios are monitored and controlled by a third unit, the Protected Switch Chassis (PSC). The PSC provides a gateway for data and radio frequency paths to the LEDR data radio transceivers. Unit performance is continuously measured and should it fall below user definable standards, the off-line LEDR radio will be placed on-line and an alarm condition generated that can be remotely monitored. Figure 2 shows a front view of the Protected version arrangements. Details on the Protected Configuration hardware and set-up can be found in Section 11.0 on page 103.

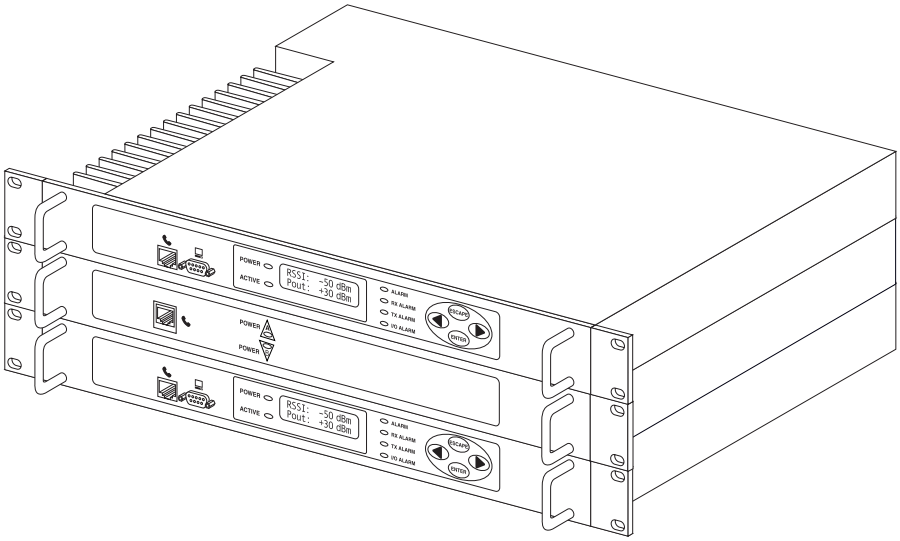


Figure 2. LEDR Digital Radio (Protected Version)

2.0 MODEL NUMBER CODES

The radio model number is printed on the serial number label affixed to the chassis. The following series of figures (Figure 3, Figure 4 and Figure 5) show the significance of each character in the model number strings. Contact the factory for specific information on optional configurations.

MODEL NUMBER CODES ARE SUBJECT TO CHANGE.

DO NOT USE FOR ORDERING PRODUCTS.

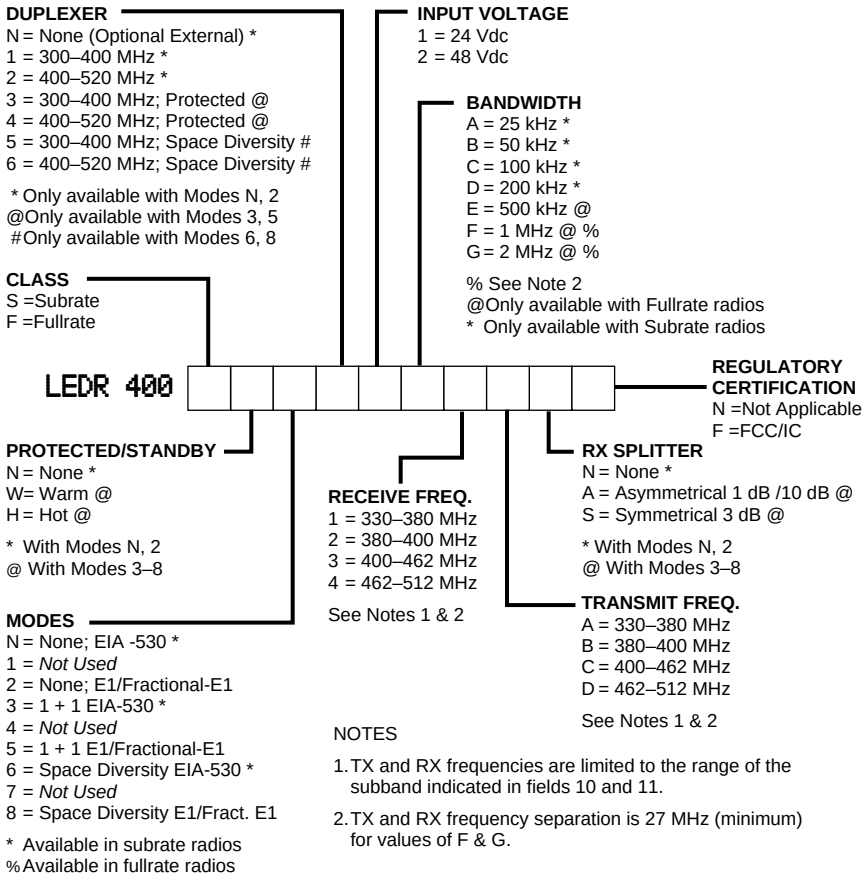


Figure 3. LEDR 400 Series Model Number Codes

MODEL NUMBER CODES ARE SUBJECT TO CHANGE.

DO NOT USE FOR ORDERING PRODUCTS.

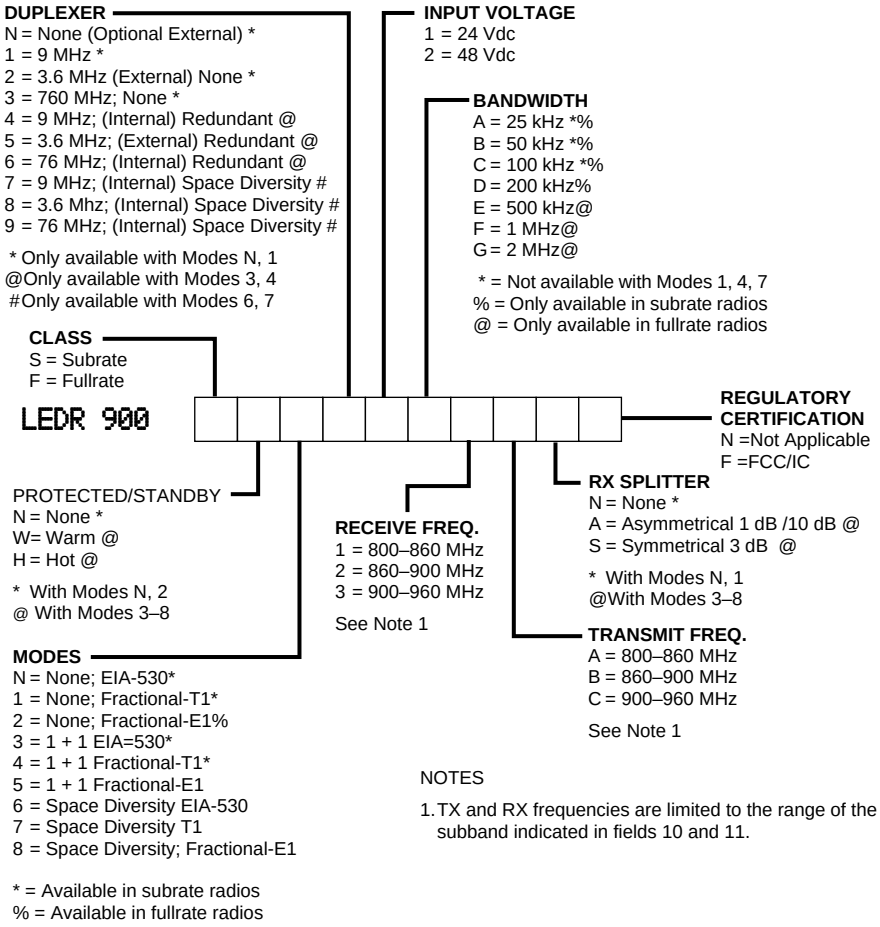


Figure 4. LEDR 900 Series Model Number Codes

MODEL NUMBER CODES ARE SUBJECT TO CHANGE.

DO NOT USE FOR ORDERING PRODUCTS.

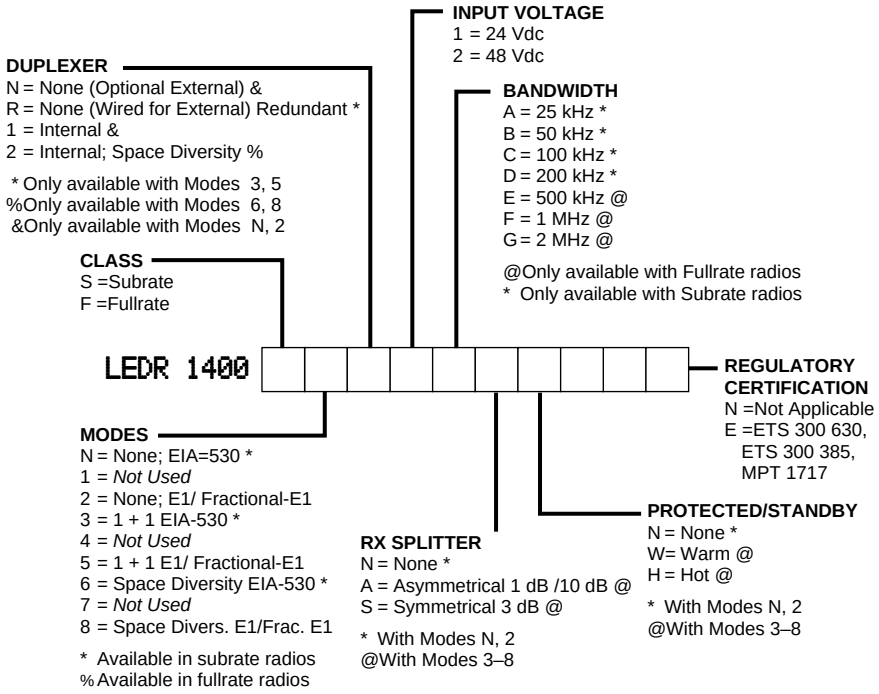


Figure 5. LEDR 1400 Series Model Number Codes

3.0 HARDWARE INSTALLATION AND BASIC INTERFACE REQUIREMENTS

3.1 Introduction

Installation of the LEDR radio transceiver is not difficult, but it does require some planning to ensure optimal efficiency and reliability. There are two major installation objectives; first, obtain good radio communications between LEDR sites, and second, configure the data interface to complement your data equipment.

This section provides information to assist you in successfully completing the first phase of installation. You will find tips for selecting an appropriate site, choosing antennas and feedlines, minimizing the chance of interference, and the basics of equipment installation. This material should be reviewed before beginning the radio hardware equipment installation.

When the radio installation is successfully complete, you will need to address the data interface and operational configuration of the LEDR radio. It is likely that the radio has been configured by the factory to meet your basic data interface requirements. Please review the factory documentation accompanying your shipment for the radios current configuration.

What ever your situation, it is recommended you review the material in the rest of the manual to gain insight to additional configuration options and user functions.

3.2 General Requirements

There are four main requirements for installing the radio transceiver—a suitable installation environment, adequate and stable primary power, a good antenna system, and the correct interface between the transceiver and the external data equipment. Figure 6 shows a typical station arrangement.

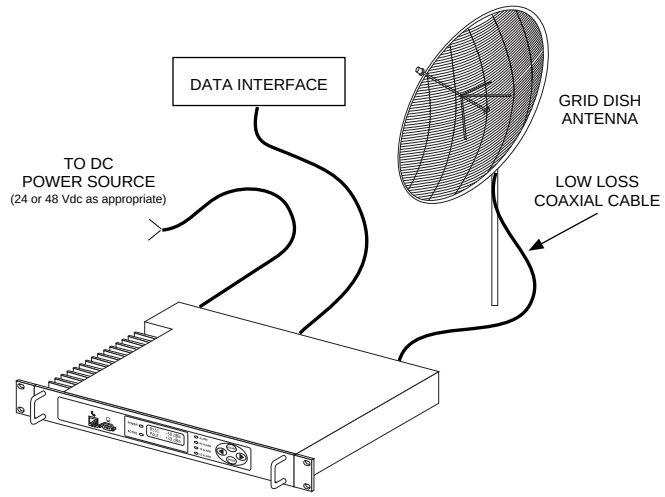


Figure 6. Typical Station Arrangement

Site Selection

For a successful installation, careful thought must be given to selecting proper sites for the radios and antenna systems. Suitable sites should offer:

- An antenna location that provides an unobstructed path in the direction of the associated station
- A source of adequate and stable primary power
- Suitable entrances for antenna, interface or other required cabling
- Adequate clearance around the radio for ventilation

These requirements can be quickly determined in most cases. A possible exception is the first item—verifying that an unobstructed transmission path exists. Microwave radio signals travel primarily by line-of-sight, and obstructions between the sending and receiving stations will affect system performance.

If you are not familiar with the effects of terrain and other obstructions on radio transmission, the following discussion will provide helpful background.

Terrain and Signal Strength

A line-of-sight path between stations is highly desirable, and provides the most reliable communications link in all cases. A line-of-sight path can often be achieved by mounting each station antenna on a tower or other elevated structure that raises it to a level sufficient to clear surrounding terrain and other obstructions.

The requirement for a clear transmission path depends upon the distance to be covered by the system. If the system is to cover only a limited distance, say 5 km (3.1 miles), then some obstructions in the transmission path may be tolerable. For longer-range systems, any obstruction could compromise the performance of the system, or block transmission entirely.

The signal strength at the receiver must exceed the receiver sensitivity by an amount known as the fade margin to provide reliable operation under various conditions.

Detailed information on path planning should be reviewed before beginning an installation. Computer software is also available for this purpose that can greatly simplify the steps involved in planning a path.

Microwave Data Systems offers path analysis (for paths in the USA) as an engineering service. Contact the factory for additional information.

On-the-Air Test

If you've analyzed the proposed transmission path and feel that it is acceptable, an on-the-air test of the equipment and path should be conducted. This not only verifies the path study results, but allows you to see firsthand the factors involved at each installation site.

The test can be performed by installing a radio at each end of the proposed link and checking the Received Signal Strength Indication (RSSI) value reported at the front panel LCD screen of each radio. If adequate signal strength cannot be obtained, it may be necessary to mount the station antennas higher, use higher gain antennas, or select a different site for one or both stations.

A Word About Interference

Interference is possible in any radio system. However, since the LEDR radio is designed for use in a licensed system, interference is less likely because frequency allocations are normally coordinated with consideration given to geographic location and existing operating frequencies.

The risk of interference can be further reduced through prudent system design and configuration. Allow adequate separation between frequencies and radio systems.

C/I Curves

A carrier to interference (C/I) curve can help in frequency and space coordination. The information in this curve can aid greatly in helping plan geographic locations and frequency usage for radio systems. Contact the factory for additional information on carrier to interference curves. A white paper on the subject is available on request. Ask for Publication No. 05-3638A01.

Keep the following points in mind when setting up your point-to-point system:

1. Systems installed in lightly populated areas are least likely to encounter interference; those in urban and suburban environments are more likely to be affected by other devices operating in the radio's frequency band and adjacent services.

2. Directional antennas must be used at each end of a point-to-point link. They confine the transmission and reception pattern to a comparatively narrow beam, which minimizes interference to and from stations located outside the pattern. The larger the antenna, the more focused the transmission and reception pattern and the higher the gain.

3. If interference is suspected from another system, it may be helpful to use antenna polarization that is opposite to the interfering system's antennas. An additional 20 dB (or more) of attenuation to interference can be achieved by using opposite antenna polarization. Refer to the antenna manufacturer's instructions for details on changing polarization.

3.3 Antenna and Feedline Selection

Antennas

The antenna system is perhaps the most crucial part of the system design. An antenna system that uses poor quality feedline, or is improperly aligned with the companion site, will result in poor performance, or no communication at all.

A directional antenna must be used for point-to-point systems to minimize interference both to and from nearby systems. In general, cylindrical or dish type antennas with a parabolic reflector must be used. Yagi or corner reflector types may be acceptable in some applications. Check government regulations for your region.

The exact style of antenna used depends on the size and layout of a system. In most cases, a directional "dish" type of antenna is used with the radio (Figure 7). Dish antennas maximize transmission efficiency and restrict the radiation pattern to the desired transmission path.

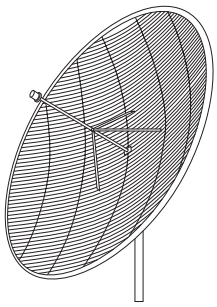


Figure 7. Typical Grid Dish Antenna

Table 2 lists common grid dish antenna sizes and their approximate gains. Note: Each antenna is designed to operate within only one frequency band.

Table 2. Dish antenna size versus gain (dBi)

Antenna Size Meters (feet)	400 MHz Gain	900 MHz Gain	1400 MHz Gain
1.2 meters (4 feet)	13.1 dBi	18.4 dBi	23.7 dBi
2.0 meters (6 feet)	16.3 dBi	22.0 dBi	26.1 dBi
3.0 meters (10 feet)	19.6 dBi	26.4 dBi	30.6 dBi
4.0 meters (12 feet)	22.2 dBi	28.0 dBi	32.1 dBi

MDS can furnish antennas for use with your LEDR radio. Consult your sales representative for details.

Feedlines

For maximum performance, a good quality feedline must be used to connect the radio transceiver to the antenna. For short-range transmission, or where very short lengths of cable are used (up to 8 meters/26 feet), an inexpensive coax cable such as Type RG-213 may be acceptable.

For longer cable runs, or for longer-range communication paths, we recommend using a low-loss cable suited for the frequency band of operation. Helical transmission lines, such as Andrew Heliax™ or other high-quality cable will provide the lowest loss and should be used in systems where every dB counts.

Whichever type of cable is used, it should be kept as short as possible to minimize signal loss.

The following tables (3, 4 & 5) can be used to select an acceptable feedline. A table is provided for each of the three bands for which the LEDR radios are available.

Table 3. Feedline Loss Table (450 MHz)

Cable Type	3.05 Meters (10 Feet)	15.24 Meters (50 Feet)	30.48 Meters (100 Feet)	152.4 Meters (500 Feet)
RG-8A/U	0.51 dB	2.53 dB	5.07 dB	25.35 dB
1/2 in. HELIAX	0.12 dB	0.76 dB	1.51 dB	7.55 dB
7/8 in. HELIAX	0.08 dB	0.42 dB	0.83 dB	4.15 dB
1-1/4 in. HELIAX	0.06 dB	0.31 dB	0.62 dB	3.10 dB
1-5/8 in. HELIAX	0.05 dB	0.26 dB	0.52 dB	2.60 dB

Table 4. Feedline Loss Table (960 MHz)

Cable Type	3.05 Meters (10 Feet)	15.24 Meters (50 Feet)	30.48 Meters (100 Feet)	152.4 Meters (500 Feet)
RG-8A/U	0.85 dB	4.27 dB	8.54 dB	42.70 dB
1/2 in. HELIAX	0.23 dB	1.15 dB	2.29 dB	11.45 dB
7/8 in. HELIAX	0.13 dB	0.64 dB	1.28 dB	6.40 dB
1-1/4 in. HELIAX	0.10 dB	0.48 dB	0.95 dB	4.75 dB
1-5/8 in. HELIAX	0.08 dB	0.40 dB	0.80 dB	4.00 dB

Table 5. Feedline Loss Table (1400 MHz)

Cable Type	8 Meters (26 Feet)	15 Meters (49 Feet)	30 Meters (98 Feet)	61 Meters (200 Feet)
RG-213	3.0 dB	6.03 dB	12.05 dB	24.1 dB
1/2 in. HELIAX	0.73 dB	1.47 dB	2.93 dB	5.9 dB
7/8 in. HELIAX	0.42 dB	0.83 dB	1.66 dB	3.32 dB
1-5/8 in. HELIAX	0.26 dB	0.26 dB	1.05 dB	2.1 dB

3.4 Radio Mounting

The radio can be mounted either in a 19-inch equipment rack or on a table top. It should be located in a relatively clean, dust-free environment that allows easy access to the rear panel connectors as well as front panel controls and indicators. Air must be allowed to pass freely over the ventilation holes and heat sink on the side panel.

The dimensions of LEDR Series radios are:

- 305 mm (12 in) deep
- 426 mm (16.75 in) wide—Excluding rack mounting brackets
- 45 mm (1.75 in) high—1RU

Maximizing RSSI

For newly installed systems, one of the first tasks is to orient the station antenna for a maximum Received Signal Strength Indication (RSSI) as shown on the LCD screen. See “Performance” on Page 40 for details. A maximum RSSI ensures the antenna is properly aimed at the associated station. Move the antenna slowly while an assistant observes the RSSI display for a maximum reading.

Attaching the Rack Mounting Brackets

The radio is normally shipped with the rack mounting brackets uninstalled. To attach them, select the desired mounting position on the sides of the chassis. (The brackets may be mounted flush with the front panel, or near the middle of the chassis.)

NOTE: Both short and long screws are provided with the brackets. Use the long screws for the heatsink (left) side of the chassis and the short screws for the right side of the chassis. Tighten the screws securely.

3.5 Front Panel

Indicators, Text Display and Navigation Keys

Figure 8 shows the details of the LEDR radio’s front panel indicators, an LCD text display and a menu navigation keys.

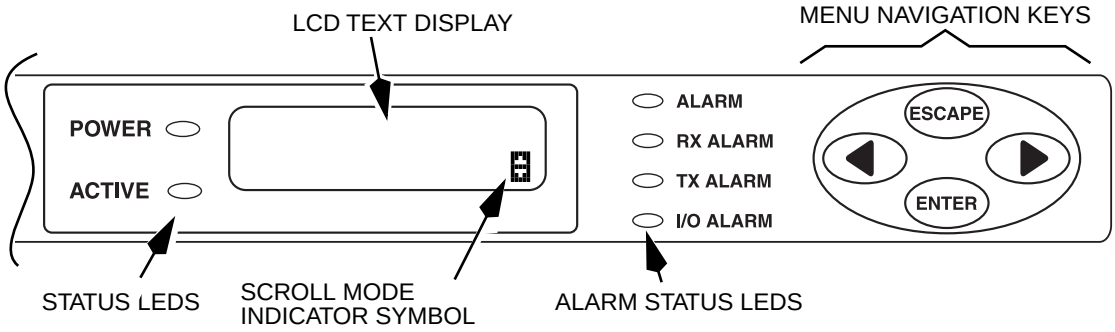


Figure 8. Front Panel Indicators, Text Display and keys

LED Indicators

The front panel LEDs indicate various operating conditions as outlined in Table 6.

Table 6. Front Panel LED Functions

LED	Indications
POWER	Primary power is applied to radio
ACTIVE	This radio is the on-line/active unit in a redundant configuration.
ALARM	A general alarm condition is present
RX ALARM	The modem is not locked to a receive signal
TX ALARM	There is a problem with the transmitter
I/O ALARM	There is a payload data interface error

LCD Display & Keys

The LCD display provides a two line by 16-character readout of radio status and parameter settings. It is used with the menu navigation keys on the right side of the front panel to control the radio's operation and access diagnostic information.

Use of the navigation keys (Figure 9) is simple, and allows many basic operating tasks to be performed without connecting an external terminal or using additional software.

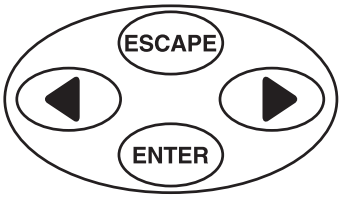


Figure 9. Menu Navigation Keypad

The keys can be used for two tasks—navigating though menus, and editing user controllable parameters. The functions of the keys are automatically selected according to the screen that is being viewed by the user.

Menus

The LEDR radio contains 16 primary menus as listed below. These primary menus serve as entry points to a variety of submenus that can be used to view or adjust operating parameters and diagnose the radio link.

- Login
- Logout
- Network
- General
- RF Config(uration)
- IO Config(uration)
- Line Config(uration)
- Performance
- G.821
- Diagnostics
- Orderwire
- Front Panel
- Redundant
- Remote Status

Detailed descriptions of each front panel LCD display is covered in-depth later in this manual. For details, see *Front Panel LCD Menu Descriptions* on Page 32.

Menu Navigation

The left and right keys (◀ ▶) provide navigation through the available top level menus (see menu tree, Figure 9) and through series of subordinate menus.

The ENTER key allows entry into each primary menu's subordinate menus, exposing another menu level. The ESCAPE key always exits the current screen, causing the program to "pop up" one level.

Parameter Selection and Data Entry

With an editable menu, such as **Login**, pressing the ENTER key puts the screen into a data entry mode. Front panel keys are used in one of three ways: A. character and string creation/selection, B. scrolling through lists, and C. adjusting horizontal slider bars.

A. Character and String Creation/Selection— With some menus, it is necessary to enter a string of alphanumeric characters. A good example is entering a password at the user **login** menu. In this example, the string is built one character at a time, and the string is built from left to right on the display.

The left and right arrow keys move the cursor in the corresponding direction. When the cursor is below the character you wish to change, press ENTER. The arrow keys are then used to step though the character set, beginning with numbers, next uppercase letters and finally lowercase letters. Each time you press one of the arrow keys, the display will step to the next character. If you press and hold the arrow key for several seconds, the characters will scroll by very quickly.

After you have built the string of characters you need, press the ENTER key to save the string on the display and return to cursor navigation mode. To save all changes you have made, place the cursor under the special carriage return symbol (↵) and press ENTER. Pressing ESCAPE will revert the arrow keys to the cursor navigation mode. Pressing ESCAPE in cursor navigation mode cancels character edit mode without saving any changes.

B. Scrolling Lists/Values— Uses left and right keys (◀ ▶) to scroll through a list of choices or adjust a numeric value, such as **power output**. When you are in a menu of with a series of fixed parameters, the vertical scroll character (▮) will appear while you are in the editing/selection mode. If you are asked to select or change more than one character, you will see a horizontal scroll symbol (▞) in the bottom right-hand corner of the display and a cursor will appear under the character being edited or changed.

When the desired parameter is in view, move the cursor to the right as far as it will go, until a carriage return symbol (↵) appears. Pressing the ENTER key will save the selection to its left, if your access privileges permit. Pressing ESCAPE cancels the selection and exits without saving the change.

C. Slider Bar Adjustment—Some menus display a horizontal bar that changes its length to indicate the level for parameters that use relative values such as the Orderwire Volume and VOX threshold. (See VOX and O/W on Page 40.) Pressing the ▶ key will increase the value and the ◀ will lower the value. Pressing ENTER saves the current setting.

Connectors

The front panel of the LEDR radio (Figure 10) has two connectors; both of them are located on the lefthand side of the panel.

Orderwire

The RJ-11 jack with the telephone symbol above it is to connect an orderwire handset. The orderwire is used by service personnel to communicate through the Service Channel to coordinate system activities with personnel at another site in the network. The orderwire will not interrupt the normal data flow through the LEDR data communication channel, however, it will reduce the throughput efficiency of any data communications on the Service Channel during periods of voice transmission. See “USING ORDERWIRE” on Page 99 for more information.

CONSOLE

The second connector is a DB-9 type with a computer icon over it. Here is where you can connect a computer’s serial port for unit configuration, diagnostics and firmware upgrades to the radio.

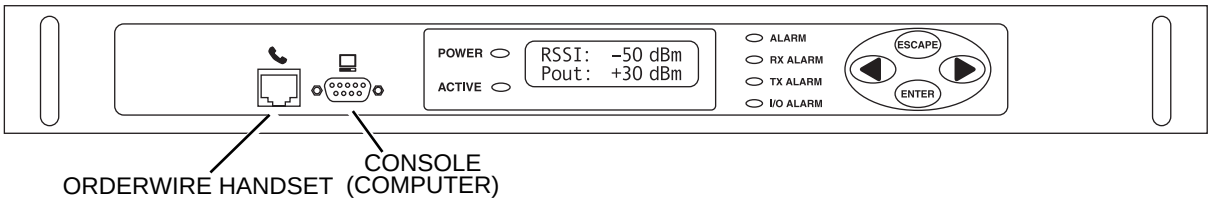


Figure 10. LEDR Front Panel
(All models Identical.)

3.6 Rear Panel Connectors

The rear panel of the LEDR radio transceiver contains a number of connectors to interface with the radio’s antenna system, data equipment, and user remote data network monitoring and control equipment.

Connector Locations

LEDR "S" Series

The rear panel of the LEDR "S" Series radios is shown in Figure 11. Refer to the descriptions that follow for specific information regarding rear panel connections.

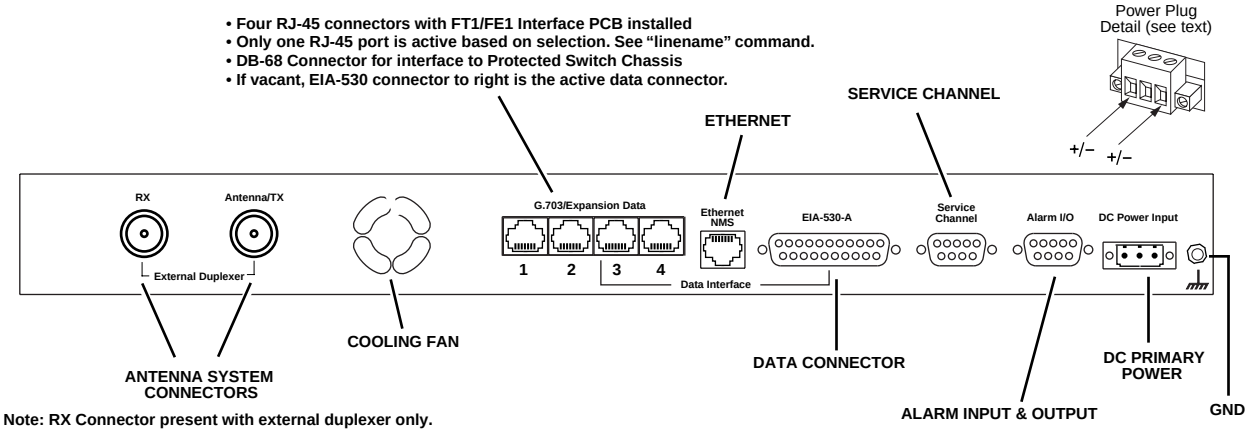


Figure 11. LEDR 400S/900S/1400S Rear Panels
(Shown with Optional FT1/FE1 Interface PCB Installed)

LEDR "F" Series

The rear panel of the LEDR "F" Series radios is shown in Figure 12. Refer to the descriptions that follow for specific information regarding rear panel connections.

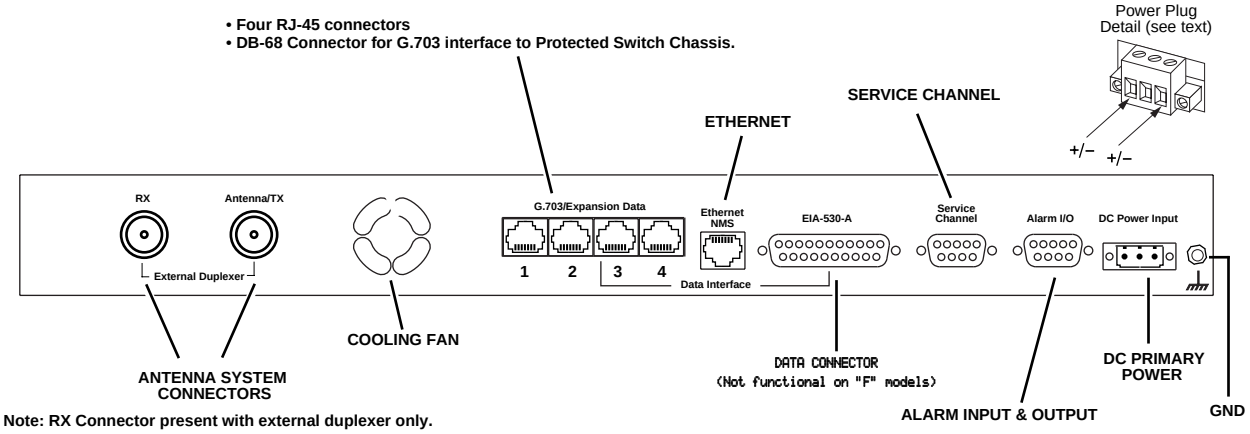


Figure 12. LEDR 400F/900F/1400F Rear Panel

Ground Stud

The ground stud on the rear panel provides a point to tie the radio's chassis ground to earth ground for safety purposes.

Antenna/TX—RF Connector

The ANTENNA/TX connector is an N-type coaxial connector. When an *internal* duplexer is installed, it serves as the connection point for the station antenna. When an *external* duplexer is used, it acts as the transmitter RF output (TX) connector to the duplexer.

RX—RF Connector

The RX (receive) connector is an N-type coaxial connector. It is only installed if the radio is supplied for use with an external duplexer. It carries receive signals (RX) from the duplexer to the LEDR radio's receiver.

When an external duplexer is used, ensure that the higher frequency (transmit or receive) is connected to the duplexer connector marked HI and the lower frequency (transmit or receive) is connected to the duplexer marked LO.

G.703/Expansion Data

The type of connector(s) at this location on the rear panel depends on several factors: the type of interface required by the customer premises equipment (CPE) and whether or not the radio is part of a protected (redundant) configuration. See Table 7 for details.

Table 7. G.703/Expansion Data Connector

Model(s)	Configuration	Data Interface	G.703/Expansion Connector
LEDR 400S LEDR 900S LEDR 1400S	Stand-alone	EIA-530	Blank. No connector(s) installed.
LEDR 900S	Stand-alone	FT1	4 x RJ-45—Only one port is active based on **linename** selection. (See Note 2)
LEDR 400S LEDR 900S LEDR 1400S	Stand-alone	FE1	4 x RJ-45—Only one port is active based on **linename** selection. (See Note 2)
LEDR 400F LEDR 900F LEDR 1400F	Stand-alone	4E1	4 x RJ-45—All four jacks (A, B, C & D) are active. (See Notes 1 & 2)
LEDR 400F/S LEDR 900S LEDR 1400F/S	Protected	All	DB-68 (See Note 3)

NOTES:

1. The capacity of the 4E1 interface can be reduced to one (1E1) or two circuits (2E1). See **linemap** command on Page 66, for configuration information.
2. For RJ-45 pinout information, see Figure 36 on Page 130.
3. This 68-pin interface connector is used only to pass the user data interface, the Service Channel, and the orderwire circuits to the Protected Switch Chassis for distribution. Fully-wired DB-68 computer cables (commonly used to interconnect SCSI devices) can be used with this data port connector.

Ethernet

The ETHERNET connector provides access to the embedded SNMP agent and other elements of the TCP/IP network-management interface. The connector is a standard 10Base-T connection with an RJ-45 modular connector. The LEDR Ethernet connections are provided for remote equipment management (NMS).

Ethernet in a Repeater Configuration

At a repeater site with two LEDR radios, the ETHERNET connectors of each chassis must be connected to each other through a cross-connect cable or using standard cables to an Ethernet hub. This inter-chassis Ethernet connection must be made in order for the Orderwire and Service Channel to function properly. (See Figure 13 on Page 20 for further information.)

Ethernet in a Protected Configuration

The Ethernet connections on the LEDR radio chassis in a protected configuration should *not* be used. The Ethernet connector of the Protected Switch Chassis (PSC) provides a connection to the two radio units. Each radio has a unique IP address and is individually addressable/controllable using SNMP over IP. See "PROTECTED CONFIGURATION" on Page 103 for general information and Figure 34 on Page 130 for ETHERNET connector pinout.

EIA-530-A

The EIA-530-A connector is the main data input/output connector for the subrate radio. The EIA-530 interface is a high-speed serial data connector. For detailed pin information, see "EIA-530-A Data—Rear Panel" on Page 130.

NOTE: This connector is not operational on LEDR "F" Series (fullrate) models.

Service Channel

The Service Channel provides a transparent ASCII "pipe" to which any RS-232/EIA-232 device can be connected at data rates between 300 and 9600 bps. Whatever ASCII data is entered onto the network through the Service Channel Port will be sent to the local radio and broadcast to any other device connected to the Service Channel Port on other associated LEDR radios in the network.

The Service Channel's function is identical for all LEDR configurations—stand-alone, repeater, and redundant.

NOTE: Use of the orderwire will slow down data communications on the Service Channel. It will not effect data traffic on the primary data interface.

For detailed information on this 9-pin connector, see "Service Channel—Rear Panel" on Page 131.

Repeater Configuration

Data and RF cabling for the repeater station configuration is shown in Figure 14.

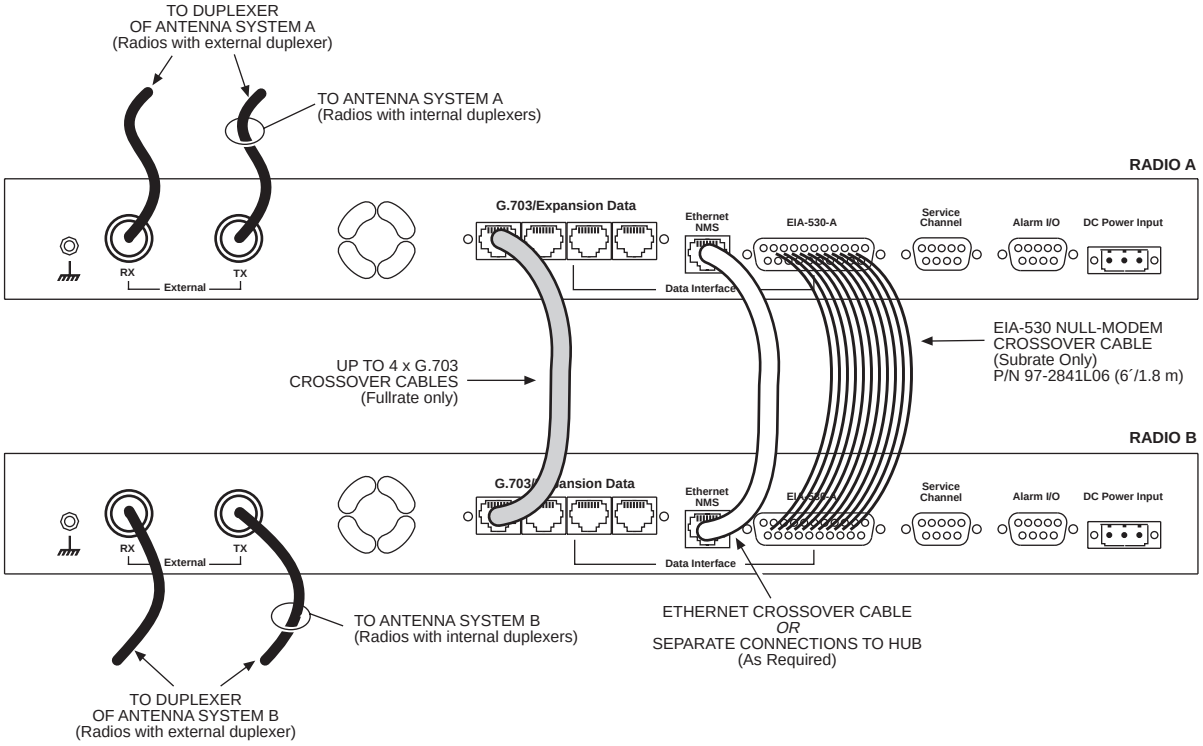


Figure 13. Inter-unit Cabling—Repeater Configuration

Protected Configuration

The Service Channel connections on the LEDR radio chassis in a protected configuration should *not* be used. The SERVICE CHANNEL connector of the Protected Switch Chassis (PSC) provides a connection to the two radio units. For further information on protected configurations please see "PROTECTED CONFIGURATION" on Page 103.

Alarm I/O

This is a 9-pin connector that has both inputs and outputs.

Output Contacts

The ALARMS Port is outfitted with four optically-isolated relays that are controlled by the LEDR radio's CPU. The contacts (Pins 6, 7, 8, & 9) are normally open and can handle a non-inductive load of ±60 Volts Peak (AC/DC) at a maximum current of 1 Ampere. These are suitable for the control of an external device or indicator when a radio event occurs.

An alarm output could be used, for example, to sound a claxon when the radio link goes down, or when the battery for the real-time clock is low. Another example is to use the alarm outputs to drive the inputs of an external monitoring system. (See the list of radio events for more options.) These outputs are not suitable for data interface without the use of an external "debouncing" circuit.

Input Connections

In addition, four external alarm input lines (Pins 1, 2, 3 & 4) are provided. Normally, the input is either left open or shorted to ground, to indicate an alarm condition.

Each alarm input is diode-clamped to +3.3 Vdc or chassis ground, and can tolerate inputs from -4 to +6 Vdc without drawing excessive current. If left open, each input is pulled up. To indicate an alarm condition, short the input pin to the ground provided on the alarm connector (Pin 5). The maximum DC loop resistance is 2 KΩ. These alarm input lines can tolerate circuit "bounce" common with mechanical relays.

NOTE: The normal (unalarmed) state of the contacts (open or closed) or input alarm state (high or low) can be selected by a software subcommand. See "alarm" on Page 49 for details.

Alarm Events

The events that cause alarm output signals can be configured in the radio software. See "evmap" on Page 57 for information on programming which events trigger an alarm.

See Figure 38 on Page 131 for Alarm I/O pinout information.

DC Power Input (Primary Power)

The DC POWER INPUT connector is a three-pin keyed connector used to connect an external DC power source that will provide the unit's primary power. The DC power source can be connected with the negative lead connected to either the left or right pin of the chassis connector. The center conductor is not connected within the LEDR chassis. A label next to the connector will indicate the nominal voltage of the radio. Table 8 lists the actual operating voltage ranges.

Table 8. Primary Power Input Options

Nominal Voltage	Operating Range
24 Vdc	19.2 to 28.8 Vdc
48 Vdc	38.4 to 57.6 Vdc

Refer to the model number codes in Figure 3 to determine the radio's power supply range.

CAUTION
POSSIBLE EQUIPMENT DAMAGE

Before connecting primary power to the radio, verify that the source provides a voltage within the operating range. Improper voltages may damage the equipment. Permissible voltage limits are shown in Table 8.

Protected Configuration Connections

There are several connections between the LEDR radio chassis and the Protected Switch Chassis. They include the primary data interface, RF, Ethernet, orderwire and Service Channel. Details on cabling and other items relating to the protected (redundant) configuration can be found in *PROTECTED CONFIGURATION* on Page 103.

3.7 Bandwidths, Data Rates and Modulation Types

The hardware in the LEDR chassis is configured at the factory for a specific bandwidth. However, the modulation type and data rate can be changed *provided the bandwidth is sufficient to support the modulation type and data rate.* (If you need to change your radio's bandwidth, please see "INCREASE BANDWIDTH BY CHANGING TRANSMITTER AND RECEIVER FILTERS" on Page 122 for details.)

Use of the **modem** command (Page 72) and configuration (**[argument]**) code automatically sets the combination of data rate, bandwidth and modulation type if the radio is capable of supporting it

Table 9 shows the combinations of radio bandwidth, data rates and modulation types that are available for subrate radios at the time of publication. Table 10 shows the combinations available for fullrate radios.

Table 9. Subrate Bandwidth vs. Modem Selection Code

Radio Bandwidth	Configuration Code	Data Rate(s)	Modulation
25 kHz	B1	64 kbps	16-QAM
	C1	64 kbps	32-QAM
50 kHz	A1	64 kbps	QPSK
	B2	128 kbps	16-QAM
100 kHz	A1	64 kbps	QPSK
	A2	128 kbps	QPSK
	B3	256 kbps	16-QAM
200 kHz	A1	64 kbps	QPSK
	A2	128 kbps	QPSK
	B3	256 kbps	16-QAM
	B4	384 kbps	16-QAM
	B5	512 kbps	16-QAM
	C6	768 kbps	32-QAM

Table 10. Fullrate Bandwidth vs. Modem Selection Code

Radio Bandwidth	Configuration Code	Data Rate(s)	Modulation
500 kHz	C7	E1	32-QAM
1000 kHz	B7	E1	16-QAM
	C7	E1	32-QAM
	C8	2E1	32-QAM
2000 kHz	A7	E1	QPSK
	B7	E1	16-QAM
	B8	2E1	16-QAM
	C8	2E1	32-QAM
	C10	4E1	32-QAM

3.8 Transmit Clock Selection (Subrate Radios Only)

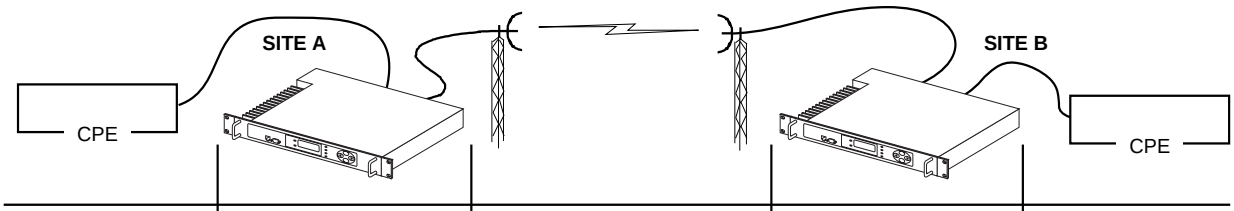
For a subrate radio, transmit clock arrangement must be set by the user. Clocking arrangements for fullrate radios is automatically handled by the LEDR radios.

It is essential that there be only *one* master clock in a subrate radio network. The master clock can originate from the radio or from the Customer Premises Equipment (CPE).

LEDR radios are capable of several different clocking modes. Refer to Figure 14 and Figure 24 for typical system clocking arrangements.

Refer to the **Clock Mode** screen description on Page 35 for setting the radio transmit clocking from the front panel. Refer to the **clkmode** description on Page 54 for setting the radio transmit clocking mode from the front panel CONSOLE Port.

NOTE: When customer premises equipment (CPE) is operated in looped clock mode, it is recommended that the radio *not* be set to line clock mode. To do so may cause the transmitting radio's PLL to be pulled out-of-lock, especially when operating at 4E1 data rates.



Customer Premises Equipment (CPE)	LEDR Radio Clock Source	Over-the-Air RF Path	LEDR Radio Clock Source	Customer Premises Equipment (CPE)
Internal Clock	External Clock	← →	Looped Clock	External Clock
External Clock	Internal Clock	← →	Looped Clock	External Clock

Figure 14. EIA-530 Clocking Arrangements for Protected (1+1) LEDR Radio Operation

4.0 INITIAL STARTUP AND CONFIGURATION

4.1 Introduction

The radio is commonly configured to parameters provided by the customer at the time the order was placed. Even so, there are some parameters that must be reviewed and set during the installation. The following steps summarize the initial set-up of a LEDR radio link. If this is your first installation of a LEDR radio system, it is recommended the equipment be setup on a test bench.

4.2 STEP 1—Power up the LEDR Radios

There is no primary power switch; simply connecting primary power to the unit will start the radio operating. After a short self-test, a "default screen" similar to the following appears on the radio's LCD display:

```
LEDR Link
RSSI: -60 dBm
```

NOTE: The LEDR radio is normally keyed continuously, and the radio will transmit whenever power is applied. Ensure there is a suitable load on the antenna connector before connecting power.

4.3 STEP 2—Establish Communications with the Radio

There are four different methods available to set radio parameters and query the radio. They are:

- **Front Panel—**The front panel is intended to serve as a convenient user interface for local radio management. Most, but not all, parameters and functions are accessible from the front panel. (See "Front Panel LCD Menu Descriptions" on Page 32.)
- **NMS (Network Management System)—**The NMS is used via a terminal connected to the front panel CONSOLE Port. It may be used to configure and query every manageable radio parameter on a given network using the out-of-band Service Channel. The Element Management System (EMS) may be used on the local radio (**login** command) or through any remote radio in the network using the **rlogin** command.
- **Telnet—**A standard network application protocol which provides a NMS-type interface to configure and query most radio parameters.
- **SNMP Network Management System—**The SNMP agent interface is optimized to fulfill the fault configuration, performance and user access requirements of the LEDR radio system. A separate manual, P/N 05-3532A01 explains SNMP in more detail.

4.4 STEP 3—Make Initial Login to Radio

When the radio is first powered up, it defaults to a read-only condition. That is, the radio parameters may be viewed, but cannot be changed. To enable changes to radio settings, a valid user name and password must be entered.

When the radio is shipped from the factory, it is pre-programmed with the following temporary login credentials:

Username:**SUPER**
Password:**SUPER**

NOTE: User names and passwords are case sensitive. Do not use punctuation mark characters. Use a maximum of eight characters.

Navigation Key Method

To log in from the front panel using the temporary credentials, follow these steps:

1. Go to the Login screen and press the front panel ENTER key. The Username screen appears with **SUPER** displayed.

2. Press the ENTER key again to access the Password screen. Use the arrow keys to scroll through the list of characters and individually select the letters spelling out the word **SUPER**. Press ENTER after each character selection. (For more information on character selection using the navigation keys, see "INITIAL STARTUP AND CONFIGURATION" on Page 24.)

3. When all of the characters have been entered, press ENTER again. The screen briefly displays **Login Success** and returns to the Login entry screen.

The user may now access any of the screens shown in Figure 15 with Administrator level privileges (the highest allowable user level).

CONSOLE Method

To login using a terminal connected to the front panel CONSOLE Port, follow the steps below.

1. Connect a terminal data port or a PC's serial port to the radio's front panel CONSOLE Port .

2. Open an ANSI terminal program, such as HyperTerminal™ in the Windows O/S. Press **ENTER** . The **LEDR>** prompt should appear on the terminal's display.

3. Enter **login SUPER**. The **Password >** prompt will appear.

4. Enter the password **SUPER**. The following response appears: **login: SUPER logged in.**

The user may now access any of the NMS commands listed in Table 14 on Page 44 with Administrator level privileges (the highest allowable user level).

4.5 STEP 4—Change the SUPER Password

The factory-programmed username and password (**SUPER**) is provided to enable a System Administrator to operate a newly installed radio. It is highly recommended that the password for **SUPER** be changed as soon as possible to maintain system security.

Follow these steps to change the factory-programmed password.

1. Login as **SUPER** using the NMS method described above.

2. Enter the command **passwd**. At the next prompt, enter a new password with a maximum of eight characters. (See *passwd* on Page 73.)

   NOTE: Passwords cannot be changed using the front panel navigation buttons.

3. Re-enter your new password (for verification purposes). If the entry is correct, the radio responds with **user: Command Complete.**

4. Set up user accounts as required beyond the factory default of SUPER.

   Create accounts, set permission levels, or delete accounts as desired using the **user** command. See Page 86 for complete description of **user** command.

NOTE: It is recommended that users log out when finished using the front panel navigation keys or console terminal. This can be done using the Logout screen on the radio, or the **logout** command from a console terminal as appropriate. *If there is no key or terminal activity for 10 minutes, the radio automatically logs out and reverts to read-only status.*

4.6 STEP 5—Review Essential Operating Parameters

Review and set the following parameters to allow data throughput and interconnection with the network. These are radio operating frequencies, data interface clocking, and data framing. Table 1 outlines these based on each model group and configuration.

Table 11. Essential Parameters for Standalone & Protected

Model Group	Data Interface	Parameter	Setting
Subrate	**EIA-530**	**RF TX/RX Frequency**	Factory configured for customer frequencies.
		Clocking	Use **clkmode** command (Page 54) to match interface equipment.
		Framing	Does not apply.
	FT1/FE1	**RF TX/RX Frequency**	Factory configured for customer frequencies.
		Clocking	Use **clkmode** command (Page 54) to match interface equipment.
		Framing	Set as appropriate using **fstruct** command (Page 59).
		Time Slot	Set as appropriate using **timeslot** command (Page 84).
		Line Code	Set as appropriate using **linecode** command (Page 66).

Table 11. Essential Parameters for Standalone & Protected *(Continued)*

Model Group	Data Interface	Parameter	Setting
FullRate	**E1**	**RF TX/RX Frequency**	Factory configured for customer frequencies.
		Clocking	No settings are necessary. Radio automatically detects clock and sets mode.
		Framing	• Radio set to unframed (default). • Make changes as appropriate using **fstruct** command (Page 59) to match interface equipment.
		Line Code	Set as appropriate using **linecode** command (Page 66).

4.7 STEP 6—Set TCP/IP Settings to Enable SNMP and/or Telnet Management (If required)

- The unit IP address is factory configured with a unique address based on the last three digits of the radio's serial number.
- Use **ip** command (Page 63) to change the IP address, set net-mask, gateway and IP Port as necessary.
- In a protected radio, change the **rdnt** settings (Page 74) to match the user-assigned IP addresses.

4.8 STEP 7—Set User Configurable Fields

Change only if required.

Many items are user configurable, to ease customer use. These include, and are not limited to the following. See the NMS command description in the manual for more detail:

- Set user information fields using **info** command (Page 62)
- Set alarms and alarm mappings using the **alarm** command (Page 49)
- Set event mappings using the **evmap** command (Page 57)
- Set alarm thresholds using the **threshold** command (Page 83)
- Set the SNMP community using the **snmpcomm** command (Page 81)

4.9 STEP 8—Verify Radio Performance

The data performance and NMS should be verified. Use the **loopback** command (Page 69) to verify data throughput.

4.10 STEP 9—Install the Link

Peak the antennas for maximum RSSI using the continuously

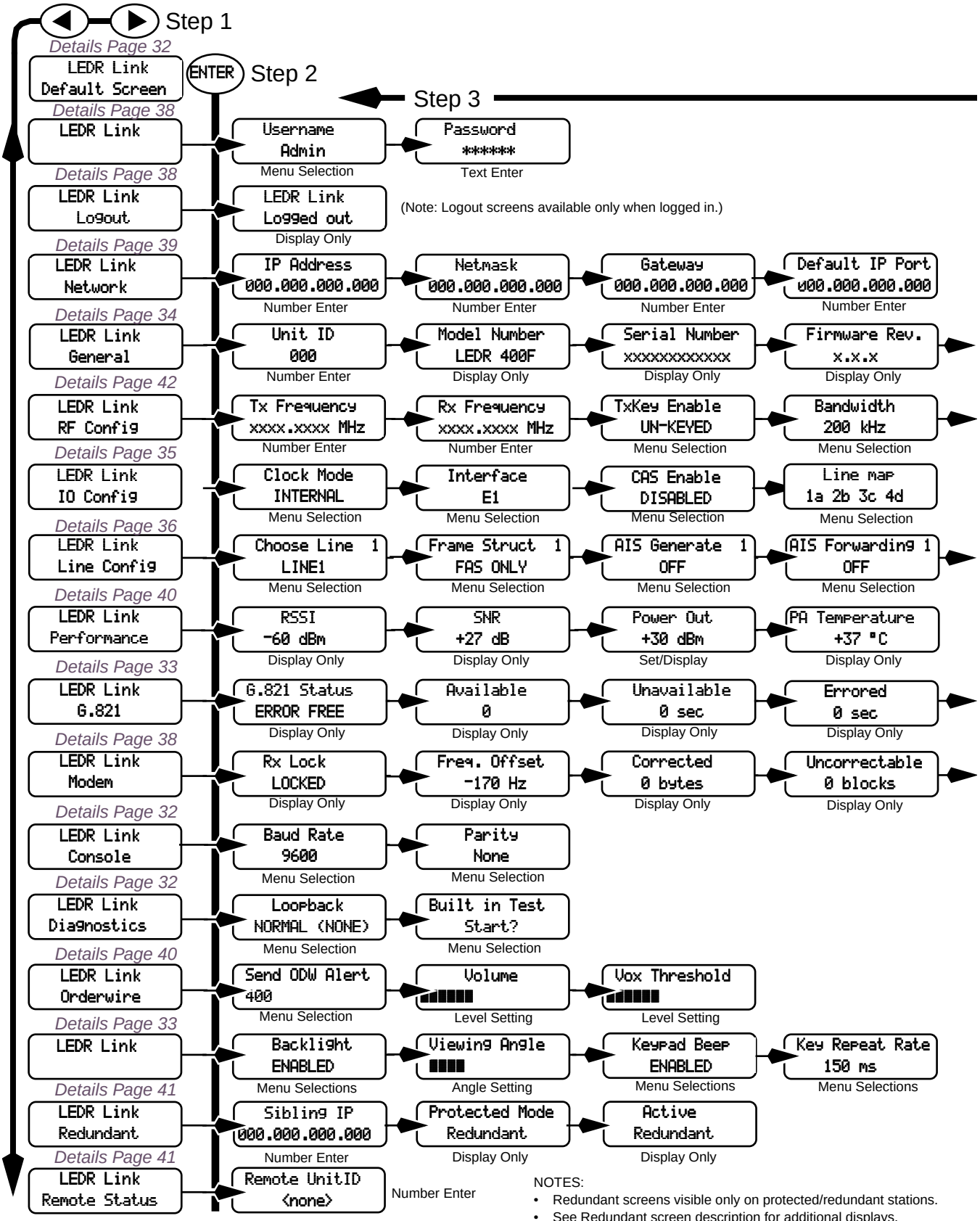
updated **rssi** command (Page 80), either the front panel screen or using the **trend** command (Page 86) via the NMS.

4.11 STEP 10—Verify the Link Performance

Connect and verify the proper operation of external equipment connected to the LEDR radio link.

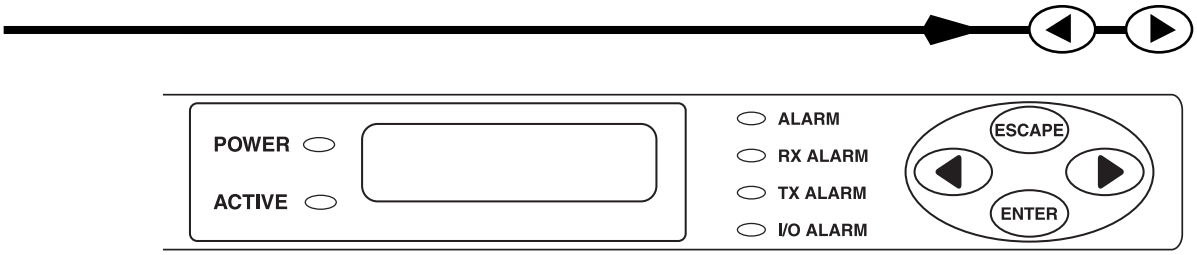
5.0 CONFIGURATION AND CONTROL VIA THE FRONT PANEL

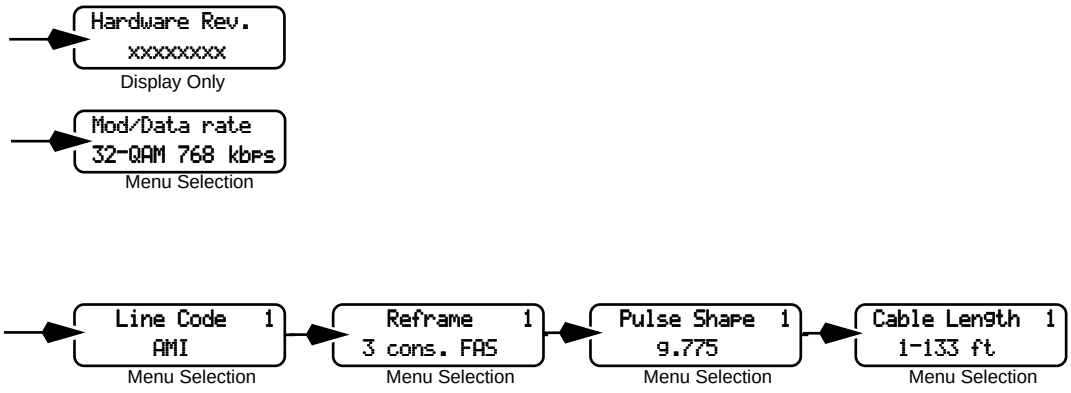
Figure 9 on the following pages are a pictorial view of the front panel menu tree. Detailed explanations of the screens are provided in *Section 5.1, Front Panel LCD Menu Descriptions*.



NOTES:

- Redundant screens visible only on protected/redundant stations.
- See Redundant screen description for additional displays. *Details Page 41*





Display Only—This description indicates the LCD menu item is for informational purposes only.

Menu Selection—This description indicates there are selections available and the choices may be scrolled through using the ◀ ▶ keys. Press the ENTER key again to save menu selection choice.

Text or Number Enter— This description indicates the entry is alphanumeric. The ◀ ▶ keys are first used to position the cursor over the text to be changed. Then, the ENTER key is pressed to enter the edit mode. Use the ◀ ▶ keys to scroll through all available characters. Press the ENTER key again to save the displayed character in displayed location.

Details Page 33

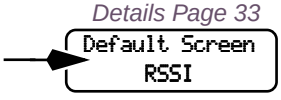


Figure 15. Front Panel LCD Menu Navigation

5.1 Front Panel LCD Menu Descriptions

NOTE: The menus in this section are listed in alphabetical order.

CONSOLE

Baud Rate
9600

This menu allows you to set or view the current data rate setting for the CONSOLE Port serial interface. Refer to Figure 33 on Page 129 for pinout information of this Port. See "OPTION 1: Uploading Firmware via the CONSOLE Port" on Page 94 for more information.

For the NMS command-line equivalent, see "con" on Page 56.

Parity
None

This menu allows you to set or view the current parity setting for the CONSOLE Port serial interface. Refer to Figure 33 on Page 129 for pinout information for this Port. Typically, this will be set to **NONE**.

For the NMS command-line equivalent, see "con" on Page 56.

Default Screen

LEDR Link
Default Screen

This menu allows you to view the default screen that appears on the LCD display. If desired, the default screen may be changed (See " Default Screen" on Page 33).

Diagnostics

Loopback
NORMAL (NONE)

This menu is used to start the loopback mode for testing purposes. Remote loopback port selection is relative to the local port. The radio link will translate any line mapping to select the correct physical remote port to loop back, based on the selected local port.

When conducting RF loopback testing, see Page 69 (**loopback** NMS command) for additional information.

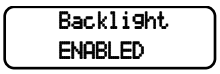
For the NMS command-line equivalent, see "loopback" on Page 69.

Built in Test
Start?

This menu is used to start the loopback mode to check radio functions. When conducting RF loopback testing, see Page 69 (**loopback**) for important information.

For the NMS command-line equivalent, see "test" on Page 83.

Front Panel

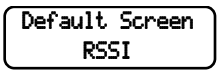


This screen provides control of the front panel LCD illumination. The LCD illumination may need to be enabled to view the LCD depending on ambient lighting conditions.

This screen allows you to adjust the viewing angle (top to bottom) of the LCD screen. The angle may need to be adjusted to compensate for the mounting position and ambient lighting conditions of the radio. Use the ◀ ▶ keys to adjust the screen. Pressing ENTER saves the adjusted value as the default setting.

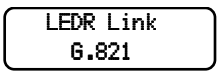
This screen allows the radio beeper to be disabled or enabled. The beeper provides a short “chirp” whenever a front panel key is pressed.

This screen allows you to set the time delay that occurs before a key will start repeating its function when held down.

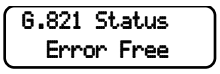


This screen allows you to set the default screen that appears when the radio is first turned on, or is left idle for more than 10 minutes. The RSSI screen is commonly chosen, but any screen may be selected as a default.

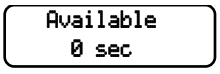
G.821



This menu contains radio link performance information. The G.821 standard defines descriptive words associated with bit-error rate performance. Refer to the ITU-T G.821 recommendations for definitions and standards.



This display shows summary information regarding the bit-error-rate (BER) status of the radio.



This screen shows the available seconds of the radio link. The G.821 standard defines Available Seconds as the period of time following a period of 10 consecutive seconds, each of which has a BER of less than $1x10^{-3}$.

This screen shows the unavailable seconds of the radio link. The G.821 standard defines Unavailable Seconds as the period of time following a period of 10 consecutive seconds, each of which has a BER of higher than $1x10^{-3}$.

This screen shows the errored seconds of the radio link. The G.821 standard defines Errored Seconds as a one second period in which one or more bits are in error.

Severely Erred 0

This screen shows the severely errored seconds of the radio link. The G.821 standard defines Severely Errored Seconds as a one second period that has a BER higher than $1x10^{-3}$.

Reset G.821? NO

This screen allows the user to reset the G.821 performance monitoring screens.

General

Unit ID 000

This menu allows the Unit ID of the radio to be displayed or changed. The Unit ID allows an individual radio to be signaled for Orderwire use.

For the NMS command-line equivalent, **see "unitid" on Page 86.**

Model Number LEDR 14005

This menu displays the radio model number. The user cannot change the radio type.

For the NMS command-line equivalent, **see "model" on Page 71.**

Serial Number xxxxxxxxxxx

This menu displays the radio serial number and matches the serial number on the chassis sticker. The user cannot change the radio's serial number.

For the NMS command-line equivalent, **see "sernum" on Page 81.**

Firmware Rev. xxxxxxx

This menu displays the firmware revision level of the internal radio software.

For the NMS command-line equivalent, **see "ver" on Page 87.**

Hardware Rev. xxxxxxx

This menu displays the hardware revision level of the main PC board in the radio.

For the NMS command-line equivalent, **see "ver" on Page 87.**

IO Configuration

Clock Mode
INTERNAL

This screen is used to set or display the data clocking method. For synchronization purposes, several different clocking schemes can be used. See “Transmit Clock Selection (Subrate Radios Only)” on Page 23.

For the NMS command-line equivalent, see “date” on Page 56.

NOTE: For subrate models: LEDR 400S/900S/1400S
Earlier versions of the software may display the Clock Mode as **NORMAL** instead of **INTERNAL.**

Interface
E1

This screen is used to set or display the payload data interface. The available selections are E1 and T1, depending on hardware configuration of the LEDR radio.

For the NMS command-line equivalent, see “interface” on Page 62.

CAS Enable
DISABLED

This screen is used to set or display the Channel Associated Signaling (CAS) status. The available selections are Enabled and Disabled.

This screen will only be functional in radios factory-equipped to support CAS. Consult the factory if you require this service.

For the NMS command-line equivalent, see “modem” on Page 72.

Line map
1a 2b 3c 4d

This screen is used to set or display the current span mapping configuration. The entry consists of from 1 to 4 alpha-numeric characters specifying line interface to span mapping. Valid numbers are 1–4. Valid span characters are a–d.

Example: Entering 1a 2b 3c 4d asserts the following:

maps line 1 to span a
maps line 2 to span b
maps line 3 to span c
maps line 4 to span d

For the NMS command-line equivalent, see “linemap” on Page 66.

Line Configuration

```
Choose Line 1
LINE1
```

This screen is used to choose or display the line (1-4) that is selected. This selection will be active for all of the screens that follow in the Line Configuration menu and will be displayed in the upper right hand corner of each screen.

For the NMS command-line equivalent, see "linename" on Page 67.

```
Frame Struct  1
FAS ONLY
```

This screen is used to set or display the span(s) frame structure. The allowable selections are shown in Table 11.

Table 11. Frame Structure—Allowable Selections

T1 Operation	E1 Operation
0–FT only (Default)	0–FAS Only (Default)
1–ESF	1–FAS + BSLIP
2–ESF + PRM	2–FAS + CRC
3–SF	3–FAS + CRC + BSLIP
4–SF + JYEL	4–FAS + CAS
5–ESF + CRC	5–FAS + CAS + BSLIP
6–ESF + CRC + PRM	6–FAS + CRC + CAS
	7–FAS +CRC + CAS +BSLIP

For the NMS command-line equivalent, see "fstruct" on Page 59.

```
AIS Generate 1
OFF
```

This screen is used to set or display the Alarm Indication Signal (AIS) status. It may be set to ON or OFF. When generation is enabled, fault conditions within the link or at the line interface will cause the appropriate AIS signaling to occur.

For the NMS command-line equivalent, see "ais" on Page 48.

```
AIS Forwarding 1
OFF
```

This screen is used to set or display the Alarm Indication Signal (AIS) forwarding status. It may be set to ON or OFF. When forwarding is enabled, AIS/RAI signaling at the line interfaces will be detected and passed to the other end of the radio link.

For the NMS command-line equivalent, see "ais" on Page 48.

Line Code 1
AMI

This screen is used to set or display the linecode used by the radio. The available selections are AMI or HDB3.

For the NMS command-line equivalent, see "linecode" on Page 66.

Reframe 1
3 cons. FAS

This screen is used to set or display the reframe criteria of the LEDR radio. The setting is based on the number of errors encountered. The available selections for T1 and E1 operation are listed in Table 12 below.

Table 12. Reframe Criteria Selections

T1 Operation	E1 Operation
2 out of 4 Fbit errors (Default)	3 consecutive FAS errors (Default)
2 out of 5 Fbit errors	915 CRC errors
2 out of 6 Fbit errors	

For the NMS command-line equivalent, see "reframe" on Page 76.

Pulse Shape 1
g.775

This command is used to select or display the pulse shape used with the data interface cable. Table 13 below shows the available selections for T1 and E1 operation.

Table 13. ITU Cable Specifications

Specification
g.775 (Default)
i.431

For the NMS command-line equivalent, see "line" on Page 65.

Cable Length 1
1-133 ft

This command is used to set or display the cable length being used for the data interface. The available selections are:

1 to 133 feet (Default)
133 to 266 feet
266 to 399 feet
399 to 533 feet
533 to 655 feet

For the NMS command-line equivalent, see "line" on Page 65.

Login

LEDR LINK
Login

The login menus allows you to log in to the radio's operating system and gain access to configuration and diagnostics functions permitted for your assigned access level.

Username
Admin

The username menu is where you specify the user name assigned by the user access administrator.

For the NMS command-line equivalent, see "login" on Page 68.

Password
******

The password screen is where you specify the password associated with your user name to gain access to the login account. A maximum of eight characters is allowed.

For the NMS command-line equivalent, see "passwd" on Page 73.

Logout

LEDR Link
Logout

The logout menu allows you to terminate your session with the LEDR radio. When this screen is displayed, press ENTER to finish your session.

Modem

Rx Lock
LOCKED

This menu indicates whether the receiver demodulator has detected a signal, acquired the carrier, and data rate, as well as achieved a Forward Error Correction (FEC) lock.

Freq. Offset
-170 Hz

This screen shows the frequency offset of the LEDR radio as measured in Hertz.

Corrected
0 bytes

This menu shows how many bytes have been corrected by the radio's FEC capability.

Uncorrectable
0 blocks

This menu shows how many frames (blocks) could *not* be corrected by the radio's FEC capability.

Bit Error Rate
< 1 x 10-6

This menu shows the current bit error rate (BER) of the LEDR radio.

Network

IP Address
000.000.000.000

This menu allows changes to the radio's IP address. The IP address is used for network connectivity. The IP address also allows new radio software to be downloaded over-the-air.

For the NMS command-line equivalent, see "ip" on Page 63.

Netmask
000.000.000.000

This menu allows the subnet mask to be viewed and changed. The subnet mask specifies which bits of the host IP address can be re-used for increased network addressing efficiency.

Example: Consider an IP address in a Class C network, such as 150.215.017.009. The Class C network means that the right-most group of numbers (009) identifies a particular host on this network. The other three groups of numbers (150.215.017) represent the network address.

Subnetting allows the further division of the host part of the address (right-most group of numbers) into two or more subnets. A subnet mask of 255.255.255.127 allows half of the host portion of the IP address to be reused to define sub-networks.

For the NMS command-line equivalent, see "ip" on Page 63.

Gateway
000.000.000.000

This menu allows the Gateway IP address to be viewed or set. The Gateway IP address is the address of the radio that connects the radio network to an IP network.

For the NMS command-line equivalent, see "ip" on Page 63.

Default IP Port
Ethernet

This menu allows selection of the Default IP port for networking connections to the LEDR radio. The **Ethernet** selection is used for cable connection to a Local Area Network (LAN) or repeater via the radio's rear panel ETHERNET connector.

The **AIR** selection is commonly used for over-the air (RF) networking between radios, but may also be used with a back-to-back cable connection between two radios via the radio's rear panel ETHERNET NMS connector. This type of communication uses the SNAP protocol and requires the use of an ethernet crossover cable.

For the NMS command-line equivalent, see "ip" on Page 63.

Orderwire

Send ODW Alert

This menu allows you to "ring" the Orderwire at a specified radio site. Refer to *USING ORDERWIRE* on Page 99 for instructions on using the Orderwire.

For the NMS command-line equivalent, see "alert" on Page 51.

Volume
■■■

This screen is used to set or display the Orderwire volume. Use the ◀ ▶ keys to adjust the screen. Pressing ENTER saves the adjusted value as the default setting.

For the NMS command-line equivalent, see "volume" on Page 88.

Vox Threshold
■■

This screen is used to set or display the Orderwire vox threshold (activation level). Use the ◀ ▶ keys to adjust the screen. Pressing ENTER saves the adjusted value as the default setting.

For the NMS command-line equivalent, see "vox" on Page 88.

Performance

The Performance menu items provide diagnostics information regarding the radio. The following diagnostic parameters are available on a continuous, updating basis:

- **RSSI—**Received Signal Strength Indicator
- **SNR—**Signal/Noise Ratio (not valid if there is an RX Alarm)
- **POUT—**Power Output
- **PA Temperature—**Power amplifier temperature

RSSI
-60 dBm

The RSSI display indicates the strength of the radio signal being received at the radio receiver. The measurement is in dBm. Therefore, an RSSI of –80 dBm is stronger than a –100 dBm signal.

For the NMS command-line equivalent, see "rssi" on Page 80.

SNR
+27 dB

The SNR display indicates the relationship of the amount of intelligence versus noise on the radio signal. The higher the SNR, the better the quality of the radio signal.

For the NMS command-line equivalent, see "snr" on Page 82.

Power Out
+30 dBm

The Power Output display indicates the transmitter power output in dBm. (+30 dBm is equal to 1.0 watt; +20 dBm is 100 mW.)

The power output level can be set from this display by pressing the ENTER key, and through use of the arrow keys, increase or decrease the power level. When the desired value is displayed, press the ENTER key to save the setting.

For the NMS command-line equivalent, see "rfout" on Page 77.

PA Temperature
+37 °C

The PA Temperature display indicates the internal temperature (degrees Celsius) at the hottest point on the radio's printed circuit board (near the power amplifier section of the radio).

For the NMS command-line equivalent, see "temp" on Page 83.

NOTE: It is normal for the PA temperature to be 30 to 40° C above the ambient room temperature.

Redundant

My Status
OK

This screen is used to display the status of the radio currently being used. "OK" is displayed when no problems are detected.

Sibling Status
OK

This screen is used to display the status of the "other" radio in a protected configuration (the one not currently being used). "OK" is displayed when no problems are detected.

Active
NO

This screen is used to set or display whether the currently selected radio is the active unit.

Mode 1 + 1 HOT

This screen is used to set or display the radio's redundancy mode. The available selections are: **1+1 HOT** (redundant hot standby), **1+1 WARM** (redundant warm standby) or **STANDALONE** (non-redundant) configuration.

Sibling IP 000.000.000.000

This screen is used to set or display the sibling radio's Internet Protocol (IP) address. (See note below.)

NOTE: The associated radio IP address should be programmed to the IP address of the other radio connected to the protected switching chassis. The associated radio IP address is used by the redundant radio to share information between the units. This address is necessary for proper operation. The associated radio IP address does *not* affect IP routing and forwarding, SNMP, or Telnet.

Hitless ON

This screen sets or displays whether the radio is set to perform error-free "hitless" switchover in the event of an alarm condition.

Default Radio Yes

This screen displays whether or not the radio is the default radio in a protected configuration. The default radio is determined by which one is connected to the top connector of the Protected Switch Chassis rear panel. (See Figure 12 on Page 17.)

Switch Xcvr Switch?

This screen is used to force a switchover to the non-active radio transceiver. (The newly selected unit becomes the active transceiver).

Remote Status

Remote UnitID <none>

This screen is used to set or display the unit identification for the remote radio.

RF Configuration

Tx Frequency

This menu is used to set or view the transmit (TX) frequency of the radio.

For the NMS command-line equivalent, see "freq" on Page 58.

`Rx Frequency`

This menu is used to set or view the receive (RX) frequency of the radio.

For the NMS command-line equivalent, see "freq" on Page 58.

`Tx Key Enable`

This menu is used to enable (key) or disable (dekey) the transmitter or to verify that the radio is keyed and the transmitter is active. The radio is normally keyed and transmitting whenever power is applied.

For the NMS command-line equivalent, see "txkey" on Page 86.

`Bandwidth`

This menu displays the bandwidth setting of the radio. The bandwidth is set at the factory and cannot be changed by the user. Refer to Table 9 on Page 22 for allowable combinations of bandwidth, data rates, and modulation types.

`Mod/Data rate`
`32-QAM 768 kbps`

This menu displays the modulation type and the aggregate link data rate. The available modulation types are QPSK, 16 QAM, and 32 QAM. The data rate can be changed, but is dependent on the modulation type. See "Bandwidths, Data Rates and Modulation Types" on Page 22.

For the NMS command-line equivalent, see "modem" on Page 72.

6.0 CONFIGURATION AND CONTROL VIA THE CONSOLE PORT

6.1 Introduction

The CONSOLE Port on the front panel provides full access to configuration and diagnostics information. It is the most common way to access the LEDR radio for its initial configuration. The CONSOLE Port is an EIA-232 connection that provides ASCII text communications to a connected terminal.

Most of the commands listed on the following pages are available through other communication channels. These include Ethernet, IP, Telnet and the rear panel Service Channel.

Refer to *I/O Connector Pinout Information* on Page 129 for connector wiring details.

NOTE: It is important to use a terminal or terminal-emulator that supports 80 characters-per-line and 25 lines-per-screen. The display will be distorted if terminals with different line characteristics are used.

6.2 Initial Connection to the CONSOLE Port

1. Connect a terminal to the front panel DB-9 connector labeled .
2. Open an ANSI terminal application on the terminal. (If using the Windows operating system, a HyperTerminal session can be started by selecting **Programs>>Accessories>>HyperTerminal.**)
3. Press **ENTER** a few times. When communications are established with the radio, an **LEDR>** text prompt appears on the terminal screen.
4. Type **login <your username>** (or **rlogin <your username>** for remote access) and press **ENTER** . At the **password>** prompt, type your password (Eight characters maximum; case sensitive).
5. You now have access to the command line interface. It can be used to configure and query the radio parameters and setup information. The available commands can be listed on the display by typing **help** at the **LEDR>** prompt, then **ENTER** .

6.3 NMS Commands

Once you are successfully logged in, the Network Management System (NMS) commands shown in Table 14 are available at the command line prompt (**LEDR>**) NOTE: Some commands are model and/or feature specific. (See Table 15 on Page 48 for Interface icons.)

Table 14. NMS Commands

Command	Description Summary	Details
?	Displays the available NMS commands. May also be entered after any other command to obtain context sensitive help. (Note: the word **help** may be entered in place of **?**).	Page 48
ais	Echoes/enables/disables Alarm Indication Signal (AIS) generation and Remote Alarm Indication (RAI) detection, AIS and RAI Signal (RAIS) forwarding on given span(s).	Page 48
alarm	Provides control of alarm outputs and displays state of alarm inputs.	Page 49
alert	Sends an alert sound to the specified radio	Page 51
arp	Set/display ARP Setting of Ethernet Port	Page 51
ber	Bit-Error Rate report for the RF link.	Page 51

Table 14. NMS Commands *(Continued)*

Command	Description Summary	Details
bert	Bit-Error Rate test of data interface	Page 52
boot	Displays the active image (firmware) or reboots the radio with a specified firmware image	Page 54
buzzer	Briefly sounds the radio's piezo buzzer to test its operation	Page 54
clkmode	Set/display data clocking mode	Page 54
coffset	Displays modem carrier frequency offset in Hz	Page 55
con	Set/display CONSOLE Port communications parameters	Page 56
config	Used to get or send a radio configuration file	Page 56
date	Set/display current date	Page 56
dtren	Set/display DTR enable	Page 57
ethernet	Displays Ethernet address	Page 57
events	Event log commands	Page 57
evmap	Set/display alarm port and alarm LED settings	Page 57
fec	Display corrected and Uncorrectable FEC errors	Page 58
freq	Set/display operating frequencies	Page 58
fset	Display absolute frequency limits	Page 59
fstruct	Set/display current span(s) frame structure	Page 59
g821	Show/Reset G.821 information	Page 60
group	Set/display network group	Page 60
help	Displays the available NMS commands. May also be entered after any other command to obtain context sensitive help. (Note: A question mark (**?**) may be entered in place of **help**).	Page 48
http	Check or boot the internal HTTP/IP server	Page 61
icopy	Firmware image copy	Page 61
idlepat	Set/display timeslot idle pattern	Page 61
info	Set/display radio/owner information	Page 62
interface	Set/display the payload data interface	Page 62
interleave	Set/display interleave depth	Page 63
ip	Set/display the radio's IP configuration	Page 63
iverify	Firmware image verify	Page 64
lcd	Tests radio's front panel LCD display	Page 64
led	Tests radio's front panel LEDs	Page 64
line	Set/display pulse shape settings	Page 65
linecode	Set/display the linecode used by span(s)	Page 66
linerr	Show/enable/clear line errors	Page 67
linemap	Set/display current linemapping configuration	Page 66
linename	Set/display names for line interfaces	Page 67

Table 14. NMS Commands *(Continued)*

Command	Description Summary	Details
log	View, sort, clear, send event log information	Page 68
login	Console user level access	Page 68
logout	Console user exit	Page 69
loopback	Set/display loopback modes	Page 69
model	Display radio model number	Page 71
modem	Set/display radio modulation type and data rate	Page 72
network	Display radios in the network	Page 73
passwd	Sets new user password (8 characters max.)	Page 73
ping	Test link to IP address on network	Page 73
pll	Displays Phase Lock Loop status	Page 74
pmmode	Enables/disables modem modulator power measurement mode (on/off)	Page 74
rdnt	Set/display redundant operating configuration	Page 74
reframe	Set/display the reframe criteria	Page 76
reprogram	Reprograms radio software	Page 76
rfocal	Set/display RF power output calibration sequence	Page 76
rfout	Displays transmit power	Page 77
rlogin	Log in to remote radio	Page 77
route	Add/delete/modify IP routing table entries	Page 78
rssi	Displays received signal strength	Page 80
rssical	Set/display RSSI calibration table	Page 80
rxlock	Displays current modem lock status	Page 81
sabytes	Echo/set sa bytes in E1 multi-frame	Page 81
sernum	Displays radio serial number	Page 81
snmpcomm	Set/display SNMP community names	Page 81
snr	Displays signal to noise ratio	Page 82
status	Displays performance and configuration data	Page 82
svch	Set/display Service Channel configuration	Page 82
telnetd	Displays or kills (terminates) Telnet session(s)	Page 82
temp	Displays PA temperature	Page 83
test	Runs self-test of LEDR hardware	Page 83
threshold	Set/display performance degradation threshold(s)	Page 83
time	Set/display system time	Page 84
timeslot	Selects which timeslots to transmit for a span(s). Default action is to enable.	Page 84
trapfilter	Set/display which events cause SNMP traps	Page 85
trapmgr	Set/display the trap manager IP address	Page 85

Table 14. NMS Commands *(Continued)*

Command	Description Summary	Details
trend	Displays continuously updated readings of: RSSI, radio temperature, RF output, signal-to-noise ratio, and FEC errors (corrected and uncorrectable)	Page 86
txkey	Key or unkey radio	Page 86
unitid	Displays the three-digit unit identification	Page 86
uptime	Displays how long the radio has been operating	Page 86
user	Administration tool for adding, modifying or deleting user accounts	Page 86
ver	Displays software version	Page 87
volume	Set/display orderwire handset volume	Page 88
vox	Set/display orderwire VOX threshold	Page 88
who	Displays the currently logged in radio users/accounts	Page 89

NOTE: The NMS commands listed in this manual show the full set of commands from all radio versions. Different hardware configurations may have fewer selections.

6.4 Command Detailed Descriptions

Introduction

The following commands are available through the CONSOLE Port. These commands all require the Enter or Return key be pressed after the command.

The following conventions are used to help describe the usage of the commands.

> Square brackets **[ ]** contain subcommands that may or may not be needed as part of the desired command. If there is more than one possible subcommand a vertical line **|** separates the commands within the square brackets. A subcommand is an optional extension of the command and changes the basic command.
>
> Angle brackets **<>** contain arguments. The arguments are values needed to carry out the command such as a frequency value or option.

Some commands are limited to use in certain radio models or configurations. These include subrate and fullrate. One or more of the symbols as listed in Table 15 will identify these commands.

Table 15. Symbols for Interface-Specific Commands

Symbol	Interface/Group
530	EIA-530
FT1	Fractional-T1/G.703
FE1	Fractional-E1/G.703
E1	E1/G.703

? or help

Help

Usage: **help**

This command returns a list of currently available commands. In addition, entering **help** as a subcommand before or after a command returns usage information regarding the command. A**?** (question mark) can be also be used to invoke help.

Command Example:

rssi help **ENTER**

Returns:

Usage: command [subcommand] <argument>

ais

Alarm Indication Signal

FT1
E1
FE1

Usage: **ais [linelist] [-g <on|off>] [-f <on|off>]**

This command enables or disables alarm signal generation [**-g**] and forwarding [**-f**] on specified E1/T1 interface lines. When generation is enabled, fault conditions within the link or at the line interface will cause the appropriate AIS/RAI signaling to occur. When forwarding is enabled, AIS/RAI signaling at the line interfaces will be detected and passed to the other end of the link.

Command Example:

ais -f on -g on

Returns:

AIS on RAI on

NOTE: For protected configurations and full-rate radios, disable the alarm generation through the use of the **ais -g off** command.

Background on AIS command:
In fractional operation, the radio extracts the required timeslots and data at the input to a link, and reconstructs the full frame at the output end. The **AIS <-g (generation)>** command, when enabled, allows the radio to override the frame reconstruction process in order to generate a proper all-ones alarm signal. For example, modem loss of synchronization will cause all-ones to be transmitted from the active G.703 ports. When **AIS <-g** is disabled, the output will consist of a framed signal with all-ones in the active timeslots. In Fractional operation, AIS generation also creates a yellow alarm/RAI back to the defective source when a problem is found at the input. In FE1 mode, when **AIS <-g** is enabled, loss of Multi-Framing Alignment Sequence (MFAS) at the line receiver will generate a Multi-frame Yellow Alarm (MYEL) or Multi-frame Remote Alarm Indication (MRAI) at the line transmitter.

AIS <-f (forwarding)> is the act of detecting a condition at the input and causing an appropriate response at the other end. For example, with forwarding enabled, an all-ones signal applied at one end causes all-ones to be output at the other. A Remote Alarm Indication (RAI) applied will likewise appear at the opposite end. Disabling the forwarding function limits the presentation of alarm signaling to the active timeslots at the remote end. It is recommended that the **ais -f on** or **ais --g on** command be used for Fractional operation, to enable alarm generation and forwarding.

In full-rate modes, the radio will always output AIS when the unit is unlocked—received radio signal is lost. When the modem is locked, and the input is removed from one end, you will get all-zeros at the other end unless AIS generation is enabled. Yellow alarms/RAI are not generated in the full-rate LEDR radio models; however AIS and RAI forwarding are available. It may be desirable to have alarms generated (**ais -g on)** in full rate models, depending on the user's requirements as outlined in the next paragraph.

Since the generation and forwarding operations require use of the Service Channel, the AIS/RAI response times are on the order of a few seconds. Generation and forwarding can be very helpful in correcting problems with the network when they arise. However, in systems where the response time is critical, these modes should be disabled: In fractional mode, enter **ais -f off -g off**. In full-rate mode, enter **ais -g off**.

alarm Alarm I/O

Usage: **alarm [in|out] [1-4|all] [subcommand] [arguments]**

This command is used to control the four (4) external alarm contacts and to display the state of the four (4) external alarm inputs.

Outputs (Relays)—Alarm outputs may be directly driven to a state, or be mapped to, internal events via the **evmap** command

(Page 57). When mapped to events, the active level may reprogrammed to be either active-open or active-closed. Active means that an event is mapped to an external alarm output that is currently active. (See “Alarm I/O” on Page 20 for electrical parameters and typical examples of alarm usage.)

Inputs—Alarm inputs are used to generate events in the event log and also generate SNMP traps if so programmed by the events filter command. They may be directly read via the **alarm** command, as well. They may also have their active level set to be either active high or low. (**alarm active high**; **alarm active low**)

Naming—Finally, both inputs and outputs may be named by users to allow for easy identification. For example, “Fire Alarm” could be used as the name for Alarm Input 1. Traps are sent with this name so that users may more easily identify the source of the alarm.

Subcommands:

active [open|closed]—Set alarm input/outputs active state.

set [open|closed] —Latch alarm outputs to one state to ignore events which are assigned to them.

name [name_string]—Create a user defined “name” for each alarm. 16 characters maximum, no spaces; not compatible with “**all**”.

Command Example #1:

alarm in all

Returns:

```
alarm:                                    Active  Current
alarm:    Type    #         Name          Level   Reading
alarm:   ======   =  ================   ======  =======
alarm:    Input   1  AlarmInput1        closed   open
alarm:    Input   2  AlarmInput2        closed   open
alarm:    Input   3  AlarmInput3        closed   open
alarm:    Input   4  AlarmInput4        closed   open
```

Command Example #2:

alarm out 2 set closed

Returns:

```
alarm:                                Active  Current
alarm:    Type    #         Name      Level   Reading
alarm:   ======   =  ================ ======  =======
alarm:   Output   2  AlarmOutput2     closed  closed
```

Command Example #3:

alarm in 3

Returns:

```
alarm:                                    Active  Current
alarm:   Type   #        Name             Level   Reading
alarm:  ======  =  ================      ======  =======
alarm:  Input   3  AlarmInput3           closed  open
```

alert Alert another LEDR Radio

Usage: **alert <3 digit unit ID>|all**

This command is used to sound the alert buzzer on another radio. This function allows you to signal a radio and alert someone that the Order-wire handset should be picked up.

The three-digit number following the command indicates the unit ID of the radio that will be signaled. Radios available for signaling can be determined by issuing the **network** command. See “USING ORDER-WIRE” on Page 99 for more information.

arp Address Resolution Protocol (ARP) Setting of Ethernet Port

Usage: **arp [-a | -s [ip address] | -d [ip address]**

- **-a** View the ARP table
- **-s** Add the IP address to the ARP table. The radio will proxy ARP for any addresses that are added
- **-d** delete the IP address from the ARP table

This command displays the contents of the radio’s ARP table, which is a listing of IP addresses of which the radio is aware. It can also be configured to “spoof,” or proxy, for other (non-LEDR radio) devices that are managed using the radio’s out-of-band Service Channel and directly connected at some point to a radio’s Ethernet port, or to a common hub with a LEDR radio. In other words, the radio network can be configured to allow seamless integration of other IP-manageable devices by responding to ARP requests and/forwarding IP traffic directed to those devices.

See the **route** command on Page 78 for information on other necessary configuration steps to allow for IP connectivity to LEDR radios and associated devices using the radio’s network-management channel.

ber Bit-Error Rate of the RF Link

Usage: **ber**

This command displays pre-FEC and post-FEC Bit-Error Rate (BER) between the LEDR radios in the first link.

NOTE: The BER measurement limit is 1E-8. For more reliable information on the link-error rate, use the **g821 demod** command.

---

bert Bit-Error Rate Test of Data Interface

FT1
E1
FE1

Usage: **bert [linelist] [-e [pattern] | -d | -i [error] | -lp | -le | stats]**

bert is used for diagnostic purposes by causing the selected line of the FT1/E1 interface port lines to output a user-selectable pseudo-random bit sequence, either framed or unframed. This command also allows the user to measure the bit error rate, number of errors, etc. This command tests all T1/E1 timeslots without regard to the timeslot command's configuration.

linelist—List of local line interfaces. Can be single line number or linename (see **linename** command), comma-separated list of line numbers or linenames, a range of line numbers (for example: 1-4), or if **linelist** is not given, all lines will be tested.

NOTE: The hyphen is part of the argument string and must be included for the command to function.

Subcommands:

Control—

-e Enable bert generation/monitoring for line(s)

Can be immediately followed by the test pattern index value (See **-lp** below). If none is included in the command, the last-used pattern will be implemented.

-d Disable bert generation/monitoring for line(s)

-i Inject error. Index specifying type of error to inject. If no error is specified, last error selected is used.

Reference—

-lp List available pseudo-random bit patterns
(See Table 16 on Page 52 for options.)

-le List available errors to inject
(See Table 17 on Page 53 for options.)

stats Display bert statistics

Table 16. Pseudo-Random Bit Patterns

Index	Description	Data Inversion
0	Unframed 2^11 (*Factory Default*)	No
1	Unframed 2^15	Yes
2	Unframed 2^20	No
3	Unframed 2^23	Yes
4	Unframed 2^11 with 7 zero limit	No

Table 16. Pseudo-Random Bit Patterns

Index	Description	Data Inversion
5	Unframed 2^15 with 7 zero limit	No
6	Unframed 2^20 with 14 zero limit (QRSS/QRS/QRTS)	No
7	Unframed 2^23 with 14 zero limit (non-standard)	No
8	Framed 2^11	No
9	Framed 2^15	Yes
10	Framed 2^20	No
11	Framed 2^23	Yes
12	Framed 2^11 with 7 zero limit	No
13	Framed 2^15 with 7 zero limit	No
14	Framed 2^20 with 14 zero limit (QRSS/QRS/QRTS)	No
15	Framed 2^23 with 14 zero limit (non-standard)	No

Table 17. Errors to Inject

Index	Description
1	CAS multiframe (MAS) pattern error (E1 only)
2	Fs (T1) or MFAS (E1)
3	PRBS error
4	Change of frame alignment, 1 bit minus
5	Change of frame alignment, E1, 1 bit plus
6	CRC6 for T1, CRC4 for E1
7	Frame bit error...Ft, FPS, or FAS bit error depending on current framer mode
8	Linecode violation

Background on BERT command:

The bit error-rate test command, **bert,** is used to evaluate the link between the LEDR data interface and the customer premises equipment (CPE). When used, the LEDR radio will send a test pattern out of the LEDR FT1/E1 Data Interface lines towards the CPE while simultaneously attempting to receive the same pattern back from the CPE. For example, you can loopback the CPE's external data device's I/O, then issue a **bert** command to the LEDR radio to check the integrity of the wire connection. The test pattern can be user-selectable. (See bert command Options above for further information.)

NOTE: The **bert** command will not test or evaluate the integrity of the LEDR radio link. (See "BENCH TESTING OF RADIOS" on Page 124 for further information.)

NOTE: When operating FT1 or FE1 interfaces, this command tests all T1/E1 timeslots without regard to the timeslot command's configuration.

boot

Boot from Active/Archive Software

Usage: **boot [<1|2|-s|-o>]**

This command is used to view or change the radio's active software image. If **boot** is entered alone, the currently active firmware image (1 or 2) is displayed. A selection of 1 or 2 after the command (e.g., **boot 2**) initiates a reboot from that image. (A message appears to confirm that you wish to reboot the radio firmware.) Upon reboot, the radio and all radio functions are restarted in a manner similar to turning the radio power off and then on again. The radio is taken out of service until it re-initializes, and the link loses synchronization until the reboot process completes and the demodulators at both ends reacquire the radio signals.

A choice of software images allows booting an alternate version of radio software. The ability to have two radio-resident software images allows radio software reprogramming over-the-air and the ability to restore operation to the original software if required.

Subcommands:

- **1** Boot from Image 1
- **2** Boot from Image 2
- **-s** Boot from the active (same) image
- **-o** Boot from the inactive (other) image

buzzer

Buzzer

Usage: **buzzer**

This command briefly sounds the radio's piezo buzzer for testing. It should be used only from the CONSOLE Port.

Example Response:

```
buzzer: Starting test
buzzer: Test complete
```

clkmode

530

Clock Mode (Subrate Radios Only)

Usage: **clkmode [<internal|exttx|looped|extdce>]**

This command displays or sets the source of the radio's transmit clock. For synchronization purposes, several different clocking schemes can be used. See "Transmit Clock Selection (Subrate Radios Only)" on Page 23.

Subcommands:

internal—Internal oscillator sources TC; RC derived from far end of radio link (default).
exttx—ETC accepted from external equipment on EIA-530 interface; RC derived from far end of radio link.
looped—Recovered RF (RX) clock; TC is synchronized to RC; RC is derived from far end of radio link. Note: Do not use looped clocks at both ends of any radio link.
extdce—ETC and ERC are accepted as inputs on the EIA-530 interface.

FT1
E1

NOTE: Earlier versions of the software may display the Clock Mode as **NORMAL** instead of **INTERNAL**.

Firmware Version 2.4.0 and Later – Use the **clkmode** command to determine which port has been selected to drive the timing at the interface.

Firmware Version 2.3.1 and Earlier – This command allows the various possible clock sources to be prioritized. As timing sources become available, the highest-priority source will be chosen by the system. If attaching to the network or equipment that provides timing, a universal form of the command would be **clkmode 1 2 3 4 internal**. If attaching to equipment that will provide looped-back timing, a universal form of the command would be **clkmode remote internal.** If both ends of the link provide looped timing, the internal clock source should be selected at one end by entering **clkmode internal.** Note that at least one end of the link should have either network or internal timing selected.

NOTE: Firmware versions 2.3.1 and earlier, require that this parameter be properly configured for correct operation of the link. More recent firmware versions do not require that this item be manually configured. However, the **clkmode** command may still be used to determine which port is being used to drive the timing.

Firmware Version 3.0.0 and Later– The **clkmode** command applies only to the EIA-530 interface.

coffset

Carrier Offset of Radio Modem

Usage: **coffset**

This command displays the Modem Carrier Frequency Offset.

con Console port configuration on LEDR front panel

Usage: **con (baud [300|1200|2400|4800|9600|19200|38400|115200]) (parity [none|even|odd])**

This command sets or displays the CONSOLE Port's operating parameters. The CONSOLE Port data rate is set or displayed using the **baud** subcommand. The parity is set or displayed using the **parity** subcommand.

The default setting is 9600 bps, no parity, 8 data bits and 1 stop bit.

config Configuration

Usage: **config [get|send|getall] [filename|console] [hostIP]**

This command is used to get or send a radio configuration file.

The radio stores its configuration data in a file that you can download using the **config send** command. The output can be directed to a file or to the NMS window, either in a Telnet session or a serial NMS session. The **config send** command allows sending the configuration file over the Ethernet management channel and storing it on a PC running a TFTP server.

Subcommands:

send—Upload entire radio configuration file to host (includes all radio-specific data)
get—Download radio configuration file from host (DOES NOT download radio-specific data)
getall—Download entire radio configuration file from host (including all radio-specific data)

Radio-specific data includes IP address, network settings, frequencies, target power thresholds, calibration data, and IP routing table.

Command Example: **config send config.txt 192.168.1.14**

This sends the configuration file to a TFTP server running on host 192.168.1.14 and stores it as a file called config.txt.

date Date

Usage: **date [MM/DD/YYYY]**

This command sets or displays the date and time of the radio's internal real-time clock. The real time clock operates from an internal lithium battery so it is running even if the radio has no DC power connected. The date format may also be set or displayed from this screen for one of three formats: U.S., European, or generic.

The real time clock is fully compliant with year 2000 standards.

Subcommands: **date format [<1-3>]**

Date Format 1: mm/dd/yyyy (All numbers)

Date Format 2: dd/mm/yyyy (All numbers)

Date Format 3: dd-MON-yyyy (English abbreviation of month)

Example Response: **date: 07-JUN-1999 08:11:30**

dtren DTR Handshaking

Usage: **dtren [<on|off>]**

The **dtren** command sets or displays the status of the DTR (handshaking) input.

Example Response: **dtren: on**

ethernet Ethernet Port's Hardware Address

Usage: **ethernet**

This command displays the fixed hardware address of the radio's Ethernet port. This address is globally unique; it is assigned at the factory and cannot be changed.

events Events

Usage: **events [subcommand] [<arguments>]**

Subcommands:
pending
filter [event#] [count]
init
desc [<event#>]

This command allows viewing the pending events (**pending**), suppressing the notification of particular events (**filter**), initializing events processing (**init**) and display of event descriptions (**desc**). To turn off logging (notification in the event log) for a particular event, the filter count value should be set to zero.

Events 135-138 are **remote alarm in [1-4]**, respectively, which reflects the event state of the **alarm in [1-4]** of the remote-located radio at the other end of the RF link.

Example Response:

events {events}: -DEMOD_ACQUISITION (Event #27)
events: Event#0 Filter count=1
events {init}: The event log has been re-initialized
events {desc}: Event#40 Description-
IO2_DIG_REM_LPBACK

evmap Event Mapping (for Alarm Output and LEDs)

Usage: **evmap [subcommand] [event #] [arguments]**

This command sets or displays which radio system events cause alarm indications on the front panel LEDs or the rear panel ALARM I/O connector. The user can rename the alarm events, but they cannot be deleted, nor can new ones be created.

The subcommands specify which output will be asserted (**led** or **aout**) upon occurrence of an **event #**. Multiple outputs can be specified with spaces between them. The **dump** option allows determining the current event mapping for all of the events or, optionally, a specified numeric range of events.

Events 135-138 are **remote alarm in [1-4]**, respectively, which reflects the event state of the **alarm in [1-4]** of the remote-located radio at the other end of the RF link. Use the event filter counter to enable each particular event. Use **evmap** and map to alarm output contact when necessary.

Subcommands:

led [ioalarm|txalarm|rxalarm|alarm|none]—Maps front panel LED(s) to an event.
aout [none|1|2|3|4]—Maps an alarm output(s) to an event.
dump [<range>]—Display the LED and alarm output mappings for all events.

Example Response:
evmap: Event #0 LED alarm
evmap: Event #0 Alarm Output NONE

See Figure 8 for reference to the Front Panel LEDs. Refer to *Alarm—Rear Panel* on Page 131 for the pinouts of the ALARM I/O connector and *Disabling the Front Panel Alarm LED for Unused E1 Option Ports* on Page 89 for further information.

fec Forward Error Correction Statistics

Usage: **[fec <clear>]**

This command displays corrected bytes and uncorrectable FEC block errors.

Example Response:
fec: 1812992 Correctable Bytes
fec: 2 Uncorrectable Blocks

freq Frequency (of TX & RX Channel)

Usage: **freq [<tx|rx>] [<freq>] [<freq>]**

This command sets or displays the transmit and receive frequency.

Example Response:
freq {TxFreq}: 942175000 Hz
freq {RxFreq}: 944175000 Hz

fset Frequency Setting

Usage: **fset [<min freq>] [<max freq>]**

This command sets the absolute frequency limits of the transmitter and receiver.

Example Response
```
fset {Tx MinFreq}: 1350000000 Hz
fset {Tx MaxFreq}: 1535000000 Hz
fset {Rx MinFreq}: 1350000000 Hz
fset {Rx MaxFreq}: 1535000000 Hz
```

fstruct Frame Structure

FT1
E1
FE1

Usage: **fstruct [linelist] [mode <0-7|none>]**

This command is used to set or display the span(s) frame structure. The **[linelist]** variable represents a list of line interfaces. This entry can be either a single line number or line name (see **linename** command), a comma-separated list of line numbers or line names, a range of line numbers (i.e., 1-4), or if **linelist** is not given *all* lines.

In general, this parameter should be configured to match the frame structure used by the customer premises equipment. The **fstruct** command also controls the generation of performance report messages in ESF modes. In E1 radios, an unframed mode is available by issuing the command **fstruct mode 8.**

In Fractional-E1 mode timeslot 0 is always sent, and for fstruct modes 4 through 7, timeslot 16 must be added to the payload list for proper operation.

Table 18 shows a list of line mode values for T1 interfaces and Table 19 for E1 interfaces.

Table 18. T1 Frame's Line Mode Values

Value	Mode
0	FT only (default)
1	ESF
2	ESF + PRM
3	SF
4	SF + JYEL
5	ESF + CRC
6	ESF + CRC +PRM

Table 19. E1 Frame's Line Mode Values

Value	Mode
0	FAS only (default)
1	FAS + BSLIP
2	FAS + CRC
3	FAS + CRC + BSLIP
4	FAS + CAS
5	FAS + CAS + BSLIP
6	FAS + CRC + CAS
7	FAS + CRC + CAS + BSLIP
8	Raw, unframed, transparent mode.

g821 G.821 Information

Usage: **demod io1|io2|io3|io4|all [clr]**

This command is used to show or reset the radio's G.821 information.

The LEDR family of radios support the ITU G.821 recommendation for display of four categories of statistical availability information: available seconds, errored seconds, severely errored seconds, and unavailable seconds.

Example Response:
Demodulator: ERROR FREE
Savail: 1036
Sunavail: 0
ES: 0
SES: 0

group Group Number in LEDR System

Usage: **Group [<0-99>]**

This command sets or displays the network group in which the radio is operating.

Example Response: **group: 1**

In a typical system, all the radios would operate in the same group, allowing the flow of network-management and orderwire activity between radios and from one radio link to any other in the system. At a repeater site, all radios must be set to the same "group number" (and not group zero) for this flow of information to take place. Setting group numbers differently in repeater systems isolates links from each other from a network-management perspective, allowing segmenting networks and controlling the flow of network-management information. Across a radio link, groups can differ from each other; only radios physically connected by Ethernet cables to each other or to the same hub must have the same group number to intercommunicate.

Setting a radio's group to zero prohibits *all* network management traffic from flowing to and from that radio's Ethernet port.

help or?

Help for Users

Usage: **help**

This command can be used alone, to list all available commands, or with a specific command, to provide syntax assistance. Entering **help** before or after a command will display the usage and possible subcommands of the command. The character**?** may also be used to obtain help.

http

HTTP Server in LEDR Radio

Usage: **http**

Displays the status of the radio's internal HTTP server accessible through the radio's ETHERNET Port. The HTTP server supports browser-based management. Use the **http** command by itself to verify the server is running and **http start** command to reboot the server.

icopy

Image Copy

Usage: **icopy [<app|dsp|fpga|scripts>]**

This command is used to copy the active software image to the inactive software image.

Each radio stores two independent firmware files that control the radio's operation. The radio uses one of the files as the active software, which is running. The other software file is inactive and is not running. The ability to have two firmware images allows firmware reprogramming to be done over-the-air and provides the ability to restore operation to the original software if required. The **icopy** command allows copying all, or a selected subset, of the regions of the active image to the inactive image area. This is typically used to update the inactive image after loading new firmware and rebooting the radio from the new image.

To view or change the active firmware image see "boot" on Page 54.

idlepat

Idle Pattern

FT1
E1
FE1

Usage: **idlepat [<linelist>] [slots <slotlist>] <pattern>**

This command is used to set or display the bit-pattern used in the idle timeslots. Some equipment requires a particular pattern. To set the bits to all ones, use the command **idlepat ff**. To set the bits to a zero followed by seven ones, use the command **idlepat 7f**. This command does not apply to subrate models.

Argument Definitions:

linelist—Represents a list of line interfaces. It can consist of a single line number or linename, a comma separated list of line numbers or line names, a range of line numbers (i.e., 1–4) or, if linelist is not given, all lines. See Table 18 on Page 59 for a list of line numbers.

slotlist—A list of timeslots consisting of a single slot number, comma separated list of slot numbers, or a range of slot numbers (i.e., 2-8).

pattern—A 2 hex digit value (default value is 17).

info

Information as Selected by User

Usage: **info [<owner|description|contact|name|location>] [<string>]**
info clear [<owner|description|contact|name|location>]

This command is used to program information into (or clear it from) radio memory that is particular to the radio site or installation. The information is intended for identification and memorandum needs.

Five text fields are provided. The owner's name string is limited to 10 characters. The description, contact, location, and name text fields are limited to 254 characters. Any standard, printable ASCII characters are allowed. The description field is programmed at the factory and is not user-definable.

To display the owner's name text field enter **info owner**. To display the contact information enter **info contact**. To display the name information enter **info name**. To display the location information enter **info location**.To display all the parameters enter **info**.

To change the info text, enter text after **info owner** or other info field name.

interface

Interface for User Data

530
FT1
E1
FE1

Usage: **interface [e1|t1|530]**

This command is used to set or display the payload data interface. If an optional data interface board is installed, the user may select between the T1 or E1 interface modes. The system will recommend a reboot and provide a prompt to do so.

Example Response:

interface {Line}: e1

NOTE: 1E1 through 4E1 data rates are not supported when using the EIA-530 interface. The maximum EIA-530 data rate is 768 kbps.

interleave Interleave

Usage: **interleave [1-12]**

This command is used to set or display the interleave depth. Range: 1–12. Default: 12. (Actual values are 1, 2, 3, 4, 6 and 12.) The interleave setting must match at both ends of a radio link, or the link cannot synchronize regardless of any other radio settings or signal strength. Larger interleave settings cause longer link latency; in latency-sensitive applications, interleave value should be reduced to as small a value as is possible while maintaining good link performance (See the **g821 demod** command).

Example Response:

interleave: 1

Background:

In digital communications, interference often occurs in the form of short noise bursts. These bursts normally corrupt a series of consecutive bits.

Interleaving is a digital algorithm that allows Forward Error Correction (FEC) to better handle bursts of noise. Interleaving reorders the data so that the symbols that would normally be neighbors in a given block are spread among multiple blocks. FEC works on a block of data of a specific size and can properly correct errors as long as the number of errors is small enough. With interleaving, the number of errors that occur within a single block is reduced, thereby allowing the FEC to more effectively correct burst errors.

The value of the interleaver function should not be changed unless there are latency limitations for the radio link. If low latency is required, then the interleave can be changed, but the ability to correct for the influence of burst-noise on the BER will be reduced.

ip Internet Protocol Settings

Usage: **ip [subcommand] [<argument>]**

Subcommands:

address [x.x.x.x]
netmask [x.x.x.x]
gateway [x.x.x.x]
IP port [ETH|AIR]

This command sets or displays the Internet Protocol (IP) settings for the LEDR radio. The subcommands allow you to set the IP **address**, IP **netmask**, IP **gateway**, or **IP port**. The port setting determines whether IP communication to and from a particular radio occurs over the radio link or via a PC (or other networked device, such as a router) directly connected to the radio's ETHERNET port. See "Network" on Page 39 for additional information.

Example Response:

IP Address: 10.2.142.143
IP Netmask: 255.255.0.0
IP Gateway: 0.0.0.0
IP Port: ETH

iverify Image Integrity Verification

Usage: **iverify [image <1|2>] [<app|dsp|fpga|scripts>]**

This command is used to determine the data integrity of the two firmware image files that reside in the radio. (See also **icopy**, above.)

Example Response:

iverify: Image has been verified

lcd Liquid Crystal Display Test

Usage: **lcd [<on|off|restore>]**

This command starts a two-part test of the radio's front panel LCD. When **lcd** is first entered, the display should appear with all blocks black. When the **RETURN** key is pressed, the screen should change to completely blank.

led Light Emitting Diodes (LEDs on Front Panel)

Usage: **led [<alarm|rxalarm|txalarm|ioalarm|all|restore>] [<on|off>]**

This command is used to test the front panel LEDs. If no argument is given, all front panel LEDs (except POWER) should flash in sequence. Press Control-C to end the test. (See "Disabling the Front Panel Alarm LED for Unused E1 Option Ports" on Page 89 for further information.)

Command Example:

led alarm on

Returns:

led: Alarm LED ON

line

Attributes of lines (cables) used with the LEDR's T1 or E1 Interface.

FT1
E1
FE1

This command is used to set or display the internal pulse template selection used by the LEDR interface to compensate for signal distortion created by various lengths and types of interface cables.

The **[linelist]** variable represents a list of line interfaces. It can consist of a single line number or line name, a comma-separated list of line numbers or line names, a range of line numbers (i.e., 1–4), or if linelist is not given all lines will be displayed. See Table 18 on Page 59 for a list of line numbers.

FT1

Usage For T1: **line [linelist] [cable length<0–4>] [spec]**

T1 interfaces require setting of a minimum of two variables: cable length and ITU cable specification. Table 20 show specification options and Table 21 the lists values used for various lengths of standard 100 Ω twisted pair cables.

Table 20. ITU Cable Specifications—Subcommand [spec]

Specification
g.775 (Default)
i.431

Table 21. T1 Cable Length Values—Subcommand [cable length]

Value	Line Length (Meters)	Line Length (Feet)
0	0.3 to 40 (Default)	1 to 133 feet (Default)
1	40 to 81	133 to 266 feet
2	81 to 122	266 to 399 feet
3	122 to 163	399 to 533 feet
4	163 to 200	533 to 655 feet

E1
FE1

Usage For E1: **line [linelist] [spec]**

The only cable specification needed for E1 is the ITU cable type.

Table 22 lists values used for various specifications for standard 120 Ω ITU-T G.703 cables.

Table 22. E1 Cable Specifications—Subcommand [spec]

Specification
g.775 (Default)
i.431

Command Example:

```
LEDR> line
```

Returns:

```
line {LINE1} {cable}: ITU-T G.703 120 Ω Twisted Pair
        {spec}: i.431
line {LINE2} {cable}: ITU-T G.703 120 Ω Twisted Pair
        {spec}: g.775
line {LINE3} {cable}: ITU-T G.703 120 Ω Twisted Pair
        {spec}: g.775
line {LINE4} {cable}: ITU-T G.703 120 Ω Twisted Pair
        {spec}: g.775
```

linecode

Line Code

FT1
E1
FE1

Usage: **linecode [linelist] [B8ZS|AMI|HDB3]**

This command sets or displays the radio's linecode (T1: B8ZS or AMI; E1: HDB3 or AMI).

The **[linelist]** variable represents a list of line interfaces. It can consist of a single line number or line name, a comma-separated list of line numbers or line names, a range of line numbers (i.e., 1–4), or if linelist is not given all lines will be displayed. See Table 18 on Page 59 for a list of line numbers.

The most typical Fractional-T1 selection is to choose B8ZS for all ports by entering **linecode b8zs** and E1 interfaces choose HDB3 for all ports by entering **linecode hdb3.**

Example Response:

```
linecode: HDB3
```

linemap

Line Mapping

Usage: **linemap [maplist]**

FT1
E1
FE1

This command is used to set or display the current span mapping configuration for E1 and T1 configurations. The **maplist** variable consists of from 1 to 4 alpha-numeric characters specifying line interface to span mapping. Valid numbers are 1–4. Valid span characters are a–d.

Example: Entering **linemap 1d 2b 3a 4c** causes the following:

maps line 1 to span d
maps line 2 to span b
maps line 3 to span a
maps line 4 to span c

Figure 16 shows the example pictorially. There are no restrictions of which lines are mapped to which data channel spans.

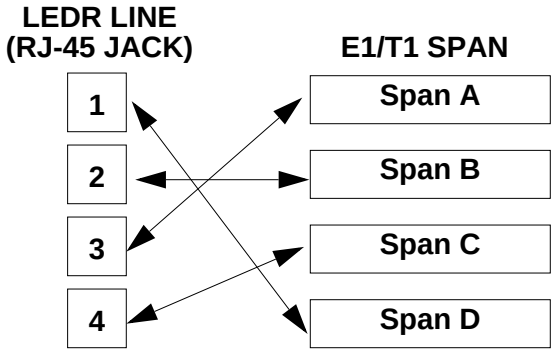


Figure 16. Example of Linemapping

NOTE: The cluster of four RJ-45 jacks on the rear of the radio is coded from left to right as 1, 2, 3 and 4 as viewed from the outside of the chassis.

linename Line Name

FT1
E1
FE1

Usage: **linename <linelist> <namelist>**

This command is used to set or display meaningful names of up to 16 characters to the four possible line interfaces.The **[linelist]** variable represents a list of line interfaces. It can consist of a single line number or line name, a comma separated list of line numbers or line names, a range of line numbers (i.e., 1–4) or, if linelist is not given, *all* lines. See Table 18 on Page 59 for a list of line numbers.

The namelist variable consists of a list of names. It can consist of a single name or a comma/whitespace-separated list of names. Names can be up to 16 characters long.

linerr Line Errors

Usage: **linerr [linelist] [on|off]**

FT1
E1
FE1

This command measures and displays the line performance between the radio and customer equipment. Entering the command **linerr on** will initialize the line error measurement feature. The **[linelist]** variable represents a list of line interfaces. It can consist of a single line number or line name, a comma-separated list of line numbers or line names, a range of line numbers (i.e., 1–4), or if linelist is not given all lines will be displayed. See Table 18 on Page 59 for a list of line numbers.

log

Log of Events

Usage: **log [subcommand] [<argument>]**

Subcommands:
view [critical|major|minor|inform]
clear
send [filename] [hostIP]

This command is used to display and manage the event log file. Without a subcommand, the complete log file will be displayed one page at a time. If you are interested in less than the full report, use one of the following subcommands:

view—Sets or displays the types of events to be displayed.

clear—Resets the event log and purges all events from memory.

send—Uploads the event log information to an IP address using TFTP protocol in a way similar to the **config** command. (See config command on Page 56.)

NOTE: When setting up a link for the first time, after powering up the unit, you may want to clear the event log. After logging in as **SUPER**, enter the command **log clear**.

login

Log Into the CONSOLE Port

Usage: **login [username]**

This command allows access to configuration and diagnostics information as allowed by the radio system administrator. You can shorten the login sequence by following the **login** command with the user/account name (**username)**.

Example:

LEDR> login

Returns:

Username>

Type: **fieldserv** (or appropriate user name)

Returns:

Password>

Type: (password)

NOTE: User names and passwords must not exceed eight characters and are case sensitive. Do not use punctuation marks.

See **user** command on Page 86 for more information on user access levels.

NOTE: Only one user can be logged in through the CONSOLE Port at a time. Any new login will close the previous user/account. Other users can login simultaneously through the ETHERNET Port or front panel.

---

logout

Logout

Usage: **logout**

This command is used to log out a user.

Subcommands:

loopback

Loopback Functions

The **loopback** command is used to set or display the loopback mode that can be used for diagnostic purposes. Entering **loopback** without any parameters displays the current loopback mode.

Various data loopback modes can be used for diagnostic purposes. To loop back Line Interface 1 towards itself, use **loopback iol 1**. To loop back all line interfaces towards themselves and test the T1 option, use **loopback local**. To loop back all data at the remote site towards the RF path, use **loopback remote.**

Entering **loopback** without any parameters displays the current loopback mode.

Usage 1 for Fractional-T1:

loopback [none|rf|local|remote|iol [linelist]|ior [linelist] <timeout>]

Usage 1 Subcommands:

iol—The **iol** subcommand, for "I/O local," refers to the *local* line loopback.

FT1
E1
FE1

local—Enables a local digital loopback mode. With this test, incoming bits on the EIA-530 interface are sent back out the radio's DATA connector before the modem module. This can be used to verify proper interconnection between the radio and the connected equipment. None

of the radio's RF circuitry is involved in this test. (This description covers only EIA-530 operation.)

For T1/E1 operation, the **local** subcommand enables a local digital MUX loopback in the radio transceiver's FT1 Interface Board before going out to the main transceiver board.

none—Disables all loopback operation. This is the mode for normal point-to-point operation.

remote—*EIA-530 Operation:* Instructs the radio at the other end of the link to "echo" all of the data it receives. This is an effective way of testing the entire communications system, including the transmission path over the air. (In the event of a communications failure with the remote radio, the message "Remote Error" is displayed, and no loopback mode is selected.

T1/E1 Operation: The **remote** subcommand mimics the **ior** subcommand described below.

rf—Enables an RF loopback mode. This mode allows testing of the local radio transceiver's transmit and receive chain.

NOTE: RF loopback testing is a valuable diagnostic tool, but it should not be considered an exhaustive test of the transceiver. In some cases, interaction between the transmit and receive phase-locked loops (PLLs) can occur, causing erroneous results during testing. Changing the transceiver's RF output setting may resolve these problems. Also, in some configurations, insufficient signal strength for RF loopback testing may exist.

In addition, on all LEDR radios except the LEDR 1400 Series, the transmit and receive frequencies must be within the same subband for RF loopback to function.

Variables:

ior—An abbreviation for "I/O remote", refers to the *remote* line loopback. Remote loopback port selection is relative to the local port. The radio link will translate any line mapping to select the correct physical remote port to loop back, based on the selected local port.

linelist—Represents a list of local line interfaces. It can consist of a single line number or line name, a comma-separated list of line numbers or line names, a range of line numbers (i.e., 1–4), or if linelist is not given *all* lines. See Table 18 on Page 59 for a list of line numbers.

timeout—The **timeout** variable may be set between 0 minutes (never time out) and 60 minutes.

FT1
E1
FE1

Usage 2: **loopback [inb|outb] [linelist] [on|off] [-u <code>] [-d <code>]**

Usage 2 (E1) subcommands:

inb—Refers to the *inband* loopback configuration.

outb—Refers to the *outband* Extended Super Frame (ESF) loopback configuration.

linelist—Represents a list of local line interfaces. It can consist of a single line number or line name, a comma-separated list of line numbers or line names, a range of line numbers (i.e., 1–4) or, if linelist is not given, *all* lines. See Table 18 on Page 59 for a list of line numbers.

on|off—To turn the loopback feature on or off.

-u <code>—Allows setting of the inband|outband loopback *upcode*.

The inband code consists of 1-7 bits, binary format.

Example: 00001

-d <code>—The subcommand allows setting of the inband|outband loopback *downcode*.

The outband code consists of 6 bits within the 16 bit ESF data link codeword.

Example: 000111
within 16 bit codeword: 0<000111>0 11111111

model Model Number

Usage: **model**

This command displays the radio model number. This information is programmed at the factory and cannot be changed.

modem Modem

Usage: **modem [matrix id] [+cas]**

This command sets or displays the radio modem modulation type and data rate. Table 23 shows the alphanumeric codes that can be entered for fullrate radios and Table 24 for codes for subrate radios. Note that the E1 selections are only valid on fullrate radios.

Table 23. Modem Command Arguments for E1 (Fullrate) Radios[1]

	DATA RATES			
Modulation Type	**1xE1**	**2xE1**	**3xE1**	**4xE1**
QPSK	A7	—	—	—
16 QAM	B7	B8	—	—
32 QAM	C7	C8	C9	C10

1. The available selections depend on the radio's factory programmed bandwidth. See Table 9 on Page 22 for the allowable combinations of bandwidth, data rates and modulation types.

Table 24. Modem Command Arguments for EIA-530 & FT1 (Subrate) Radios[1]

	DATA RATES					
Modulation Type	**64 kbps**	**128 kbps**	**256 kbps**	**384 kbps**	**512 kbps**	**768 kbps**
QPSK	A1	A2	A3	—	—	—
16 QAM	B1	B2	B3	B4	B5	B6
32 QAM	—	—	—	—	—	C6

1. The available selections depend on the radio's factory programmed bandwidth. See Table 9 on Page 22 for the allowable combinations of bandwidth, data rates and modulation types.

Command Examples:
To set 32 QAM with 1xE1, enter **modem C7**
To set 16 QAM/384 kbps, enter **modem B4**

Special-Order Argument

NOTE: The **cas** command functions only in radios equipped with either the FT1 or FE1 Interface and user firmware of revision 3.0 or higher.

FT1
FE1

cas—Set or display the Channel Associated Signaling (CAS) status for Fractional-T1 or Fractional-E1 operation. The available selections are **modem +cas** (on) and **modem -cas** (off). This command provides for FT1 Robbed-Bit Signaling bits to pass over the link. In the FE1 case, this command, in conjunction with the **fstruct** command, ensures the proper handling of the timeslot 16 signaling bid.

network

Network

Usage: **network**

This command displays the radios that can be reached via the Service Channel for Orderwire and Element Management System (EMS) diagnostics.

Example Response:

Network Address	Netmask	RF Hops	Ethernet Hops	Received on Port	Owner
10.2.142.148	255.255.0.0	0	0	LPBK	Tech Serv 1
10.2.200.196	255.255.0.0	1	0	AIR	Tech Serv 2

passwd

Password

Usage: **passwd**

This command is used to change the password for the user currently logged in. A maximum of 8 characters is allowed, and it is case sensitive.

ping

Ping IP Address (Send ICMP Echo Request)

Usage: **ping [ip address] [reps]**

This command is used to verify the accessibility of any IP address on the network to determine availability and measure network response time. This commands requires proper IP Routing and IP connectivity.

ipaddress—IP address to which you will send the request

reps - Number of requests-to-send (default = 1, max = 1000)

Example:

```
LEDR> ping 10.2.233.12 5
```

Example Response:

```
PING 10.2.233.12: 56 data bytes
64 bytes from 10.2.233.12: seq=1, ttl=255, rtt=49ms
64 bytes from 10.2.233.12: seq=2, ttl=255, rtt=6ms
64 bytes from 10.2.233.12: seq=3, ttl=255, rtt=9ms
64 bytes from 10.2.233.12: seq=4, ttl=255, rtt=33ms
64 bytes from 10.2.233.12: seq=5, ttl=255, rtt=12ms
```

pll Phase Locked Loop

Displays several key frequency control parameters, including the Minimum frequency step, the reference frequency, oscillator output, current TX & RX frequencies, and TX/RX PLL status.

Example Response:

```
pll:

Min Freq Step = 25000 Hz, Reference = 400000 Hz, ICPO = 1600 uA
Tx Freq = 438075000 Hz, Rx Freq = 428075000
Tx PLL Status: Locked
Rx PLL Status: Locked
```

pmmode Power Measurement Mode

Usage: **pmmode <on|off>**

This command is used to generate an unmodulated carrier on the transmitter frequency for the purpose of measuring RF output power or frequency stability using a spectrum analyzer.

Example Response:

```
pmmode: off
```

NOTE: Enabling the power measurement mode (**pmmode on**) will take the local link down (out-of-service).

rdnt Redundant (Protected Operation)

The **rdnt** command is used to manage protected operation of the LEDR radio and display operating status.

Usage: **rdnt [subcommand] [arguments]**

Subcommands:	**active**
	default
	hitless
	ip
	mode
	nsd
	status
	swxcvr
	temp
	mode

The following subcommands are divided into two groups: read only and read and set.

Read Only

active—Shows whether the currently selected transmitter is active or inactive.

default—Displays whether the radio is the default radio in a protected configuration.

status—Protected status of this radio and the sibling radio.

Read & Set

hitless—Sets or displays the hitless (error-free) switching status of the receivers. It can be enabled or disabled using the **hitless on|off** command. In protected operation, either receiver (regardless of which transmitter is active) can provide data to the user data port(s) in hitless mode. In non-hitless mode, only the receiver in the active radio provides received data. Radios operated in a space-diversity configuration must be configured to use hitless switching.

ip—Used to set or display the IP address to be kept in the memory of this unit of the associated (sibling) radio in a redundant pair of transceivers. In other words, the **rdnt ip** setting of the top radio in a protected pair must be set to the bottom radio's IP address for proper switching and network-management functionality.

NOTE: The associated radio (sibling) IP address should be programmed to the IP address of the other radio connected to the Protected Switch Chassis. The associated radio IP address is used by the redundant radio to share information between the units. This address is necessary for warm-standby switching. The associated radio IP address parameters do not affect IP routing and forwarding, SNMP, or Telnet.

The **rdnt swxcvr** will not operate correctly if this parameter is not set correctly.

---

mode [#]—Set or display one of three redundant operation modes (**0** = Standalone, **1** = 1+1 Hot Standby, **2** = 1+1 Warm Standby).

status—Shows the state of both radios. Two status lines are displayed; **This Radio** and **Other Radio**.

swxcvr—Forces a switchover to the inactive radio transceiver. (The newly selected unit becomes the active transceiver.) The **rdnt ip** parameter must be configured correctly on both radios in order for the **swxcvr** command to operate correctly.

NOTE: The **rdnt swxcvr** command should not be used within 2 minutes of a power-up to ensure reliable communications exist between the two transceivers.

---

temp—Set or display an over-temperature threshold (final amplifier temperature in degrees Celsius), at which temperature switchover to the other radio occurs.

nsd—Enable or disable network self-discovery between the units in a protected pair

Example Response for **rdnt** command:

```
rdnt {status}: This Radio = OK
rdnt {status}: Other Radio = OK
rdnt {active}: inactive
rdnt {mode}: 1+1 Hot Standby
rdnt {ip}: 10.2.233.12
rdnt {hitless}: on
rdnt {default}: no
rdnt {temp}:    50
rdnt {nsd}:     on
```

reframe

Reframe Criteria for User Interface Ports

FT1
E1
FE1

Usage: **reframe [linelist] [2of4 | 2of5 | 2of6 | CFAS | CRC]**

This command is used to set or display the reframe criteria. The **[linelist]** variable represents a list of line interfaces. It can consist of a single line number or linename, a comma separated list of line numbers or line names, a range of line numbers (i.e., 1–4), or if linelist is not given *all* lines. See Table 18 on Page 59 for a list of line numbers.

For Fractional-T1:

2of4 – 2 out of 4 Fbit errors (default)
2of5 – 2 out of 5 Fbit errors
2of6 – 2 out of 6 Fbit errors

For E1:

CFAS – Consecutive FAS errors (default)
CRC – 915 CRC (rx framer only)

reprogram

Load Radio Firmware Into LEDR Radio

Usage: **reprogram [subcommand] [<argument>]**

Subcommands:**network [filename] [hostIP]**
status

This write command loads the radio application software (firmware) into the LEDR chassis from an external resource using Trivial File Transfer Protocol (TFTP). A TFTP server must be running on the network and properly configured to serve the necessary file(s). See "OPTION 3: Uploading Firmware from a Remote Server via Ethernet" on Page 97 for further details.

rfocal

Transmitter RF Output Calibration Table

Usage: **rfocal <freq region#> <cal-point#>**

This command starts the **RFOUT** Calibration Sequence and should only be used when directed by MDS factory personnel.

CAUTION: This command is used to recalibrate the internal transmitter power output metering circuitry and may affect the accuracy of the power output level measurement. **Contact the Technical Services Department at MDS for further instructions before using this command. Ask for technical publication, *Retuning Procedure for LEDR II Radios*, P/N 05-3633A01.**

Recalibration may be necessary if the radio's transmitting frequency has been significantly changed. For the LEDR 400 and 900 radios, this is generally a change of more than two radio channels. In addition, it is very important to verify the power calibration is *incorrect* on the new frequency by measurement with a calibrated external wattmeter before using this command.

The radio frequencies of the LEDR 1400 radio can be changed without impacting the accuracy of the power metering circuit's calibration.

Example Entry: **rfocal**

Example Response:

```
Region 0
Index 0, Rfout = 18 dbm, Gain = 17
Index 1, Rfout = 20 dbm, Gain = 28
Index 2, Rfout = 22 dbm, Gain = 47
Index 3, Rfout = 25 dbm, Gain = 79
Index 4, Rfout = 27 dbm, Gain = 110
Index 5, Rfout = 30 dbm, Gain = 170
Index 6, Rfout = 32 dbm, Gain = 210
```

rfout RF Output Level Measurement

Usage: **rfout**

This command displays the transmitter RF power output in dBm. See "Watts-dBm-Volts Conversion" on Page 132.

rlogin Remote Login

Usage: **[<toUnitID>} [<UserName>]**

The **rlogin** command is used to login to a remotely located radio via the CONSOLE Port. It can be used to log into any radio that appears in the **network** command display.

route Routing Tables for IP

Usage:
route [command [destination] [mask netmask] [gateway] [port]]

The **route** command is used to add, delete or modify the IP routing table entries. Other radios in the network are automatically added to the routing table using the radio's "Network Self-Discovery." Routing IP traffic to other devices via the radio's management channel can be performed by adding routes to the radio's routing table.

Once the IP configuration is set using the **ip** command (Page 63), several routing entries will appear in the routing table. The first of these routes is the default route which has a destination address of 0.0.0.0. This route is used when a more appropriate route is not available. Thus it becomes the "catch-all" route. The second route that will appear is the default network route. This route has a destination address calculated by "anding" the IP address and subnet mask together. The Next Hop address of this entry will be the default gateway configured using the **ip** command and the Interface will be the default port. This route is used to tell the radio how to reach its base network.

The third route that is added has a destination address of 127.0.0.1. This is known as the loopback route and is used when the radio sends a packet to its own IP address.

Primary Commands:

print —Show the current IP routing table

add [address] mask [netmask] [gw] [port]—Add/Change a route

gw is a gateway IP address

port is specified as either "ETH" or "AIR"

delete [address] mask [netmask] [gw]—Delete a route

gw is a gateway IP address

stored—Display all user-added stored routes

flush—Deletes all stored routes

destination—Specifies the host to send command

Command Arguments:

mask—Where the **mask** keyword is present, the next parameter is interpreted as the netmask parameter.

netmask—Specifies a sub-net mask value to be associated with this route entry.

gateway—Specifies gateway IP address

port—Specifies IP port, either “ETH” or “AIR”

Example 1 Entry:

```
LEDR> route add 10.2.150.1 mask 255.255.255.255 10.2.150.101 air
```

Example 1 Response:

```
route: Route added
```

Example 2 Entry:

```
LEDR> route stored
```

Example 2 Response:

```
DestinationNet MaskNext HopInterface
10.2.150.1255.255.255.25510.2.150.101AIR
10.2.140.0255.255.255.010.2.227.51ETH
```

Example 3 Entry:

```
LEDR> route print
```

Example 3 Response:

```
DestinationNet MaskNext HopInterface
0.0.0.00.0.0.0 0.0.0.0ETH
10.2.140.0255.255.255.010.2.227.51ETH
10.2.150.1255.255.255.25510.2.150.101AIR
127.0.0.1255.255.255.25510.2.227.5LPBK
```

Background:

The LEDR Series of radios can be configured to pass IP management traffic across the radio’s raw service channel. A process called “network self-discovery” automatically configures IP routes between all radios in a network (provided that the **group** command has been correctly configured throughout the system. (See “group” on Page 60). Also, see the arp command on Page 51.

IP management traffic routing allows configuring and monitoring devices other than LEDR radios using the same management channel, providing clean integration of SNMP, Telnet, TFTP, and other IP management methods via one channel that doesn’t use any of the customer payload bandwidth of the radio network.

Routes must be added to the radios at two points in the system to support routing IP traffic to and from the connected devices: 1. At the gateway end (where the management station is located), and 2. At the destination end. Routes are added to the radios using the same convention as used in the MS Windows, Windows NT, and DOS operating environments. The exceptions here are that a mask and port must be specified, as well as the target and gateway IP addresses. At both ends, the command used is exactly the same (see command Example 1, above). In the command

example given above, the route is being added at the gateway end. The difference is that at the gateway end, the port is **air**, and at the destination end, the port is **eth**. Routes do not need to be added at points between the gateway and destination, because the radio network handles the routing between radios via network self-discovery. However, in each radio, the IP gateway must be specified as the IP address of the radio at the network-management gateway in the system.

NOTE: Gateway Settings in Connected Devices
In the connected IP-manageable device, use the local radio's IP address as the default IP gateway for the device.

NOTE: Routing in Protected Systems
Each route added to a protected radio must be added to both units in the protected pair, as they are stored separately. The radios in a protected pair proxy for one another depending on which radio is active, so the routing functionality is unchanged and either radio in a protected pair can be specified as the gateway for a connected device; but if a protected LEDR radio is removed for servicing, all the routing information must be programmed in the remaining radio for proper IP management functionality.

rssi

Received Signal Strength Indicator

Usage: **rssi**

This command displays the received signal strength. The measurement is in dBm. Therefore, an RSSI of –80 dBm is stronger than a –100 dBm signal.

rssical

RSSI Calibration

Usage: **rssical <freq region#> <cal-point#>**

This command starts the RSSI Calibration Sequence. See rfocal command on Page 76 for conditions.

CAUTION: This command should never be used unless calibrated test equipment has shown the radio to have inaccurate RSSI calibration. **Contact the Technical Services Group at MDS for further instructions before using this command.**

Example entry: **rssical**

Example Response:

Region 0
Index 0, RSSI = –110 dbm, Gain = –104
Index 1, RSSI = –90 dbm, Gain = –40
Index 2, RSSI = –75 dbm, Gain = +1
Index 3, RSSI = –60 dbm, Gain = +28
Index 4, RSSI = –45 dbm, Gain = +61
Index 5, RSSI = –30 dbm, Gain = +97

rxlock

Receiver locked onto Remote radio

Usage: **rxlock**

This command displays the current modem synchronization status.

Example Response: **rxlock: Modem is locked**

sabytes

SA Bytes in E1 Multi-framing

E1

Usage: **sabytes [linelist] [bytes <bytelist>]**

This command is used to set or display SA bytes in E1 multiframing. The **[linelist]** variable represents a list of line interfaces. It can consist of a single line number or line name, a comma-separated list of line numbers or line names, a range of line numbers (i.e., 1–4), or if linelist is not given *all* lines. See Table 18 on Page 59 for a list of line numbers.

The **bytelist** variable consists 5 hex bytes (i.e., 3c) representing SA[4-8]. To keep a bytes present value when modifying higher bytes (i.e., modifying SA[7] only) use a * character in the respective byte position. Example: **sabytes 1 bytes *,*,*,3c** changes only SA[7] for line 1 to 3c.

sernum

Serial Number of Radio

Usage: **sernum**

This command displays the serial number of the radio. The number displayed with this command matches the serial number printed on the serial number sticker on the radio chassis.

snmpcomm

SNMP Community Names

Usage: **[<read|write|trap>][<string>]**

This command is used to set or display SNMP community names. Community names are passwords that are required to match at the SNMP management station and each radio or other SNMP agent. You can add security to the radio system's network management by choosing non-default community names (listed in the example) and setting the community names in your management software to match.

Example Response:
snmpcomm {read}: public
snmpcomm {write}: private
snmpcomm {trap}: public

snr Signal-to-Noise Ratio of Incoming RF Signal

Usage: **snr**

This command displays the signal-to-noise ratio (SNR) of the received signal in dB. The SNR is an indication of the quality of the received signal. The higher this number, the higher the quality of the received signal. SNR readings are invalid when the receiver is unlocked. See rxlock command for details.

status Status

Usage: **status**

This command is used to display key performance and configuration data.

Example Response:

```
status {Tx Freq}:438075000
status {Rx Freq}:428075000
status {Bandwidth}:100 kHz
status {Data Rate}: 256 kbps
status {Interleave}: 1
status {Clock Mode}:internal
status {RSSI}:–78 dBm
status {SNR}:28 dB
status {Rx Lock}:Locked
status {Tx RF Out}:30 dBm
status {TxKey}: Keyed
status {Temp}:37 Degrees C
status {IP Address}: 192.168.11.49
status {IP Netmask}: 255.255.0.0
status {IP Gateway}: 0.0.0.0
```

svch Service Channel Settings

Usage: **svch [subcommand] [<argument>]**

Subcommands: **baud [300|1200|2400|4800|9600|19200|38400]**
csize [5–8]
parity [none|even|odd]
stop [0–2]

This command sets or displays the Service Channel settings. For further information, see “USING THE SERVICE CHANNEL” on Page 101.

telnetd Telnet Display or Terminate Session

Usage: **telnetd [kill session]**

This command is used to display or kill (terminate) the current Telnet session(s).

Example: **telnetd**

Response:

Session	Username	Rem. Addr.	Connected	
	tns0	ENGR	10.2.129.22	07/01/1999 @ 13:57:17

Use **telnetd kill session** to terminate the current session.

temp Temperature of PA Device

This command displays the radio's power amplifier (PA) temperature.

Example Response: **temp: 35 Degrees C (PA Temperature)**

test Self-Test of Radio Hardware

Usage: **test [<0–n>|<testname>]**

This command starts a self-test function of the radio. There are several separate tests that can be run individually by specifying the test number after the command.

CAUTION

POSSIBLE EQUIPMENT DAMAGE

CAUTION: Do not perform a transmitter PLL test while the radio is keyed, or the radio's receive LNA may be damaged.

NOTE: Performing a receiver or transmitter PLL test during normal link operation will take the link down for the duration of the test and the re-synchronization interval.

The internal self tests are listed in Table 25.

Table 25. Internal self tests

Function Evaluated	Number	Name
Flash Memory	0	flash
DRAM Memory	1	dram
Configuration	2	config
Battery	3	batt
Radio A- to-D Circuits	4	atod
Transmitter Phase Locked Loop	5	txpll
Receiver Phase Locked Loop	6	rxpll
Real-Time Clock	7	rtc
FPGA Logic	8	fpga
DSP	9	dsp
CODEC	10	codec

threshold Threshold of Performance Degradation

Usage: **threshold [<level>]**

This command sets or displays the performance degradation threshold(s) of the LEDR radio, at which time events are logged and SNMP traps are generated. Setting these thresholds to zero or a negative number will disable event logging and trap generation for those parameters.

Example Response:
```
threshold {rssi}: 0
threshold {snr}: 0
threshold {coffset}: 0
threshold {temp}: 110
threshold {15mines}: 900
threshold {15minses}: 900
threshold {24hres}: 86400
threshold {24hrses}: 86400
```

rssi—dBm level below which an RSSI alarm is generated.

snr—Value below which a signal-to-noise level alarm is generated.

coffset—Maximum tolerable RF carrier frequency difference between the local LEDR unit's transmit frequency and the incoming RF signal from the other LEDR radio.

temp—Power amplifier temperature above which an alarm condition is generated.

15mines—Number of errored seconds within the last 15 minutes.

15minses—Number of severely errored seconds within the last 15 minutes.

24hres—Number of errored seconds within the last 24 hours.

24hrses—Number of severely errored seconds within the last 24 hours.

time Time of Internal Clock

Usage: **time [HH:MM[:SS]**

This command displays or sets the time of the radio's internal real-time clock. The radio's real time clock operates from an internal lithium battery so it is running even if the radio has no DC power connected.

The real time clock is fully compliant with Year 2000 standards.

timeslot Time Slot Assignment

FT1
FE1

Select which timeslots to transmit. This command has two uses; in Usage 1, the timeslots can be set or displayed. In Usage 2, all pending timeslots are committed/made active.

The timeslots may be different at each end of the link. They will be monotonically mapped; that is, Slot 1 is mapped to Slot 13, Slot 2 is mapped to Slot 14, etc. To select timeslots 1 through 12, enter the command **timeslot 1-12.**

Usage 1: **timeslot [-d] [slotlist]**

Usage 2: **timeslot -c**

Variables:

–d Disable timeslot(s)
–c Commit pending timeslots

Modifications to the timeslot list are kept pending until *all available* slots have been assigned. The user can choose to commit slots when the last available slot is added to the pending list, or by using the **-c** option. (See Usage 2.)

The default action is to enable given timeslots. If no arguments are entered, the currently active timeslots and pending timeslots are displayed.

The **slotlist** variable is a list of timeslots and can be a single slot number, comma separated list of slot numbers, or a range of slot numbers (i.e., 2-8). Timeslots can be entered in any order and are automatically configured. Extra slots will be ignored. *Unassigned timeslots in the pending list are signified by **MA** (must assign).*

NOTE: Enough slots for the full data capacity of the modem setting must be specified or the link will not synchronize.

NOTE: FT1 timeslots are 1–24. E1 timeslots are 0–31.

NOTE: In FE1 mode timeslot 0 is always selected. When frame structures are selected that contain CAS (**fstruct 4-7**) timeslot 16 must be selected.

trapfilter Trap Filtering for SNMP

Usage: **trapfilter [<critical|major|minor|inform>]**

This command sets or displays which events cause SNMP traps. Filtering traps is done by category. Traps that are filtered are allowed to pass through the network-management system. (See *trapmgr* on Page 85 and *snmpcomm* on Page 81 for additional information.)

trapmgr Trap Manager IP Addresses

Usage: **trapmgr [<1-5>] [<IP address>]**

This command sets or displays the trap manager IP addresses. These are the IP addresses of up to five network-management stations on which SNMP manager software is operating, and to which notifications of SNMP events (traps) are to be sent. The IP mask used for sending traps is that set by the **ip** command. (See "ip" on Page 63.)

Example Response:
```
trapmgr: 1 = 10.2.129.22
trapmgr: 2 = 0.0.0.0
trapmgr: 3 = 0.0.0.0
trapmgr: 4 = 0.0.0.0
trapmgr: 5 = 10.2.129.1
```

trend — Trend of RF Performance Indicators

Usage: **trend [<rssi|temp|rfout|snr|fec|ifec|time|all>] [<display time (msec)>]**

This command is used to display continuously updated readings of: RSSI, radio temperature, RF output, signal-to-noise ratio, and FEC errors (corrected and uncorrectable). The display can be stopped by pressing Control-C on the terminal.

If the **trend** command is used by itself or with **all** (**trend all**), all associated parameters will be reported. More than one argument can be used to display several selected items in the desired order.

NOTE: This command is not available from a Telnet session.

txkey — Radio Transmitter Keying Status

Usage: **txkey [on|off]**

This command sets or displays the radio transmitter status. ON indicates the radio transmitter is keyed and transmitting. **OFF** indicates the transmitter is not keyed.

unitid — Unit Identification Number for Orderwire and NMS

Usage: **unitid [<ID>]**

This command sets or displays the radio's unit identification number. This number is used for Orderwire signaling and by the NMS (Network Management System). (See "USING ORDERWIRE" on Page 99.) The factory default is the last three numbers of the unit serial number. (1-999)

uptime — Up Time

Usage: **uptime**

This command displays how long the radio has been powered-on.

user — User Account Information

Usage: **user [subcommand] [<argument>]**

Subcommands: **add <user> <pass> <perm>**
del <user>
perm <user> <perm>
pass

This command provides administrator access for setting new user accounts and permission levels.

NOTE: The password (**pass**) and user names are case sensitive and may not exceed eight characters. Two quotation mark characters ("") may be used as a "blank" password. If quotation marks are used, the shift key or cap lock keys must be depressed.

User permission (**perm**) may be set to: read (**r**), write (**w**), network (**n**) or administrator (**a**). The privileges granted by each level are as follows:

- Read (**r**) is the lowest level of user access and allows radio information to be viewed only. Changes to radio settings are not allowed.
- Write (**w**) allows most, but not all radio settings to be changed.
- Network (**n**) allows everything permitted by lower levels, and also allows changes to the radio's IP configuration.
- Administrator (**a**) allows everything permitted in lower levels, and also allows changes to be made to user accounts (add, delete, modify). It is normally used by a System Administrator or other person responsible for the radio system.

Example entry: **user add fieldserv secret w**

The above example shows the command string for adding a new user (fieldserv), with "write" permission and a password of **secret.**

Example Response: **user: Command Complete**

NOTE: If you are logging in for the *first time* since the radio was shipped from the factory, refer to Page 25 for important login information.

---

ver

Version of Firmware/Hardware

Usage: **ver [frw|hdw|ext]**

This command displays radio version information for firmware (**frw**), hardware (**hdw**) and Extended Version Information (**ext**).

Example 1: **LEDR> ver frw**

Response 1: **ver: LEDR Part #06-3451A01**
ver: 2.4.3 (Version of firmware P/N above)

Example 2: **LEDR> ver hdw**

Response 2: **ver: {Hardware version}: A**

Example 3: **LEDR> ver ext**

Response 3:

```
ver: Part #06-3451A01
ver: 2.4.3
ver:
ver: Image 1
ver: Region    Expected   Upgrade
ver: Firmware 2.4.3
ver: DSP       1.1.0
ver: FPGA      Ver1.22
ver: Scripts   Ver1.44                ver: Option    Ver1.56
ver:
ver: Image 2 (Active)
ver: Region    Expected   Upgrade
ver: Firmware 2.4.3
ver: DSP       1.1.0
ver: FPGA      Ver1.22
ver: Scripts   Ver1.44
ver: Option    Ver1.56
ver {Active code}: compiled Aug 15 2000 08:47:46
```

Note: Blank lines following "Ver:" are spaces used as vertical separations between data groups.

volume

Volume of Orderwire Earpiece

Usage: **volume [<level (0–255)>]**

This command sets or displays the orderwire handset volume.

Example Response: **volume: 100**

vox

Voice Operated Transmit

Usage: **vox threshold <1–100>**

The **vox** command sets or displays the level/threshold at which the orderwire microphone will key the transmitter.

NOTE: When the orderwire microphone is spoken into, the audio will be heard by all LEDR radios in the network which currently have a handset plugged into the front panel ORDERWIRE jack. Only one station can transmit at a time; the circuit is half-duplex.

Example Response: **vox: 5**

who Who is currently logged on to the Network Management Ports?

Usage: **who**

This command displays users currently logged in to the radio operating system.

6.5 Disabling the Front Panel Alarm LED for Unused E1 Option Ports

To disable the ALARM LED on the front panel for a particular E1 port, use the commands found in Table 26 according to the E1 port number. When alarm events are pending, the alarm condition for the unused E1 ports remains until a valid input signal (as defined by G.703) is applied.

You must log into the LEDR radio as a user with "Administrator" privileges to execute these commands. If you are using a terminal program connected to the radio, send one command sequence at a time to the radio with a 5 ms delay between each line.

Table 26. Commands to Disable E1 Port Alarms

Disable the LED for IO1	Disable the LED for IO2
Evmap led 74 none	Evmap led 87 none
Evmap led 75 none	Evmap led 88 none
Evmap led 76 none	Evmap led 89 none
Evmap led 77 none	Evmap led 90 none
Evmap led 78 none	Evmap led 91 none
Evmap led 79 none	Evmap led 92 none
Evmap led 80 none	Evmap led 93 none
Evmap led 81 none	Evmap led 94 none
Evmap led 82 none	Evmap led 95 none
Evmap led 83 none	Evmap led 96 none
Evmap led 84 none	Evmap led 97 none
Evmap led 85 none	Evmap led 98 none
Evmap led 86 none	Evmap led 99 none
Disable the LED for IO3	**Disable the LED for IO4**
Evmap led 100 none	Evmap led 113 none
Evmap led 101 none	Evmap led 114 none
Evmap led 102 none	Evmap led 115 none
Evmap led 103 none	Evmap led 116 none
Evmap led 104 none	Evmap led 117 none
Evmap led 105 none	Evmap led 118 none
Evmap led 106 none	Evmap led 119 none
Evmap led 107 none	Evmap led 120 none
Evmap led 108 none	Evmap led 121 none
Evmap led 109 none	Evmap led 122 none
Evmap led 110 none	Evmap led 123 none
Evmap led 111 none	Evmap led 124 none
Evmap led 112 none	Evmap led 125 none

To restore the factory default settings to all of the E1 ports, issue the commands shown in Table 27.

Table 27. Restore Factory Defaults to Alarm Ports

Evmap led 74 ioalarm	Evmap led 100 ioalarm
Evmap led 75 ioalarm	Evmap led 101 ioalarm
Evmap led 76 ioalarm	Evmap led 102 ioalarm
Evmap led 77 ioalarm	Evmap led 103 ioalarm
Evmap led 78 ioalarm	Evmap led 104 ioalarm
Evmap led 79 ioalarm	Evmap led 105 ioalarm
Evmap led 80 ioalarm	Evmap led 106 ioalarm
Evmap led 81 ioalarm	Evmap led 107 ioalarm
Evmap led 82 ioalarm	Evmap led 108 ioalarm
Evmap led 83 ioalarm	Evmap led 109 ioalarm
Evmap led 84 ioalarm	Evmap led 110 ioalarm
Evmap led 85 ioalarm	Evmap led 111 ioalarm
Evmap led 86 ioalarm	Evmap led 112 ioalarm
Evmap led 87 ioalarm	Evmap led 113 ioalarm
Evmap led 88 ioalarm	Evmap led 114 ioalarm
Evmap led 89 ioalarm	Evmap led 115 ioalarm
Evmap led 90 ioalarm	Evmap led 116 ioalarm
Evmap led 91 ioalarm	Evmap led 117 ioalarm
Evmap led 92 ioalarm	Evmap led 118 ioalarm
Evmap led 93 ioalarm	Evmap led 119 ioalarm
Evmap led 94 ioalarm	Evmap led 120 ioalarm
Evmap led 95 ioalarm	Evmap led 121 ioalarm
Evmap led 96 ioalarm	Evmap led 122 ioalarm
Evmap led 97 ioalarm	Evmap led 123 ioalarm
Evmap led 98 ioalarm	Evmap led 124 ioalarm
Evmap led 99 ioalarm	Evmap led 125 ioalarm

7.0 STANDARDIZING RADIO CONFIGURATIONS

7.1 Introduction

Setting up and configuring a network of point-to-point systems can be a frustrating task. To make the task easier and more predictable, the parameters of one LEDR radio can be used as a template for other radios in your system. You need only address the parameters that are site or unit-specific, such as an IP addresses.

The **config** command allows the user to upload/download the radio's configuration data from/to a PC. There are two classifications of configuration data—radio-specific data and standard data.

Radio-Specific data is:

- Frequencies
- Target Power
- Thresholds
- Calibration Data
- IP Address
- IP Routing Table
- Network Settings

Standard radio data are the configuration parameters that are common in *all* LEDR radios.

Both types of data can be uploaded and downloaded between the radio and a PC. It is up to the user to decide whether to download *both* types or just the standard (core) data. Once the data is on a PC, the file can be edited off-line, for example, the configuration data, if desired. The customized configuration file can then be downloaded to other LEDR radios in your system from your PC.

7.2 Setup by TFTP

To use this function the user will need:

- A PC with a TFTP server running.
- The IP address of the PC running the TFTP server.

If you do not know your computer's address on a Windows PC, you can use the **RUN** function from the **Start** menu and enter **winipcfg** to determine your local PC's IP address. The IP address of the radio can be found by the use of the radio's **ip** command.

Downloading Procedure

To download the configuration data from the LEDR chassis to a file (**filename.txt**) on the user's PC, enter the following command:

LEDR> config send [filename.txt] [1.2.3.4 <IP Address>]

The file, **filename.txt,** will be written to in the default path set in the TFTP server. The numeric string, "**1.2.3.4**", is the IP address of the PC destined to receive the file.

Uploading Procedure

To upload into a LEDR radio only the *standard* configuration data from a file on the PC (filename.txt) to the radio enter the following command:

LEDR> config get [filename.txt] [1.2.3.4 <IP Address>]

To download *both* the standard and radio-specific configuration data from a file on the PC **(filename.txt)** to the radio enter the following command:

LEDR> config getall [filename.txt] [1.2.3.4 <IP Address>]

Ideally, the process of updating a system would go like this:

1. Upload the current configuration data from each radio to a specific file on your PC.

   At radio 1 CONSOLE Port enter: **config send radio_1.txt 1.2.3.4**
   At radio 2 CONSOLE Port enter: **config send radio_2.txt 1.2.3.4**
   (etc.…)

2. Upgrade the software on each radio.

3. Boot from the new software.

4. Download the saved configuration data from Step 1 back into each radio using the **getall** subcommand so that you will get both the standard and radio-specific parameters.

   At radio 1 CONSOLE Port enter: **config getall radio_1.txt 1.2.3.4**

   At radio 2 CONSOLE Port enter: **config getall radio_2.txt 1.2.3.4** (etc.)

7.3 Setup Through the DB-9 CONSOLE Port

You have the option of sending the configuration data to the CONSOLE Port instead of sending it to a file on a PC. Then the terminal program can be set to log the data as it is created by the radio. The advantage of this option is that you do not need to use the TFTP server, routing, etc. on the PC.

During the upload, the LEDR software will prompt you to begin/end recording at the terminal program. You will also be prompted on how to end a download.

When the **config get** downloading option is chosen (standard data only), the software will filter out all the radio-specific parameters as they come through.

To upload the data to the CONSOLE Port:

LEDR> config send console

To download only the standard data via the CONSOLE Port:

LEDR> config get console

To download standard and radio-specific data: **LEDR> config getall console**