

Getting Started with the LX-4000 Series



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Preface

This guide contains all the information you need to get the LX-4000 Series up and running.

This guide is organized as follows:

- **Preface** - Describes the manual's organization and how to contact customer support.
- **Chapter 1** – Provides an overview of the LX-4000 Series, including supported communication speeds, software requirements, and conventions.
- **Chapter 2** – Describes how to install and connect the LX-4000 Series, as well as the unit's LEDs and connectors.
- **Chapter 3** – Explains how to configure the unit for the first time, access the Graphical User Interface, install Java Runtime Environment (JRE), and connect to the LX-4000 Series via telnet and SSH.
- **Chapter 4** – Describes alternative port capabilities, including temperature/humidity sensors, 4800/5150 power control units, and using LX ports as alarm input and control output port points.
- **Appendix A** – Provides the electrical, environmental, and physical requirements for the LX-4000 Series installation.
- **Appendix B** - Lists the factory default settings.
- **Appendix C** – Provides the error code definitions for the POST test error codes.
- **Appendix D** - Describes how to cable the LX-4000 Series unit.

Customer Support

Should you experience trouble with this equipment, please contact your MRV Americas Service and Support customer representative in the USA at 978-952-4888. International customers call +011 978-952-4888.

Other Documentation

Other manuals in the LX documentation set are:

- *LX-Series Commands Reference Guide* - Describes each individual command in the LX CLI tree.
- *LX-Series Configuration Guide* - Provides information on network configuration, initial setup, how to set up for remote console functions, RADIUS, and system administration. Provides basic information regarding the Network Management System (NMS), and procedures on how to use the Management Information Base (MIB) structure (as pointers to objects in the devices) to manage these units.
- *Software Release Notes* - Cites supported features as well as any notes and restrictions for the current software version.

Chapter 1

Overview of the LX-4000 Series

The LX-4000 Series is a secure standalone communication server that is designed for applications requiring secure console or serial port management. The LX-4000 Series provides the most secure and robust feature set to meet your remote console management and terminal server needs. The LX-4000 Series includes the most comprehensive security features, such as per port access protection, RADIUS, Secure Shell v2.0, PPP PAP/CHAP, PPP dial-back, on-board database, menus, and others.

The LX-4000 Series console management solution enables centrally located or remote personnel to connect to the console or craft ports of any network element or server. This serial connection allows administrators to manage and configure the remote network devices and servers, as well as perform software upgrades as if attached locally.

The LX-4000 Series also provides various port densities of RS-232 DTE RJ45 Serial ports, as well as V.90/K56 flex Internal Modem options. Currently, the LX-4000 hardware provides port densities of 8, 16, 32, and 48 ports, plus port 0 for local management.

Conventions

The following conventions are used throughout this guide:

- **User prompt** – The user prompt is (for example) InReach:0> for Non-superusers or InReach:0>> for superusers. The prompt will change based on a login user profile, as configured by the Superuser. The 0 represents the session number.

- **Configure Mode prompt** – A sample configure mode prompt is `Async 1-6:0 >>`, where Async is a reminder that tells you which part of the configuration you are in, 1-6 is the range of ports any operation will affect, 0 is a session number, and `>>` indicates superuser mode. To get to the `Async 1-6:0 >>` prompt, you must first type `port async 1 6` at the `Config:0 >>` prompt. Note that you do not add a dash between the range numbers in `port async 1 6`.
- **Command execution** – Unless otherwise specified, commands are executed when you press `<RETURN>`.
- **Keyboard characters (keys)** – Keyboard characters are represented using left and right angle brackets (`<` and `>`). For example, the notation `<CTRL>` refers to the CTRL key; `<A>` refers to the letter A; and `<Enter>` refers to the RETURN key.
- **Typographical conventions** – The following typographical conventions are used:
 - `Monospace Typeface` – indicates text that can be displayed or typed at a terminal (i.e., displays, user input, messages, prompts, etc.).
 - italics* – are used to indicate variables in command syntax descriptions.
- **Help Key (?)** - At any prompt level, you can press `?` to display the available commands at that level. The only time this is not true is if you are in the midst of entering a command. If `?` is at the end of a partial command, the LX displays a list of valid arguments to assist you in adding to the current command line.
- **Tab** - Press the Tab button to complete a partially entered command. You must enter the first three characters of a command for autocomplete to work. If the command is already complete, the Tab button displays available commands.
- **Command Recall** - The up arrow recalls previously used commands.
- **Ctrl-F** – Moves forward to the next session.
- **Ctrl-B** – Moves back to the previous session.
- **Ctrl-L** – Returns you to the Local Command Mode.
- **Ctrl-K** – Clears the current command line.

NOTE: You must press the Enter key after you type **Ctrl-F**, **Ctrl-B**, **Ctrl-L**, or **Ctrl-K**.

System Specifications

The following table lists important system specifications:

Item	Description
Interface	DTE RS-232 - RJ-45
Serial Line Speed	134.5 bps to 230 Kbps
Ethernet Interface	10/100 Auto Sensing
Default Serial Line Speed	9600 bps

Chapter 2

Installing the LX-4000 Series

Hardware Installation

This section explains how to install an LX-4000 Series Communications server and place it into operation.

Unpack and Inspect the Unit

Place all packing materials back into the shipping carton and save the carton. (If you need to return the unit to MRV or your distributor, you should return it in the original carton.)

Package Contents

The LX-4000 unit shipping carton contains the following items:

- One rack mounting kit. MRV provides the following mounting screws: Eight 6-32 x 5/16" flathead screws for attaching the ears to the unit, and four 10-32 screws to attach to the rack.
- One power cord appropriate to your particular LX model.
- One 8-wire RJ-45 serial crossover cable.
- One female DB-9 to RJ-45 adapter.
- One software/documentation CD.

LX-4000 Indicators and Interfaces

This section explains the LX-4000 unit's indicators and interfaces.

Front Panel LEDs

This section explains the front panel LEDs (see Figures 1 through 4).



Figure 1 - LX Series 4008 Front Panel



Figure 2 - LX Series 4016 Front Panel



Figure 3 - LX Series 4032 Front Panel



Figure 4 - LX Series 4048 Front Panel

FLT

Solid red indicates a fault condition exists or maintenance is required. This LED remains on until the initial Power On Self Test (POST) completes successfully.

OK

Solid green indicates the system's voltages are normal and the unit has passed the POST test.

Port Status LEDs

Each of the eight (or 16, or 32, or 48) green LEDs flash when receive, transmit, or status activity is detected on its corresponding serial port. The port status LEDs are used in several ways. During the initialization process, the LEDs indicate self-tests are being performed, and if any self-test fails, they indicate an error code. After a POST test and a system software boot, the lights indicate when a port is actively being used.

Rear Panel LEDs

This section explains the rear panel LEDs and shows you a rear view of the various LX-4000 models (see Figures 5 through 11).

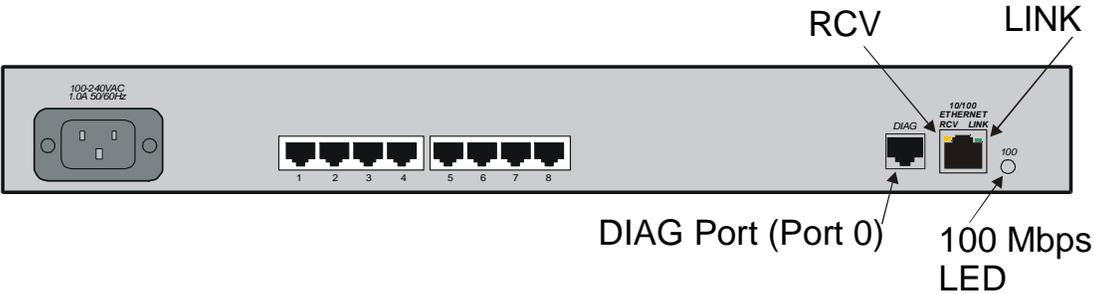


Figure 5 - LX Series 4008 Rear Panel

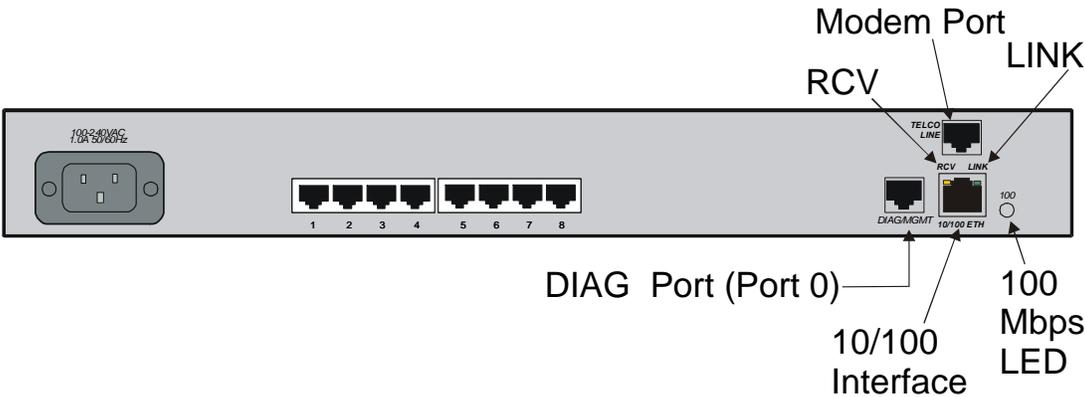


Figure 6 - LX Series 4008 with Modem Rear Panel

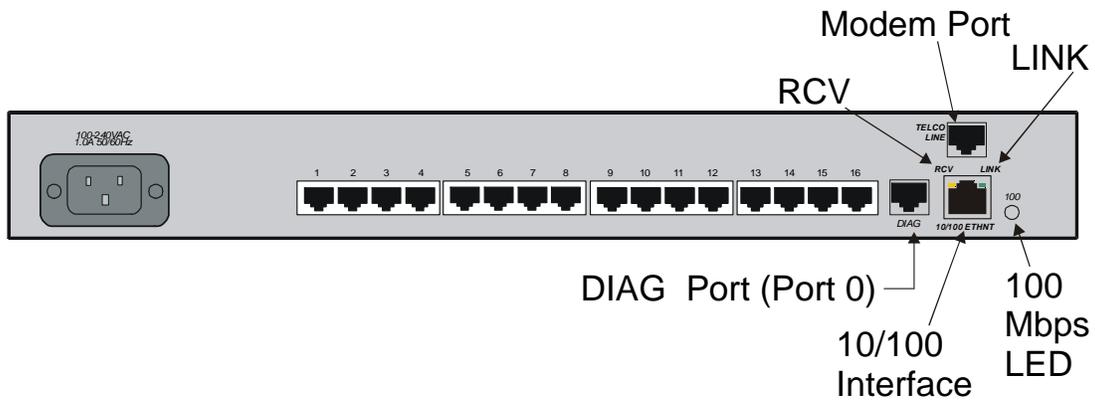


Figure 7 - LX Series 4016 with Modem Rear Panel

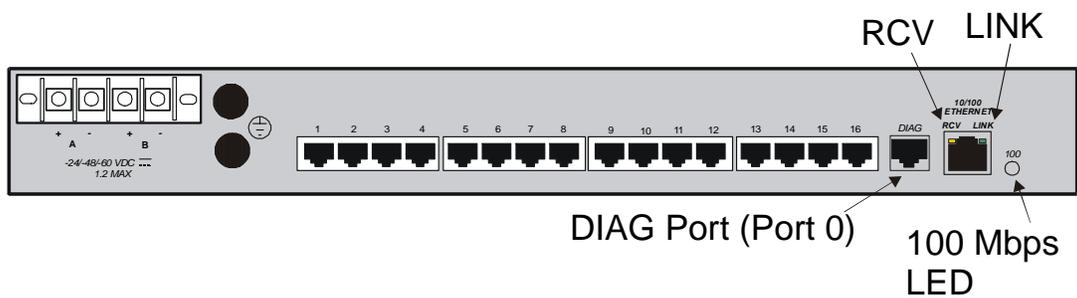


Figure 8 - LX Series 4016 DC Version Rear Panel

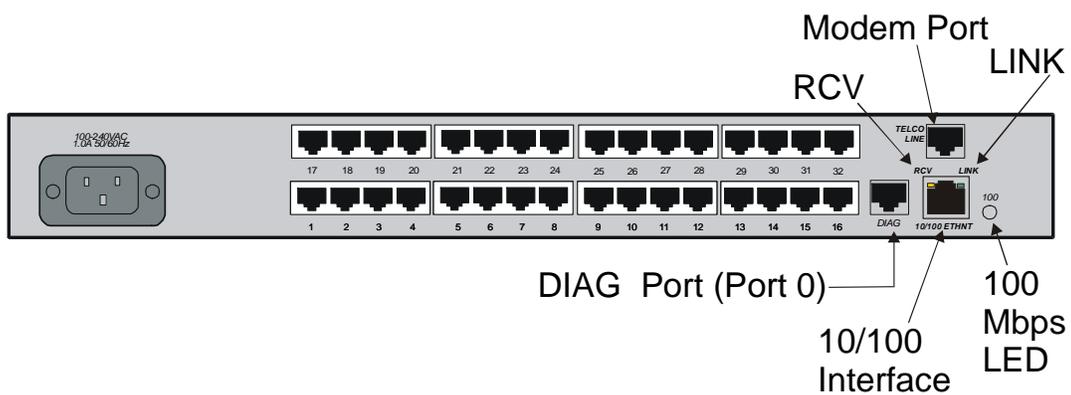


Figure 9 - LX Series 4032 with Modem Rear Panel

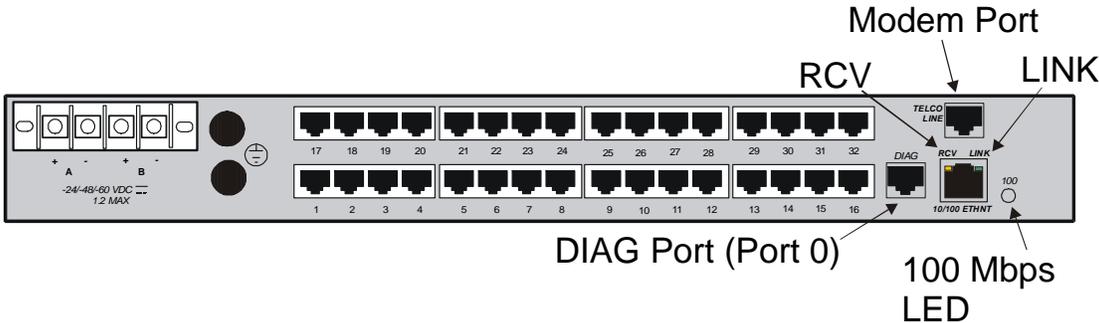


Figure 10 - LX Series 4032 DC Version with Modem Rear Panel

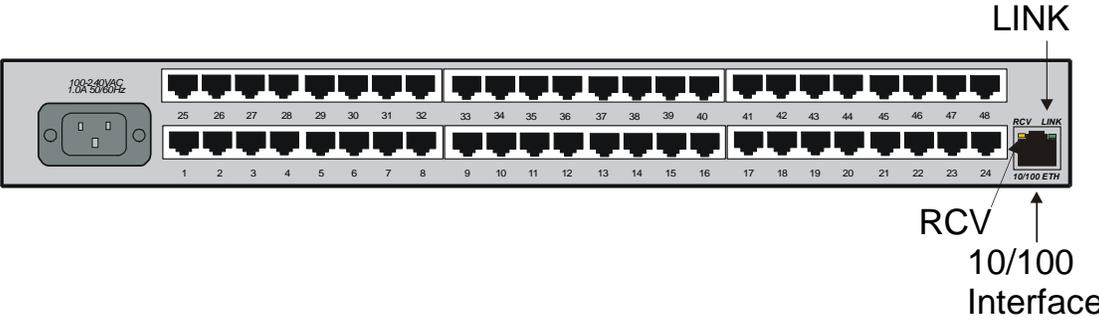


Figure 11 - LX Series 4048 AC Rear Panel

RCV

The RCV LED is one of two integral LEDs on the 10/100 jack. This yellow LED flashes to indicate receive activity on the link.

LINK

This green LED defaults to a link good indicator. If the link is present and operating, the LED comes ON.

100 Mbps

This green LED indicates speed. If the link is 100 Mbps, the LED comes ON. On LX-4048 units, this LED is on the front of the unit.

Environmental and Installation Considerations

- Unit must be installed in an environment with 5% to 90% humidity, noncondensing, 0° - 40° C (32°-104° F).
- Do not choose a location where the unit will be exposed to direct sunlight or subjected to vibration.
- Do not place an object on the side(s) of the unit that might block airflow through the unit.

- The unit may be front, rear, or center mounted.
- There is no mounting difference between the 19" and 23" rack mount ears.

Mounting the Unit into a 19-inch or 23-inch Rack

Attach the brackets to the unit, and then mount the unit in the rack. Refer to Figure 12 for further information.

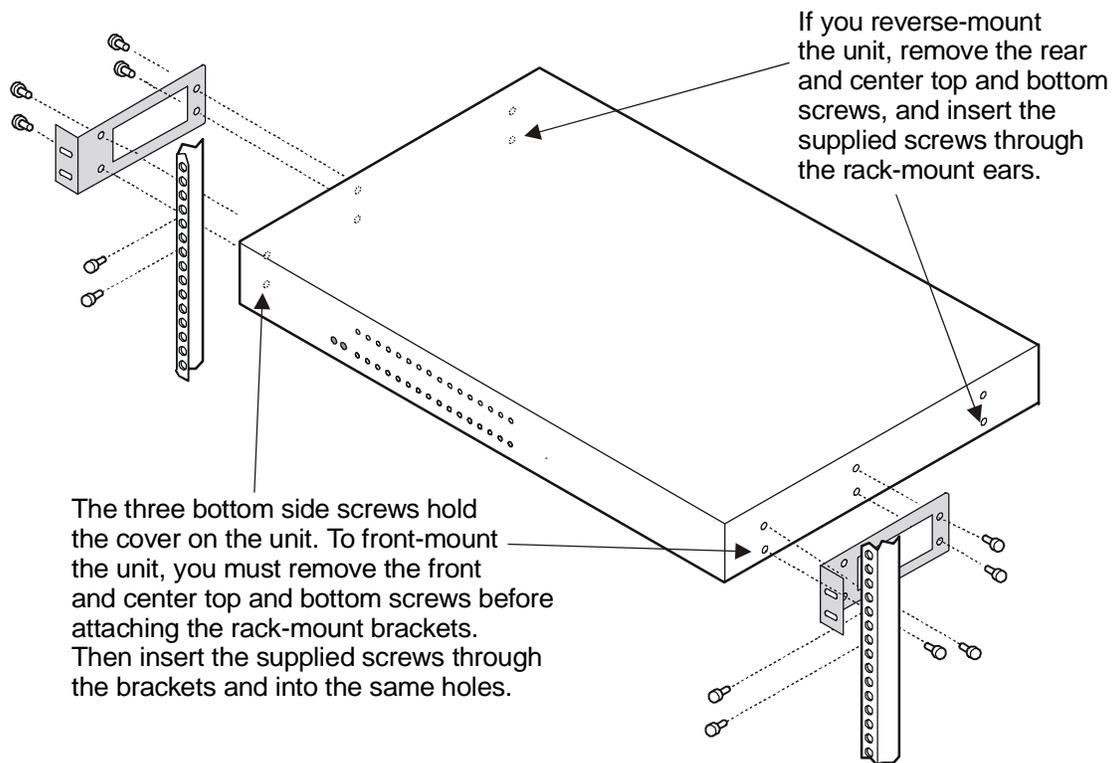


Figure 12 - Mounting an LX-4000 Series in Rack

Cable Connections

This section explains the cable connections for the LX-4000 unit.

Connect the Power Cable

Connect the supplied power cable to the rear of the LX-4000 unit and plug the other end into a 3-prong wall outlet.

Connecting the Ethernet Interface

NOTE: This port is set to auto negotiation by default. You can manually configure the port speed and duplex if you want. Refer to the *LX-Series Commands Reference Guide* for further details.

Connect a category 3 (CAT 3) cable for 10 Mbps operation, or a category 5 (CAT 5) cable for 10/100 Mbps operation to the 10/100 connector on the rear of the LX-4000 Series (see Figure 5) and the other end to your network. The LINK LED comes on steady green if the cable is properly connected.

Connect Serial Device Cables

Connect the serial device cables to the 8-pin RJ-45 jacks on the rear of the unit.

NOTE: LX-4000 Series serial ports provide concurrent support for RTS/CTS flow control and modem control. Refer to Appendix A and Appendix D for further information.

Connecting Your Management Station

Connect the management station to the DIAG port (port 0) using the connector and cable you received with the LX-4000 unit. Refer to “Connecting to the Diagnostic Port (Port 0)” in Appendix D for more information on DIAG port connections.

Connecting DC Power

This section describes how to connect power to the DC version of the LX Series 4008, 4016, and 4032. The LX-4048 model is made in an AC version only.

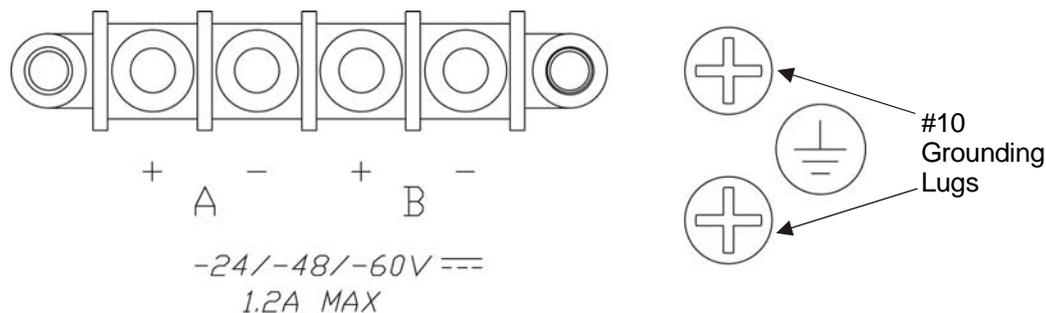


Figure 13 - Connecting DC Power

After you have installed the LX-4000 unit, you can connect the DC power as described in the following procedure (refer to Figure 13):

1. Connect the LX-4000 to the facility's bonding network (or earth ground), using the points on the rear panel of the LX-4000. The connection to the facility's bonding network should be made per local practices, using wire with a minimum conductor size of 18 AWG.
2. Using a ¼-inch nut driver, remove the terminal block nuts.
3. Attach the facility's "A" feed to the terminal block labeled "A".

NOTE: Be sure that the -48VDC is connected to the *minus* side, and the 48VDC return is connected to the *plus* side.

4. Attach the facility's "B" feed to the terminal block labeled "B".
5. Replace the nuts and tighten them securely.

The DC leads should be 22 AWG or larger. They should be terminated with a #5 ring terminal or larger depending on the wire size used.

NOTE: The LX-4000 will run with only one DC power feed connected. The second input is provided for redundant system power, which is used in high reliability installations.

6. Attach the clear plastic safety guard to the terminal blocks. (The clear plastic safety guard is provided with the LX-4000 kit.)

Modem Port (Optional)

The modem port is a V.90/K56flex Kbps optional factory installed modem on the LX-4000 Series. The modem port allows you to dial back from, or dial in to or out of the LX-4000. If the modem is present, connect your phone line to the modem's RJ11 connector. If the modem is not installed, the RJ11 connector will not be present on the rear of the unit. In LX-4048 models, the modem port is on the front of the unit.

The Modem port number is as follows for LX-4000 models:

- LX-4008 - port number 9
- LX-4016 - port number 17
- LX-4032 - port number 33
- LX-4048 - port number 49

At the `InReach:0>>` prompt, enter the `show port async 33 modem` command to display a screen containing the LX-4032 modem port fields.

Powering On

The Power On Self Test (POST) starts when you apply power to the LX-4000 Series unit. The port status LEDs flicker and the FLT LED remains on while the test is running (this may take only a few seconds). If the unit passes the POST test, the FLT LED extinguishes, and the OK LED turns green. If there is a failure, the FLT LED stays on, and the port status LEDs begin flashing an error code. Refer to Appendix C for an explanation of the codes.

When the POST test is completed, you are presented with two options: `[B] Boot System` and `[L] Login to System Setup`. If you choose neither, the unit boots on its own after eight seconds. If you type `L`, a password prompt appears. The default password is `access`. The Main Menu appears after you enter the password. The Main Menu allows you to change the boot settings and IP address assignments. You can review the factory default boot setting by referring to the “ppciboot Factory Default Settings” on page 50. The system loads the LX-Series software from flash and then loads the system configuration file.

If the LX boots with default operational parameters, the Quick Configuration menu appears. Refer to the “System Maintenance” chapter in the *LX-Series Configuration Guide* for further information on the Main menu. Refer to “First Time Quick Configuration” on page 25 for further details on the Quick Configuration menu.

Once the unit finishes loading the operating system, you can access the unit. At your management station, access the unit with any terminal emulation software. The terminal settings are 9600 baud, eight data bits, no parity, one stop bit, Xon/Xoff flow control, autowrap enabled, and terminal type ANSI. The `Login:` screen appears.

System Login and Passwords

The following username and passwords are the defaults the first time you use the LX-4000 Series.

- The default login username is **InReach** (be sure to use a capital I and R). The default login password is **access**.
- To enter the superuser mode at the `InReach>` prompt, enter **enable**. The default password is **system**.

These passwords prevent persons who do not know them from accessing the server. Change the default passwords to other values as part of your basic server setup. You can use any character or number in a password. However, backspace, tab, and escape are not supported. Refer to the “Password Enable” section in the Subscriber chapter of the *LX-Series Commands Reference Guide* for information on changing passwords.

IMPORTANT

Take steps to ensure that the password is not lost or forgotten. If you forget the password, call Customer Support.

Resetting the Unit

To reset the LX-4000 Series, use a paper clip to momentarily press the reset button, which is behind the small hole labeled R on the front panel. Refer to Figure 14 for the exact location.



Figure 14 - LX Series RESET Switch Location

When the LX-4000 Series enters the RESET state, all front panel LEDs illuminate. When you release the reset button, the unit begins to execute the Power On Self Test (POST).

If the LX-4000 Series detects an error, the front panel LEDs illuminate to show an error code. This error sequence is repeated continually until the error is corrected or you power off the unit. During this time, no data is exchanged over the Ethernet cable or serial ports.

If the LX-4000 Series does not detect an error, the unit begins loading software from the internal flash. Once loaded, the LX-4000 Series resumes normal operations.

Chapter 3

Configuring the LX-4000 Series for the First Time

Configuring the LX-4000 Unit for the First Time

You can choose from five options to configure the unit for the first time:

- **First Time Configuration Utility** - The first time an LX-4000 unit boots up at default parameters, you are presented with the option to run the Initial Connectivity setup. Enter `y` and press `<Enter>`. Refer to “First Time Quick Configuration” for further details.
- **Assign the IP Address via the Network** - Refer to “Assigning an IP Address via the Network” for further details. Use this option if your network is using DHCP, BOOTP, or RARP.
- **Setting the IP Address Manually** - Refer to “Manually Setting the IP Address Via the CLI”.
- **Creating and Loading a Default Configuration File** - Refer to “Applying Default Configurations to Other Units” in the *LX-Series Configuration Guide*.
- **Configuring the LX-4000 Manually via the CLI** - Refer to “Upgrading Software with the ppciboot Main Menu” in the *LX-Series Configuration Guide*.

First Time Quick Configuration

NOTE: The first time quick configuration runs only on the DIAG port (port 0) on all models when booting from default parameters. The DIAG port (port 0) of the LX-4008, LX-4016, and LX-4032 is on the rear of the unit. The LX-4048 DIAG port (port 0) is on the front of the unit.

NOTE: Display problems may occur during bootup when you attach a terminal to the DIAG port (port 0) and the display setup is configured to `Smooth-2 Scroll`. To avoid this, change the scroll setting to `Jump Scroll`.

Use the following procedure to configure your LX-4000 unit for the first time.

1. Plug in the terminal at the DIAG port (port 0 - port values are 9600 bps, eight data bits, one stop bit, no parity, and Xon/Xoff flow control). The Main Menu appears.

2. Press `b` to boot the LX-4000 unit. The setup takes a minute or two. The unit has loaded to factory defaults, would you like to run Initial Connectivity Setup? `y/n` message appears.
3. Press `y` (yes) and press `Enter`. The "Enter your superuser password" message appears, followed by the Superuser Password prompt.
4. Enter superuser password `system`. The Quick Configuration menu appears:

```
Quick Configuration menu
    1 Unit IP address
    2 Subnet mask
    3 Default Gateway
    4 Domain Name Server
    5 Domain Name Suffix
    6 Cluster Secret
    7 Superuser Password
    8 Exit and Save
Enter your choice:
```

5. Press the number corresponding to the parameter you want to set.
6. Enter the appropriate information and press `<Enter>` to return to the Quick Configuration menu. Once you enter a parameter value, a data entry line specific to that parameter appears on the Quick Configuration menu.
7. Continue in this way through the menu, configuring as many parameters as you want. You are not required to configure all parameters.

NOTE: You should change the Superuser Password, since this is the first time you are configuring the LX-4000 unit (the default password is `system`). The login username and password are case-sensitive.

8. Press 8 (Exit and Save) to save your changes. The “Is this information correct?” message appears.

```

CONFIGURATION SUMMARY
      1 Unit IP address                10.80.1.5
      2 Subnet mask                    255.0.0.0
      3 Default Gateway
      4 Domain Name Server
      5 Domain Name Suffix
      6 Cluster Secret                 Configured
      7 Superuser Password            Not Changed
      8 Exit and Save

Is this information correct? (y/n) :

```

9. Press `y` (yes) and press `<Enter>`. The `Save this information to flash?` message appears.
10. Press `y` (yes) and press `<Enter>`. The information is saved to flash.
11. Press `<Enter>` several times to display the `Login:` prompt.
12. Enter your login name. The default is `InReach`.
13. Enter your password. The default is `access`. You can now use the LX-4000 unit.

Completing the First Time Configuration

Once configured, the system stores the configuration in a file called `Config.prm` by default. From here you can continue configuring the unit via the CLI, Telnet, SSH, or by using the web browser.

- To use the CLI, refer to Figure 15 on page 36 for the CLI tree structure and to the *LX-Series Commands Reference Guide* for information on specific commands.
- To use Telnet, refer to “Connecting to the LX-4000 Series via Telnet or SSH” on page 34.
- To use the web browser, refer to “Accessing and Configuring the Graphical User Interface (GUI)” on page 28.

Assigning an IP Address via the Network

If you are running DHCP, BOOTP, or RARP the LX-4000 obtains its own IP information automatically while it boots.

Once the unit has been assigned an IP address from your network, you can configure the unit.

- To use the CLI, refer to Figure 15 on page 36 for the CLI tree structure and to the *LX-Series Commands Reference Guide* for information on specific commands.
- To use Telnet, refer to “Connecting to the LX-4000 Series via Telnet or SSH” on page 34.
- To use the web browser, refer to “Accessing and Configuring the Graphical User Interface (GUI)” on page 28.

Manually Setting the IP Address Via the CLI

If the unit boots up with or without an IP address from the network, you can change the addressing via the CLI.

Use the following procedure to change the IP address information as needed:

1. Connect the terminal to the DIAG port (port 0 - port values are 9600 bps, eight data bits, one stop bit, no parity, and Xon/Xoff flow control).
2. Press <Enter> several times to display the Login: prompt.
3. Enter your login name. The default is InReach.
4. Enter your password. The default is access. The InReach:0> user prompt appears.
5. Enter enable and press <Enter>. The Password: prompt appears.
6. Enter the default system and press <Enter>. The InReach:0>> superuser prompt appears.
7. Enter config and press <Enter>. The Config:0>> prompt appears.
8. Enter interface 1 and press <Enter>. The Intf 1-1:0>> prompt appears.
9. Enter address *ip_address* mask *network_mask* and press <Enter>. The Intf 1-1:0>> prompt reappears.
10. Enter broadcast *broadcast_address* and press <Enter>. The Intf 1-1:0>> prompt reappears.
11. Enter exit and press <Enter>. The Config:0>> prompt appears.
12. Enter gateway *gateway_address* and press <Enter>. The Config:0>> prompt reappears.
13. Enter exit and press <Enter>. The InReach:0>> superuser prompt appears.
14. Enter save config flash to save your changes.

Accessing and Configuring the Graphical User Interface (GUI)

IMPORTANT

If your browser is connected to an LX running an older software version, you must close the browser completely and clear the cache before connecting your browser to an LX running a more recent software version. This is because the Java saves the applet to your PC. If you fail to close the browser completely, the browser will use the old applet when you connect to the LX running a later software version, and therefore some features will be missing from the GUI windows.

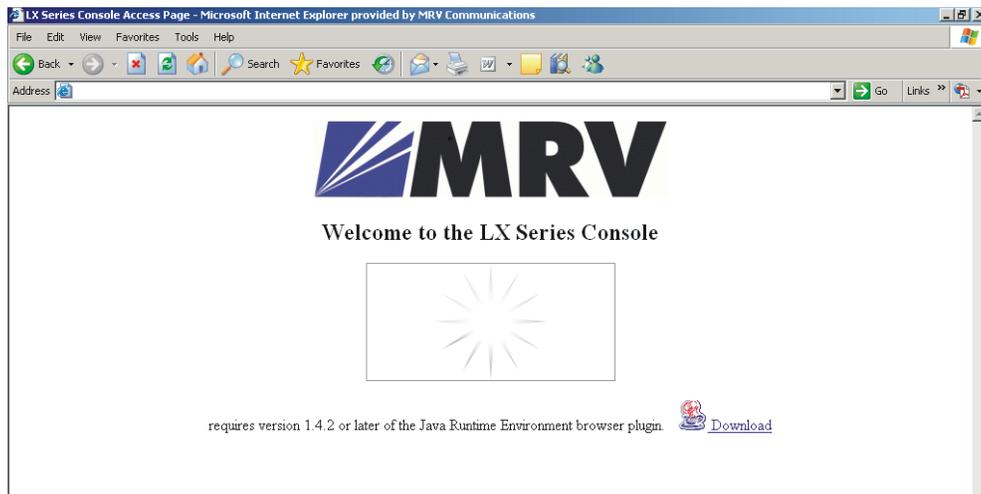
This section describes how to access and configure the LX via the GUI. To perform this procedure, you need a PC with Java Runtime Environment (JRE) 1.4.2 or later installed.

NOTE: For optimum GUI performance, MRV recommends that your PC run at 500 MHz or better. The minimum requirement for desktop color settings is 256.

The GUI has two modes: Configuration and Menu. The one you can access depends on what privileges the administrator has given you.

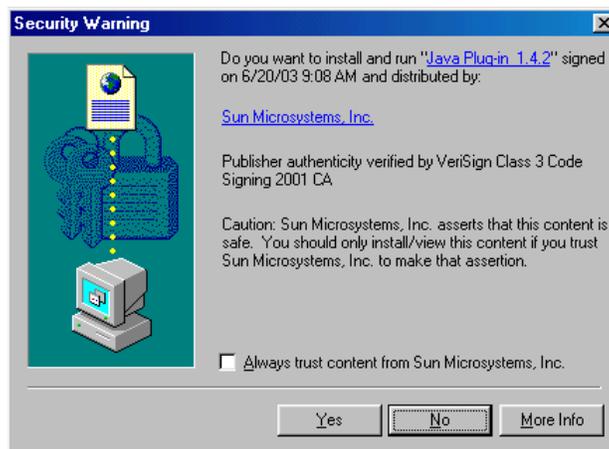
To access the GUI, do the following:

1. At your browser, type the IP address of your LX-4000 unit. The LX Series Console page appears.



NOTE: Make sure that your PC has access to the World Wide Web. You may need to download the latest release of the Java plug in to your PC. This download is performed automatically if the GUI sees that the plugin version is out of date, or not available at all. If for some reason your PC does not download the Java plug-in automatically, click on the **Download** link and install the software manually from the <http://java.sun.com> web site.

2. If you need to download Java, the following window appears automatically.

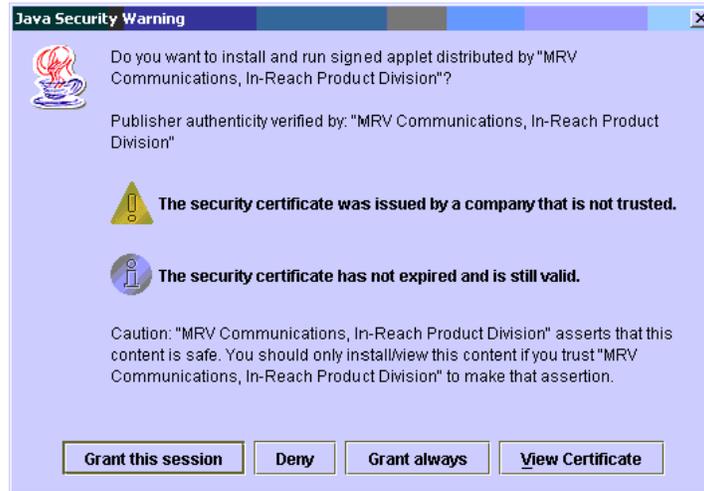


3. Click **Yes**. The plugin is downloaded and then the installation begins. A Java Runtime Environment window appears after about two minutes.

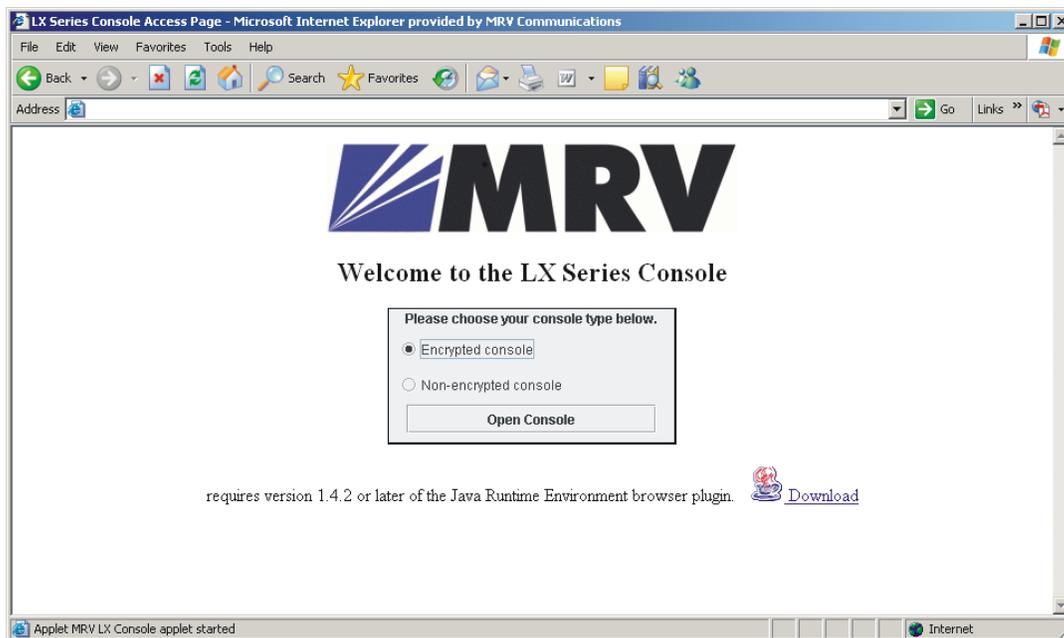
NOTE: Depending on the speed of your PC, this may take several minutes.

4. Follow the defaults to the end of the install.
5. When your browser connects to the LX, the Java Security Warning window appears.

NOTE: Your Java Security Warning window may vary, depending on your PC operating system.



6. Click on **Grant this session**. The Java Security Warning window closes. The LX Series Console page reappears, now with the console selection visible.



7. Choosing **Encrypted Console** means the GUI will run slower, but with security. Choosing **Non-Encrypted Console** means the GUI will run faster, but without security.
8. Select **Encrypted** or **Non-Encrypted** and then select **Open Console**. A login window appears.

9. Enter your Username and Password, and click **Login**.

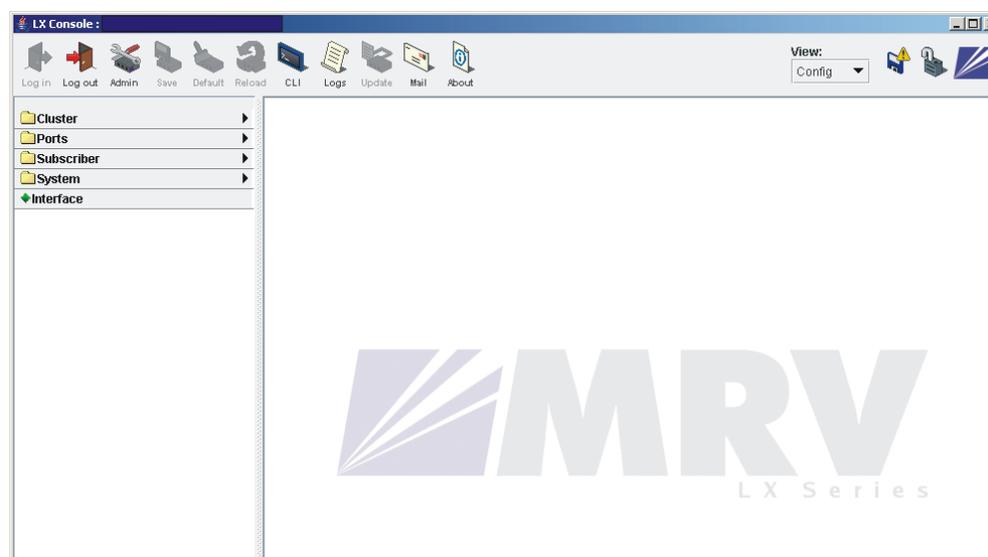
NOTE: By default, authentication is done against the LX local user database. To start, use the known username InReach and password access.

When you login, the next screen that appears depends on which mode you are authorized to configure and monitor. Refer to “Web Configure Mode” on page 31 or “Web Access Mode” on page 32, depending on which mode you can access.

Web Configure Mode

If you are authorized to access the Web Configure Mode, do the following:

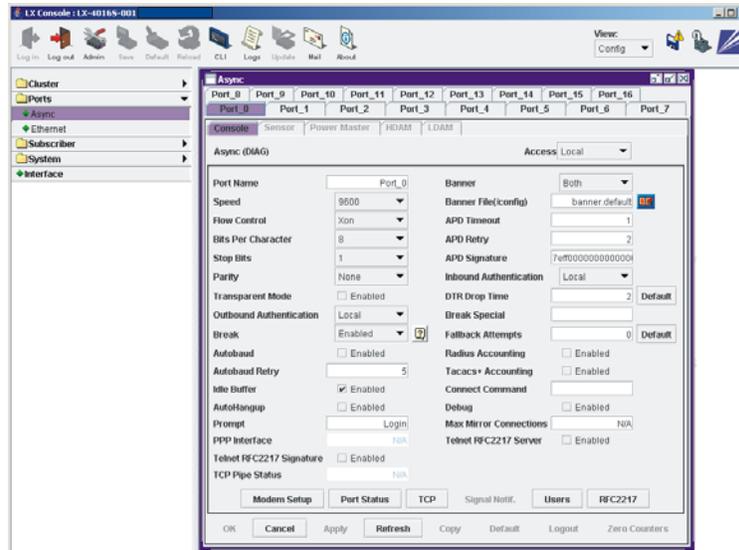
1. If you log in as a user, the following window appears.



2. To log in as a superuser, click the **Admin** button on the tool bar and log in with the default Superuser password system. You can now configure the unit via the GUI.

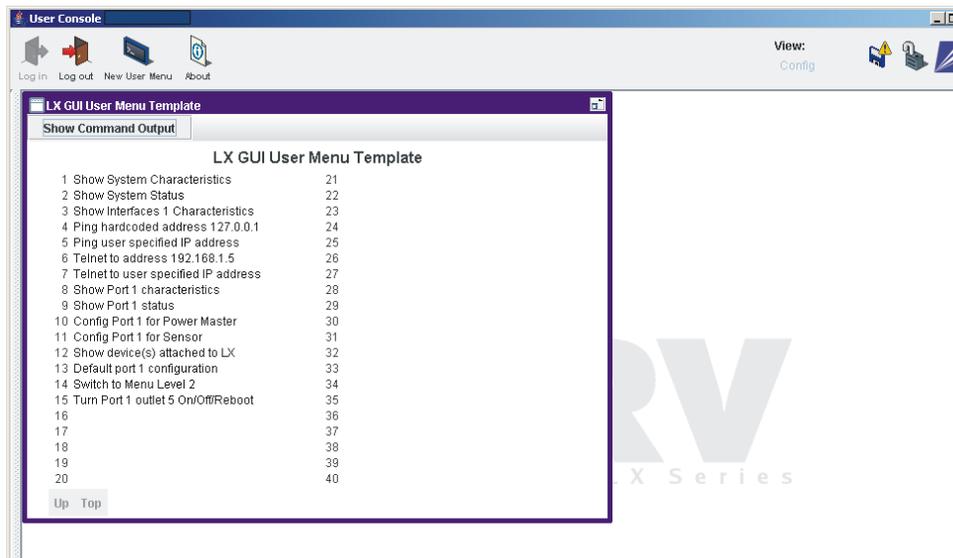
Configuring the LX-4000 Series for the First Time

- Click on the menu items on the left side of the window. For example, selecting **Ports: Async** opens the Async ports window.



Web Access Mode

If you have Web Access Mode, your pre-configured menu screen appears when you login. Click on the various menu items on the left side of the window to perform preconfigured menu option tasks.



Menu/Config Mode

When you have both Menu and Config modes, your initial login presents the menu. Then select **View: Config** to open the Config Mode window. After completing your configuration, click on the **Save** button on the toolbar to save your changes.

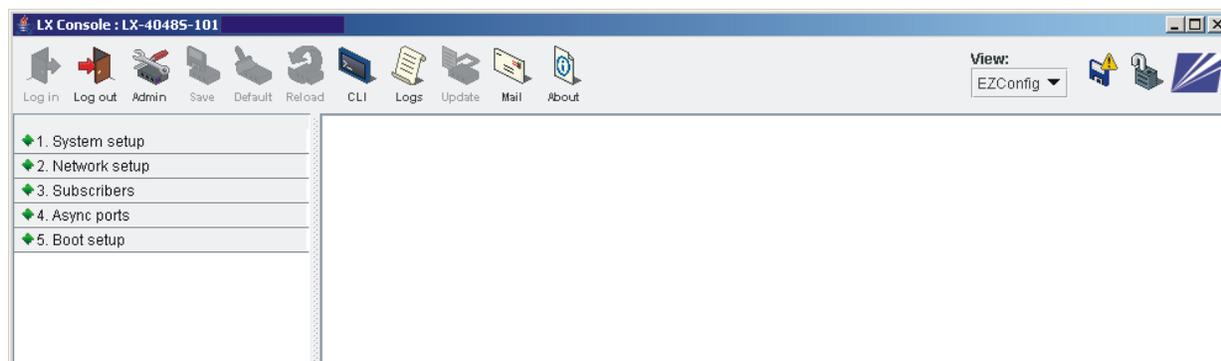
GUI EZ Configuration

The GUI EZConfig is an ease-of-use configuration tool for basic LX configuration after initial installation. More experienced users with more complex networks to configure should use the standard GUI, rather than the EZConfig GUI.

Launching the EZConfig GUI

To access the EZConfig GUI windows:

1. Open your browser.
2. Select **Encrypted console** or **Non-encrypted console** and click **Open Console**.
3. Enter a valid username and password and click **Login**. The top-level LX Console window appears.
4. Login as superuser (the default is `system`).
5. In the top right side of the window, select the down arrow to the right of **View: Config**.
6. Choose **EZConfig** from the pull-down menu. The five-option menu appears as shown in the following window.



Select each of the following menu options to open a specific window for quick configuration.

1. System setup
2. Network setup
3. Subscribers
4. Async Port
5. Boot setup

Follow the menu and the accompanying help text to configure the LX unit.

Software Upgrades

To upgrade software using the ppciboot menu, refer to “Upgrading Software with the ppciboot Main Menu” in the *LX-Series Configuration Guide*. To upgrade software using the CLI, refer to “Upgrading Software and ppciboot with the Command Line Interface” in the same manual.

IP Configuration Menu

For details on using the IP Configuration Menu, refer to “Using the IP Configuration Menu” in the *LX-Series Configuration Guide*.

Booting from Defaults

For information on how to boot your unit from defaults, refer to “Booting from Defaults” in the *LX-Series Configuration Guide*.

Accessing and Configuring Additional Features

The following sections describe additional LX-4000 features you can access and configure.

Connecting to the LX-4000 Series via Telnet or SSH

Telnet Directly into the Communication Server

NOTE: The default telnet port is 23. The default SSH port is 22.

1. Telnet to the unit from your machine.
2. Enter your subscriber login name, then your password.
3. If you entered the password correctly, the `user>` prompt is displayed.

Connecting to a Serial Port

NOTE: Devices connected to serial ports 1-32 on the LX-4032 are assigned telnet port numbers 2100-5200 by default. For example:

- Port 1 = 2100
- Port 2 = 2200
- Port 3 = 2300

NOTE: The corresponding SSH port numbers are 2122-5222. For example:

- Port 1 = 2122
- Port 2 = 2222
- Port 3 = 2322

You can gain telnet/ssh access to a serial device by using the LX IP address and default port number of that serial port.

Changing the Telnet Port

To change the interface telnet port number, use the following commands:

```
InReach> enable
```

Password> system

InReach>> config

Config:0>> interface 1

Intf 1-1:0>> telnet port #

NOTE: If you change the port number, be sure not to use a socket number assigned to another application or daemon.

Accessing from a Terminal Attached to an LX-4000 Series Serial Port

Use the following procedure to access the command line interface port from a dumb terminal attached to an LX Series serial port, which is set for access local, or dynamic:

1. Hit the return key several times to autobaud (if autobaud is enabled) the port and get the Login: prompt.
2. Enter your login name. The default is InReach.
3. Enter your password. The default is access.

Additional Considerations

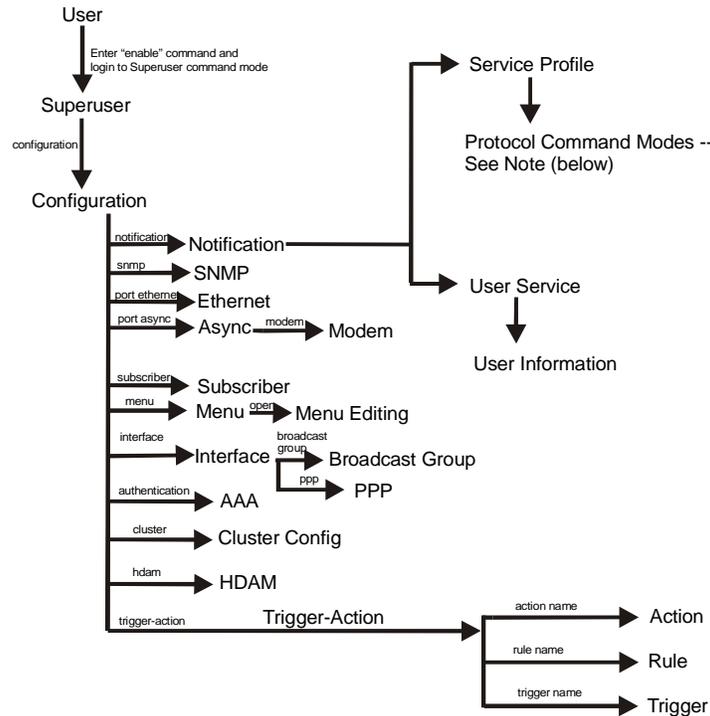
Other considerations include the following:

- Setting up users
- Authentication/Security
- Configuring modem settings

For further information on these issues, refer to the *LX-Series Commands Reference Guide*, and to the Support area of the MRV website at www.mrv.com.

Command Line Interface (CLI) Tree Structure

The command line interface structure is designed to be as intuitive as possible. Refer to “Navigating the LX Command Line Interface (CLI)” in the *LX-Series Commands Reference Guide* for detailed information on the menu tree modes. See Figure 15 for the CLI menu structure.



Note: The Protocol Command Modes include Async, Localsyslog, Remotesyslog, SMTP, SNPP, TAP, and WEB.

Figure 15 - Basic Menu Structure

Additional Considerations for an Internet Environment

If you plan to use the unit in an Internet environment, you must define addressing and identification characteristics to enable Internet hosts to recognize the unit as a member of the network. Using ppciboot, an LX-Series unit can be configured to obtain an IP address and other parameter values from the network when the unit boots.

Autobauding Feature

Autobaud is disabled on all ports. The administrator can enable autobaud on a per-port basis, except for the DIAG port (port 0). Default settings for the DIAG port (port 0) are 9600/8/None/1.

Reinitializing/Powering Off the Unit

To reinitialize the unit, enter the following command from the superuser mode:

```
reload
```

To power off the unit, disconnect the power cord.

Chapter 4

Alternative Port Capabilities

The LX-4000 Series offers extended capabilities beyond traditional RS-232 communication uses. For example, a port with specialized hardware attached can be configured to monitor temperature and humidity remotely. The following sections present some of these capabilities.

Sensor (Temperature/Humidity) Ports

NOTE: Refer to Appendix A for Temperature/Humidity sensor technical specifications.

You can configure ports to act as temperature and humidity monitors when connected to an In-Reach Temperature/Humidity Sensor. The Temperature/Humidity Sensor provides an accurate measurement of the temperature/humidity in the area in which your LX Series unit is placed.

The following section explains how to connect and install the sensor.

Connecting the Temperature/Humidity Sensor

A 10' Male RJ-45 to Male RJ-45 straight-through cable (P/N MX-151-3027) connects the temperature/humidity sensor to an LX-4000 async port. The LX unit can be configured to support the sensor on any async port other than the DIAG port (port 0).

To connect the sensor:

1. Connect one end of the RJ-45 double-ended straight through cable to the temperature/humidity sensor. The maximum length of this cable is 50 feet.

2. Connect the other end to any port you have configured as a sensor port.

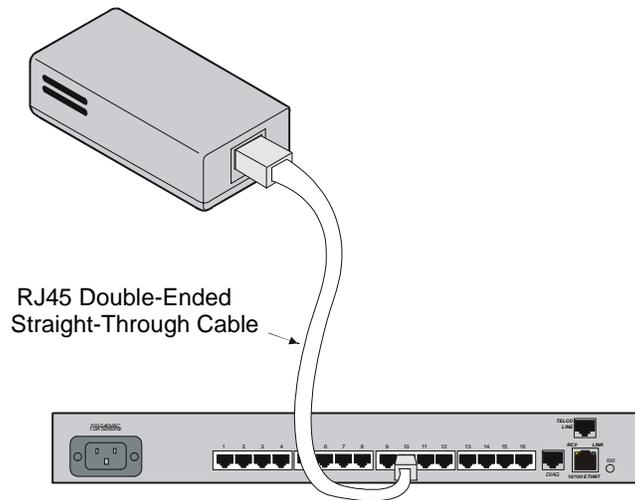


Figure 16 - Connecting the Temperature/Humidity Sensor

You must change the port's "access" to "sensor" before performing any monitoring. Use the following command, in the Async Port Configure Mode, to configure asynchronous port 4 as a Sensor Port:

```
Async 4-4:0>>access sensor
```

Once the sensor is enabled, you can check the temperature with the following command:

```
InReach:0>> show port async 4 status
```

3. You can also monitor the temperature/humidity remotely through the LX CLI. Refer to the *LX-Series Commands Reference Guide* for a detailed explanation of the commands used to configure and view your temperature/humidity sensor through the CLI interface.

5250 Power Management

The 5250 Power Control Series family of products provides easy, practical, and secure solutions for power distribution, power management and load-measurement for data centers and remote sites.

5250 Power Control Series products are available in a variety of models for 100-120VAC up to 30A, and for 230VAC up to 16A (Continental Europe). A 5250 Series offers individual remote control over the power on/off status to a maximum of 32 devices.

See the Technical Specifications Appendix for more information about available 5250 Power Control Series models.

The following section explains how to connect and install the 5250.

Connecting the 5250

The 5250 Series is equipped with a single RJ45 RS-232 serial port for attachment to the LX serial port using the supplied RJ45 to RJ45 crossover cable and RJ45 to DB9F serial port adapter as required. See the Technical Specifications in *Getting Started with the 5250 Power Control Series* for more information about the RS-232 serial port.

To connect the 5250:

1. Connect one end of the standard RJ-45 double-ended crossover cable to the serial port of the 5250.
2. Connect the other end to any LX-Series port you have configured as a power management port.

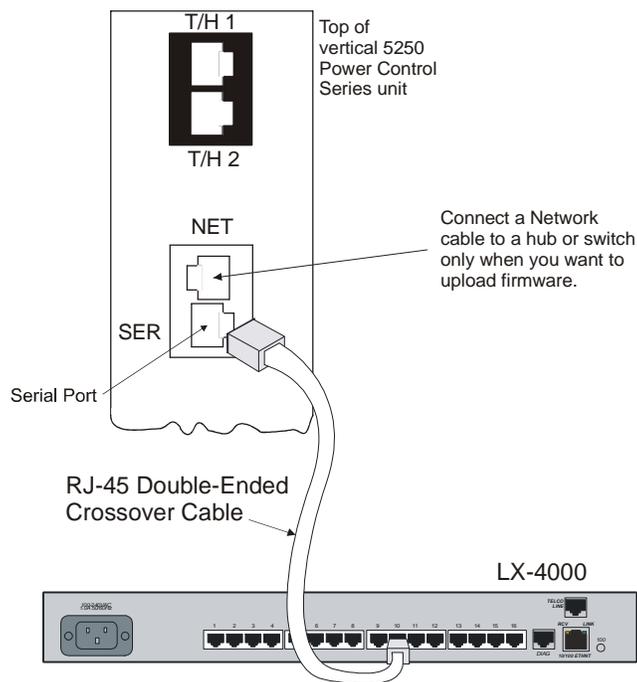


Figure 17 - Connecting the 5250

You must change the port's "access" to "power model ir5250" before performing any control and monitoring. Use the following command, in the Async Port Configure Mode, to configure asynchronous port 1 as a 5250 port:

```
Async 1-1:0>>access power model ir5250
```

After the 5250 is enabled, you can check its status with the following command:

```
InReach:0>> show port async 1 status
```

3. You can also control and monitor the 5250 remotely through the LX CLI. See the *LX-Series Commands Reference Guide* for a detailed explanation of the commands used to configure and view your 5250 through the CLI interface. See Chapter 3 for details on how to access the GUI interface.

5150 Power Strip Management

The 5150 Series family of products provides easy, practical, and secure solutions for power distribution, power management and load-measurement for remote internetworking equipment and branch AC circuits.

5150 Series products are available in 8-outlet and 16-outlet configurations for 100-120VAC up to 30A, and for 230VAC up to 16A (Continental Europe). An 5150 Series offers individual remote control over the power on/off status to a maximum of 16 devices.

The following section explains how to connect and install the 5150.

Connecting the 5150

The 5150 Series is equipped with a single RJ45 RS-232 serial port for attachment to a PC or networked terminal server using the supplied RJ45 to RJ45 crossover cable and RJ45 to DB9F serial port adapter as required. See the Technical Specifications in *Getting Started with the MRV Communications 5150 Power Control Series* for more information on the RS-232 serial port.

To connect the 5150:

1. Connect one end of the standard RJ-45 double-ended crossover cable to the serial port of the 5150.
2. Connect the other end to any port you have configured as a power management port.

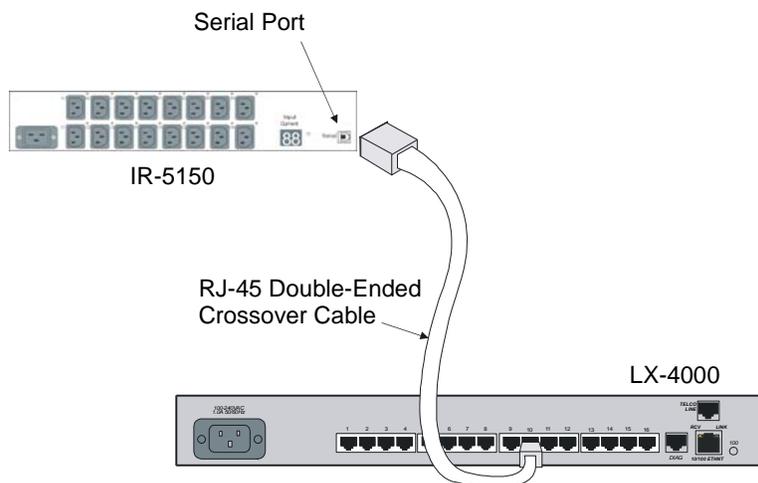


Figure 18 - Connecting the 5150

You must change the port's "access" to "power model ir5150" before performing any control and monitoring. Use the following command, in the Async Port Configure Mode, to configure asynchronous port 1 as an 5150 port:

```
Async 1-1:0>>access power model ir5150
```

Once the 5150 is enabled, you can check its status with the following command:

```
InReach:0>> show port async 1 status
```

3. You can also control and monitor the 5150 remotely through the LX CLI. Refer to the *LX-Series Commands Reference Guide* for a detailed explanation of the commands used to configure and view your 5150 through the CLI interface.

4800 Power Strip Management

The 4800 -48 VDC Series family of products provides easy, practical, and secure solutions for power distribution, power management and load-measurement for remote internetworking equipment and branch AC circuits.

4800 Series products are available in a 4-outlet configuration. An 4800 Series offers individual remote control over the power on/off status to a maximum of four DC powered devices. The 4800 supports -48 VDC up to 70A.

The following section explains how to connect and install the 4800.

Connecting the 4800

The 4800 Series is equipped with a single RJ45 RS-232 serial port for attachment to a PC or networked terminal server using the supplied RJ45 to RJ45 crossover cable and RJ45 to DB9F serial port adapter as required. See the Technical Specifications in *Getting Started with the MRV Communications 4800 Power Control Series* for more information on the RS-232 serial port.

To connect the 4800:

1. Connect one end of the standard RJ-45 double-ended crossover cable to the serial port of the 4800.
2. Connect the other end to any LX port you have configured as a power management port.

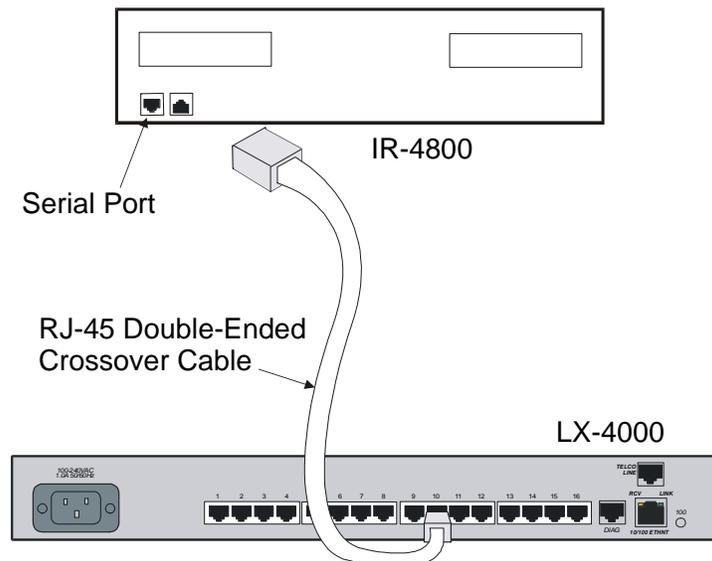


Figure 19 - Connecting the 4800

You must change the port's "access" to "power model ir4800" before performing any control and monitoring operations. Use the following command, in the Async Port Configure Mode, to configure asynchronous port 10 as a 4800 port:

```
Async 1-10:0>>access power model ir4800
```

Once the 4800 is enabled, you can check its status with the following command:

```
InReach:0>> show port async 10 status
```

3. You can also control and monitor the 4800 remotely through the LX CLI. Refer to the *LX-Series Commands Reference Guide* for a detailed explanation of the commands used to configure and view your 4800 through the CLI interface.

Using LX Ports as Alarm Inputs and Control Outputs

The LX-Series can be configured to provide two low voltage/low current outputs per port which can be used to control remote devices. Using the DTR and RTS signals, these are designated *Control Outputs*. They can be used to control external equipment, or they may be used as the controlling voltage for *Alarm Inputs* circuits.

The LX-Series can be configured to provide two signal monitor inputs per port using the DSR and CTS signal to provide a remote device monitoring capability. These are designated *Alarm Inputs*. The following sections describe the use of these signals in greater detail.

Some common terms are:

- **Alarm Inputs** - LX-Series port input signals DSR and CTS used in conjunction with the Signal-Notice software feature to monitor real world events.
- **Alarm Points** - High impedance, low current, isolated inputs available in the MRV Corporation IR-7104 product.
- **Control Outputs** - LX-Series port output signals DTR and RTS managed with the *Access Control* software commands that could be used to control external equipment or provide a controlling voltage for Alarm Inputs.
- **Control Relays** - True SPDT (Single Pole Double Throw) "Form C" Relay contact points available in the MRV Corporation IR-7104 product.

Alarm Inputs Setup and Usage

The LX-Series can be configured to provide two Alarm Inputs per port using the DSR and CTS signals. These are enabled with the *Signal-Notice* feature. *Signal-Notice* utilizes sets of *Trigger-Action-Rule* commands to detect contact closure/opens. The contacts you are monitoring may be located within your facility, for example doors alarms, window alarms or fluid level sensors. The contacts may also be contained within your equipment you wish to monitor, for example equipment fault alarms, temperature alarms and other error condition signals. The signaling device may be a simple electro-mechanical device such as a switch, a magnetic contact or a relay. The signaling device may also be electrical such as an opto-isolator, a CMOS driver or a transistor circuit. Typical circuits are illustrated in Figure 20.

Alarm Inputs use the LX-Series input circuits (DSR and CTS) to detect level transitions. These input circuits sit at the 0V level when left unconnected and can accept a voltage input in the range of $\pm 10V$.

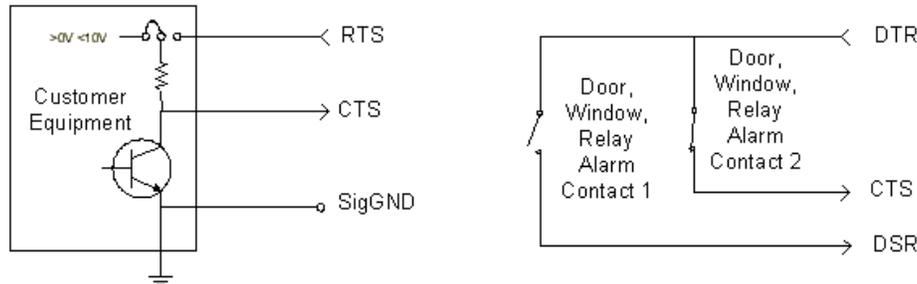


Figure 20 - Typical Alarm Inputs Connections

An external voltage within the range of $\pm 10V$ is required in order for a change to be detected when the contact opens or closes. Typically, an LX-Series Control Output is used to provide the controlling voltage for the Alarm Inputs, but it is not required. An external voltage could be used as long as it is within both the $\pm 10V$ limits and the limits of the contacts or semiconductor used in the circuit. A common Signal Ground is required. Refer to Figure 20 for typical implementations.

Important design issues to remember are:

- Electro-mechanical contacts must be rated up to 10V and 3.5mA.
- The inputs present a nominal 5K Ohm impedance but can vary from 3K to 7K Ohm.
- Input levels must be 0.6V or lower to guarantee a low state and 2.4V or higher to guarantee a high state.
- LX-Series products do not support the use of TXD as the controlling voltage for Alarm Inputs. DTR or RTS must be used.
- DTR or RTS can provide the controlling voltage for up to 2 Alarm Inputs each.
- A common Signal Ground is required. Twisted pair connections are recommended to reduce sensitivity to noise.

Note that provisions for handling alarm contact bounce and alarm flooding are available in the IR-7104 Alarm Manager family only.

Control Output Setup and Usage

The LX-Series can be configured to provide two low voltage/low current Control Outputs per port using the DTR and RTS output signals. Typically the Control Output is used as the controlling voltage for the LX-Series Alarm Inputs. In another case you can design an interface to transition from the output signals to a higher capacity circuit to implement a control subsystem. An example circuit is shown in Figure 21.

Important design issues to remember are:

- Special design attention is required when using Control Outputs in a control subsystem.
- Upon a restart or power up the states of DTR and RTS will transition several times as the LX-Series begins its start-up initialization.

- The states are *undefined* upwards of 30 Seconds + the *Boot Delay Timer* value in some configurations, i.e. the signals are non-latching through power cycles.
- Note that negative voltage could be present on the interface until the software is completely initialized.
- Control Outputs in the LX-Series guarantee $\pm 5.0V$ drive into a 3K Ohm load.
- External loading below 3K Ohm can be tolerated but under no circumstances should the device load the LX-Series output below $\pm 2.5V/7.6mA$ absolute maximum drive.
- A common Signal Ground is required.
- The MRV Corporation IR-7104 family can provide true Form C SPDT Relay outputs rated to 30VDC/1A per contact if higher capacity and stable contacts are required through restart and power cycles.

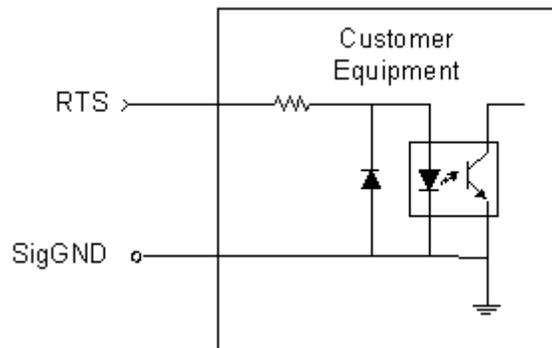


Figure 21 - Typical Interface Design for Control Output Signals

You must change the LX-Series port access type to control to utilize DTR and RTS as the Control Outputs. For example:

```
InReach:0>> config port async # access control
```

If you want the DTR signal to be asserted High (positive voltage) on the port:

```
InReach:0>> control port async # dtr high
```

Refer to the *LX-Series Configuration Guide* for a detailed explanation of the commands to set up a port in the Control function.

Appendix A - Technical Specifications

The following table provides the specifications for the LX-4000 Series.

Table 1 - LX-4000 Series Specifications

Item	Description
Terminal Signals	Transmit Data, Receive Data, Signal Ground, Data Set Ready/ Data Carrier Detect (DSR/DCD), Data Terminal Ready (DTR), Clear-to-Send (CTS), and Request-to-Send (RTS). Supports concurrent modem control.
Terminal Cabling	Modular RJ-45 DTE
Serial Line Speed	LX-4000 Series - 134.5 bps to 230 Kbps
Number of Serial Ports	LX 4008 - 8 ports LX 4016 - 16 ports LX-4032 - 32 ports LX-4048 - 48 ports
Modem (optional)	V.90/K56flex 56 Kbps
LEDs	FLT, OK, Port Status LEDs 1-8 (1-16 on 16 port, 1-32 on 32 port, 1-48 on 48 port), 10/100 Ethernet RCV, 10/100 Ethernet Link, 100Mbps speed
Controls	Reset push button switch
Dimensions Height Depth Width	LX-4000 Series 4.34 cm (1.71 in) 21.6 cm (8.5 in) 44.45 cm (17.5 in)

Appendix A - Technical Specifications

Weight (unpackaged, no cables)	LX 4008 - 2.7 kg (6.0 lbs) LX-4016 - 3.06 kg (6.75 lbs) LX-4032 - 3.4 kg (7.5 lbs) LX-4048 - 3.47 kg (7.65 lbs)
Processor/Speeds	LX-4008, LX-4016: 66 MHz PowerPC system board processor with integral 33 MHz communication co-processor, plus: LX-4008 - Two 60 MHz RISC asynchronous communication co-processors LX-4016 - Four 60 MHz RISC asynchronous communication co-processors LX-4032, LX-4048: 100 MHz PowerPC system board processor with integral 50 MHz communication co-processor, plus: LX-4032 - Eight 60 MHz RISC asynchronous communication co-processors LX-4048 - Twelve 60 MHz RISC asynchronous communication co-processors
Memory	LX-4008, LX-4016: 8 MB Flash, 64 MB SDRAM LX-4032, LX-4048: 8 MB Flash, 128 MB SDRAM
Environment	5% to 90% humidity, noncondensing Operating Temperature: 0 to 40°C (32° to 104° F) Storage Temperature: -40 to 85°C (-40 to 185° F)
Input Voltage	100 - 240 VAC 50 - 60 Hz (All LX-4000 Series)
Cable Length - Alarm Input	150 meters (500 feet)
Cable Length - Control Output	300 Meters (1000 feet)

Power Requirements	<p>LX-4008 AC - 11W, (38BTU/hr) 0.09A at 120V (typ), 11W 0.05A at 220V (typ)</p> <p>LX-4008 DC - -48VDC Nominal, -20VDC to -72VDC Operating Range, 1A @ -48VDC, Dual Feed, 165 BTU/hr</p> <p>LX-4016 AC - 14W, (47.8 BTU/hr) 0.11A at 120V (typ), 14W 0.06A at 220V (typ)</p> <p>LX-4016 DC - -48VDC Nominal, -20VDC to -72VDC Operating Range, 1.2A @ -20VDC, Dual Feed, 165 BTU/hr</p> <p>LX-4032AC - 23W, (79 BTU/hr) 0.19A @ 120V (typ), 0.105A @ 220V</p> <p>LX-4032DC - -48VDC Nominal, -20VDC to -72VDC Operating Range, 0.6A @ 48VDC, Dual Feed, (99 BTU/hr)</p> <p>LX-4048AC - 41W, (140 BTU/hr) 0.24A @ 120V (typ), 0.13A @ 220V</p>
Minimum Software Requirements	LX-4008 requires V2.0.0 or greater, LX-4016 requires V2.0.1 or greater, LX-4032 requires V2.2.0 or greater, LX-4048 requires V3.0.0 or greater.
Ethernet Interface	10BASE-T/100Base-TX on single RJ-45, Auto-negotiation, Standard CSMA/CD or Full-Duplex operation.
Control Output Ratings	RTS/DTR: 5.0V @ 1.6mA (Nominal), 2.5V @ 7.6mA (Absolute Maximum)
Real Time Clock Battery	32.768KHz crystal Lithium coin cell battery CR2032 or equivalent. Power down shelf-life: 1 year at 20°C.

The following table provides the specifications for the Temperature/Humidity Sensor.

Table 2 - Temperature/Humidity Sensor Specifications

Item	Description
Interface	Proprietary
Maximum Cable Length	50 feet
Operating Environment	5% to 90% humidity, noncondensing Operating Temperature: 0 to 40°C (32° to 104° F) Storage Temperature: -40 to 85°C (-40 to 185° F)
Dimensions	Height: 0.8 inches Length: 3.15 inches Width: 1.57 inches
Weight	1.2 oz
Accuracy	Temp: +/-3 deg C Humidity: +/- 5%

Appendix B - Factory Defaults

The following table provides the factory defaults for the LX-4000 Series.

Table 3 - LX-4000 Series Factory Defaults

Item	Description
DIAG Port/local management port (default settings)	The DIAG port (port 0) is the console management port. Auto Protocol Detect (APD) is disabled. Autobaud is disabled. 9600/8/1/None. Quick Start is enabled. Access is Local. Flow Control is Xon/Xoff.
All Ports Except Management and Modem Ports (default settings)	Autobaud is disabled. 9600/8/1/None. Access is Remote. APD is disabled. Flow Control is Xon/Xoff.
Modem Port (default settings)	Autobaud is disabled. Speed is 57600. Access is Local. APD is enabled. Flow Control is CTS.

ppciboot Factory Default Settings

The following table lists the factory default settings.

Main Menu Configuration	Factory Default Setting
Boot from Network	yes
Save boot image to flash	no
Boot from flash	yes
Time Out, in seconds	8
IP Configuration Menu Configuration	Factory Default Setting
IP Assignment method #1	DHCP
IP Assignment method #2	BOOTP
IP Assignment method #3	RARP
IP Assignment method #4	User Defined

NOTE: For defaults on specific commands, refer to the *LX-Series Commands Reference Guide*.

Each LX Series unit is configured at the factory to use a default set of initialization parameters that sets all ports to operate with asynchronous ASCII terminal devices.

Appendix C - POST Test Error Codes

Error Code Definitions

The following table provides the definitions for the LX-4000 Series POST test error codes.

Table 4 - POST Test Error Codes

Error Definition	Error Code (in Hexadecimal)
CPU Clock Slow	1020
Reading Invalid Default Value from CPLD Diagnostic Register	2010
Reading Invalid Default Value from Expansion CPLD Diagnostic Register	2011
Reading Invalid Pattern Value from CPLD Diagnostic Register	2020
Reading Invalid Pattern Value from Expansion CPLD Diagnostic Register	2021
Reading Invalid Value from CPLD System Fail Status Register	2030
AC FAIL bit is set in the CPLD System Fail Status Register	2031
+12VFAIL bit is set in the CPLD System Fail Status Register	2033
-12VFAIL bit is set in the CPLD System Fail Status Register	2034
CPLD FAIL bit is set in the CPLD System Fail Status Register	2035
Watchdog Timer Failed	2040
Invalid HW Type	2050
Fast Ethernet Controller (FEC) Reset Delay Timeout	3010
Fast Ethernet Controller (FEC) Transmission Failed Timeout	3020

Appendix C - POST Test Error Codes

Fast Ethernet Controller (FEC) Reception Failed Timeout	3030
Fast Ethernet Controller (FEC) Invalid Data Received	3040
No PHY Device Detected	3050
CD1400 Reset delay timeout for Quadart 1	4110
CD1400 Reset delay timeout for Quadart 2	4120
CD1400 Reset delay timeout for Quadart 3	4130
CD1400 Reset delay timeout for Quadart 4	4140
CD1400 Reset delay timeout for Quadart 5	4150
CD1400 Reset delay timeout for Quadart 6	4160
CD1400 Reset delay timeout for Quadart 7	4170
CD1400 Reset delay timeout for Quadart 8	4180
CD1400 Reset delay timeout for Quadart 9	4190
CD1400 Reset delay timeout for Quadart 10	41A0
CD1400 Reset delay timeout for Quadart 11	41B0
CD1400 Reset delay timeout for Quadart 12	41C0
CD1400 Loopback operation timeout for Quadart 1	4210
CD1400 Loopback operation timeout for Quadart 2	4220
CD1400 Loopback operation timeout for Quadart 3	4230
CD1400 Loopback operation timeout for Quadart 4	4240
CD1400 Loopback operation timeout for Quadart 5	4250
CD1400 Loopback operation timeout for Quadart 6	4260
CD1400 Loopback operation timeout for Quadart 7	4270
CD1400 Loopback operation timeout for Quadart 8	4280
CD1400 Loopback operation timeout for Quadart 9	4290
CD1400 Loopback operation timeout for Quadart 10	42A0
CD1400 Loopback operation timeout for Quadart 11	42B0
CD1400 Loopback operation timeout for Quadart 12	42C0
CD1400 Invalid Data Received for Quadart 1	4410
CD1400 Invalid Data Received for Quadart 2	4420
CD1400 Invalid Data Received for Quadart 3	4430
CD1400 Invalid Data Received for Quadart 4	4440
CD1400 Invalid Data Received for Quadart 5	4450

CD1400 Invalid Data Received for Quadart 6	4460
CD1400 Invalid Data Received for Quadart 7	4470
CD1400 Invalid Data Received for Quadart 8	4480
CD1400 Invalid Data Received for Quadart 9	4490
CD1400 Invalid Data Received for Quadart A0	44A0
CD1400 Invalid Data Received for Quadart B0	44B0
CD1400 Invalid Data Received for Quadart C0	44C0
Memory Error at (printing address)	5010
Memory Data Bus Failed	5020
Memory Address Bus Failed High	5030
Memory Address Bus Failed Low	5040
Flash Checksum Error	5055

POST Test Error Code Sample

NOTE: This example applies to 8, 16, 32, and 48 port LX units. The 16, 32, and 48 port LX units use only the first eight LEDs when generating error codes.

The following sample illustrates the Port Status LED sequence for Error 2030 (Reading Invalid Value from PLD System Fail Status Register) on the LX-4008. In this example:

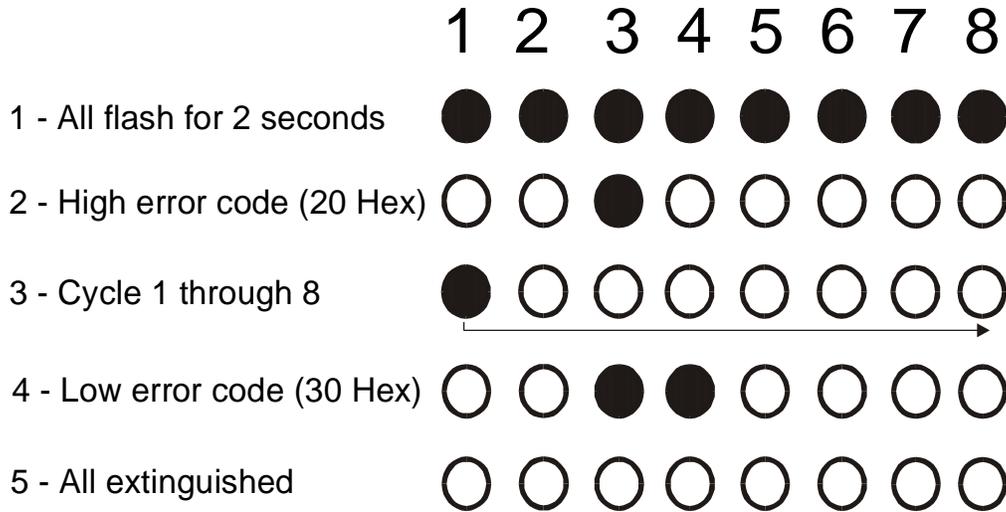
1. A POST test failure occurs on an 8-port unit. All LEDs flash eight times, very quickly, then the error code is displayed.
2. You record that LED 3 turns on. Again, all LEDs flash eight times very quickly, then the rest of the error code is displayed.
3. You record that LEDs 3 and 4 turn on. Figure 22 explains how to interpret the sample error code.

NOTE: In hexadecimal, 0 indicates the LED is OFF. 1 indicates the LED is ON.

Each group of four LEDs is converted to a hexadecimal value as follows:

- 0 = 0000
- 1 = 0001
- 2 = 0010
- 3 = 0011
- 4 = 0100
- 5 = 0101
- 6 = 0110
- 7 = 0111
- 8 = 1000
- 9 = 1001

- A = 1010
- B = 1011
- C = 1100
- D = 1101
- E = 1110
- F = 1111



You can generate the Error Code result from steps 2 and 4 above. Put an x in the column in which the LEDs were illuminated and record the value.

LED	1	2	3	4	5	6	7	8
Binary Value	8	4	2	1	8	4	2	1
Cycle 1 <small>(from step 2)</small>	-	-	x	-	-	-	-	-
Result in Hex	2				0			
Cycle 2 <small>(from step 4)</small>	-	-	x	x	-	-	-	-
Result in Hex	2+1=3				0			

Therefore, the High error code is 20, and the Low error code is 30, which means the combined error code is 2030.

Figure 22 - POST Test Error Code Sample

Appendix D - Cabling the LX-4000 Series

Cabling Considerations

Standard cabling items available from MRV allow you to connect to any serial device that uses male or female DB-25 or DB-9 connectors. All you need is the appropriate cable (crossover cable for connecting to a DTE (Data Terminal Equipment) device, straight-through cable for connecting to a DCE (Data Communication Equipment) device), and the correct modular adapter (male or female DB-25 connector), which is essentially an RJ-45-to-DB25 adapter.

Serial Device Connectors

The signal assignments of the 8-pin jacks are shown in Figure 23.

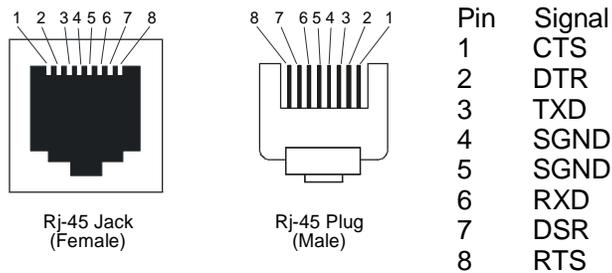


Figure 23 - Serial Device Connector (RJ-45) Signal Assignments

Diagnostic Port Connector (Port 0)

The pinout for the Diagnostic Port connector is the same as that of the serial connector.

10/100 Connector

Figure 24 shows the standard 10/100 (RJ-45 jack) connector signal assignments.

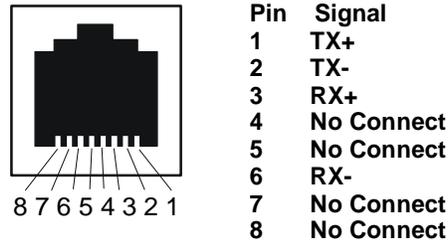


Figure 24 - 10/100 Connector Assignments

Ordering Cables

MRV also supplies crossover cables and modular adapters for use with all LX-4000 Series units. To order cables, adapters or other cabling accessories from MRV, contact your Sales representative or distributor.

Modular Adapters

MRV provides the following modular adapters for use with LX-4000 Series units:

- Female DB-9 (PN MX-350-0308)
- Female DB-25 (PN MX-350-0181)
- Male DB-25 (PN MX-350-0179) – supports RING
- Male DB-25 (PN MX-350-0180) – supports RTS/CTS

This section describes the pinouts and wiring of the MRV-supplied DB-25 adapter.

Pin Assignments

The following table shows the pinouts for a standard RS-232 DB-25 connector.

Pin	Signal
1	Cable Shield
2	Transmit Data
3	Receive Data to DCE
4	RTS (Request to Send)
5	CTS (Clear to Send)
6	DSR (Data Set Ready)
7	Signal Ground
8	Data Carrier Detect

9	Unused
10	Unused
11	Unused
12	Unused
13	Unused
14	Unused
15	Unused
16	Unused
17	Unused
18	Unused
19	Unused
20	Data Terminal Ready
21	Unused
22	Ring Indicate
23	Unused
24	Unused
25	Unused

Figure 25 shows serial DB-25 pin assignments.

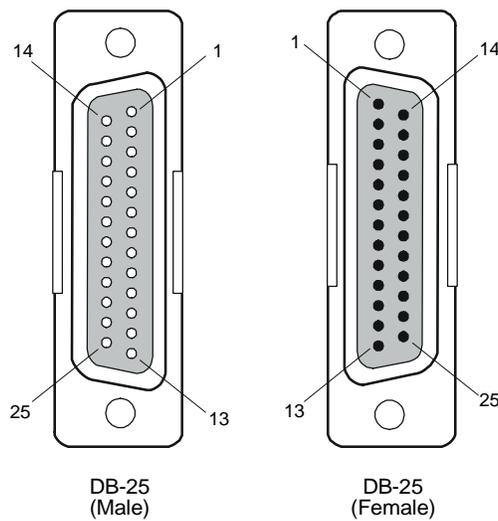


Figure 25 - DB-25 Pins

Ordering and Installing the Inlet Connector Lock

NOTE: The Inlet Connector Lock is available only on the LX-4008, LX-4016, and LX-4032. It is not supported on the LX-4048.

You can use an inlet connector lock to lock the AC power cord to the LX-4000 Series unit. MRV does not supply this lock. You can order the connector lock (part number 85910020) from Panel Components Corporation. The web address at which you can order the connector lock is: www.panelcomponents.com/first.html. See Figure 26 for installation instructions.

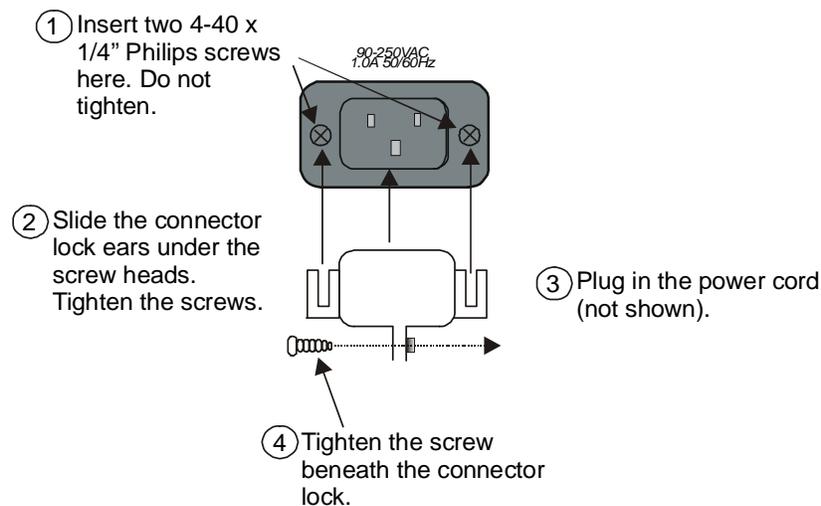


Figure 26 - Installing the Inlet Connector Lock

Connecting to the Diagnostic Port (Port 0)

NOTE: Display problems may occur during bootup when you attach a VT420 terminal to the DIAG port (port 0) and the VT420 display setup is configured to Smooth-2 Scroll. To avoid this, change the VT420 scroll setting to Jump Scroll.

Connect the provided serial port cable to the DIAG connector (port 0), and the other end to your terminal. You can use this direct connect serial link to send commands to the boot loader and diagnostics. This port is used to log system messages during bootup. You can also use port 0 to manage and configure the LX-4000 once the unit completes the bootstrap process.

Modem Control/Hardware Flow Control

LX-4000 Series serial ports can be set up to support RTS/CTS flow control. The adapters shown in Figure 27 and Figure 28 illustrate RTS/CTS flow control for DTE devices using DB25 and DB9 connectors. Figure 29 illustrates RTS/CTS flow control for a DB-25 connector on a DCE device like a modem. LX-4000 Series serial ports can also be set up to support modem control (except for the DIAG port (port 0)). Figure 27, Figure 28, and Figure 29 support modem control as needed. Only Figure 28 and Figure 29 support concurrent modem control and RTS/CTS flow control between the LX-4000 Serial Port and the attached device.

The adapter shown in Figure 29 supports modem control.

NOTE: You would use a "null-modem" cable when making a direct connection between the serial ports of two communication servers (i.e., no modems involved) or other DTE device. For that application, use a DTE-to-DTE cable.

RJ-45 Wiring Considerations

You should give special consideration to the wiring scheme when connecting a device such as a terminal to a LX-4000 Series serial port. The LX-4000 Series is considered a DTE device. To connect to another DTE device such as a terminal, you will need crossover wiring, as shown in Figure 27 and Figure 28. When a DCE device is connected to an LX-4000 Series serial port, straight-through wiring is required, as shown in Figure 29.

NOTE: In general, an ethernet category 3 (CAT 3) or category 5 (CAT 5) may introduce noise due to the crossing of pins 3 and 6 (transmit and receive). Flat eight wire cables are recommended.

Modular Adapters (RJ-45 to DB-25)

You can obtain adapters with male and female DB-25 connectors from MRV. These adapters direct signals from the RJ-45 connector on the cable to the correct pin on the DB-25 connector. Figure 27, Figure 28, and Figure 29 show how devices are cabled when you use these adapters.

Application (see Figure 27): Use RJ-45 to DB-25 to connect your LX-Series unit to a PC.

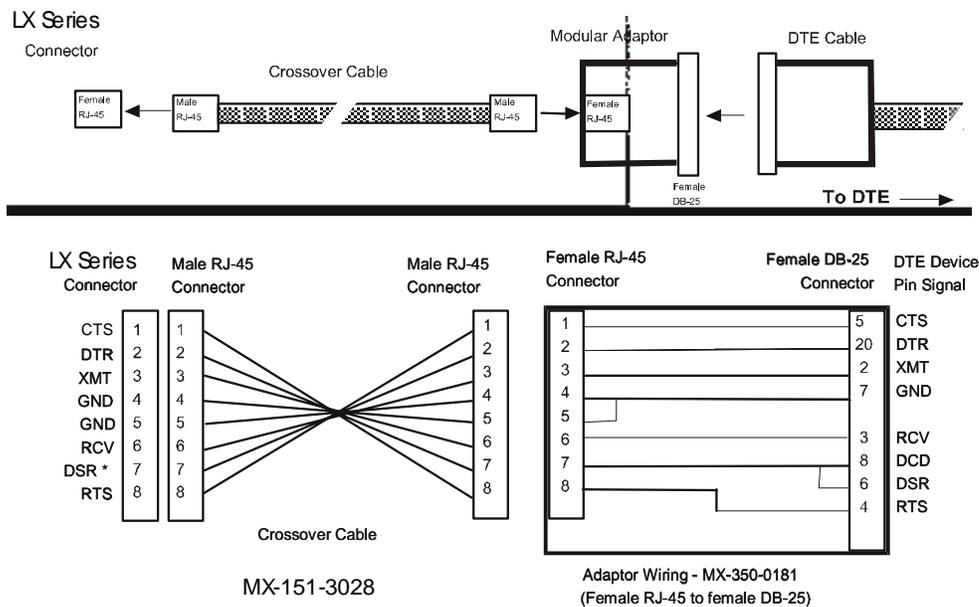


Figure 27 - Adapter Wiring, LX Series to DTE

Application (see Figure 28): Use RJ-45 to DB-9 to connect your LX-Series unit to a PC or other serial port using a D sub-9 connector.

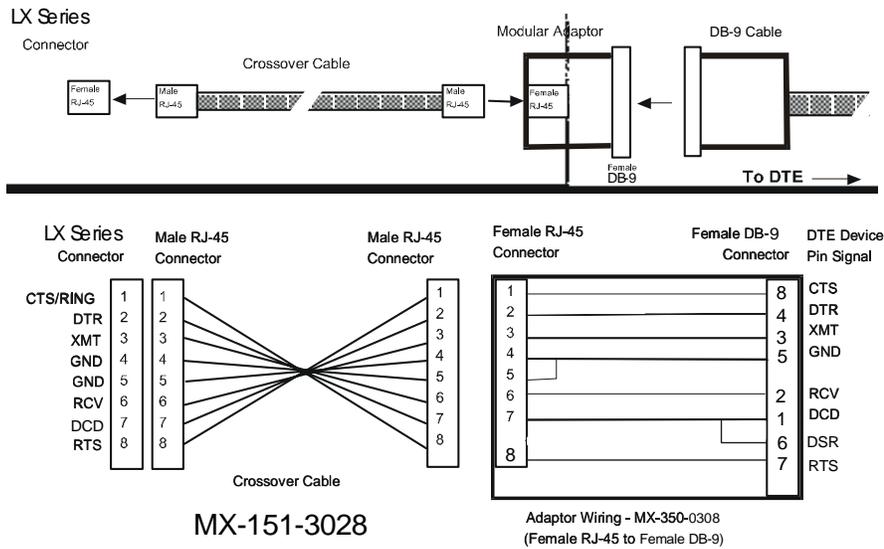


Figure 28 - Adapter Wiring, RJ-45 to DB-9, LX Series to DTE

Application (see Figure 29): Use LX-Series to DCE to connect your LX-Series unit to a modem.

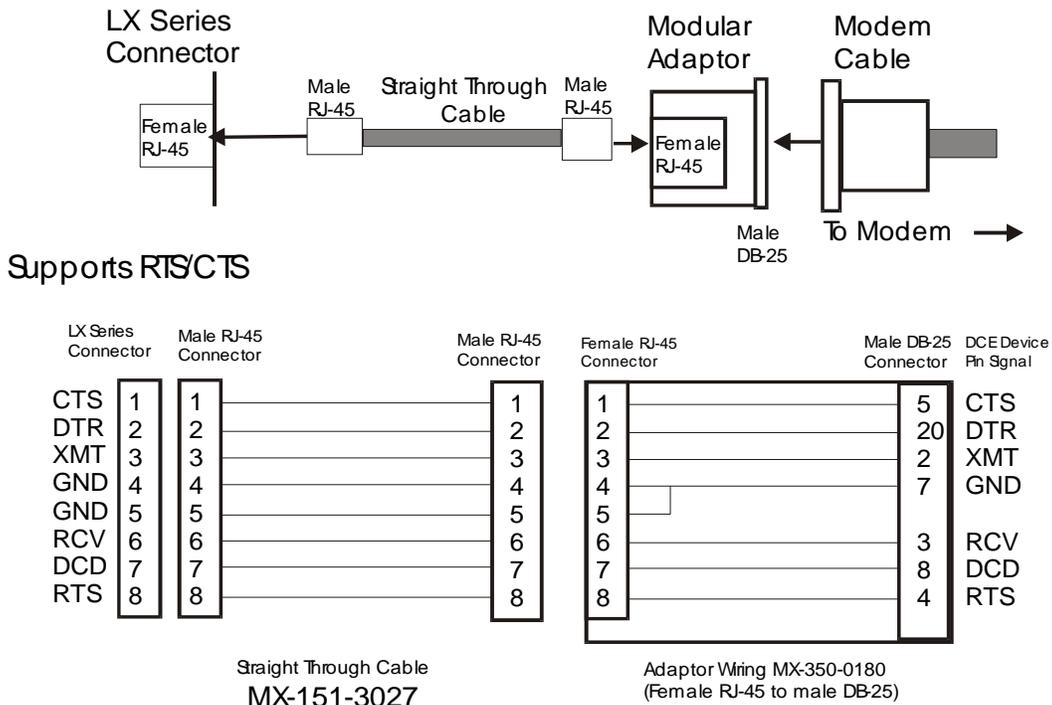


Figure 29 - Adapter Wiring, LX Series to DCE

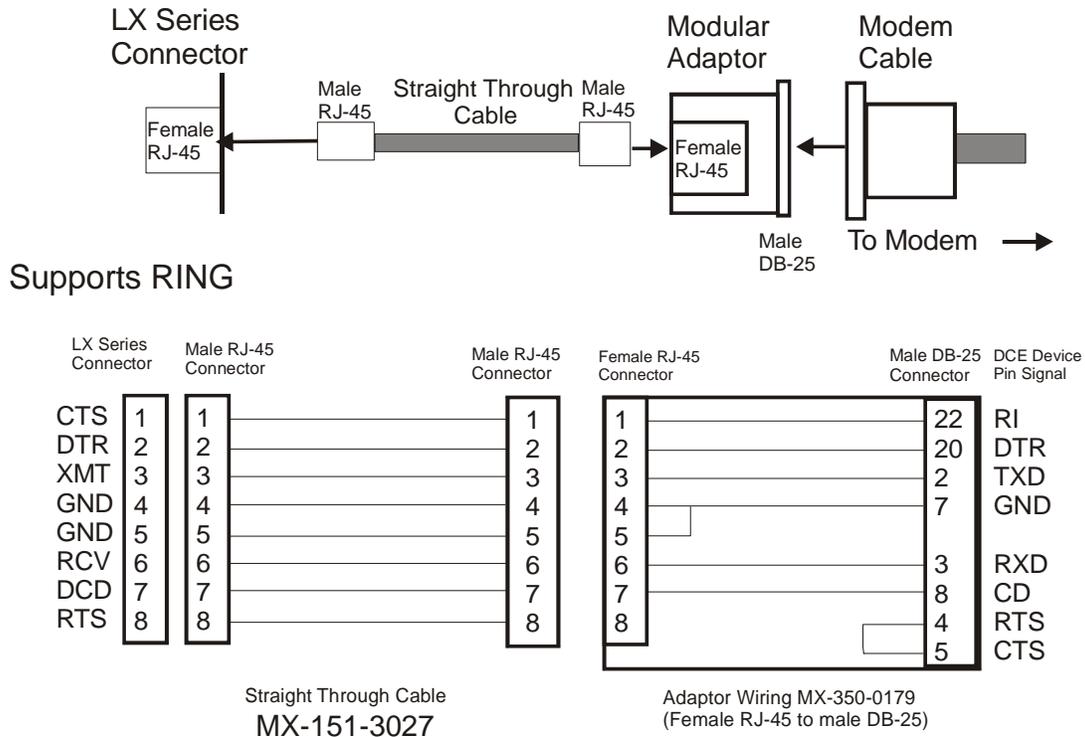


Figure 30 - Adapter Wiring, LX-Series to DCE, with RING

NOTE: In order to expand the functionality of the serial interface, the LX-4000 Series modular cabling allows you to connect different signals to pin 7 of the LX-4000 Series. (This pin is an input to the LX-4000 Series.) When a DCE device is connected to an LX-4000 Series serial port, the device's DCD output is connected to pin 7. In this case, the signal at pin 7 is referred to as DCD. DCD is used here for session control only, not for flow control.

When a DTE device is connected to an LX-4000 Series serial port, the device's DTR output is connected to pin 7 of the LX-4000 Series. In this case, the signal at pin 7 is referred to as DSR. (This cabling scheme also provides DECconnect compatibility, since DECconnect does not support the DCD signal.)

MRV 8-Wire Cabling

This cabling scheme provides XMT, RCV, DCD/DSR, DTR, RTS, CTS, and two signal ground wires. This cabling is provided through RJ-45 connectors. Using this cabling scheme you can concurrently use modem control and RTS/CTS hardware flow control, since there are four control signals. This scheme is useful with relatively high speed devices, complex modem control applications.

In Figure 31, one signal is referred to as CTS. The CTS signal designation refers to the signal observed at pin 1 of each serial port. Pin 1 is multiplexed to these signals.

This scheme is useful with the following applications:

- Terminal emulation and file transfer applications, such as Kermit, Xmodem, Microphone, etc.
- Applications such as PPP using low speed modems.
- Applications such as PPP using high speed modems.
- Applications using CCITT V.42-compliant modems, or other devices operating at high port speeds.

Application (see Figure 31): Use RTS/CTS to connect your LX-Series unit to a modem.

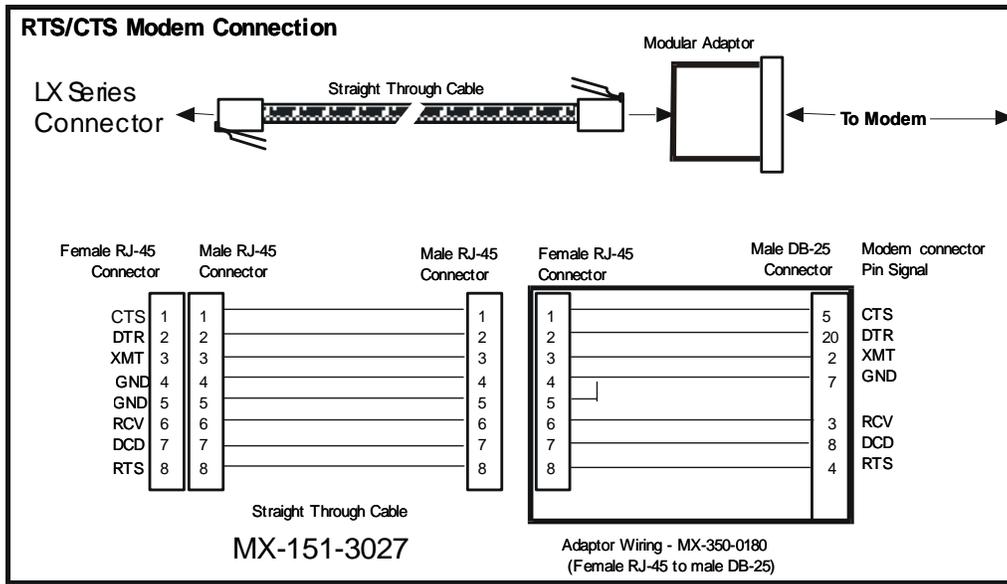


Figure 31 - Modular Cables for RTS/CTS Flow Control (Eight-Wire), Concurrent with Modem Control Signalling

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