Getting Started with the LX-1000 Series

Should you experience trouble with this equipment, please contact one of the following support locations:

- **If you purchased your equipment in the Americas,** contact MRV Americas Service and Support in the U.S. at 978-952-4888. (If you are calling from outside the U.S., call +011 978-952-4888.)
- **If you purchased your equipment outside the Americas (Europe, EU, Middle-East, Africa, Asia),** contact MRV International Service and Support at 972-4-993-6200.

CAUTION

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, can cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the power cord of the equipment into an outlet on a circuit that is different from that to which the receiver is connected.
- Consult the dealer or experienced radio/TV technician for help.

Changes or modifications not expressly approved by MRV Communications, Inc. could void the user's authority to operate the equipment.

HUMAN EXPOSURE COMPLIANCE STATEMENT

Pursuant to 47 CFR § 24.52 of the FCC Rules and Regulations, personal communications services (PCS) equipment is subject to the radio frequency radiation exposure requirements specified in § 1.1307(b), § 2.1091 and § 2.1093, as appropriate. Wavecom, Inc. certifies that it has determined that the Modem complies with the RF hazard requirements applicable to broadband PCS equipment operating under the authority of 47 CFR Part 24, Subpart E and 47 CFR Part 22, of the FCC Rules and Regulations. This determination is dependent upon installation, operation and use of the equipment in accordance with all instructions provided. The Modem is designed for and intended to be used in fixed and mobile applications. "Fixed" means that the device is physically secured at one location and is not able to be easily moved to another location. "Mobile" means that the device is designed to be used in other than fixed locations and generally in such a way that a separation distance of at least 20 cm is normally maintained between the transmitter's antenna and the body of the user or nearby persons. The Modem is not designed for or intended to be used in portable applications (within 20 cm of the body of the user) and such uses are strictly prohibited. To ensure that the Modem complies with current FCC regulations limiting both maximum RF output power and human exposure to radio frequency radiation, a separation distance of at least 20 cm must be maintained between the unit's antenna and the body of the user and any nearby persons at all times and in all applications and uses. Additionally, in mobile applications, maximum antenna gain must not exceed 3 dBi for 1900 MHz operations and -0.5 dB for 850 MHz operations.

EXPORT NOTICE

MRV models contain 128-bit encryption software. Export of this product is restricted under U.S. law. Information is available from the U.S. Department of Commerce, Bureau of Export Administration at www.bxa.doc.gov.

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Preface

This guide contains all the information you need to get the LX-1000 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-1000 Series, including supported communication speeds, software requirements, and conventions.
- **Chapter 2** – Describes how to install and connect the LX-1000 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-1000 Series via telnet and SSH.
- **Chapter 4** – Describes alternative port capabilities, including temperature/humidity sensors, IR-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-1000 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-1000 Series unit.
- **Appendix E** - Explains how to install a SIM Card.

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-1000 Series

The LX-1000 Series products are secure standalone communication servers designed for applications requiring secure console, serial port management and remote access. The LX-1000 Series provides the most secure and robust feature set to meet your remote console management and terminal server needs. The LX-1000 Series includes the most comprehensive security features, such as per port access protection, TACACS+, SecurID, RADIUS, Secure Shell v2.0, PPP PAP/CHAP, PPP dial-back, on-board database, menus, and others.

The LX-1000 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-1000 Series also provides various port densities of RS-232 DTE RJ45 Serial ports, V.90/K56 flex Modems, and Global System for Mobile Communications/General Packet Radio Service (GSM/GPRS) Modem options. Currently, the LX-1000 2-port unit hardware provides port densities of 1 serial port plus a modem, or 2 async serial ports plus port 0 for local management. The LX-1000 4-port unit hardware provides port densities of 4 serial ports plus an optional modem, and is offered with two power sources: AC and Power over Ethernet (PoE). There are two models each for both AC and PoE:

- LX-1004-AC without modem
- LX-1004-AC with modem
- LX-1004-PoE without modem
- LX-1004-PoE with modem

The LX-1004 is a PoE IEEE 802.3af compliant PD (Powered Device).

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 1-4:0 >>`, where Async is a reminder that tells you which part of the configuration you are in, `1-4` is the range of ports any operation will affect, `0` is a session number, and `>>` indicates superuser mode. To get to the `Async 1-4:0 >>` prompt, you must first type `port async 1 4` at the `Config:0 >>` prompt. Note that you do not add a dash between the range numbers in `port async 1 4`.

- **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

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Chapter 2

Installing the LX-1000 Series

Hardware Installation

This section explains how to install an LX-1000 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 unit shipping carton contains the following items:

- Bracket and bracket mounting hardware. MRV provides the following mounting screws: Two 4-40 x 1/4" screws for attaching the bracket to the unit, and two 10-32 screws to attach to the rack.
- External power supply (if applicable).
- Rubber feet (4).
- Tie wrap (3.5") for strain relief.
- Cable for attaching the DIAG/MGMT port.
- One software/documentation CD.
- DB9 - RJ45 adapter.
- GSM/GPRS Antenna (if applicable)

LX Indicators and Interfaces

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

Front Panel LEDs

This section explains the front panel LEDs (see Figure 1 for the 1 and 2-port models, and Figure 2 for the 4-port model).
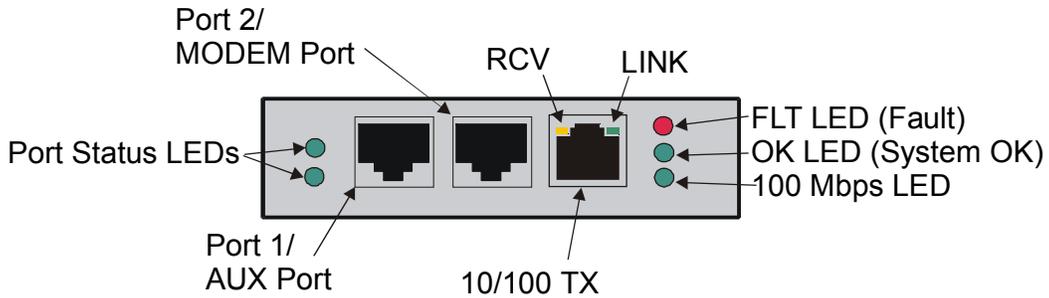
Figure 1 - LX-1000 Series 1- and 2-Port Front Panel
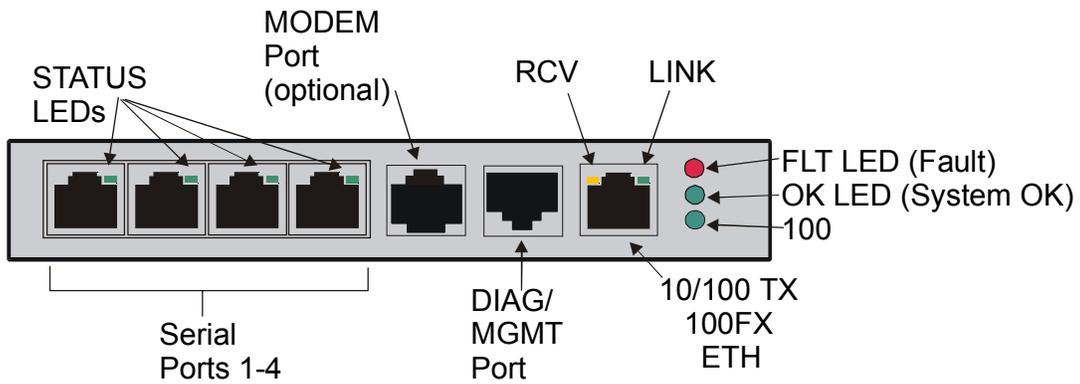
Figure 2 - LX-1000 Series 4-Port Front Panel
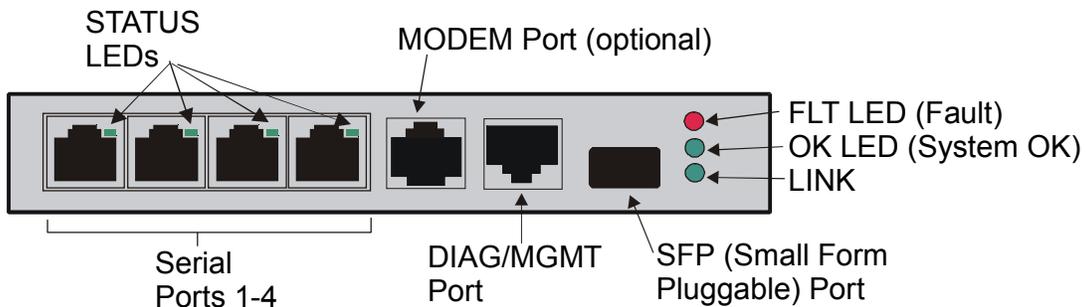
Figure 3 - LX-1000 Front Panel with SFP (Small Form-Factor Pluggable) Slot
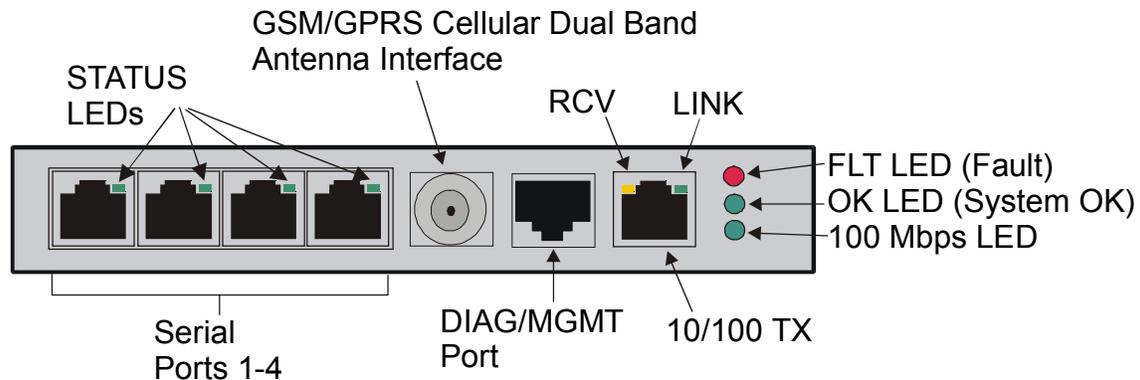
Figure 4 - LX-1000 Front Panel with Cellular Dual Band Antenna Interface

Port Status LEDs

Each of the two (or four) green LEDs flash when receive activity is detected on its corresponding serial port.

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.

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.

100 Mbps

This green LED indicates speed. If the link is 100 Mbps, the LED comes ON.

Rear Panel

This section explains the rear panel and shows you a rear view of the LX-1000 series (see Figure 5 and Figure 6).

DIAG/MGMT Port (Port 0)

Power Connector 1A +5V DC Only
(Center Pin Positive)
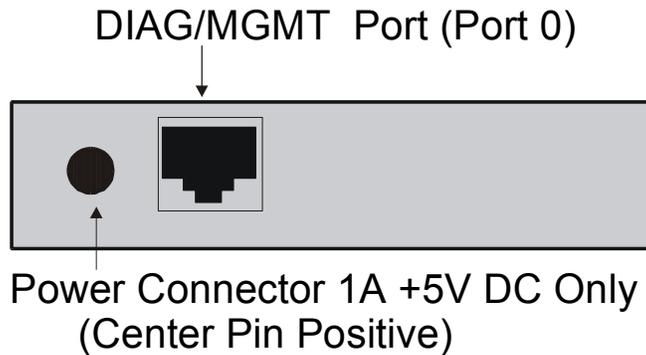
Figure 5 - LX-1000 Series 1- and 2-Port Rear Panel

Reset Button

Power Connector 1.25A +5V DC Only
(Center Pin Positive)
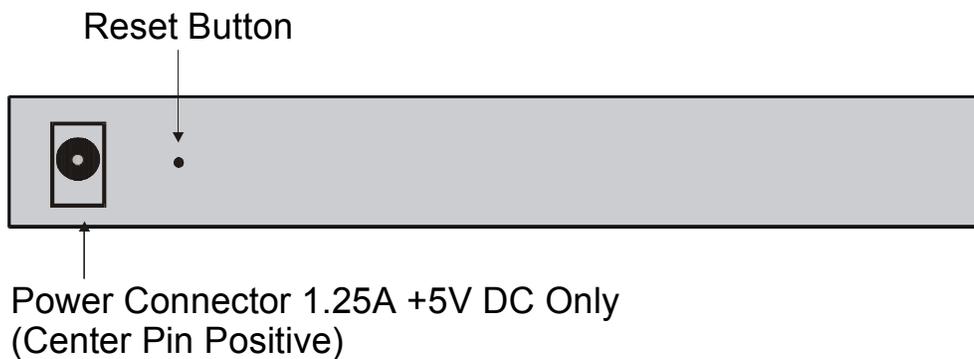
Figure 6 - LX-1000 Series 4-Port Rear Panel

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.

Mounting the LX-1000 Unit

You can mount the LX-1000 unit in three ways: rack mount, wall mount, and desk top. The following figures show mounting for the 2-port unit, but the 4-port unit mounts the same way.

Rack Mount

You can rack mount the LX-1000 to the side of the rack or to the front of the rack. Attach the brackets to the unit, and then mount the unit in the rack. Refer to Figure 7 and Figure 8 for further information.
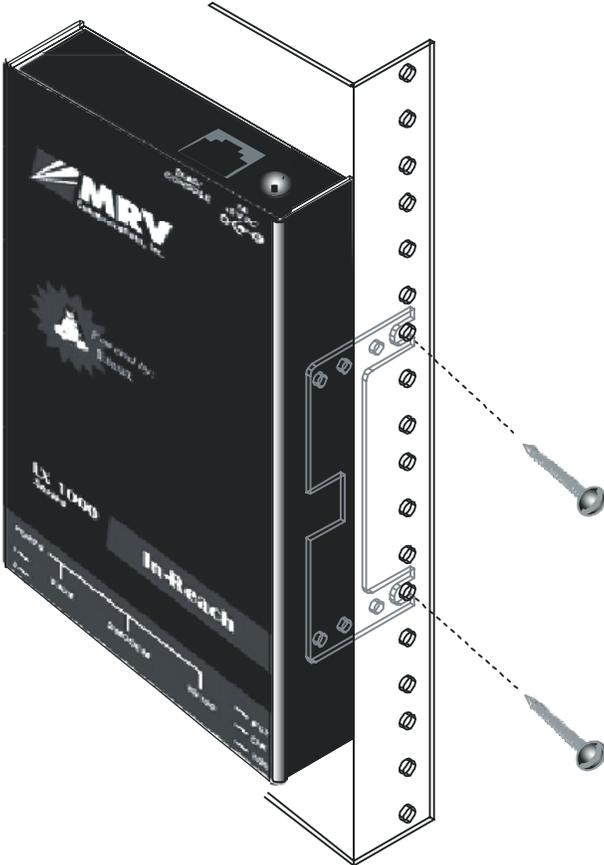
Figure 7 - Side-Mounting an LX-1000 Series in a Rack
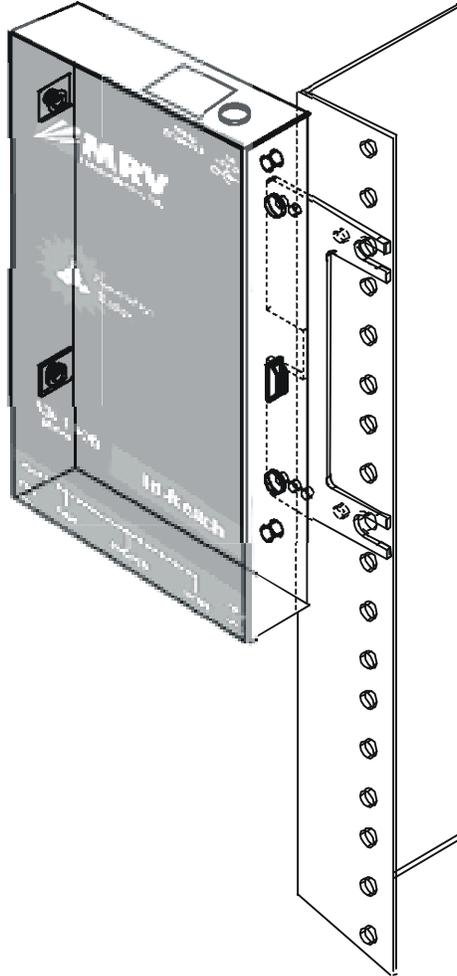
Figure 8 - Front-Mounting an LX-1000 Series in a Rack

Wall Mount

Attach the brackets to the unit, and then mount the unit on the wall. Refer to Figure 9 for further information.
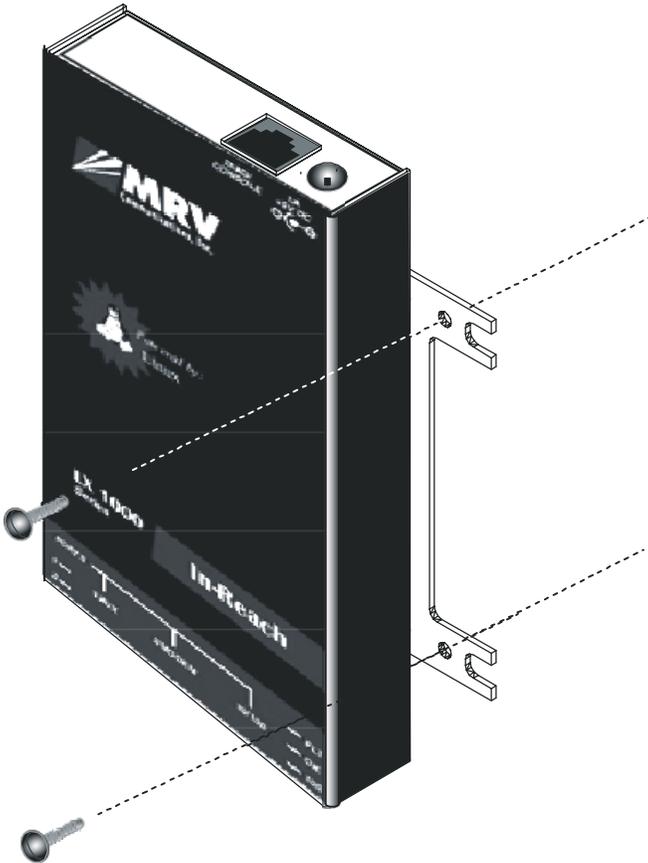
Figure 9 - Mounting the LX-1000 Series on a Wall

Desk Top Mount

Attach the four rubber feet to the bottom of the unit, and then place the unit on a flat surface.

Cable Connections

This section explains the cable connections for the LX unit.

Connect the Power Cable

Connect the supplied power supply cable to the DC power connector on the rear of the LX unit and plug the other end into a wall outlet. The outlet type depends on which adapter cable you have. The North American adapter cable is a standard 2-prong connector (see Figure 10).
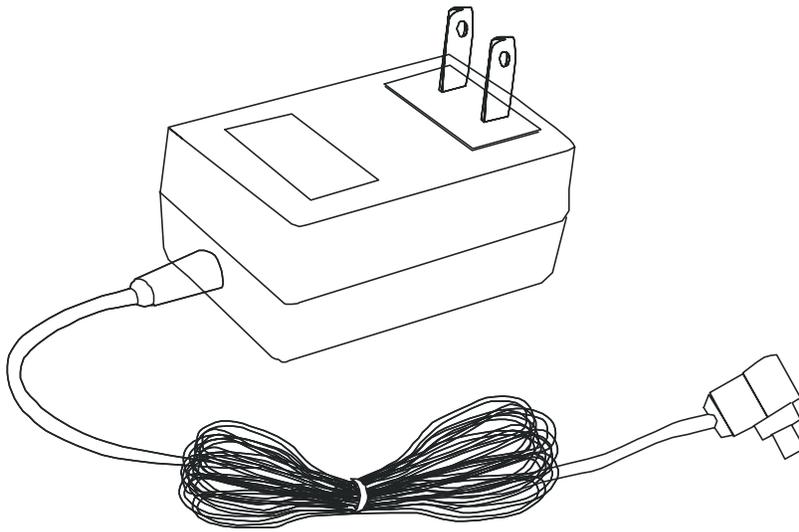
Figure 10 - U.S. Adapter Cable

The international adapter cable (see Figure 11) ships with several detached plug-in connectors. Fit the connector you want into the slot on the top face of the international adapter and slide it downward until it snaps into place over the push-down tab. Make sure the connector is seated properly before you use it.
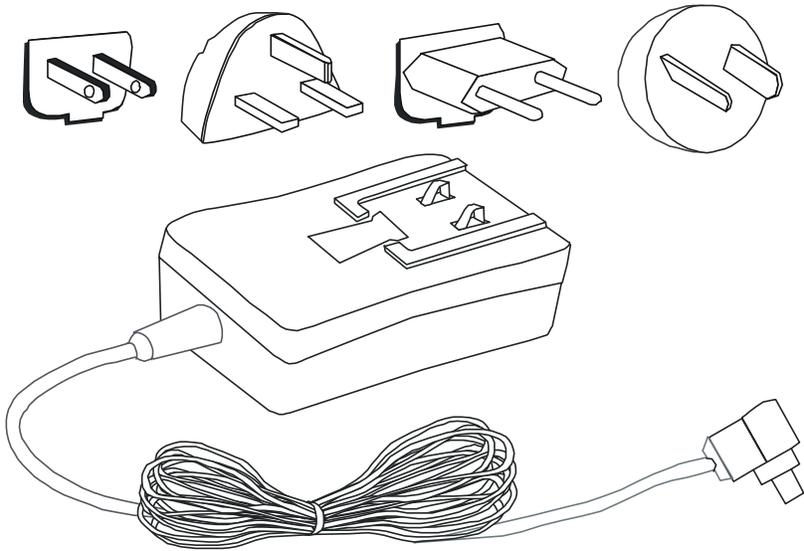
Figure 11 - International Adapter Cable

To remove a plug-in connector, press the push-down tab and slide the connector up and out of the slot.

Tie-Wrap Strain Relief

A small, black tie-wrap is included in the rack-mount kit. Thread this through the metal loop on the side of the LX-1000 unit, hold the adapter cable flush with the side of the unit (over the metal loop), and fasten the adapter cable to the side of the unit (see Figure 12). This reduces strain on the adapter cable connection.

③ Slide tie-wrap through bracket on side of LX-1000 unit. Place power cable inside tie-wrap loop and pull tie-wrap tight and lock, so that power cable is flush with side of unit.

① Connect power cable to the DC power connector.

② Align power cable with side of LX-1000 unit.
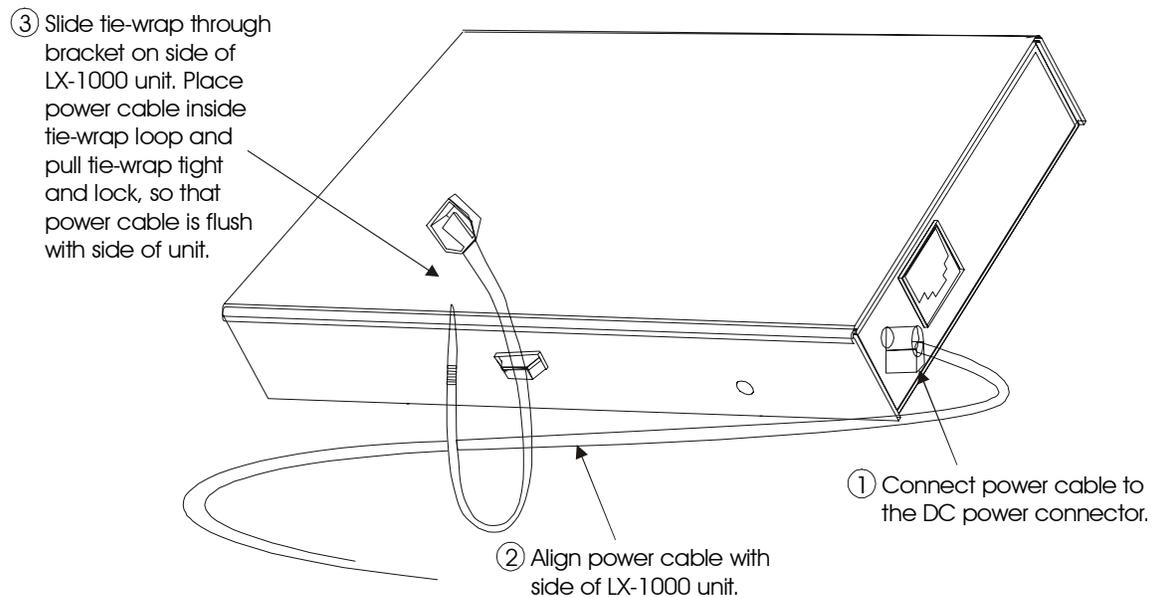
Figure 12 - Attaching the Tie-Wrap

Connecting the Ethernet Interface

NOTE: This port is set to auto negotiation by default. You can manually configure the desired port speed and duplex. 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-1000 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 front of the unit.

NOTE: The LX-1000 Series modem port provides 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/MGMT port (port 0) using the connector and cable you received with the LX unit. Refer to "Connecting to the Diagnostic Port (Port 0)" in Appendix D for more information on DIAG/MGMT port connections.

Connecting SFP Cabling

SFP (Small Form-Factor Pluggable) modules are small, hot-swappable transceiver components that can be plugged into a variety of networking equipment. SFP modules are either multimode or single-mode optical transceivers. The LX SFP port is a 100Base FX full-duplex connection, which requires a fiber cable with an SC style termination. Supported SFPs are Luminent Corporation's SFP-MR-SR1 Single Mode 1310NM and SFP-MR2-M Multi-Mode 1310NM.

Power over Ethernet (PoE)

Power over Ethernet (PoE) Power Source Equipment (PSE) can provide up to 13W (Max) of power to a Powered Device (PD) using the same Category 5 cable that is used to deliver your 10/100/1000Mb Ethernet network connectivity. Current is supplied to a PD device using one of the following methods:

- Using the two unused twisted pair wires (10/100Mb only).
- Using the two data pairs or "phantom power" method (1000Mb).

The voltage range is 36-57VDC (nominally 48VDC). PoE requires that a PD device draw a minimum of 10mA and is limited to a maximum of 350mA.

The LX-1004 PoE model is a Powered Device and can only accept power from an IEEE 802.3af compliant PSE device. It provides a PD Load Classification of Class 3 to any connected PSE device that is requesting power classification information.

Modem Port (Optional)

Two options are available for the modem port: a V.90/K56flex modem, and a GSM/GPRS wireless modem.

V.90/K56flex Kbps Modem Port

The modem port is a V.90/K56flex Kbps optional factory installed modem on the LX-1000 Series. The modem port allows you to dial back from, or dial in to or out of the LX-1000. 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 front of the unit.

The Modem port number is as follows for LX-1000 models:

- LX-1002 - port number 2
- LX-1004 - port number 5

For the LX-1000 2-port unit with a modem, enter the `show port async 2 modem` command at the `InReach:0>>` prompt to display a screen containing the LX-1000 modem port fields. For the LX-1000 4-port unit with a modem, enter `show port async 5 modem` to display the same screen.

GPRS Modem with GSM/GPRS Cellular Dual Band Antenna Port

The GSM/GPRS Modem is a factory installed option for those customers requiring wireless connectivity to the internet. Use of this option requires that you enter a service agreement with a regional wireless provider. The wireless provider will create a SIM Card which enables you to make data connections through the provider's network to the PSTN or the Internet. Refer to Appendix E for instructions on how to install the SIM Card.

Global System for Mobile Communications (GSM) is a voice service that can provide Circuit Switched Data connections with a maximum bit rate of 14.4 Kbps. General Packet Radio Service (GPRS) is a non-voice service that can provide data connections with a maximum bit rate of 115 Kbps. The actual data rates vary depending on the type of agreement you enter with your service provider and local RF related conditions. GPRS provides for the transmission and reception of IP packets over the cellular networks. The LX1004 can support both styles of wireless connectivity.

There are two variants of the GSM/GPRS modem, one for the U.S. and one for Europe. See the Technical Specifications in Appendix A for further details.

You can attach an GSM/GPRS Cellular Dual Band Antenna to the GPRS antenna interface.

To set up your LX-1004 product for use on the GSM/GPRS network:

1. Enter into a service agreement with your regional wireless provider. Obtain a SIM Card from the provider.

2. Refer to Appendix E for SIM Card installation instructions.

3. Connect the end of the GSM/GPRS Cellular Dual Band R/A Antenna to the GPRS antenna inter-face.

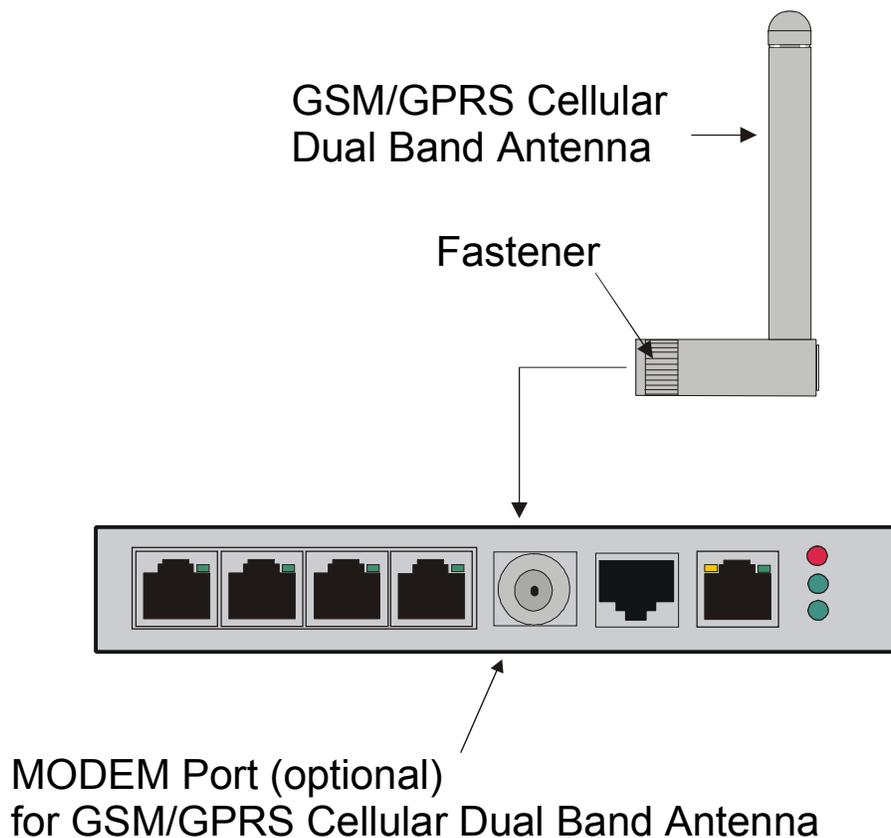4. Tighten the fastener at the end of the antenna.

Figure 13 - Connecting the Cellular Dual Band Antenna

5. Attach the appropriate cables to the LX-1004.

6. Attach power to the LX-1004.

NOTE: You need to configure the internal modem for dial-out. Refer to the "Internal Modem" chapter in the *LX-Series Configuration Guide* for further information.

GSM/GPRS Signal Strength

If you experience problems with reception or service due to poor signal strength, do the following:

- Attempt to move or relocate the LX-1004 Series unit to an area with better reception.

- Some environments and locations may require an exterior antenna. Consult your service provider for contact information for cellular antenna installers.

Powering On

The Power On Self Test (POST) starts when you apply power to the LX-1000 Series unit. At any time, POST status and failures are displayed on the management station. The POST test also detects whether you have a V.90 or GSM/GPRS Modem, or no modem at all.

When the POST test is completed, you are presented with two options: `[B] Boot System` and `[L] Login in 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 56. 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 31 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-1000 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**.

NOTE: Once you set up another superuser account, you can then delete the default In-Reach subscriber account in the same way you would any subscriber. This improves your security.

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, non-printable characters such as backspace, tab, escape, and control characters 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.

<div style="border:1px solid black; text-align:center;">

IMPORTANT

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

</div>

Restarting the Unit

You can restart the LX-1000 Series using the following methods:

Locate the power strip that the LX-1000 Series AC adapter is connected to and use the power strip On/Off switch to toggle the power to the LX-1000 Series device off. Wait at least 10 seconds before repowering the unit. Alternately, remove the AC adapter from the power strip for 10 seconds and re-install to repower the unit.

In the case of the LX-1004, locate the reset button hole on the rear of the unit (refer to Figure 6 on page 20). A pushbutton switch is located behind this hole. Using an unfolded paper clip, insert, depress and hold the switch for at least 3 seconds. This restarts the LX-1004 unit.

When you restart the LX-1000, the unit begins to execute the Power On Self Test (POST). The front panel LEDs illuminate, and then go out.

If the LX-1000 Series does not detect an error, the unit begins loading software from the internal flash. Once loaded, the LX-1000 Series resumes normal operations.

Chapter 3

Configuring the LX-1000 Series for the First Time

Configuring the LX 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 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 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/MGMT port (port 0) when booting from default parameters. The DIAG/MGMT port (port 0) is on the rear of the unit on 1 and 2-port LX-1000 versions. The DIAG/MGMT port (port 0) is on the front of the unit on the LX-1004.

NOTE: Display problems may occur during bootup when you attach a terminal to the DIAG/MGMT 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 unit for the first time.

1. Plug in the terminal at the DIAG/MGMT 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 unit. The setup takes a minute or two. The `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 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 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 14 on page 41 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-1000 Series via Telnet or SSH" on page 39.
- To use the web browser, refer to "Accessing and Configuring the Graphical User Interface (GUI)" on page 34.

Assigning an IP Address via the Network

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

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

- To use the CLI, refer to Figure 14 on page 41 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-1000 Series via Telnet or SSH" on page 39.

- To use the web browser, refer to "Accessing and Configuring the Graphical User Interface (GUI)" on page 34.

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)

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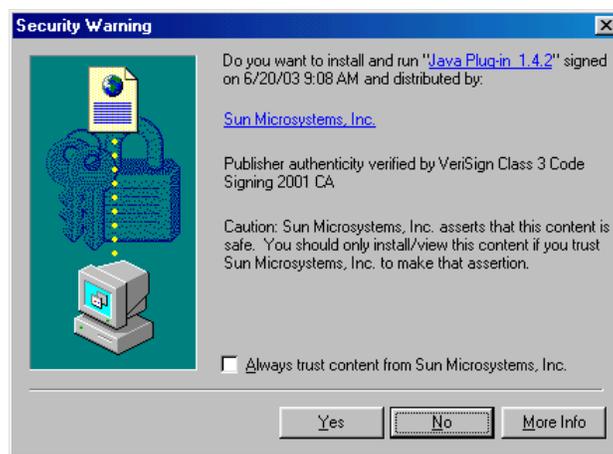
3. Click **Yes**. The plugin is downloaded and then the installation begins. A Java Runtime Environment window appears after about two minutes.

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.
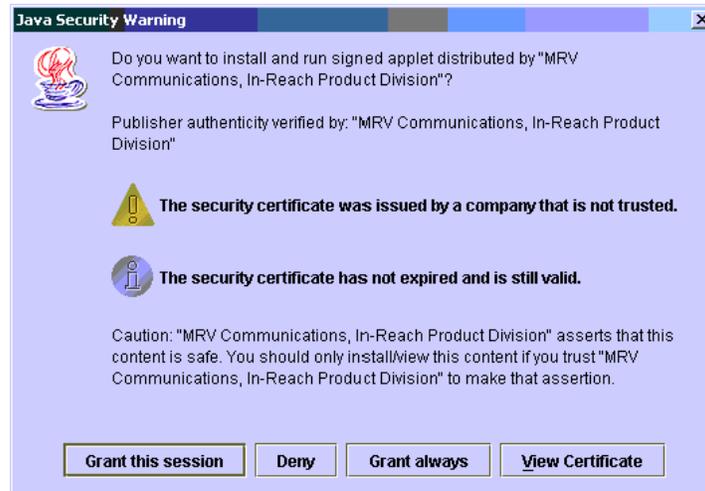
6.   Click on **Grant this session**. The Java Security Warning window closes. The LX Series Console page reappears, now with the green console selection visible.
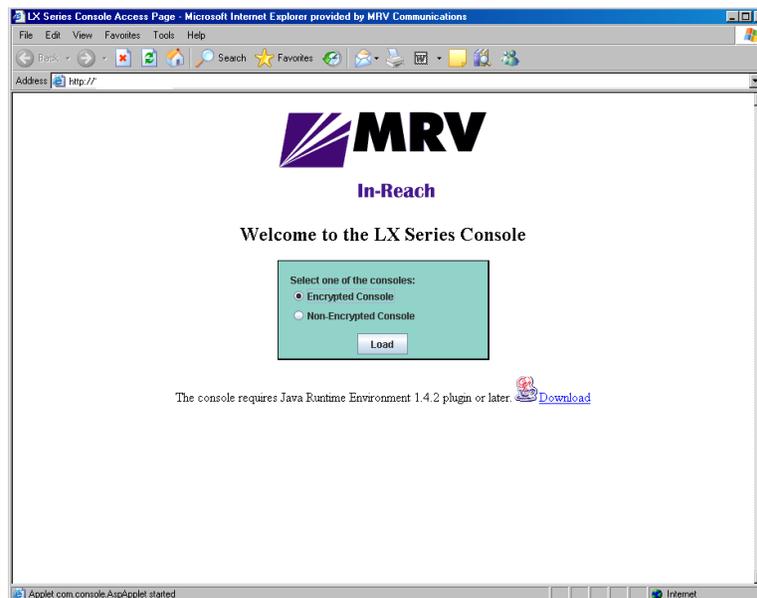
7.   Choosing **Encrypted Console** means the GUI will run slower, but with security. Choosing **Non-Encrypted Console** means the GUI will run faster, but without security.

8.   Select **Encrypted** or **Non-Encrypted** and then select **Load**. 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 "Configure Mode" on page 37 or "Menu Mode" on page 38, depending on which mode you can access.

Configure Mode

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

1. If you log in as a user, the following window appears.
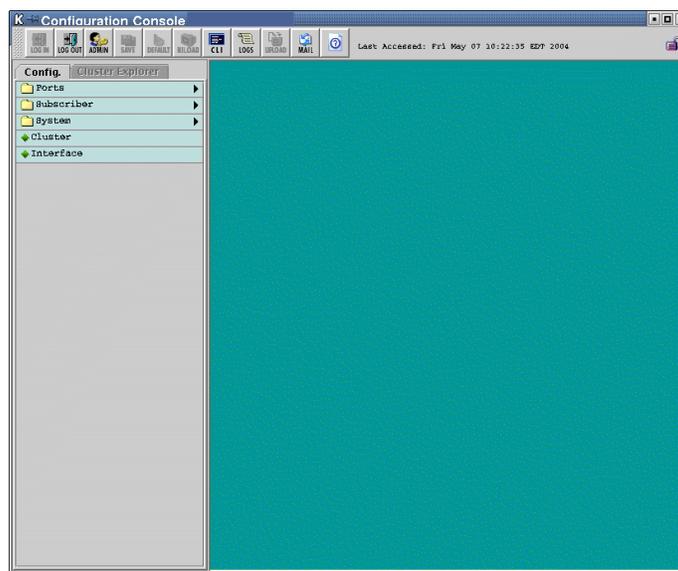
2. To log in as a superuser, click the **Admin** button on the tool bar and log in with the default Superuser password `system`. You can now configure the unit via the GUI.
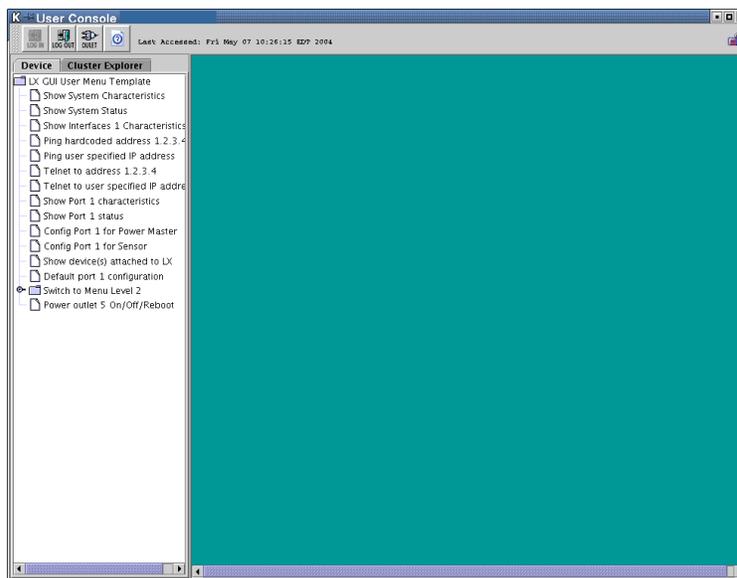
3. Click on the menus on the left side of the window. For example, selecting **Ports: Async** opens the Async ports window:
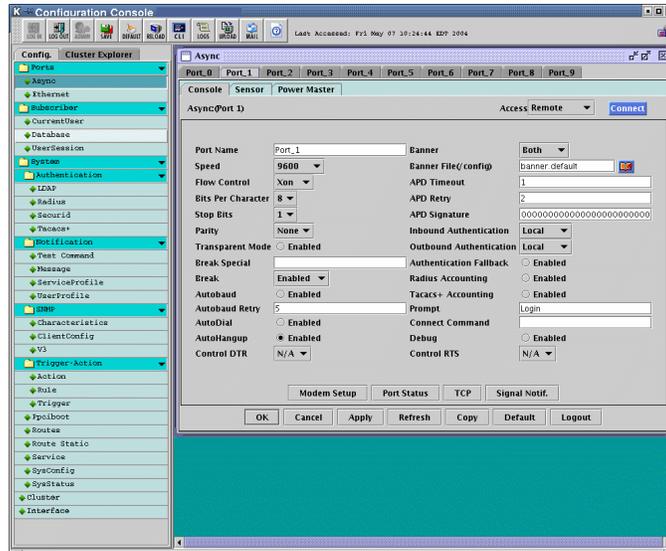
Menu Mode

If you have access to the Menu Mode, the following screen appears when you login. Click on the various menu items on the left side of the window to perform preconfigured menu option tasks.

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 features you can access and configure.

Connecting to the LX-1000 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 1-2 on the LX-1000 are assigned telnet port numbers (2-port unit - 2100-2200, 4-port unit - 2100-2400) by default. For example:

- Port 1 = 2100
- Port 2 = 2200
- Port 3 = 2300
- Port 4 = 2400

NOTE: The corresponding SSH port numbers are 2122-2222 for the 2-port unit, and 2122-2422 for the 4-port unit. For example:

- Port 1 = 2122
- Port 2 = 2222
- Port 3 = 2322
- Port 4 = 2422

You can gain telnet/ssh access to a serial device attached to the LX unit 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-1000 Series Serial Port

Use the following procedure to access the command line interface port from a dumb terminal attached to an LX-1000 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`.

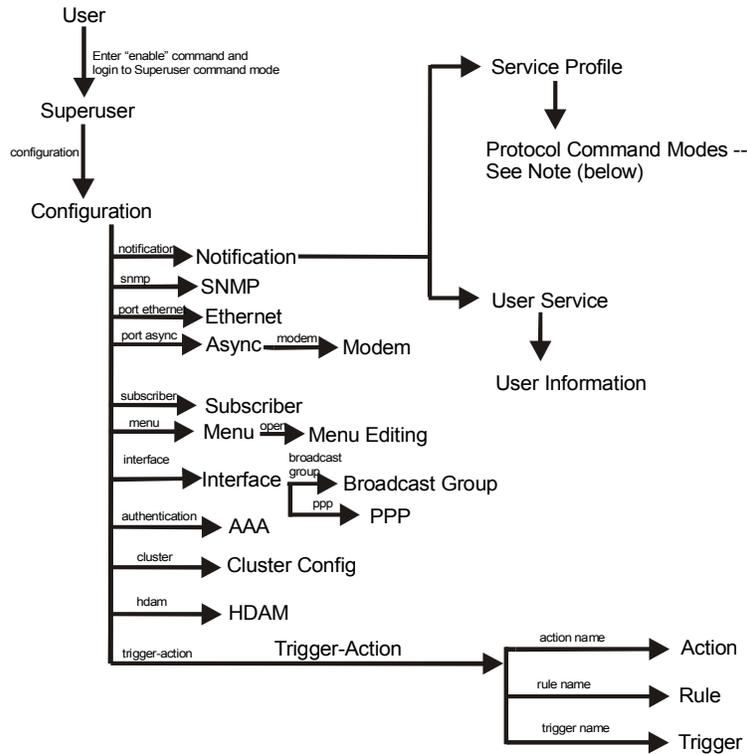# Additional Considerations

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 command structure modes. See Figure 14 for the CLI command structure.

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

Figure 14 - Basic CLI Tree 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/MGMT port (port 0). Default settings for the DIAG/MGMT 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-1000 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-1000 Series unit is placed.

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

Connecting the Temperature/Humidity Sensor

A 10-foot Male RJ-45 to Male RJ-45 straight-through cable (P/N MX-151-3027) connects the temperature/humidity sensor to the LX-1000 1/AUX port on the one or two port models, and ports 1-4 on the 4-port LX. The LX unit can be configured to support the sensor on any async port. The temperature/humidity sensor is not supported on the DIAG/MGMT 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 the port you have configured as a sensor port (port 1 or 2 only).
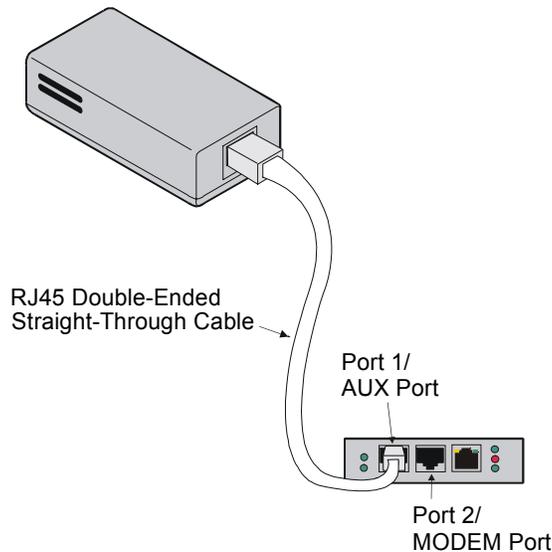

RJ45 Double-Ended
Straight-Through Cable

Port 1/
AUX Port

Port 2/
MODEM Port

Figure 15 - 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 1 as a Sensor Port:

Async 1-1:0>>`access sensor`

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

InReach:0>> `show port async 1 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.

IR-5150 Power Strip Management

The IR-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.

IR-5150 Series products are available in 8-outlet and 16-outlet configurations for 100-120VAC up to 30A, and for 208-240VAC up to 30A (Continental Europe). An IR-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 IR-5150.

Connecting the IR-5150

The IR-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 IR-5150:

1. Connect one end of the standard RJ-45 double-ended crossover cable to the serial port of the IR-5150.

2. Connect the other end to the async port you have configured as a power management port.
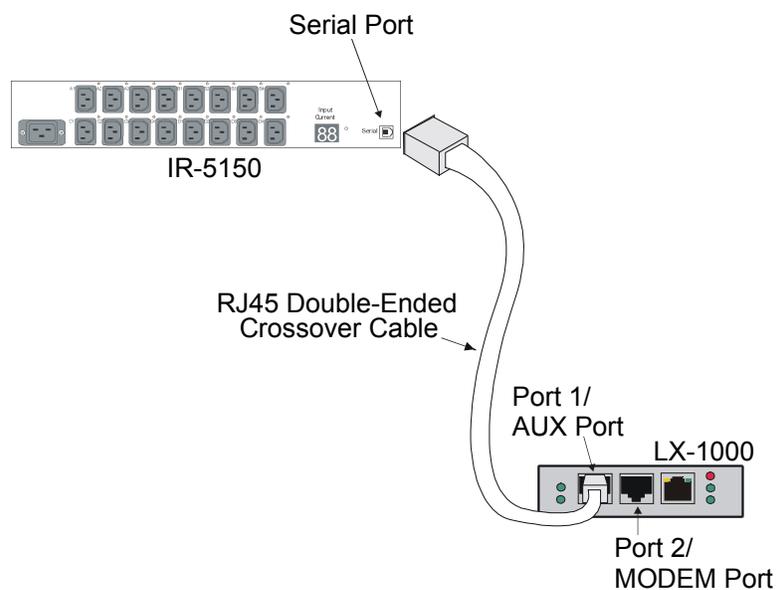

Figure 16 - Connecting the IR-5150

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 IR-5150 port:

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

Once the IR-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 IR-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 IR-5150 through the CLI interface.

IR-4800 Power Strip Management

The IR-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.

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

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

Connecting the IR-4800

The IR-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 IR-4800:

1. Connect one end of the standard RJ-45 double-ended crossover cable to the serial port of the IR-4800.

2. Connect the other end to any LX port you have configured as a power management port.
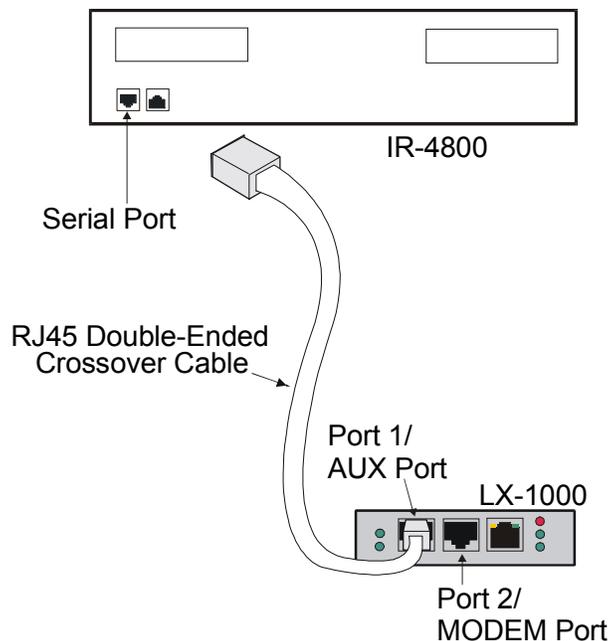

Figure 17 - Connecting the IR-4800

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 an IR-4800 port:

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

Once the IR-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 IR-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 IR-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 18.

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 ±10V.

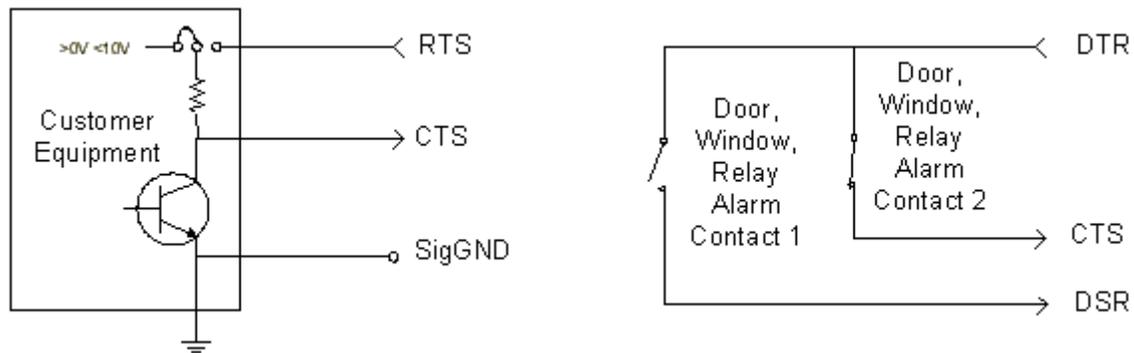**Figure 18 - Typical Alarm Inputs Connections**

An external voltage within the range of ±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 ±10V limits and the limits of the contacts or semiconductor used in the circuit. A common Signal Ground is required. Refer to Figure 18 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 19.

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 ±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 ±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.
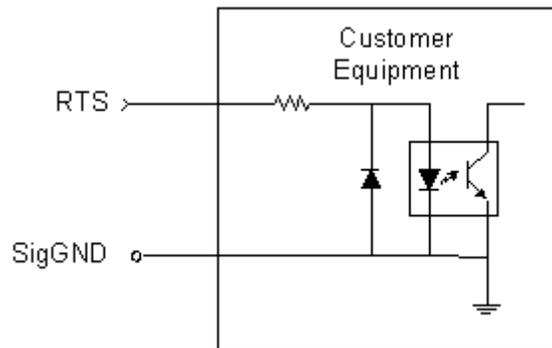
Figure 19 - Typical Interface Design for Control Output Signals

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.

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Appendix A -Technical Specifications

The following table provides the specifications for the LX-1000 Series.

Table 1 - LX-1000 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	134.5 bps to 230 Kbps
Number of Serial Ports	LX-1000 2-Port - 2 ports, or 1 port on modem models. LX-1000 4-Port - 4 ports
Modem (optional)	V.90/K56flex 56 Kbps or GPRS embedded wireless modem GSM frequency bands are different in the U.S. and Europe: Transmit Receive U.S. - GSM: 824-849 MHz 869-894 MHz PCS 1850-1910 MHz 1930-1990 MHz Europe - E-GSM: 880-915 MHz 925-960 MHz DCS: 1710-1785 MHz 1805-1880 MHz
LEDs	FLT (fault), OK, Port Status LEDs 1-2 on LX-1002, Port Status LEDs 1-4 on LX-1004. 10/100 Ethernet RCV, 10/100 Ethernet Link, 100Mbps speed, Link on SFP models only.

Dimensions	**LX-1000 Series 2-Port:**	**LX-1000 Series 4-Port:**
Height	2.54 cm (1 in)	2.79 cm (1.1 in)
Depth	15.8 cm (6.25 in)	15.8 cm (6.25 in)
Width	10.7 cm (4.25 in)	15.01 cm (5.91 in)
Weight	LX 1000 2-Port - 0.4082 kg (0.9 lbs.)	
	LX-1000 4-port - 0.66 kg (1.45 lbs)	
Processor/Speeds	66 MHz RISC processor with integral communications co-processor.	
Memory	8 MB Flash, 64MB SDRAM	
Environment	5% to 90% humidity, noncondensing	
	Operating Temperature: 0 - 40°C (32° - 104° F)	
	Storage Temperature: -40 to 85°C (-40 to 185° F)	
Input Voltage	Domestic: AC input 90V - 132VAC (57-63 Hz)	
	International: AC input 90VAC - 264VAC (47-63 Hz)	
Power Requirements	LX-1000 2-Port (Domestic) - 7.2W (24.6 BTU), 0.06A @ 120V (typ)	
	LX-1000 2-Port (International) - 7.7W (26.3 BTU), 0.035A @ 220V (typ)	
	LX-1000 4-Port (Domestic) - 8.9W (30.4 BTU), 0.075A @ 120V (typ)	
	LX-1000 4-Port (International) - 9.6W (32.7 BTU), 0.044A @ 220V (typ)	
PoE IEEE 802.3af	The PoE Standard dictates a Voltage range between -44V and -57VDC-. The maximum current draw is 220mA. The LX-1004 is a IEEE 802.3af compliant PD (Powered Device). PoE version works only when the 10/100 ethernet port is connected to an appropriate IEEE 802.3af compliant PSE (Power Sourcing Equipment) device.	
Minimum Software Requirements	LX-1000 2-port unit requires V3.0.2 or greater.	
	LX-1000 4-port unit requires V3.2.2 or greater.	
Ethernet Interface	10/100 TX, Auto/10/100 Mbps duplex half full auto	
SFP Interface	100Base FX, full duplex only. Supported SFPs are: SFP-MR-SR1 Single Mode 1310NM, and SFP-MR2-M Multi-Mode 1310NM	
Control Output Ratings	RTS/DTR: 5.0V @ 1.6mA (Nominal), 2.5V @ 7.6mA (Absolute Maximum)	
Real Time Clock	32.768KHz crystal	
Battery	Lithium battery 48mAH. Power down shelf-life >3 years at 20^0C.	
Antenna Connector	SMA	

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	0 to 70 deg. C (+32 to 158 deg. F) 5 to 90% humidity non-condensing
Dimensions	Height: 0.8 inches Length: 3.15 inches Width: 1.57 inches
Weight	1.2 oz
Accuracy	Temp: +/-3 deg C Humidity: +/- 5%

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Appendix B - Factory Defaults

The following table provides the factory defaults for the LX-1000 Series.

Table 3 - LX-1000 Series Factory Defaults

Item	Description
DIAG/MGMT Port/local management port (default settings)	The DIAG/MGMT 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-1000 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

Viewing Error Codes

To view the error codes, connect a terminal to the DIAG/MGMT port. The error codes appear on the screen during a reboot.

Error Code Definitions

The following table provides the definitions for the LX-1000 Series POST test error codes.

Table 4 - POST Test Error Codes

Error Definition	Error Code (in Hexadecimal)
Real Time Clock does not work properly	1010
Reading Invalid Default Value from CPLD Diagnostic Register	2010
Reading Invalid Pattern Value from CPLD Diagnostic Register	2020
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
DC_A bit is set in the CPLD System Fail Status Register	2037
DC_B bit is set in the CPLD System Fail Status Register	2038
Watchdog Timer Failed	2040
Invalid HW Type	2050

Fast Ethernet Controller (FEC) Reset Delay Timeout	3010
Fast Ethernet Controller (FEC) Transmission Failed Timeout	3020
Fast Ethernet Controller (FEC) Reception Failed Timeout	3030
Fast Ethernet Controller (FEC) Invalid Data Received	3040
Memory Error at (printing address)	5010
Memory Data Bus Failed	5020
Memory Address Bus Failed High	5030
Memory Address Bus Failed Low	5040

Appendix D - Cabling the LX-1000 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 20.

Pin	Signal
1	CTS
2	DTR
3	TXD
4	SGND
5	SGND
6	RXD
7	DSR
8	RTS
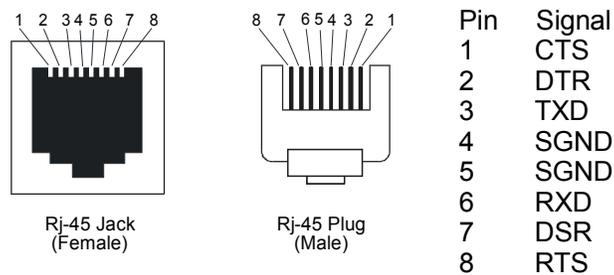
Figure 20 - Serial Device Connector (RJ-45) Signal Assignments

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 21 shows the standard and IEEE 802.3af unit 10/100 (RJ-45 jack) connector signal assignments.

Standard   **802.3AF Unit**

Pin	Signal	Pin	Signal
1	TX+	1	TX+
2	TX-	2	TX-
3	RX+	3	RX+
4	No Connect	4	+ Voltage
5	No Connect	5	+ Voltage
6	RX-	6	RX-
7	No Connect	7	- Voltage
8	No Connect	8	- Voltage

8 7 6 5 4 3 2 1
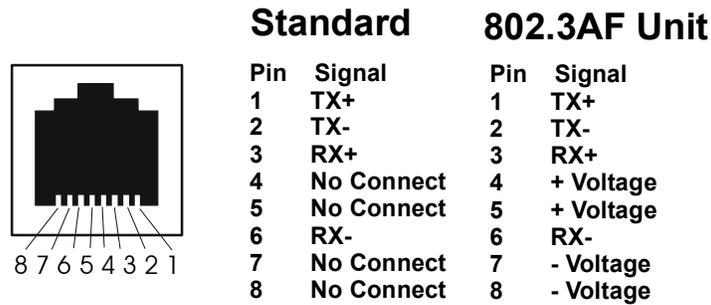
Figure 21 - 10/100 Connector Assignments

Ordering Cables

MRV also supplies crossover cables and modular adapters for use with all LX-1000 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 adapter for use with LX-series units:

· Female DB-9 (PN MX-350-0308)

This section describes the pinouts and wiring of the MRV-supplied DB-9 adapter.

Connecting to the Diagnostic Port (Port 0)

NOTE: Display problems may occur during bootup when you attach a VT420 terminal to the DIAG/ MGMT 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/MGMT 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 once the unit completes the bootstrap process.

Modem Control/Hardware Flow Control

NOTE: Hardware flow control is supported only on the port 2 interface. This restriction applies to the 2-port LX-1000 only.

LX-1000 Series serial ports can be set up to support RTS/CTS flow control. The adapters shown in Figure 22 and Figure 23 illustrate RTS/CTS flow control for DTE devices using DB25 and DB9 connectors. Figure 24 illustrates RTS/CTS flow control for a DB-25 connector on a DCE device like a modem. LX-1000 Series serial ports can also be set up to support modem control (except for the DIAG/MGMT port (port 0)). Figure 22, Figure 23, and Figure 24 support modem control as needed. Only Figure 23 and Figure 24 support concurrent modem control and RTS/CTS flow control between the LX Serial Port and the attached device.

The adapter shown in Figure 24 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-1000 Series serial port. The LX-1000 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 22 and Figure 23. When a DCE device is connected to an LX-1000 Series serial port, straight-through wiring is required, as shown in Figure 24.

NOTE: In general, an ethernet CAT3/CAT5 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 22, Figure 23, and Figure 24 show how devices are cabled when you use these adapters.

Application: Use RJ-45 to DB-25 to connect your LX-Series unit to a PC.
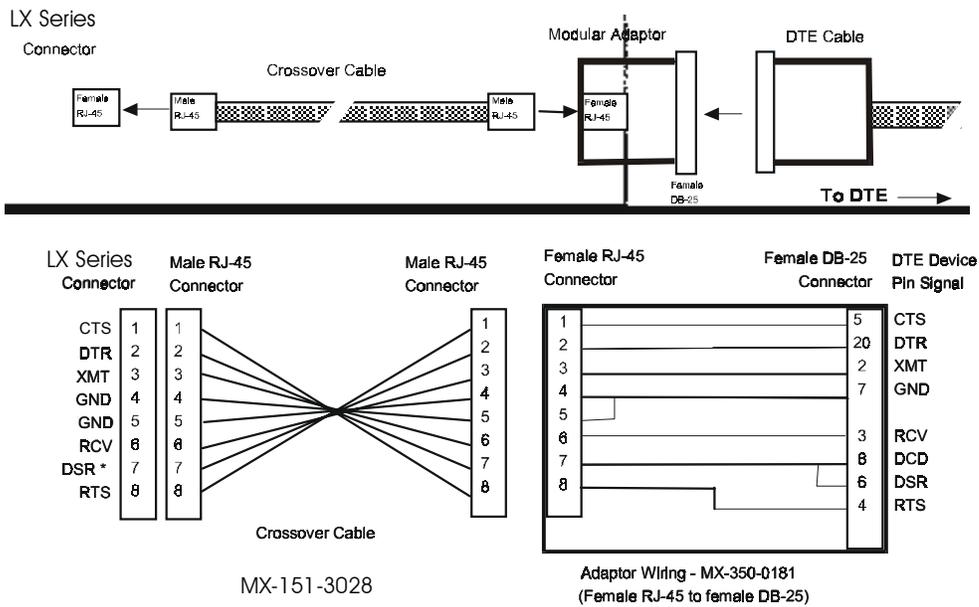
Figure 22 - Adapter Wiring, LX-1000 Series to DTE

Application: 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.
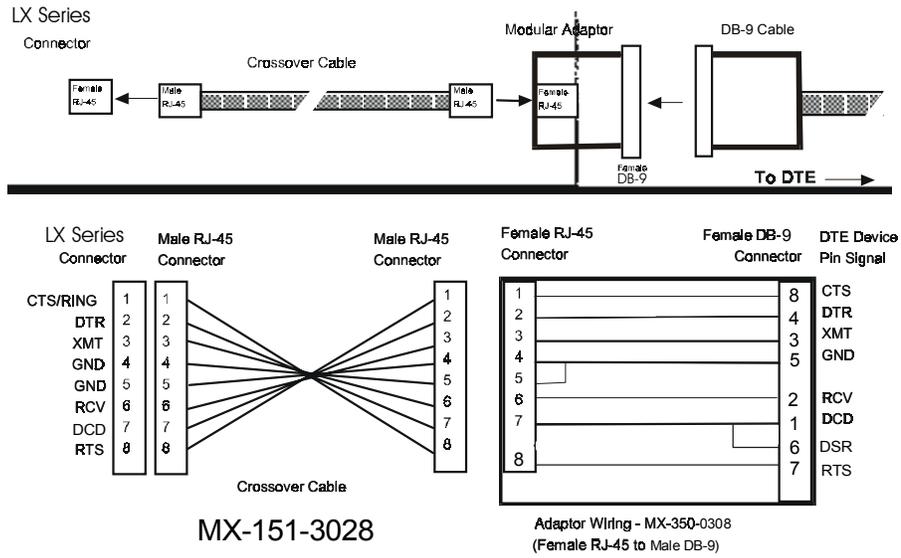
Figure 23 - Adapter Wiring, RJ-45 to DB-9, LX-1000 Series to DTE

Application: Use LX-Series to DCE to connect your LX-Series unit to a modem.
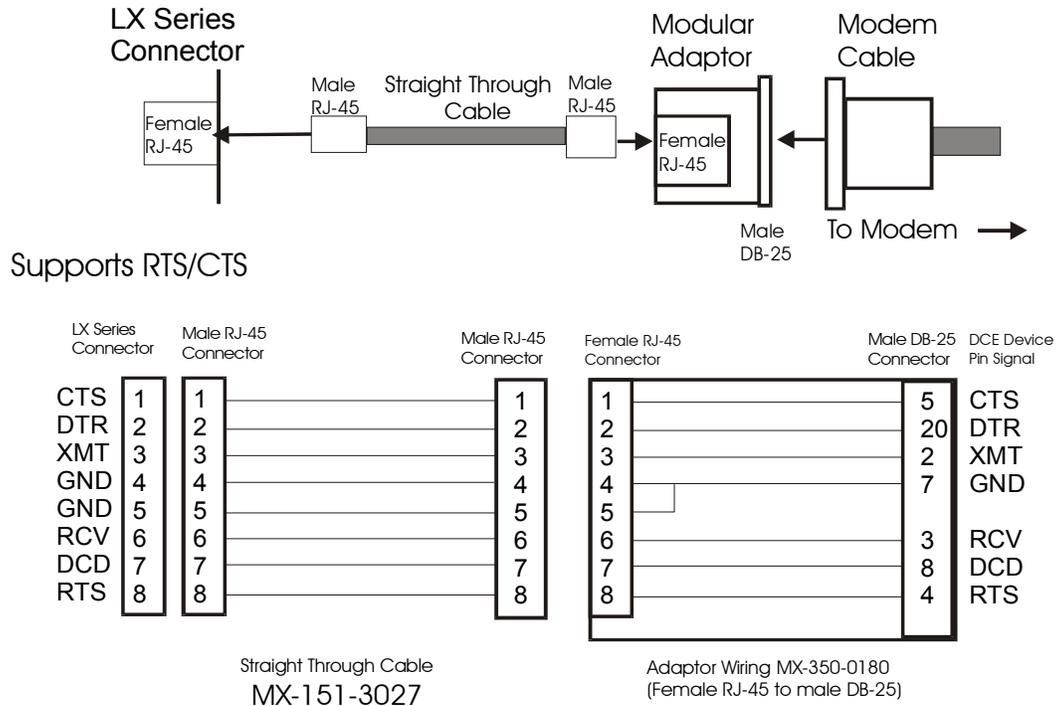
Figure 24 - Adapter Wiring, LX-1000 Series to DCE

NOTE: In order to expand the functionality of the serial interface, the LX-1000 Series modular cabling allows you to connect different signals to pin 7 of the LX-1000 Series. (This pin is an input to the LX-1000 Series.) When a DCE device is connected to an LX-1000 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-1000 Series serial port, the device's DTR output is connected to pin 7 of the LX-1000 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 25, 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: Use RTS/CTS to connect your LX-Series unit to a modem.
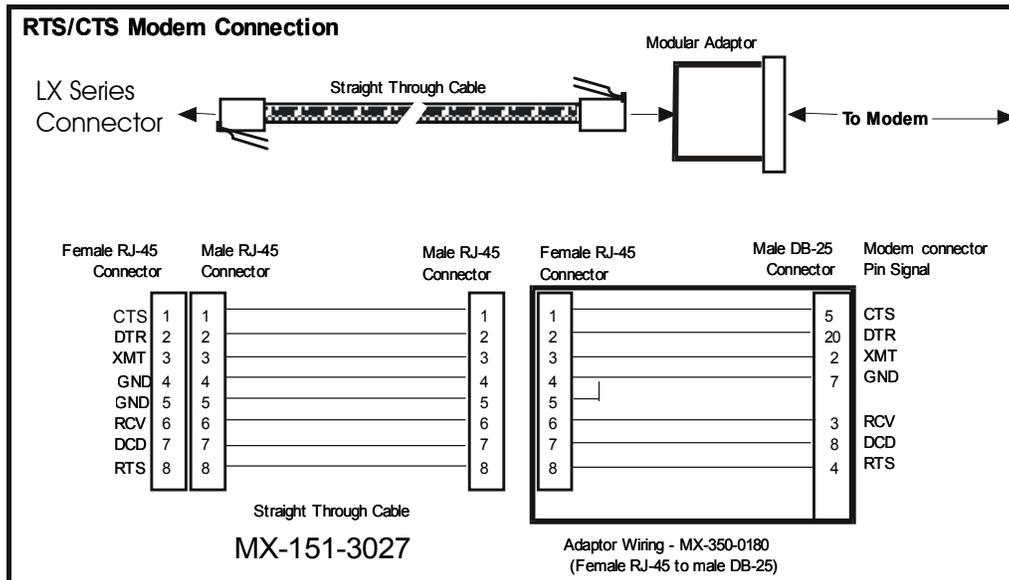
Figure 25 - Modular Cables for RTS/CTS Flow Control (Eight-Wire), Concur-rent with Modem Control Signalling

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Appendix E - Installing SIM Cards

This appendix explains how to install and remove LX-1000 GPRS Modem Subscriber Identity Modules (SIMs).

<div style="border:1px solid black;padding:1em;">

CAUTION

Only qualified personnel should install or remove LX-1000 GPRS Modem SIM Cards.

Unplug the LX-1000 before you begin the installation. There is danger of Electrical Shock if you fail to do so.

SIM Cards are extremely sensitive to static electricity. Static from your clothes or work environment can destroy SIM Cards, or diminish their reliability.

Handle SIM Cards by their non-connector edges only, and use standard static-preventive procedures. Preferably, the installation should be done with an anti-static wrist band, on a grounded work surface.

</div>

Installation

Be sure your parameter files are current before you proceed.

To install the SIM Cards, follow these steps:

1. Unplug the LX-1000 if you have not already done so. It is not necessary to remove the serial cables and Ethernet cable. If the LX-1000 is mounted in a rack, remove it from the rack.

2. Set the LX-1000 on a grounded workbench or other flat, stable surface.

3. Attach an anti-static strap to your wrist, and connect the strap to a well-grounded object. If a well-grounded object is not available, connect the strap to the LX-1000 after you remove the cover.

4. Remove the screws that secure the cover on the LX-1000, using a Phillips-head screwdriver. Put the screws in a safe place. Then, lift and remove the cover.
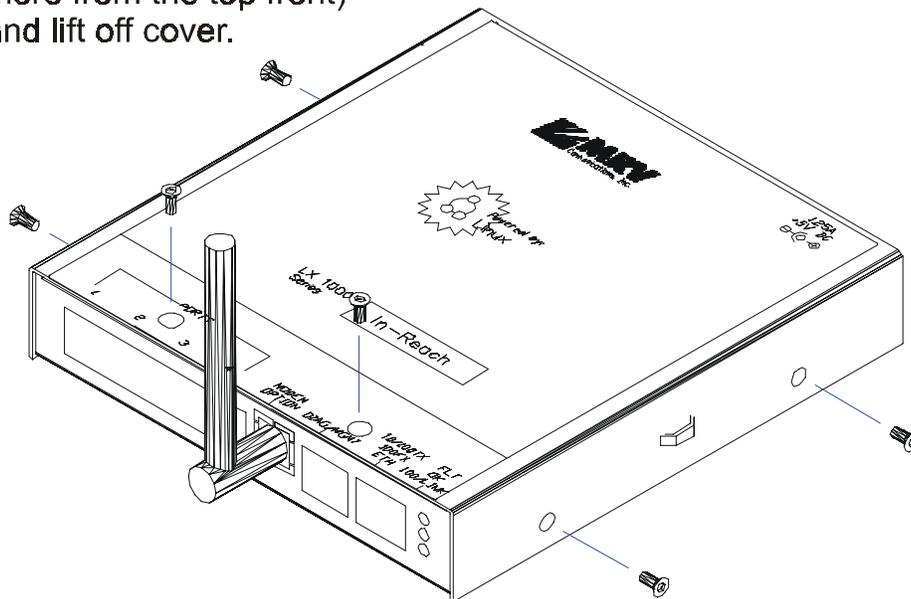
Figure 26 - Removing the Cover

5. Locate the SIM Card socket on the GPRS Modem inside the LX-1000.
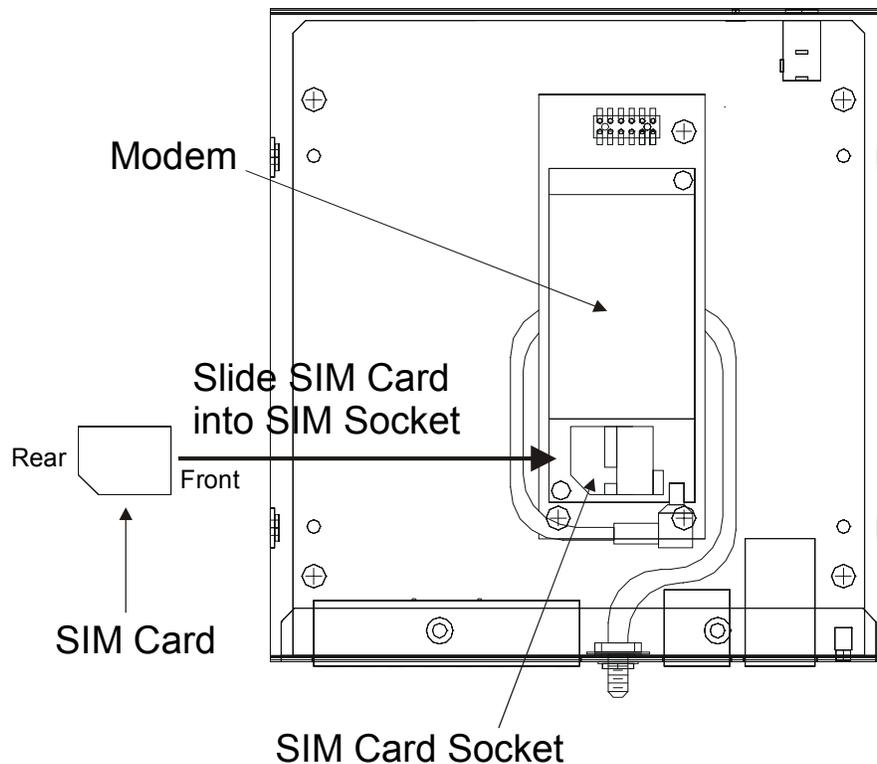
Figure 27 - Installing a SIM Card

6. Hold the SIM Card by its edges, with the front facing the right of the LX-1000, then insert the SIM Card into the slot on the GPRS Modem.

7. Place your thumbs on the rear of the SIM Card and press firmly.

8. Press forward (toward the right of the LX-1000) until you feel the SIM Card snap into place.

9. Make sure that the SIM Card are secure within the retainers.

10. Replace the LX-1000 cover, and secure it with the screws you had removed.

11. Return the unit to the rack or flat surface from which you removed it, and plug it back in.

12. When you apply power, the LX-1000 performs a self-test of its circuitry and then proceeds to load its software. When the unit has finished loading its software, the LAN light flashes as Ethernet packets are received.

Set up the software per your Internet Service Provider's requirements.

NOTE: You need to configure the internal modem for dial-out. Refer to the "Internal Modem" chapter in the *LX-Series Configuration Guide* for further information.

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