

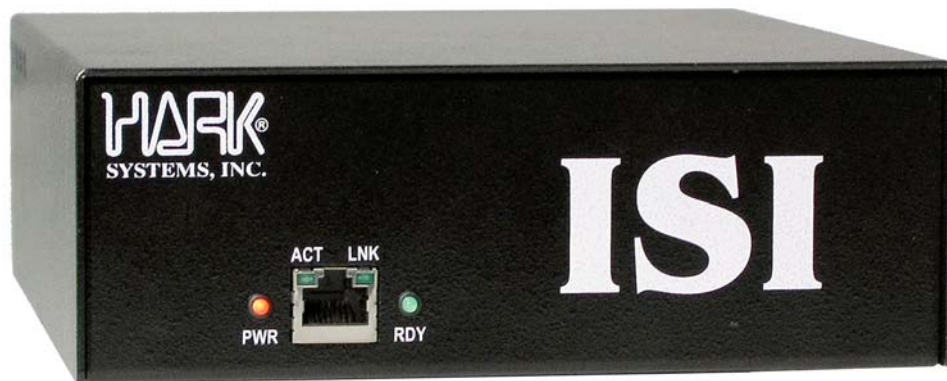
Internet Serial Interface

With Protocol Conversion

ISI-LX System Version 1.10

User's Manual

September 2005



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CONTENTS

CONTENTS.....	I
BEFORE YOU BEGIN.....	III
HOW TO USE THIS MANUAL.....	IV
CONVENTIONS USED IN THIS MANUAL.....	IV
SUPPORT SERVICES.....	V
SECTION 1: INTRODUCTION TO ISI-LX OPERATIONS.....	1
1.1 LOGGING IN LOCALLY.....	3
1.2 LOGGING IN REMOTELY.....	3
1.2 BACKUP CONNECTIONS.....	3
SECTION 2: GETTING STARTED.....	1
2.1 ISI-LX NETWORK HARDWARE SETUP.....	3
2.2 ISI-LX STARTUP.....	5
2.3 FINALIZING THE ISI-LX CONFIGURATION.....	6
2.4 WHAT TO DO NEXT.....	7
SECTION 3: ISI-LX SETUP AND CONFIGURATION.....	1
3.1 ISI-LX CONFIGURATION PREREQUISITE.....	3
3.2 ISI-LX CONFIGURATION PARAMETERS.....	7
3.3 SETUP UTILITY AND LOGIN PROCEDURES.....	8
3.3.1 Selecting Menu Items.....	9
3.4 EDITING THE ROUTING ENTRIES.....	10
3.4.1 Add Route Entry.....	12
3.4.2 Modify Route Entry.....	14
3.4.3 Delete Route Entry.....	15
3.4.4 List Route Entries.....	16
3.5 SYSTEM CONFIGURATION MENU OPTIONS.....	17
3.5.1 Edit Ethernet Settings.....	17
3.5.2 Edit Dialup PPP Parameters.....	20
3.5.3 Edit Backup PPP Settings.....	24
3.5.4 Edit Communication Port Parameters.....	28
3.5.5 Edit Syslog Settings.....	34
3.5.6 Set Timezone Option.....	35
3.5.7 Edit General Settings.....	36
3.5.8 Finalize Setup.....	39
3.5.9 Exit Setup.....	40
3.6 WHAT TO DO NEXT.....	41
SECTION 4: ISI-LX UTILITIES.....	1
4.1 Viewing of Errors.....	3
4.2 Viewing of Debug.....	3
4.3 Updating Network files and Restarting Ethernet Interface.....	4
4.4 Restarting a Communication Port.....	5
4.5 Restarting All Communication Ports.....	6
4.5 Starting and Stopping the ISI-LX daemon process.....	6
APPENDIX A: WARRANTY INFORMATION.....	1
APPENDIX B: CANCELLATION.....	1

BEFORE YOU BEGIN

The purpose of the Internet Serial Interface System User's Manual is to provide you with the knowledge needed to efficiently operate the Internet Serial Interface software (from hereon referred to as ISI-LX). It is recommended that the manual be read before operating the ISI-LX equipment and using the ISI-LX software.

The ISI-LX consists of a hardware device that is used to transport paging traffic over the Internet. Specifically, the ISI-LX device accepts TAP messages, converts them using common paging protocols such as SNPP, SMTP, SMPP, and WCTP, then transmits them over the Internet using either a dial-up Internet Service Provider (ISP) account and modem, or a built-on Ethernet network connection (for example, DSL cable modem, T1 interface, or ISDN). The ISI-LX can also convert any serial data, which is in any type of paging format or RS-232 protocol (such as TNPP or TAP), into TCP/IP packets for transmission over the Internet to either another ISI-LX at a remote location or to a similar device (such as Hark System's Omega Messaging Gateway device). The ISI-LX software allows you to configure and define how you will be using the ISI-LX. Various configuration parameters that you can identify include the Ethernet interface, PPP Dialup ISP and Backup Device, and Serial Port information.

The ISI-LX provides an alternate method for transferring data across the Internet, and eliminates the charges incurred when using conventional phone lines or a dial-up ISP connection to connect to the Internet. The ISI-LX can be configured to use one to four serial ports.

The following system features and benefits are provided by the ISI-LX.

- Convert Incoming Serial TAP to Simple Network Paging Protocol (SNPP), SMPP, SMTP, or WCTP.
- The ISI-LX converts serial data to TCP/IP and vice-versa.
- The ISI-LX connects to the Internet using a 10Base-T Network connection or PPP.
- If using the built-in Ethernet port, the ISI-LX provides a dial-up backup feature to another ISP or modem. If the ISI-LX fails to connect to the primary ISP providing the Internet service, a secondary ISP or other device can be called.

The front and rear view of the ISI-LX is illustrated on the following page.



HOW TO USE THIS MANUAL

To help you understand and learn how to use the ISI-LX equipment and software, this manual is organized in a logical sequence that leads you from the hardware installation through the software configuration.

This User's manual is intended for users of all experience levels. Many general concepts and simple guidelines are discussed in the initial portions of the manual. A familiarity with the basic concepts ensures that you can use the software efficiently. Subsequent sections describe particular tasks and list the procedures to accomplish them.

CONVENTIONS USED IN THIS MANUAL

- The ISI-LX software is fully menu driven. The functions performed within the application are accomplished using data terminal or PC.

- Names of keys are shown in capital letters; for example, TAB, SHIFT, and RETURN.
- Certain actions may require the simultaneous use of multiple keystrokes. A plus sign (+) between key names indicates that you press those keys at the same time. For example, "Press CTRL+A" means that you must hold down the CTRL key while you press the A key.

SUPPORT SERVICES

If you have any questions about the ISI-LX device or software, first refer to the *ISI-LX System User's Manual*.

High quality, responsive technical support is available 24 hours a day, 7 days a week, including holidays. If you cannot find the answer, contact technical support at the following numbers:

- For technical support between the hours of 7:30 AM and 4:30 PM Eastern Standard time, Monday through Friday, excluding holidays, call (843) 764-1560.
- For technical support outside of normal business hours or on holidays, call (843) 764-1560. The voice mail operator will answer your call. This number allows you to leave a message for normal business matters, or initiate a page for immediate technical support. The voice mail attendant will lead you through the appropriate procedures.
 - For matters that do not require an urgent response, leave a voice mail message within the general mailbox.
 - For urgent matters that require that you speak to an on-call technician, select the appropriate key identifying the product for which you need technical support. After the technician's greeting, leave a short message with the area code and phone number at which you can be reached. The on-call technician will be paged and return your call.

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SECTION 1: INTRODUCTION TO ISI-LX OPERATIONS

The ISI-LX device is used to accept TAP messages, convert them using common paging protocols such as SNPP, SMTP, SMPP, and WCTP, then transmit them over the Internet using either a dial-up Internet Service Provider (ISP) account and modem, or a built-on Ethernet network connection (for example, DSL cable modem, T1 interface, or ISDN). The ISI-LX can also convert any serial data, which is in any type of paging format or RS-232 protocol (such as TNPP or TAP), into TCP/IP packets for transmission over the Internet to either another ISI-LX at a remote location or to a similar device (such as Hark System's Omega Messaging Gateway device). The ISI-LX software allows you to configure and define how you will be using the ISI-LX. Various configuration parameters that you can identify include the Ethernet interface, PPP Dialup ISP and Backup Device, and Serial Port information.

The ISI-LX can have the input connects configured as Direct Serial, Modem, or Modem Emulation. With modem emulation you will need a NULL MODEM adapter on the serial port. See Figure 1-3 for a NULL MODEM pin-out.

When the ISI-LX is configured as a TAP input device it will use a routing table to determine the protocol and destination used to send messages to. The Pager ID from the TAP message is used when searching through the routing table and must match a subscriber entry or a block entry before it is sent out. Once a match is found the ISI-LX uses the programmed Destination string to determine the Internet protocol, remote server, and port used to send the message.

The paging data throughput of the ISI-LX is determined by the packet turn-around time and network congestion of the ISP connection. The link throughput can be determined by "pinging" the remote IP address from the local IP address. The ping will identify how long it takes to send a packet to, and get a response from, the remote location. As a conversion basis, if the ping time is 50 ms, then the throughput time could be up to 20 packets per second.

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1.1 Logging in Locally

The ISI-LX can be configured locally using the CONSOLE port located in Figure 1-2. The ISI-LX is protected from unauthorized access by requiring a username and password. The username of the ISI-LX is **root** and the supplied password can be located on the ISI-LX enclosure.

1.2 Logging in Remotely

The ISI-LX runs an SSHD process which will allow a secure remote login over the Internet or local LAN connection. A SSH client are available for most operating systems and is included with most Linux installations. A popular Windows SSH client is PUTTY. It can be downloaded from:

<http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html>

To log on using SSH remotely use the username of **isi** and the supplied password located on the ISI-LX enclosure.

1.2 Backup Connections

If using the Ethernet network connection configuration (that is, the Ethernet port is connected to a DSL, cable modem, T1 interface, or ISDN), the ISI-LX can be configured to use a backup connection (using a modem to either connect to another ISP or call another modem to pass the data directly). The ISI-LX will ping the Ethernet gateway and check to see if data is not being received within a predetermined period of time. If this link test fails (no response is received back from the gateway within a predetermined period of time), the link is considered down.

- If the backup path is to another ISP, the ISI-LX will hang-up the modem and dial the new ISP and establish a PPP connection.
- The ISI-LX will periodically test the Ethernet link and if it comes back up will drop the PPP modem connection.

SECTION 2: GETTING STARTED

The following is discussed in Section 2:

- ISI-LX Hardware Setup
- ISI-LX Power Up

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2.1 ISI-LX Network Hardware Setup

Perform the following to setup the ISI-LX network hardware connections.

1. If using a network interface, connect the Ethernet cable to the RJ-45 connector located on the front of the ISI-LX device. Figure 2-1 illustrates the front view of the ISI-LX.
2. If using a dialup ISP, connect the modem to the PORT4 located on the rear of the ISI-LX device. Refer to Figure 2-2 for the location of the PORT4.
3. Connect an RS-232 cable from the paging terminal to PORT1, PORT2, or PORT3 located on the rear of the ISI-LX device. The RS-232 ports are wired as a DCE device. If you are replacing a modem a NULL MODEM adapter will be needed (See Figure 2-3). Refer to Figure 2-2 for the locations of these ports. The number of serial ports that are functional is dictated by the ISI-LX model that was purchased and the number of paging terminals that are being connected.

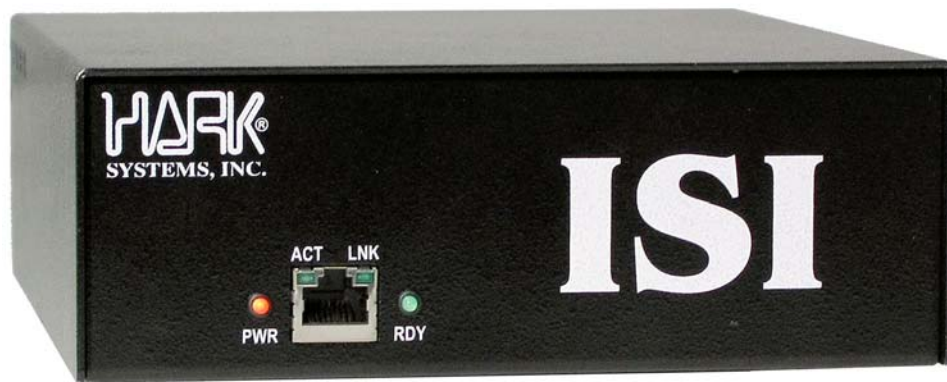


Figure 2-1 Front View of the ISI-LX Device

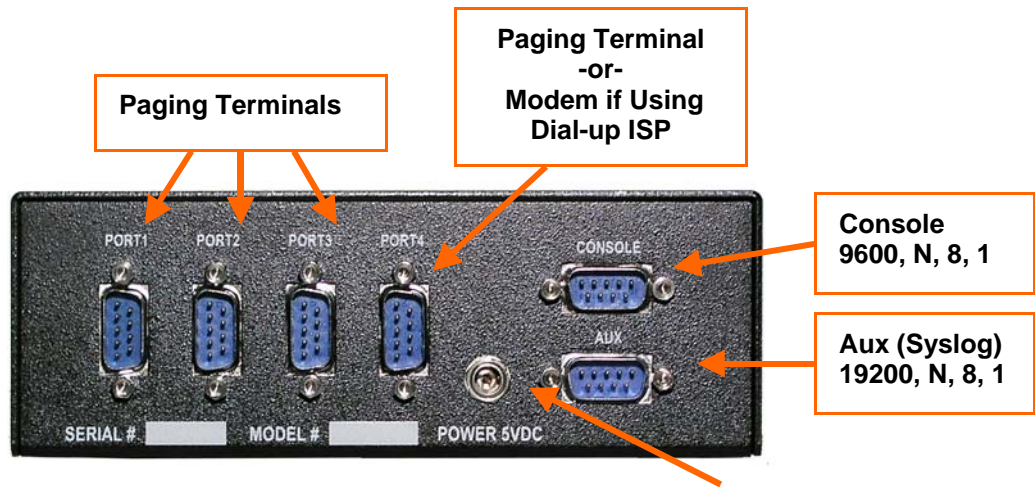


Figure 2-2 Rear View of the ISI-LX Device 5 VDC Regulated Power Supply Only

4. Connect a laptop or dumb terminal to the CONSOLE port located on the rear of the ISI-LX device. Refer to Figure 2-2 for the location of the CONSOLE port. The RS-232 ports are wired as a DCE device. If you are connecting to another PC a NULLMODEM adapter will be needed. Note that the Communication software on the terminal must be running at 9600 baud. The laptop or dumb terminal will be used to access the configuration, setup, and diagnostic applications.
5. The AUX port is used for displaying system messages. A laptop or dumb terminal can be connected to the this port located on the rear of the ISI-LX device. Refer to Figure 2-2 for the location of the AUX port. The RS-232 ports are wired as a DCE device. If you are connecting to another PC a NULLMODEM adapter will be needed. Note that the Communication software on the terminal must be running at 19200 baud.

	25 Pin	9 Pin		9 Pin	25 Pin	
FG (Frame Ground)	1	-	X	-	1	FG
TD (Transmit Data)	2	3	-	2	3	RD
RD (Receive Data)	3	2	-	3	2	TD
RTS (Request To Send)	4	7	-	8	5	CTS
CTS (Clear To Send)	5	8	-	7	4	RTS
SG (Signal Ground)	7	5	-	5	7	SG
DSR (Data Set Ready)	6	6	-	4	20	DTR
DTR (Data Terminal Ready)	20	4	-	6	6	DSR

Figure 2-3 NULL MODEM Pin-out

2.2 ISI-LX Startup

1. Once the appropriate connections have been made, power up the ISI-LX device by connecting the 5 VDC Regulated Power Supply (provided with the ISI-LX device) to the rear of the ISI-LX device and to an appropriate power source.

!!! CAUTION !!!

ONLY USE THE 5 VOLT POWER SUPPLY PROVIDED WITH THE ISI-LX DEVICE.

Do not use a standard 12 Volt power supply. Use of a 12 Volt power supply will cause serious damage to the equipment.

2. Verify that the following indicator lights are illuminated on the front of the ISI-LX device (refer to Figure 2-1 for the location of the indicator lights):
 - The PWR indicator light must be lit.
 - If using an Ethernet interface, the LINK indicator light should be lit (indicating that there is a physical connection), and the ACT indicator light should be flashing (indicating that there is activity or data is being transmitted on the port). If the Ethernet port is not used these indicator lights will not be lit or flashing.
 - The RDY indicator light will be lit once the ISI-LX starts. The RDY light will blink when data is received on any of the COM Ports. The RDY light is also used as an indication the ISI-LX is connected to the Internet using the dial backup modem. It will blink slowly until the Ethernet connection is re-established.
3. If a dialup ISP is being used, the modem should go off-hook and dial the ISP.
4. Once the ISI-LX device is powered up a login prompt will be displayed as in Figure 2-4. Refer to Section 3.3, *ISI-LX Setup and Configuration*, for details on Logging into and configuring the ISI-LX. Refer to Section 4.6 for more information about logging in remotely using SSH.

```
Checking Local Filesystems
fsck 1.27 (8-Mar-2002)
mounting local filesystems (in fstab)
setting system clock
Tue Feb 3 07:12:31 UTC 2004
Linking Libraries...
INIT: Entering runlevel: 3
Setting hostname to isilx.harksystems.com
Bringing up interface eth0..
Determining IP information for eth0...eth0: using half-duplex 10Base-T
(RJ-45)
done....
Bringing up interface lo..
setting kernel IP routing tables
starting system loggers
Starting sshd:
Starting ISI
/etc/rc.d/rcS 3 finished

Hark Systems, Inc
ISI-LX
OS Version 3.05

isilx.harksystems.com login:
```

Figure 2-4 ISI-LX Initialization and Login

```
ISI version..: LX 1.10
Host name...: isilx.harksystems.com
IP address...: 10.100.1.47
MAC address..: 00:d0:69:06:30:64

1) Stop Syslog and View Errors
2) Stop Syslog and View Debug
3) Edit Routing Entries
8) System utilities
9) System Configuration

Enter selection (or L to Log Off):
```

Figure 2-5 ISI-LX Setup Utility Main Menu

2.3 Finalizing the ISI-LX Configuration

Once you have accessed the ISI-LX configuration program (as indicated by the ISI-LX Initialization and Communication Status window shown in Figure 2-4), and configured the Ethernet and ports you may need to restart the ISI-LX. Select option 8 for System Utilities then option 1 to *Update system files and restart ethernet interface*. You will be prompted to enter a <Y>es or <N>o to continue as in Figure 2-6. Your connection may be disconnected if you are connected via SSH.

The ISI-LX processes will need restarting to load the new configuration. Select option 3 to *Reload the ISI daemon process and restart communication ports*. You will be prompted to enter a <Y>es or <N>o to continue as in Figure 2-7.

```
IP address...: 10.100.1.47
MAC address...: 00:d0:69:06:30:64

1) Stop Syslog and View Errors
2) Stop Syslog and View Debug
3) Edit Routing Entries
8) System utilities
9) System Configuration

Enter selection (or L to Log Off): 8

1) Update system files and restart ethernet interface
2) Restart a specific Communication Port
3) Reload ISI daemon process configs and restart communication ports
4) Stop ISI Daemon Process
5) Start ISI Daemon Process

Enter selection (or Q to quit): 1
Warning, restarting the ethernet interface will disconnect
all network connections, including SSH.

Continue with update and restart (Y/N) [Y]:
```

Figure 2-6 Update system files

```
Shutting down device lo
shutting down eth0...
killing dhcpd pid 34
Shutting down device eth0
Setting hostname to isilx.harksystems.com
Bringing up interface eth0..
Determining IP information for eth0.... done....
Bringing up interface lo..
setting kernel IP routing tables

*** NETWORK INTERFACE RESTARTED ***
Press any key to continue

1) Update system files and restart ethernet interface
2) Restart a specific Communication Port
3) Reload ISI daemon process configs, restart network and all ports
4) Stop ISI Daemon Process
5) Start ISI Daemon Process

Enter selection (or Q to quit): 3
Warning, restarting the ISI daemon process will close
all Communication Ports and Internet connections.

Do you wish to continue (Y/N) [Y]:
```

Figure 2-7 Reloading of the ISI daemon process

2.4 What To Do Next...

Now that the ISI-LX device has been setup and the appropriate connections have been established, you should refer to Section 3, *ISI-LX Setup and Configuration*, to configure the various parameters used by the ISI-LX.

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SECTION 3: ISI-LX SETUP AND CONFIGURATION

The configuration parameters of the ISI-LX are setup using the Setup utility that displays on the dumb terminal or laptop (that is, any PC with a terminal emulation) connected to the ISI-LX device.

The following is discussed within Section 3:

- ISI-LX Logon procedure
- ISI-LX configuration parameters
- ISI-LX Setup Utility
- Configuring and changing the ISI-LX configuration parameters

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3.1 ISI-LX Configuration Prerequisite

Before starting the configuration procedures described in the following sections, refer to the Configuration Form shown on the following page. The Configuration Form identifies all of the information that you will need to configure your ISI-LX. Obtaining the required information before beginning the configuration procedure will ensure that the configuration process runs smoothly and efficiently.

Configuration Form	
Required Information:	
ISI-LX Host Name:	_____
Remote Syslog IP Address:	_____
The following information is required if the ISI-LX will be using an Ethernet LAN connection:	
DHCP (Y/N):	_____
The following four settings are only used if DHCP is not used:	
IP Address (must be fixed for Server ISI-LX):	_____
Netmask:	_____
Gateway:	_____
DNS Servers:	_____,_____
Ping Address:	_____
Ping Interval:	_____

Configuration Form (cont'd)

The following information is required if the ISI-LX will be using the **PPP Dialup Modem**:

DHCP (Y/N): _____

ISP Modem #: _____

Username: _____

Password: _____

The following four settings are only used if DHCP is not used:

IP Address (must be fixed for Server ISI-LX): _____

Netmask: _____

Gateway: _____

DNS Servers: _____, _____

The following information is required if the **Dial-Backup is another ISP**:

DHCP (Y/N): _____

ISP Modem #: _____

Username: _____

Password: _____

The following four settings are only used if DHCP is not used:

IP Address (must be fixed for Server ISI-LX): _____

Netmask: _____

Gateway: _____

DNS Servers: _____, _____

Configuration Form (cont'd)

The following information is required for the **Communication Port Settings**:

Port Protocol: _____ (TAP, TNPP, PASSTHROUGH)

Port Parity: _____ (N, E, O)

Port Data Bits: _____ (7 or 8)

Port Stop Bits: _____ (1 or 2)

Connection Type: _____ (Direct, Modem, or Modem Emulation)

Modem Init 1: _____ (AT&F2E)

Modem Init 2: _____ (AT E&H0&I0&K0&M0&R1S0=1)

Port Baudrate (9600 or greater is preferred on the ports): _____

Configuration Form (cont'd)

The following information is required for the **Routing Table**:

Start ID: _____ (ID, **dn** for Dialed Number, **sub** for Subscriber, **tnppdest** for TNPP dest ID, **tnppsrc** for TNPP source ID)

End ID: _____ (ID, Dialed Number, or Subscriber ID)

Strip Length: _____ (How many digits to strip off beginning of ID)

Prefix: _____ (What to Prefix on the beginning of ID)

Connection: _____

TCP/IP destinations: protocol://server:port
- protocol is one of: snpp, smtp, smpp, wctp

Backup Connection: _____

TCP/IP destinations: protocol://server:port
- protocol is one of: snpp, smtp, smpp, wctp

Serial destinations:
protocol://device, modemtype, modemnum, baud, parity, data, stop
- protocol is one of: tap
- device is the serial device without the leading /dev/
For example /dev/ttyS2 would be ttyS2
- modemtype is a modem listed in isi.ini

3.2 ISI-LX Configuration Parameters

The ISI-LX configuration parameters that can be setup and modified include the following:

Ethernet Interface	IP Address or DHCP Netmask, Gateway, DNS Server
PPP Dialup ISP	Phone Number IP Address or DHCP Gateway, DNS Server User Name, Password
PPP Backup Device	Phone Number IP Address or DHCP Gateway, DNS Server User Name, Password Baud Rate
Serial Port	Baud Rate Protocol Type, Connection Type Parity, Data bits, Stop bits Modem Initialization Strings
General	Local Host Name Remote Syslog Server IP Address Time-zone

The ISI-LX Setup Utility window and procedures that must be followed to configure and edit each of the above parameters are described in detail in Sections 3.2 and 3.3.

3.3 Setup Utility and Login procedures

Log in to the system by entering the username **root** at the login prompt as shown in Figure 2-4. Next you will be prompted to enter the password. A unique password is assigned to each ISI-LX at the time of shipment. The password can be found on a temporary label located on the ISI-LX enclosure. This label should be removed to prevent un-authorized access.

After logging into the system the Setup program will automatically start, displaying the ISI-LX Setup Utility window shown in Figure 3-1. This utility is used to configure Ethernet parameters, Dialup PPP parameters, Communication port parameters, and the Routing table. The Setup utility is also used for diagnostic purposes to view the system log or enable debug message viewing.

The communication ports may need restarting if any parameters change. There is an option under utilities to restart all ports or an individual port. The Routing table changes get reloaded automatically and do not require any restarts.

For better security you should log out of the Setup Utility when finished making changes. To be protected from un-authorized access, the ISI-LX will require a username and password to log back in.

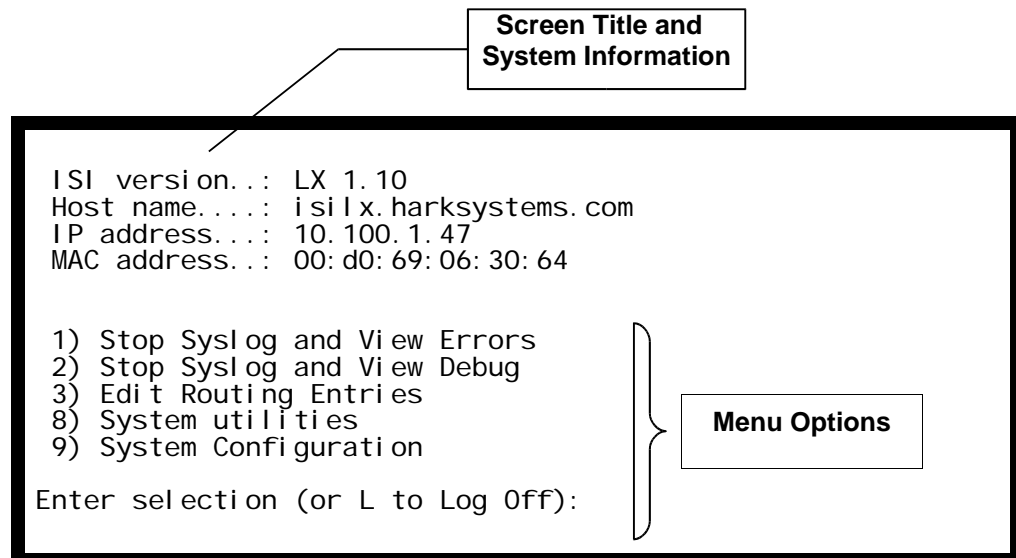


Figure 3-1 ISI-LX Setup Utility Window

Selection of the menu options displayed on the ISI-LX Setup Utility window initiates the corresponding utility. The appropriate display window or entry prompts are displayed. Each option is discussed in detail in Section 3.4 and Section 3.5 of this manual.

In general, the following steps must be performed to configure the ISI-LX:

- Program the ISI-LX Routing table. The routing table is used to determine how messages are delivered once they have been received on one of the Communication ports. Refer to Section 3.4 for details.
- Set the ISI-LX configuration parameters using the options provided on the ISI-LX System Configuration menu. Refer to Sections 3.5.1 through 3.5.9 for details.
- Once the parameters have been set, the configuration must be finalized and saved. Refer to Section 3.5.8 for details.
- Once the configuration is finalized, you must exit the Setup program using the procedures discussed in Section 3.5.9.

3.3.1 Selecting Menu Items

Select a menu option displayed on the ISI-LX Setup Utility window by performing the following:

1. Key the number that is displayed to the left of the menu option at the *Enter Selection* prompt.

For example, to access the *Edit Routing Entries* option, enter a **3** at the *Enter Selection* prompt. To access the *System Utilities* option, enter a **8** at the *Enter Selection* prompt.

2. Press the [RETURN] key.

The selected menu option initiates the appropriate utility. The corresponding prompts display. Each of the options is described in detail in Section 3.5.

3.4 Editing the Routing Entries

The menu options provided on the ISI-LX Routing Entry menu are described in detail in the following sections. The routing entries are used to determine how messages are delivered once they have been received on one of the communication ports except for when the port type is set to PASSTHROUGH. The routing entries can contain entries for the following types of lookups:

dn (Dialed Number) This type of entry is only used when the communications port connection type is set to *Modem Emulation*. Refer to Section 3.5.4 for more information on communication port configurations. The phone number parsed from the modem dial string will be used as the lookup id. When a matching entry is found the corresponding destination string will be used to deliver the data. This is useful in steering TAP messages from a paging device to different destinations based on the original TAP modem number dialed.

sub (Subscriber) This type of entry is used to match the pager id from the received TAP message. When a matching entry is found the corresponding destination string will be used to deliver the data. This is useful in steering specific pager id's to different destinations. A match on a subscriber record overrides a block entry.

tnppdest This type of entry is used to match the TNPP destination ID. When a matching entry is found the corresponding destination string will be used to deliver the data. This is useful in steering TNPP messages from a paging device to different destinations based on the TNPP destination ID. If a TNPP packet is received for a destination that doesn't have a routing entry the block will be used to route based on the pager ID.

tnppsrc This type of entry is used to match the TNPP source ID. When a matching entry is found the corresponding destination string

will be used to deliver the data. This is useful in steering TNPP messages from a paging device to different destinations based on the TNPP source ID. If a TNPP packet is received for a destination that doesn't have a routing entry the block will be used to route based on the pager ID.

Block Entry

This type of entry will match if the pager id is between the Start ID and the End ID. When a matching entry is found the corresponding destination string will be used to deliver the data. This is useful in steering blocks of pager id's from TAP messages to different destinations.

Perform the following to edit the Routing Entries.

1. Enter a **3** at the *Enter Selection* prompt displayed on the ISI-LX Setup Utility main menu (See Figure 3-1).

The Routing Entry menu shown in Figure 3-2 displays.

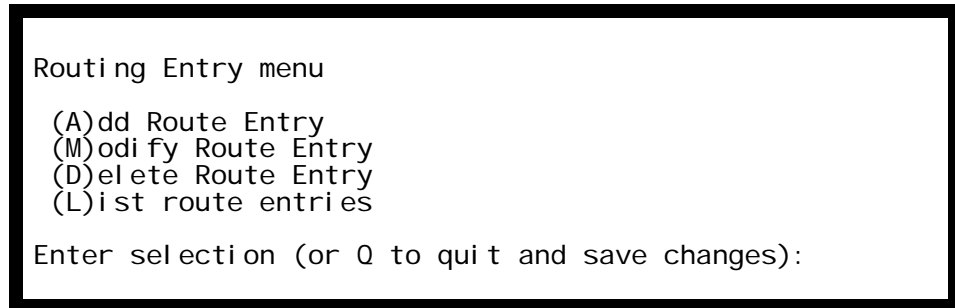


Figure 3-2 Routing Entry Menu

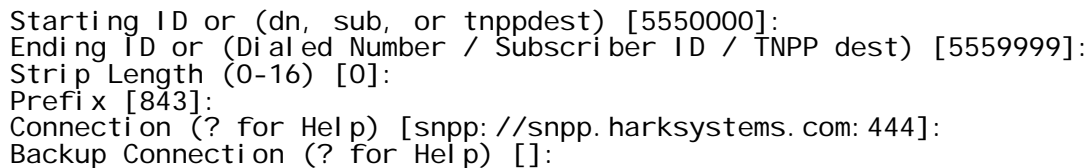
2. The choices from the Routing Entry menu are **Add**, **Modify**, **Delete**, and **List**. Use the *Add* option to add new items to the routing entries. Use the *Modify* option if an existing entry needs to be changed. The *Delete* option will remove entries that are no longer needed. The current list of routing entries can be displayed by selecting the *List* option. Enter the letter of the option at the *Enter Selection* prompt displayed on the ISI-LX Routing Entry menu.
3. Each of the options is described in detail in Sections 3.4.1 through 3.4.4.

3.4.1 Add Route Entry

This option is used to add new routing entries. The ISI-LX uses the routing entries to determine the destination of a message. This is done by comparing a pager id to a block of numbers or a subscriber id. If a match is found the pager id will be translated as defined by the Strip Len and Prefix digits then the message will be delivered using the defined protocol.

Perform the following to configure or add a Route entry.

1. Enter an **A** at the *Enter Selection* prompt displayed on the ISI-LX Routing Entry menu .
2. The Add Routing Entry window shown in Figure 3-8 displays. Note that only the first prompt displays on the window when first accessed. Subsequent prompts will be displayed as a result of pressing the [Enter] key, which allows you to move to the next prompt. Figure 3-8 displays all the prompts that will appear as a result of entering data onto the Add Routing Entry window.



```
Starting ID or (dn, sub, or tnppdest) [5550000]:  
Ending ID or (Dialed Number / Subscriber ID / TNPP dest) [5559999]:  
Strip Length (0-16) [0]:  
Prefix [843]:  
Connection (? for Help) [snpp://snpp.harksystems.com: 444]:  
Backup Connection (? for Help) []:
```

Figure 3-3 Add Routing Entry Window

3. Enter data at each of the prompts displayed on the Add Routing Entry window using the data requirements listed below. Refer to Figure 3-8 for the sequencing of the prompts.

Prompt	Data Requirements
Starting ID	If this entry is for a range of pagers enter the starting pager ID. If this routing entry is for a unique subscriber enter sub (Ending ID will be the subscriber ID), or if you want to match on the modem dial number (example ATDT5551234), enter dn in this field. A value of dn will only match if the communication port type is set to <i>Modem Emulation</i> . Refer to Section 3.5.4 for more information on port settings. To route based on the TNPP destination ID, enter tnppdest for this field.
Ending ID	If this entry is for a range of pagers enter the ending pager ID. If this routing entry is for a unique subscriber (<i>sub</i> in starting ID) enter the subscriber ID. If you want to match on the modem dial number, enter number that will be dialed in this field. If you want to match on the TNPP destination ID enter the 4 digit TNPP destination here.
Strip Length	This field indicates how many digits will be stripped off the beginning of the pager ID as it was received. This is useful for translating the id before it is sent out to the destination device and is commonly used to remove the area code. Enter the number of digits to strip then press the [Enter] key. The default value is 0. Example, if an ID of 8435551234 is received and the <i>Strip Length</i> is 3 the resulting id will be 5551234.
Prefix	This field indicates what string should be prefixed on to the pager id. This will be done after any digits have been stripped using the <i>Strip Length</i> and is useful for translating the id before it is sent out to the destination device. Enter the string to prefix then press the [Enter] key. Example, if an ID of 5551234 is received and the <i>Prefix</i> is 843 the resulting id will be 8435551234.

Prompt	Data Requirements
Connection	This field indicates how and where the message should be delivered and is also referred to as the Destination string. It is in the form of, Protocol://device or host:port or device specific options.

```
TCP/IP connections:
protocol://server:port
- protocol is one of: snpp, smtp, smpp, wctp
  For example: snpp://pager.harksystems.com:444

Serial connections:
protocol://device,modemtype,modemnum,baud,parity,data,stop
- protocol is one of: tap (tnpp in future)
- device is the serial device without the /dev/
  For example: tap://ttyS2:usr:18886561727:9600:e:7:1
starting in v1.6 the device name can also be PORTn where n is
a number from 1 to 4
  For example: tap://PORT2:usr:18886561727:9600:e:7:1
```

Backup Connection	This field indicates how and where the message should be delivered if the main connection fails. It is entered in the same format as the <i>Connection</i> field.
-------------------	---

3.4.2 Modify Route Entry

This option is used to modify an existing routing entry. Perform the following to modify a route entry.

1. Enter an **M** at the *Enter Selection* prompt displayed on the ISI-LX Routing Entry menu (Figure 3-2).
2. The first routing entry will be displayed then you will be prompted if this is the record you want to modify. Enter a **Y** to modify the entry or press [Enter] to have the next entry displayed. Refer to Figure 3-4 for an example.

```
START ID      END ID      STRIP PREFIX CONNECTION
-----
4322         4399       0      843      snpp: //omegademo. harksystems. com: 44
Modify this record? N
START ID      END ID      STRIP PREFIX CONNECTION
-----
5550000      5559999    0      843      SNPP: //snpp. harksystems. com: 444
Modify this record? Y
Starting ID or (dn, sub, or tnppdest) [5550000]:
Ending ID or (Dialed Number / Subscriber ID / TNPP dest) [5559999]:
Strip Length (0-16) [0]:
Prefix [843]:
Connection (? for Help) [snpp: //snpp. harksystems. com: 444]:
Backup Connection (? for Help) []:
```

Figure 3-4 Modify Routing Entry Window

3. Enter data at each of the prompts displayed on the Modify Routing Entry window using the data requirements listed in Section 3.4.1. The Edit Routing Entry menu will be re-displayed once all the data has been entered.

3.4.3 Delete Route Entry

This option is used to delete an existing routing entry. Perform the following to delete a route entry.

1. Enter a **D** at the *Enter Selection* prompt displayed on the ISI-LX Routing Entry menu (Figure 3-2).
2. The first routing entry will be displayed then you will be prompted if this is the record you want to delete. Enter a **Y** to delete the entry or press [Enter] to have the next entry displayed. Refer to Figure 3-5 for an example.

```
START ID      END ID      STRIP PREFIX CONNECTION
-----
4322         4399       0      843      snpp: //omegademo. harksystems. com: 44
Delete this record? Y
```

Figure 3-5 Delete Routing Entry Window

3.4.4 List Route Entries

This option is used to list all existing routing entries. Perform the following to list the entries.

1. Enter an **L** at the *Enter Selection* prompt displayed on the ISI-LX Routing Entry menu (Figure 3-2).
2. The current routing entries will be displayed as in Figure 3-6.

START ID	END ID	STRIP	PREFIX	CONNECTION
0000	9999	0		snpp: //pager.harksystems.com: 444
sub	102	3	james	smtp: //mail.harksystems.com: 25
5550000	5559999	0	843	snpp: //snpp.harksystems.com: 444
7641000	7641999	0		snpp: //vmail.harksystems.com: 444

Figure 3-6 List Routing Entries Window

3.5 System Configuration Menu Options

The menu options provided on the ISI-LX Setup Utility window are described in detail in the following sections.

In general, the following steps must be performed to configure the ISI-LX:

- Set the ISI-LX configuration parameters using the options provided on the ISI-LX System Configuration menu. Refer to Sections 3.5.1 through 3.5.5 for details.
- Once the parameters have been set, the configuration must be finalized and saved. Refer to Section 3.5.6 for details.
- Once the configuration is finalized, you must exit the Setup program using the procedures discussed in Section 3.5.7.

3.5.1 Edit Ethernet Settings

If using the 10-BaseT Ethernet connection (DSL, cable modem, T1, or ISDN), you will need to configure the Ethernet parameters using the *Edit Ethernet Settings* menu option provided on the System Configuration menu which can be found under option **9**, *System Configuration*.

Perform the following to configure or edit the Ethernet parameters.

1. Enter a **9** at the *Enter Selection* prompt displayed on the ISI-LX Setup Utility window .

The System Configuration menu shown in Figure 3-7 displays.

```
System configuration menu

 1) Ethernet Settings
 2) PPP Settings
 3) Backup PPP Settings
 4) Port Settings
 5) Syslog Settings
 6) Set timezone
 7) General Settings

Enter selection (or Q to quit):
```

Figure 3-7 System Configuration Menu

2. Enter a **1** at the *Enter Selection* prompt displayed on the ISI-LX Setup Utility window.

The Ethernet Settings window shown in Figure 3-8 displays. Note that only the first prompt displays on the window when first accessed. Subsequent prompts will be displayed as a result of pressing the [Enter] key, which allows you to move to the next prompt. Figure 3-8 displays all the prompts that will appear as a result of entering data onto the Ethernet Parameters Configuration window.

```
Enable Ethernet Interface (Y/N) [Y]:
Ethernet device name (normally eth0) [eth0]:
Use DHCP [N]:
IP Address or (DHCP) [DHCP]: 10.100.1.47
Netmask [255.255.255.0]:
Default Gateway [192.168.2.254]:
NameServer 1 [192.168.2.253]:
NameServer 2 [192.168.2.252]:
Ping interval (in secs) [30]:
Ping address [192.168.2.1]:
```

Figure 3-8 Ethernet Parameters Configuration Window

3. Upon accessing the Ethernet Parameters Configuration window, the cursor is located at the *Enabled the Ethernet Network Interface* prompt. Either enter the appropriate data and press the [Enter] key to move to the next prompt, or accept the displayed default data by pressing the [Enter] key without entering any data at the prompt.

Enter data at each of the prompts displayed on the Ethernet Parameters Configuration window using the data requirements listed below. Refer to Figure 3-8 for the sequencing of the prompts.

Prompt	Data Requirements
Enable Ethernet Interface (Y/N)	<p>The default value is Yes, indicating that an Ethernet connection is being used. To accept the Network Interface (Y/N) default value, press the [Enter] key without entering any data.</p> <p>To disable the Ethernet network interface, enter an N.</p>
Use DHCP	<p>Enter Y here to have the ISI automatically get an IP address and settings from a DHCP server. You must have a DHCP server on your local subnet for this option to function.</p>
IP Address, Netmask, Default Gateway, NameServer 1, and NameServer 2	<p>are not displayed if you are using DHCP.</p>
IP Address	<p>If you are not using a DHCP address or if you need to run the ISI-LX in server mode enter an IP address here.</p>
Netmask	<p>Enter the netmask address associated with your device, and press the [Enter] key.</p>
Default Gateway	<p>Enter the default gateway associated with your device and press the [Enter] key.</p>
NameServer 1	<p>Enter the name of the primary DNS server and press the [Enter] key. The system will need to access the DNS server to convert the destination server names into the corresponding IP address.</p>
NameServer 2	<p>Enter the name of the secondary DNS server and press the [Enter] key. The system will need to access the DNS server to convert the destination server names into the corresponding IP address.</p>
Ping interval	<p>The amount of time in seconds between ping attempts. Normally 30.</p>

Prompt	Data Requirements
Ping address	IP address of the remote host to ping to make sure the ethernet connection is still alive. Normally this is the gateway, however if your gateway is configured to block pings this address can be used. Please note that if your backup method is PPP this IP address can not be a host on the internet. If you specify a host on the internet, when the PPP connection comes up you will be able to ping the host again causing the PPP connection to drop and the ethernet to be tried again. If you are using PPP this IP address should be another host on your local subnet which can be pinged.

4. Once the above prompts have been displayed and you have entered the appropriate data, the System Configuration window redisplay as in Figure 3-7. Follow the steps from Section 2.3 to save the configuration changes and restart the Ethernet interface.

3.5.2 Edit Dialup PPP Parameters

If using Point-to-Point Protocol (PPP), which is standard ISPN protocol, you will need to configure the PPP parameters using the *Edit PPP Settings* menu option provided on the System Configuration window.

Perform the following to configure or edit the Dialup PPP parameters.

1. Enter a **2** at the *Enter Selection* prompt displayed on the ISI-LX System Configuration menu from Figure 3-7.

The PPP Settings window shown in Figure 3-9 displays. Note that only the first prompt displays on the window when first accessed. Subsequent prompts will be displayed as a result of pressing the [Enter] key, which allows you to move to the next prompt. Figure 3-9 displays all the prompts that will appear as a result of entering data onto the PPP Settings window.

2. Upon accessing the PPP Settings window, the cursor is located at the *Enabled the Dialup PPP Interface* prompt. Either enter the appropriate data then press the [Enter] key to move to the next prompt, or accept the

displayed default data by pressing the [Enter] key without entering any data at the prompt.

```
Enable Dialup PPP Interface (Y/N) [Y]:
Modem Device Name [/dev/ttyS5]:
Modem Baudrate [115200]:
ISP Dialup Number [5551234]:
Login Username [ms144121]:
Login Password [3abc4]:
Login Prompt [ogin:]:
Password Prompt [word:]:
PPP Prompt (normally ~) [-]:
PPP Start Command (normally blank) []:
PPP Chat Command [connect '/usr/sbin/chat -v -f /usr/local/etc/ppp_chat']:
Use DHCP [Y]:
IP Address [10.100.1.47]:
Netmask [255.255.255.0]:
Default Gateway []:
NameServer 1 []:
NameServer 2 []:
```

Figure 3-9 Dialup PPP Settings Window

Enter data at each of the prompts displayed on the Dialup PPP Parameters Configuration window using the data requirements listed below. Refer to Figure 3-9 for the sequencing of the prompts.

Prompt	Data Requirements
Enable Dialup PPP Interface (Y/N)	The default value is Yes, indicating that a dialup PPP interface is going to be used. To accept the default value, press the [Enter] key without entering any data. To disable the Dialup PPP interface, enter an N.

Prompt	Data Requirements
Modem Device Name	<p>Enter the device name that will be used to access the PPP Modem. The default is /dev/ttyS5 or PORT4. The following are the device names assigned to the PORTS:</p> <p>PORT1 - /dev/ttyS2 PORT2 - /dev/ttyS3 PORT3 - /dev/ttyS4 PORT4 - /dev/ttyS5</p> <p>The port used must be marked as disabled in the com port setup in order for the PPP program to use it.</p>
PPP Modem Baudrate	<p>The default value of 115200 may be accepted by pressing the [Enter] key without entering any data. Valid baud rates are within the range of 1200 through 115200. To enter a value other than the default, key the appropriate value at the prompt and press the [Enter] key.</p>
ISP Dialup Number	<p>Enter the phone number associated with the ISP modem at the prompt and press the [Enter] key.</p>
Login Username	<p>This represents the login name associated with your dialup password. Accept the default value of <i>loginuser</i> by pressing the [Enter] key without entering any data. To enter a login name other than the default, key the appropriate login name at the prompt and press the [Enter] key.</p>
Login Password	<p>Enter your dialup password in this field. Accept the default value of <i>loginpass</i> by pressing the [Enter] key without entering any data. To enter a login password other than the default, key the appropriate login password at the prompt and press the [Enter] key.</p>

Prompt	Data Requirements
Login Prompt	This is the text that the ISI-LX will wait for before sending the login id. Accept the default value of <i>ogin:</i> by pressing the [Enter] key without entering any data. To enter a login prompt other than the default, key the appropriate login prompt at the prompt and press the [Enter] key.
Password Prompt	This is the text that the ISI-LX will wait for before sending the password. Accept the default value of <i>word:</i> by pressing the [Enter] key without entering any data. To enter a password prompt other than the default, key the appropriate password prompt at the prompt and press the [Enter] key.
PPP Prompt	Enter the PPP success string that the ISI-LX will wait for to know when the PPP mode has been entered successfully. This is usually a single '~' for most ISP's. Accept the default value by pressing the [Enter] key without entering any data.
PPP Start Command	Enter any PPP command string needed by your ISP to enter PPP mode. This is usually blank for most ISP's. Accept the default value by pressing the [Enter] key without entering any data.
PPP Chat Command	This is the command string used to start the PPP script. This should not be changed unless specified by a Hark Systems Technician. The default is: <pre>connect '/usr/sbin/chat -v -f /usr/local/etc/ppp_chat'</pre>
Use DHCP	Enter Y here to have the ISI automatically get an IP address and settings from a DHCP server. You must have a DHCP server on your local subnet for this option to function.

Prompt	Data Requirements
	The following fields are not displayed if you are using DHCP.
IP Address	If you are not using a DHCP address or if you need to run the ISI-LX in server mode enter an IP address here.
Netmask	If an IP address has been entered in the <i>TCPIP Address</i> field, enter the netmask address associated with your device, and press the [Enter] key.
Default Gateway	If an IP address has been entered in the <i>TCPIP Address</i> field, enter the default gateway associated with your device and press the [Enter] key.
NameServer 1	Enter the name of the primary DNS server provided by the ISP and press the [Enter] key. The system will need to access the DNS server to convert the destination server names into the corresponding IP address.
NameServer 2	Enter the name of the secondary DNS server provided by the ISP and press the [Enter] key. The system will need to access the DNS server to convert the destination server names into the corresponding IP address.

3. Once the above prompts have been displayed and you have entered the appropriate data, the ISI-LX System Configuration menu redisplay.

3.5.3 Edit Backup PPP Settings

If using an Ethernet connection, you have the option to enable the dial backup feature using the *Dial Backup Settings* menu option provided on the ISI-LX Setup Utility window. Note, if using an Ethernet connection, you must have a modem that can be used for the backup connection. If using an ISP connection, you may use a modem or another ISP connection or account as

backup. The default Communications port used for dialup connections is PORT4 or /dev/ttyS5.

Perform the following to configure or edit the Dial Backup parameters.

1. Enter a **3** at the *Enter Selection* prompt displayed on the ISI-LX System Configuration menu from Figure 3-7. The Dial Backup PPP Settings window shown in Figure 3-9 displays. Note that only the first prompt displays on the window when first accessed. Subsequent prompts will be displayed as a result of pressing the [Enter] key, which allows you to move to the next prompt. Figure 3-9 displays all the prompts that will appear as a result of entering data onto the Backup PPP Settings window.
2. Upon accessing the PPP Settings window, the cursor is located at the *Enabled Backup PPP Interface* prompt. Either enter the appropriate data and press the [Enter] key to move to the next prompt, or accept the displayed default data by pressing the [Enter] key without entering any data at the prompt.

```

Enable Backup PPP Interface (Y/N) [Y]:
Modem Device Name [/dev/ttyS5]:
Modem Baudrate [115200]:
ISP Dial up Number [5551234]:
Login Username [ms144121]:
Login Password [3abc4]:
Login Prompt [ogin:]:
Password Prompt [word:]:
PPP Prompt (normally ~) [-]:
PPP Start Command (normally blank) []:
PPP Chat Command [connect '/usr/sbin/chat -v -f /usr/local/etc/ppp_chat']:
Use DHCP [y]:

```

Figure 3-10 Backup PPP Settings Window

Enter data at each of the prompts displayed on the Dialup PPP Parameters Configuration window using the data requirements listed below. Refer to Figure 3-9 for the sequencing of the prompts.

Prompt	Data Requirements
Enable Dialup PPP Interface (Y/N)	The default value is Yes, indicating that a dialup PPP interface is going to be used. To accept the default value, press the [Enter] key without entering any data. To disable the Dialup PPP interface, enter an N .

Prompt	Data Requirements
Modem Device Name	<p>Enter the device name that will be used to access the PPP Modem. The default is /dev/ttyS5 or PORT4. The following are the device names assigned to the PORTS:</p> <p>PORT1 - /dev/ttyS2 PORT2 - /dev/ttyS3 PORT3 - /dev/ttyS4 PORT4 - /dev/ttyS5</p> <p>The port used must be marked as disabled in the com port setup in order for the PPP program to use it.</p>
PPP Modem Baudrate	<p>The default value of 115200 may be accepted by pressing the [Enter] key without entering any data. Valid baud rates are within the range of 1200 through 115200. To enter a value other than the default, enter the appropriate value at the prompt.</p>
ISP Dialup Number	<p>Enter the phone number associated with the ISP modem at the prompt and press the [Enter] key.</p>
Login Username	<p>This represents the login name associated with your dialup password. Accept the default value of <i>loginuser</i> by pressing the [Enter] key without entering any data. To enter a login name other than the default, enter the appropriate login name at the prompt.</p>
Login Password	<p>Enter your dialup password in this field. Accept the default value of <i>loginpass</i> by pressing the [Enter] key without entering any data. To enter a login password other than the default, enter the appropriate login password at the prompt.</p>

Prompt	Data Requirements
Login Prompt	This is the text that the ISI-LX will wait for before sending the login id. Accept the default value of <i>ogin:</i> by pressing the [Enter] key without entering any data. To enter a login prompt other than the default, enter the appropriate login prompt at the prompt.
Password Prompt	This is the text that the ISI-LX will wait for before sending the password. Accept the default value of <i>word:</i> by pressing the [Enter] key without entering any data. To enter a password prompt other than the default, enter the appropriate password prompt at the prompt.
PPP Prompt	Enter the PPP success string that the ISI-LX will wait for to know that the PPP mode has been entered successfully. This is usually a single '~' for most ISP's. Accept the default value by pressing the [Enter] key without entering any data.
PPP Start Command	Enter any PPP command string needed by your ISP to enter PPP mode. This is usually blank for most ISP's. Accept the default value by pressing the [Enter] key without entering any data.
PPP Chat Command	This is the command string used to start the PPP script. This should not be changed unless specified by a Hark Systems Technician. The default is: <pre>connect '/usr/sbi n/chat -v -f /usr/local/etc/backup_i sp'</pre>
Use DHCP	Enter Y here to have the ISI automatically get an IP address and settings from a DHCP server. You must have a DHCP server on your local subnet for this option to function.

Prompt	Data Requirements
	The following fields are not displayed if you are using DHCP.
IP Address	If you are not using a DHCP address or if you need to run the ISI-LX in server mode enter an IP address here.
Netmask	If an IP address has been entered in the <i>TCPIP Address</i> field, enter the netmask address associated with your device, and press the [Enter] key.
Default Gateway	If an IP address has been entered in the <i>TCPIP Address</i> field, enter the default gateway associated with your device and press the [Enter] key.
NameServer 1	Enter the name of the primary DNS server provided by the ISP and press the [Enter] key. The system will need to access the DNS server to convert the destination server names into the corresponding IP address.
NameServer 2	Enter the name of the secondary DNS server provided by the ISP and press the [Enter] key. The system will need to access the DNS server to convert the destination server names into the corresponding IP address.

3. Once the above prompts have been displayed and you have entered the appropriate data, the ISI-LX System Configuration menu redisplay.

3.5.4 Edit Communication Port Parameters

Use the *Edit Port Settings* option provided on the ISI-LX Setup Utility under the System Configuration menu to setup the configuration for the four Communication ports on the ISI-LX.

Perform the following to configure one to four of the ports.

1. Enter a **2** at the *Enter Selection* prompt displayed on the ISI-LX System Configuration menu from Figure 3-7.
2. Upon accessing the Port Configuration window, the cursor is located at the *Enter Port to Edit (1-4 or Q or L)*. Enter the appropriate data and press the [Enter] key to move to the next prompt, or accept the displayed default data by pressing the [Enter] key without entering any data at the prompt. Enter a **Q** to quit and return the System Configuration menu or an **L** to list the current setting for all the ports.

Configure each of the four ports by entering data at each of the prompts displayed on the Communication Ports Configuration window using the data requirements listed below. Do not configure port 4 if using an external modem. A port is disabled by entering a 'N' on the *Enable this Port* prompt after selecting the port to edit. Refer to Figure 3-11 for the sequencing of the prompts.

```

Enter Port to Edit (Q to Quit or L to List) (1234QL) [1]:
Enable this Port (Y/N) [Y]:
Port Protocol (1=TAP, 2=TNPP, 3=PASSTHROUGH) (1-3) [1]:
Max Message Length (1-1024) [240]:
Enable TAP Transparent Characters (Y/N) [N]:
Enable TAP Extension Blocks (Y/N) [Y]:
Disable TAP 1.6 response codes [N]:
Port Baudrate [38400]:
Port Parity (NE0) [E]:
Port Data Bits (78) [7]:
Port Stop Bits (12) [1]:
Port Connection <M>odem, <D>irect or Modem <E>mulation [M]:
Port Modem Init1 [AT&F2E]:
Port Modem Init2 [ATE&H0&I0&K0&M0&R1S0=1S7=45S10=1S12=0&W]:

```

Figure 3-11 Port Settings Window

Prompt	Data Requirements
Enter Port to Edit (1234QL)	The default value is Comm Port 1. To accept the default value, press the [Enter] key without entering any data. To configure the parameters for Ports 2 through 4, enter the appropriate Comm Port number and press the [Enter] key. Enter a Q to exit this menu or L to list the ports current settings.

Prompt	Data Requirements
Port Protocol	This determines the protocol this port will use when communicating with the connected device. The default value is 1 for TAP. The possible choices are: (1) TAP, (2) TNPP, or (3) PASSTHROUGH. Accept the default value by pressing the [Enter] key without keying any data.

If **TAP** is selected, the port will emulate a TAP server, excepting the pager id and message from the connected device. Once the message has been received it will be sent out over the Internet using routing options found in the Routing Entry menu in Section 3.4.

If **TNPP** is selected, the port will emulate a TNPP node, excepting the pager id and message from the connected device's TNPP packets. Once the message has been received it will be sent out over the Internet using routing options found in the Routing Entry menu in Section 3.4.

If **PASSTHROUGH** is selected, the port will pass any serial data received on the port over the internet to other devices that accept serial encapsulated data over TCP/IP such as the Hark Omega Gateway line of products. The ISI-LX can act as a server and wait for an incoming TCP/IP connection or a Client and initiate an outgoing TCP/IP connection. The *Passthrough Host*, *Passthrough Port*, and *Passthrough Type* fields will need to be entered if this protocol is selected.

Max Message Length	The maximum message length for TAP and TNPP messages. This is only used if the Protocol is set to TAP or TNPP. To accept the default value, press the [Enter] key without entering any data.
--------------------	--

Prompt

Data Requirements

If the *Port Protocol* is TAP the following fields will be required.

Enable TAP Transparent Characters (Y/N)

Earlier versions of TAP did not allow ASCII Control-Code characters (characters whose value is less than Hex 20) to be sent to a Pager. This is now supported by a control transparency mechanism. If a control character which would cause a protocol conflict must be transmitted within the packet the originator must perform “transparency insertion” to make the control character transparent to the protocol. Enter a ‘**Y**’ to enable this feature.

Enable TAP Extension Blocks (Y/N)

Enabling this feature will allow the use of TAP extension blocks.

Disable TAP Response Codes (Y/N)

Enabling this feature will turn off the numeric result codes that are enabled by default in TAP 1.6 and higher.

If the *Port Protocol* is PASSTHROUGH the following four fields will be required.

Passthrough Mode

The following prompt will be displayed:

Will this port act as a TCP Server (N for Client connection) (Y/N) [Y]:

To have the ISI-LX act as a Server (Host) on this port enter a **Y** then press the [Enter] key. To have this port connect to a remote server (host) enter a **N**.

Passthrough Hostname

If this port is configured as a TCP Client connection this field will indicate the remote server or host that will be connected to. Enter the remote host name or IP address and press the [Enter] key.

Prompt	Data Requirements
Passthrough Hostport	Enter the TCP port (or socket) number that the ISI-LX will wait for connections on if configured as a TCP Server. If the ISI-LX is configured as a TCP Client this will be the remote host's TCP port (or socket) number.
Passthrough Buffsize	Enter the size of the read/write buffer. Typically this is 1024. Allowable values are 1024 to 16384.
Passthrough Init timeout	Enter the initial read timeout in milliseconds. Allowable values are 100 to 30000.
Passthrough Sec timeout	Enter the secondary read timeout in milliseconds. Allowable values are 100 to 10000.
Enable ISI Link Tests	This option is for compatibility with previous ISI models and the Hark Internet Paging Gateway. Enter a Y if the ISI-LX will send and receive ISI Link tests on this port.
The remainder of these fields are valid for all port protocols.	
Port Baudrate	The default value is 9600. This represents the baud rate of the serial data being received. To accept the default value, press the [Enter] key without entering any data. Valid values range from 0 through 115200. To enter a value other than 9600, enter the appropriate value and press the [Enter] key.
Port Parity (N, E, O)	The default value is N. To accept the default value, press the [Enter] key without entering any data. Valid values include N (none), E (even), and O (odd). To enter a value other than N, enter the appropriate value and press the [Enter] key.

Prompt	Data Requirements
Port Data Bits (7,8)	The default value is 8. To accept the default value, press the [Enter] key without entering any data. Valid values include 7 and 8. To enter a value other than 8, enter the appropriate value and press the [Enter] key.
Port Stop Bits (1,2)	The default value is 1. To accept the default value, press the [Enter] key without entering any data. Valid values include 1 and 2.
Port Connection	This field identifies the type of connection used to connect the ISI-LX to the serial device. The default value is D (Direct). To accept the default value, press the [Enter] key without entering any data. Valid values include M, D, and E. To enter a value other than D, enter the appropriate value and press the [Enter] key.

A **DIRECT** connection implies the ISI-LX is connected directly to the other equipment. This can be used to connect right to a paging terminal or other devices that send TAP messages.

With a **MODEM** connection the ISI-LX will configure the modem with the programmed modem init strings then wait for a connection (modem carrier detect) before attempting to process data. Once the modem is connected the ISI-LX will proceed with accepting message and delivering them based on the Routing Table.

With a **MODEM EMULATION** connection the ISI-LX will emulate a modem. This can be used to make the ISI-LX look like a drop in replacement for a modem that is currently delivering TAP messages. The ISI-LX will respond to all AT commands with an OK. If the AT Dial command is received the ISI-LX will use the dialed number and search for a Routing Table entry. If one is used the destination device will be used and the modem will be connected. If the dialed number is not found the modem will be connected and the ISI-LX will proceed with the TAP protocol. Once a message has been received the pager id will be looked up in the Routing Table and delivered appropriately. A NULL MODEM adapter must be used and the pin-out can be found in Figure 2-3.

Prompt	Data Requirements
Modem Init1	If the Port Connection is configured as a <i>Modem</i> this field will contain the modem initialization string that will be sent on startup and after each call. The default value is <i>AT&F2E</i> . To accept the default value, press the [Enter] key without entering any data. To enter a value other than the default, enter the appropriate value and press the [Enter] key.

Prompt	Data Requirements
Modem Init2	<p>If the Port Connection is configured as a <i>Modem</i> this field will contain a second modem initialization string that will be sent on startup and after each call. The default value is:</p> <p><i>ATE&H0&I0&K0&M0&R1S0=1S7=45S10=1S12=0&W.</i></p> <p>To accept the default value, press the [Enter] key without entering any data. To enter a value other than the default, enter the appropriate value and press the [Enter] key.</p>

3. Once the above prompts have been displayed and you have entered the appropriate data, the ISI-LX System Configuration menu redisplay. The ISI-LX port processes must be restarted if any changes have been made. Refer to Section 4 for more information about the System Utilities and how to restart the ports.

3.5.5 Edit Syslog Settings

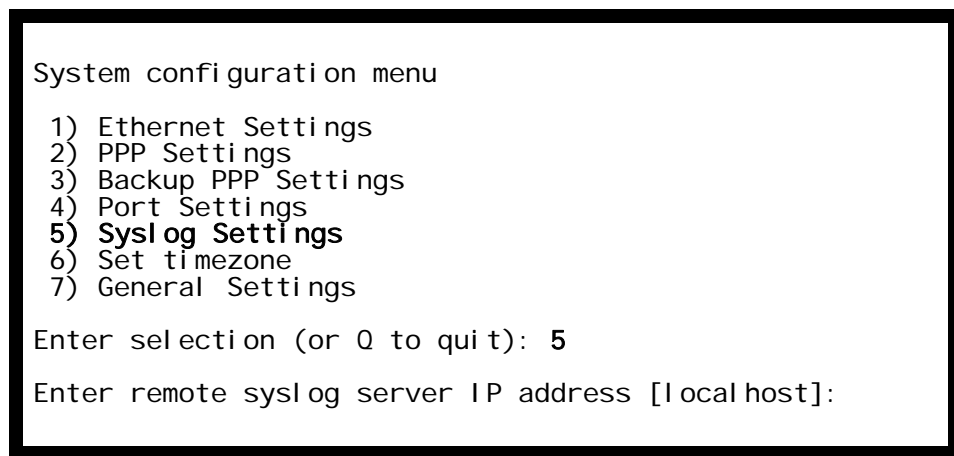
The *Edit Syslog Settings* option provided on the ISI-LX System Configuration menu allows you to change the host address where all Syslog messages will be sent. Syslog is the service that receives debug and general warnings and system messages. When a message is received it will be sent out the AUX port

(See Figure 2) of the ISI-LX and if configured the message will be sent to the Syslog host IP address using the syslog protocol as defined in RFC3164. These messages can also be view locally or remotely (using the SSH protocol) by selecting option 1 or 2 from the main menu.

Perform the following to configure the syslog settings.

1. Enter a **5** at the *Enter Selection* prompt displayed on the ISI-LX System Configuration menu and press the [Enter] key.

The Syslog Settings window shown in Figure 3-12 displays.



```
System configuration menu
 1) Ethernet Settings
 2) PPP Settings
 3) Backup PPP Settings
 4) Port Settings
 5) Syslog Settings
 6) Set timezone
 7) General Settings

Enter selection (or Q to quit): 5
Enter remote syslog server IP address [localhost]:
```

Figure 3-12 Syslog Settings Window

2. Upon accessing the Syslog Settings option, the cursor is located at the *Enter remote syslog server IP address* prompt. Enter the IP address of the remote Syslog server or use the default value of *localhost* and press the [Enter] key to accept data.
3. Once the above prompts have been displayed and you have entered the appropriate data, the ISI-LX System Configuration menu redisplay.

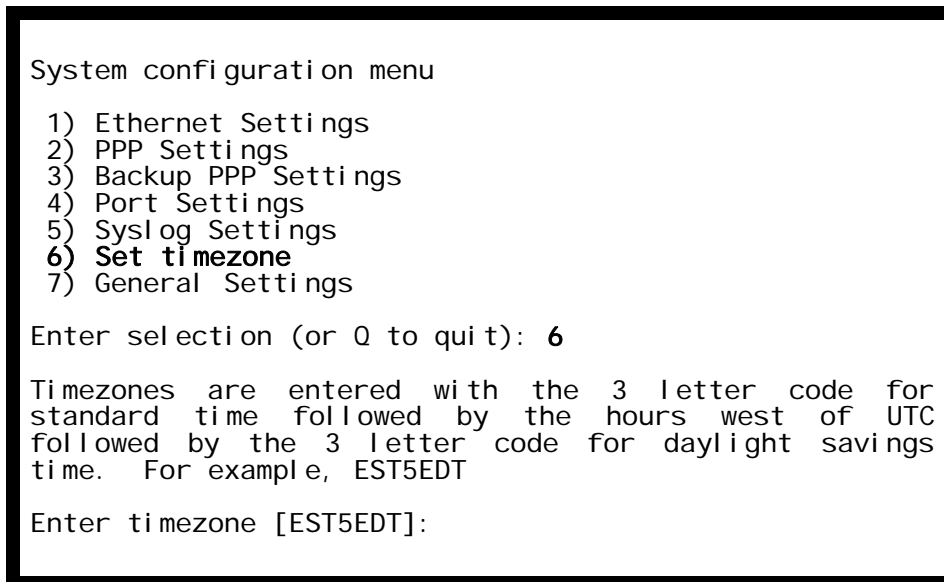
3.5.6 Set Timezone Option

The *Set Timezone* option provided on the ISI-LX System Configuration menu allows you to set the timezone that the ISI-LX resides in. This is needed by the OS for message logging.

Perform the following to set the timezone.

4. Enter a **6** at the *Enter Selection* prompt displayed on the ISI-LX System Configuration menu and press the [Enter] key.

The Set Timezone window shown in Figure 3-13 displays.



```
System configuration menu
1) Ethernet Settings
2) PPP Settings
3) Backup PPP Settings
4) Port Settings
5) Syslog Settings
6) Set timezone
7) General Settings

Enter selection (or Q to quit): 6

Timezones are entered with the 3 letter code for
standard time followed by the hours west of UTC
followed by the 3 letter code for daylight savings
time. For example, EST5EDT

Enter timezone [EST5EDT]:
```

Figure 3-13 Set Timezone Window

5. Upon accessing the Set Timezone option, the cursor is located at the *Enter Timezone* prompt. Enter the seven character timezone code then press the [Enter] key to accept data. Timezones are entered with the 3 letter code for standard time followed by the hours west of UTC followed by the 3 letter code for daylight savings time. For example, EST5EDT, PST8PDT.
6. Once the above prompts have been displayed and you have entered the appropriate data, the ISI-LX System Configuration menu redisplay.

3.5.7 Edit General Settings

The *Edit General Settings* option provided on the ISI-LX System Configuration menu allows you to setup the general configuration parameters for the ISI-LX, such as the email from address, debug level, etc.

Perform the following to configure the general system settings.

1. Enter a **5** at the *Enter Selection* prompt displayed on the ISI-LX System Configuration menu and press the [Enter] key.

The General Settings window shown in Figure 3-14 displays. Note that only the first prompt displays on the window when first accessed.

Subsequent prompts will be displayed as a result of pressing the [Enter] key, which allows you to move to the next prompt. Figure 3-14 displays all the prompts that will appear as a result of entering data onto the General Parameters window.

```
System configuration menu
  1) Ethernet Settings
  2) PPP Settings
  3) Backup PPP Settings
  4) Port Settings
  5) Syslog Settings
  6) Set timezone
  7) General Settings

Enter selection (or Q to quit): 7

Debug level (0-65535) [0]:
Email from address [isimessage@harksystems.com]:
Email subject [ISI message]:
Initial read timeout (100-600000) [30000]:
Secondary read timeout (100-600000) [1000]:
```

Figure 3-14 General Settings Window

2. Upon accessing the General Settings window, the cursor is located at the *Debug level* prompt. Configure the general settings by entering data at each of the prompts displayed on the General Settings window using the data requirements listed below. Refer to Figure 3-14 for the sequencing of the prompts.

Prompt	Data Requirements
Debug level	Enter the value of the default debug level. This field determines how much information is sent out the AUX port or to the Console if using the option to View System Debug. The value is derived by adding the following values depending on the level of debug required. Example, to log TAP and NETLIB data add 4096 and 64 to get a value of 4160.

Prompt

Data Requirements

- **0** - DEBUG_NONE
A value of zero disables debug messages
- **1** - DEBUG_LOGGING
Logs information messages
- **2** - DEBUG_FUNCTIONS
Logs functions as they are called
- **32** - DEBUG_COMLIB
Logs serial communication messages
- **64** - DEBUG_NETLIB
Logs TCP/IP messages
- **128** - DEBUG_READ
Logs Comlib & Netlib Read messages
- **256** - DEBUG_WRITE
Logs Comlib & Netlib Write messages
- **4096** - DEBUG_TAP
Logs TAP protocol messages
- **8192** - DEBUG_TNPP
Logs TNPP protocol messages

Email from address

Enter the email address to which an email notification is to be sent when the system reboots or when the dial backup feature is enabled.

Email subject

Enter the email address to which an email notification is to be sent when the system reboots or when the dial backup feature is enabled.

Prompt	Data Requirements
Initial read timeout	Enter amount of time to wait for the first character to be received on TCP connections before timing-out. This time is entered in milliseconds. The default value should be used unless another value is specified by Hark Systems.
Secondary read timeout	Enter amount of time to wait for additional characters to be received on TCP connections before timing-out. This time is entered in milliseconds. The default value should be used unless another value is specified by Hark Systems.

3. Once the above prompts have been displayed and you have entered the appropriate data, the ISI-LX Setup Utility window redisplay.

3.5.8 Finalize Setup

Once you have completed the setup and configuration of the ISI-LX parameters, select the *System Utilities* option provided on the ISI-LX Setup Utility main menu. From here you will need to save the Ethernet settings and restart the ISI-LX communication ports.

Perform the following to save and finalize the configuration setup.

1. Enter a **8** at the *Enter Selection* prompt displayed on the ISI-LX Setup Utility main menu and press the [Enter] key. The *System Utilities menu* displays, as shown in Figure 3-15.

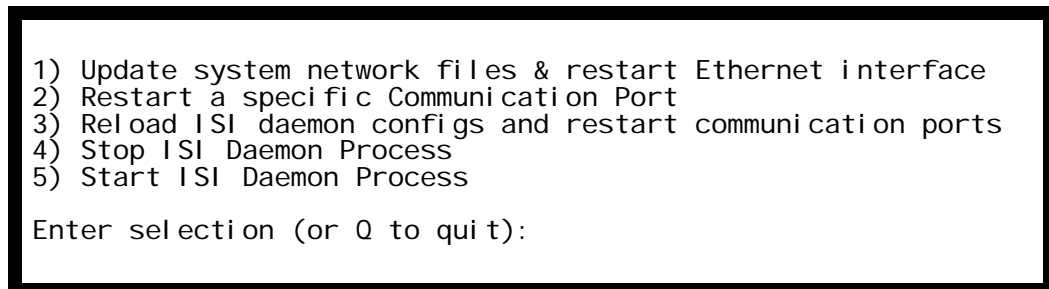


Figure 3-15 System Utilities Menu

2. Enter a **1** at the prompt and press the [Enter] key, the message shown in Figure 3-16 will be displayed. You will be prompted with a warning and must enter a **Yes** to continue. Your connection to the ISI-LX may be disconnected after restarting the Ethernet interface if you are connected using SSH over TCP/IP.

```
Warning, restarting the ethernet interface will disconnect
all network connections, including SSH.

Continue with update and restart (Y/N) [Y]:
```

Figure 3-16 Restarting of Ethernet Interface

3. Enter a **3** at the ISI-LX System Utilities menu and press the [Enter] key, the message shown in Figure 3-17 will be displayed. You will be prompted with a warning and must enter a **Yes** to continue. This will restart the ISI-LX processes and load the new configuration files.

```
Warning, restarting the ISI daemon process will close
all Communication Ports and Internet connections.

Do you wish to continue (Y/N) [Y]:
```

Figure 3-17 Restarting of ISI-LX processes

3.5.9 Exit Setup

Once you have completed the setup, finalized the configuration parameters, and programmed the Routing table, you may exit the setup program. You should log out of the ISI-LX Setup Utility to prevent un-authorized changes.

Perform the following to exit the setup program.

1. Enter a **L** at the *Enter Selection* prompt displayed on the ISI-LX Setup Utility window and press the [Enter] key.

The Setup program will be closed, logging out of the current session. The ISI-LX will display another login prompt at which time it is safe to remove the serial cable from the Console port.

3.6 What To Do Next...

You are now ready to monitor the ISI-LX connections. Refer to Section 4 for details.

SECTION 4: ISI-LX UTILITIES

The ISI-LX has several utilities that can be used to monitor the running status and aid with updates to the system. The ISI-LX is protected with a username and password and requires a login to gain access to programming functions. The username is **root** and must be entered in lowercase. The password can be located on a temporary label attached to the ISI-LX enclosure.

Two utilities can be found on the *System Configuration* main menu. They are View Errors and View Debug as shown in Figure 4-1. Other utilities include restarting the communication ports, restarting the ISI-LX processes, and restarting the Ethernet interface. These can be found on the *System Utilities* menu as displayed in Figure 2-8.

```
ISI version... : LX 1.10
Host name...  : isilx.harksystems.com
IP address... : 10.100.1.47
MAC address.. : 00:d0:69:06:30:64

1) Stop Syslog and View Errors
2) Stop Syslog and View Debug
3) Edit Routing Entries
8) System utilities
9) System Configuration

Enter selection (or L to Log Off):
```

Figure 4-1 ISI-LX Setup Utility Main Menu

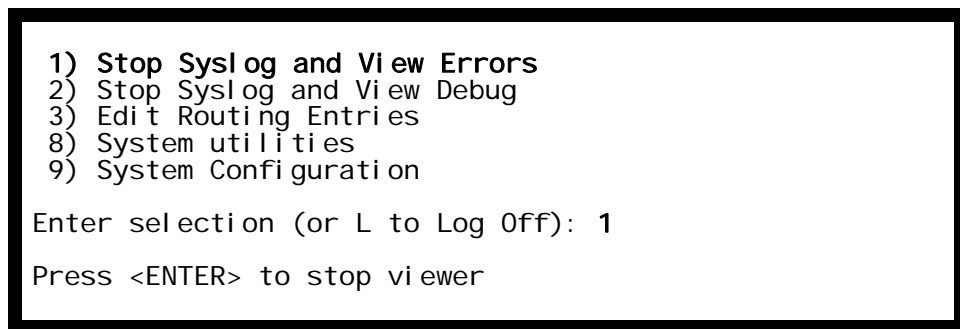
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4.1 Viewing of Errors

The *Stop Syslog and View Errors* option can be used view any system messages and errors. This option is usually only needed when the ISI-LX is being maintained remotely as these messages are also available locally on the AUX port. The AUX port is configured for 19200 baud, N, 8, 1 and can be located in Figure 2-2.

Perform the following to View Errors using the Setup Utility.

1. Enter a **1** at the *Enter Selection* prompt displayed on the ISI-LX Setup Utility main menu and press the [Enter] key. The *View Errors* window displays, as shown in Figure 3-154-2.



```
1) Stop Syslog and View Errors
2) Stop Syslog and View Debug
3) Edit Routing Entries
8) System utilities
9) System Configuration

Enter selection (or L to Log Off): 1

Press <ENTER> to stop viewer
```

Figure 4-2 Viewing of Errors

2. Press the [Enter] key to stop the viewer and return to the main menu.

4.2 Viewing of Debug

The *Stop Syslog and View Debug* option can be used to set the debug level and view the debug log generated by the ISI-LX. This option is usually only needed when the ISI-LX is being maintained remotely as these messages are also available locally on the AUX port. The AUX port is configured for 19200 baud, N, 8, 1 and can be located in Figure 2-2.

Perform the following to View Debug using the Setup Utility.

1. Enter a **2** at the *Enter Selection* prompt displayed on the ISI-LX Setup Utility main menu and press the [Enter] key. The *View Debug* window displays, and you will be prompted to enter the desired debug level as shown in Figure 3-15. The debug level can be computed by adding the desired levels as shown in the following table.

- **0** - DEBUG_NONE. A value of zero disables debug messages
- **1** - DEBUG_LOGGING. Logs information messages
- **2** - DEBUG_FUNCTIONS. Logs functions as they are called
- **32** - DEBUG_COMLIB. Logs serial communication messages
- **64** - DEBUG_NETLIB. Logs TCP/IP messages
- **128** - DEBUG_READ. Logs Comlib & Netlib Read messages
- **256** - DEBUG_WRITE. Logs Comlib & Netlib Write messages
- **4096** - DEBUG_TAP. Logs TAP protocol messages
- **8192** - DEBUG_TNPP. Logs TNPP protocol messages

2. Press the [Enter] key to stop the viewer and return to the main menu.

```
1) Stop Syslog and View Errors
2) Stop Syslog and View Debug
3) Edit Routing Entries
8) System utilities
9) System Configuration

Enter selection (or L to Log Off): 2
Enter debug level (1-65535) [65535]:

Press <ENTER> to stop viewer
```

Figure 4-3 Viewing of Debug

4.3 Updating Network files and Restarting Ethernet Interface

Once you have completed the setup and configuration of the ISI-LX parameters, select the *System Utilities* option provided on the ISI-LX Setup Utility main menu. From here you will need to save the Ethernet settings and restart the ISI-LX communication ports. This option will read the setup parameters from the ISI-LX parameter file and create the necessary system files used by the Ethernet and dialup PPP interface. The Ethernet interface will be restarted in order to read any changes made during setup. If you have logged into the system remotely using SSH your connection will be disconnected after restarting the interface.

Perform the following to save the system network files and restart the Ethernet interface.

1. Enter a **8** at the *Enter Selection* prompt displayed on the ISI-LX Setup Utility main menu and press the [Enter] key. The *System Utilities menu* displays, as shown in Figure 3-15.

```
1) Update system network files & restart Ethernet interface
2) Restart a specific Communication Port
3) Reload ISI daemon configs and restart communication ports
4) Stop ISI Daemon Process
5) Start ISI Daemon Process

Enter selection (or Q to quit):
```

Figure 4-4 System Utilities Menu

2. Enter a **1** at the prompt and press the [Enter] key, the message shown in Figure 4-5 will be displayed. You will be prompted with a warning and must enter a **Yes** to continue. Your connection to the ISI-LX may be disconnected after restarting the Ethernet interface if you are connected using SSH over TCP/IP.

```
Warning, restarting the ethernet interface will disconnect
all network connections, including SSH.

Continue with update and restart (Y/N) [Y]:
```

Figure 4-5 Restarting of Ethernet Interface

4.4 Restarting a Communication Port

A communications port should be restarted if any parameters for the port have changed. This will cause the process to exit then restart loading all the new parameters that may have changed using the instructions found in Section 3.5.4. If all the ports need to be restarted skip to Section 4.5.

Perform the following to restart a single communications port.

1. Enter a **8** at the *Enter Selection* prompt displayed on the ISI-LX Setup Utility main menu and press the [Enter] key. The *System Utilities menu* displays, as shown in Figure 3-15.
2. Enter a **2** at the prompt and press the [Enter] key, the message shown in Figure 4-6 will be displayed. You will be prompted to enter the port

number to restart. Enter a value of 1 to 4 then press the [Enter] key. You will then be prompted with a warning and must enter a **Yes** to continue. The port will close then restart using the new parameters.

```
Restart which port (1-4) [1]:  
Warning, restarting the communication port will disconnect  
all established connections and re-read any configuration changes.  
Do you wish to continue (Y/N) [Y]: Y  
SIGTERM sent to Communication Port 1
```

Figure 4-6 Restarting a Communications Port

4.5 Restarting All Communication Ports

A communications port should be restarted if any parameters for the port have changed. This will cause the process to exit then restart loading all the new parameters that may have changed using the instructions found in Section 3.5.4.

Perform the following to restart all communications ports.

1. Enter a **8** at the *Enter Selection* prompt displayed on the ISI-LX Setup Utility main menu and press the [Enter] key. The *System Utilities menu* displays, as shown in Figure 3-15.
2. Enter a **3** at the ISI-LX System Utilities menu and press the [Enter] key, the message shown in Figure 4-7 will be displayed. You will be prompted with a warning and must enter a **Yes** to continue. This will restart the ISI-LX processes and load the new configuration files.

```
Warning, restarting the ISI daemon process will close  
all Communication Ports and Internet connections.  
Do you wish to continue (Y/N) [Y]:
```

Figure 4-7 Restarting the Communication Ports

4.5 Starting and Stopping the ISI-LX daemon process

The ISI-LX daemon process is responsible for the starting and monitoring of the communication port processes. If a communication port process terminates unexpectedly the daemon process will automatically restart it. Option 4, *Stop*

ISI Daemon process, and 5, *Start ISI Daemon process*, of the System Utilities menu can be used to stop and start this daemon process. This should only be done if instructed by a Hark Systems technician as doing so will stop the ISI-LX from functioning until the process is restarted. This is mainly used when uploading new files.

APPENDIX A: WARRANTY INFORMATION

WARRANTIES

For a period not to exceed one year from the date of purchase, Hark Technologies, guarantees that the electronic equipment sold will be fit for the ordinary purposes for which they are supplied, and will conform to the property description and statements of fact contained within any applicable brochure and labels provided with the product. However, upon the cessation of the one-year warranty, Hark makes no warranty, expressed, or implied, that the equipment is merchantable and/or fit for any particular purposes.

The Seller warrants that the goods covered by this agreement shall be free from defects in material and workmanship for one year when use under normal conditions and for the purpose for which they are sold. However, the warranty period for expendable parts, such as bulbs and fuses shall be limited to thirty days.

This warranty does not extend to damage incurred by natural causes such as lightning, fire, floods, or other catastrophes, damages caused by environmental extremes such as power surges and/or transients or willful, malicious, reckless, negligent acts or misuse by the purchaser or third parties.

All warranty work must be performed at Hark Technologies. No credit will be given for unauthorized repair work attempted by the customer or other unauthorized repair facilities. In-warranty merchandise must be shipped freight prepaid to the nearest Hark Technologies facility.

A Return Materials Authorization (RMA) Number must be obtained from Hark Technologies customer service department prior to returning any equipment, in-warranty, or otherwise to Hark Technologies for repair. Equipment received without the proper RMA number will be returned to the shipper.

All goods and materials are carefully tested and inspected before leaving the point of manufacture; however, as it is impossible to always detect imperfections, the only guarantee that is given by us, or for which we are in any way liable, is to repair or replace such goods as prove defective, when used for the purposes for which manufactured. All replaced goods are to be returned to us transportation prepaid. Under no circumstances are we responsible for any other damages, incidental, consequential, or otherwise, nor in any case shall we be responsible for any damages beyond the price of the goods. No damages or charges of any kind, for labor, expenses, or otherwise suffered or incurred by the customer in replacing or repairing defective goods or otherwise occasioned by the customer will be allowed.

Written notice must be promptly given to the Seller of any perceived failure of the equipment sold, in order to fulfill the warranty, and in no event shall notice be given more than ten days after the discovery of the product defect. The notice shall state in what parts and wherein the warranty has failed and reasonable time shall be given to the

Hark Technologies

Internet Serial Interface – September 2005

Seller to remedy the difficulty. Failure to provide adequate notice within the required time frame shall be conclusive evidence of due fulfillment of the warranty on the part of the Seller, and that the product is satisfactory to the Purchaser, and that the Seller shall be released from all liability under the warranty.

DISCLAIMER OF WARRANTIES

THE WARRANTY PRINTED ABOVE IS THE ONLY WARRANTY APPLICABLE TO THIS PURCHASE. ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED.

IT IS UNDERSTOOD AND AGREED THAT UNDER NO CIRCUMSTANCES SHALL THE SELLER BE LIABLE FOR ANY SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, WHETHER THE THEORY OF LIABILITY IS BASED IN CONTRACT, TORT, UNDER ANY WARRANTY, OR IN NEGLIGENCE. THE PRICE AS STATED FOR THE WARRANTY IS A CONSIDERATION FOR LIMITING SELLERS WARRANTY. FURTHER, NO ACTION, REGARDLESS OF FORM, ARISING OUT OF THE TRANSACTIONS UNDER THIS AGREEMENT MAY BE BROUGHT BY THE PURCHASER MORE THAN ONE YEAR AFTER THE CAUSE OF ACTION HAS ACCRUED.

BREACH OF AGREEMENT

In the event that the terms or conditions of this Agreement are breached, then Hark is entitled to have the customer pay all reasonable court costs, attorney fees and expenses that shall be made or incurred by Hark in enforcing this Agreement; and the parties agree that the terms and conditions of this Agreement shall be binding on, apply and inure to their respective heirs, executors, administrators, successors and assigns.

This invoice shall be construed and governed by the laws of the State of South Carolina AND VENUE IN ANY LITIGATION PURSUANT TO THIS INVOICE SHALL BE IN DORCHESTER COUNTY, SOUTH CAROLINA.

ALTERATIONS AND CHANGES

Any alterations for deviations from the above specifications that involve extra material, costs, or additional or more costly labor will require extra charges. These extra charges will be billed over and above the proposal amount.

PROPOSAL GOOD FOR THIRTY (30) DAYS

The price given in the proposal for material and labor is an offer that shall bind Hark for 30 days. If the proposal is not accepted within 30 days, then Hark has the option of revoking its proposal.

AGREEMENT SUBJECT TO APPROVAL BY MANAGEMENT

This offer is subject to management's approval. If terms of payment are: cash on completion, or if this is a credit sale, this offer is also subject to approval by Hark's credit manager.

ACTS BEYOND HARK'S CONTROL

Hark is not responsible for delays in delivery or for delays in installation due to weather, fire, strikes, governmental regulations, or other causes unforeseen or beyond it's control.

SECURITY AGREEMENT

Hark may require as a condition to this Agreement that the customer execute a security agreement to safeguard its position as a creditor in extending payment terms to the customer. In the event that Hark requires collateral, the customer agrees to provide a promissory note and a security agreement (and UCC-1) in the manner acceptable to Hark.

BAD CHECKS & C.O.D.

A service charge of \$10.00 will be applied to each returned check. Accounts 60 days old will be placed on C.O.D. and technical service shall be withheld. Legal action will be taken after the account is 90 days old.

RETURNS

No returned goods will be accepted without a Returned Merchandise Authorization Number.

HANDLING/RESTOCKING CHARGE

A restocking charge of 20% will be made on all goods returned unless due to error caused by Supplier.

EQUIPMENT PACKING

Packing instructions: Equipment to be returned to Hark Technologies for repair must be packed in the original packing supplied by the factory. If the original packing is not available, Hark Technologies will provide it to you for a nominal fee. Customer packing materials can be used, providing the precautions are taken to provide adequate static protection for the equipment.

DO NOT PACK HARK EQUIPMENT IN STYROFOAM PEANUTS ONLY

Repairs necessitated due to improper packing will be billed at the standard factory repair rate.

Hark Technologies will repair or replace equipment and return to customer, freight prepaid, within the continental United States. Equipment found not to be defective will be returned at purchaser's expense and will include cost of handling, testing and returning of equipment.

Out-of-warranty repairs will be billed at the established factory flat rate per hour, plus components needed for replacement.

TITLE

Title to and all goods or material hereafter purchased shall remain with Supplier until full purchase price has been paid.

ENTIRE AGREEMENT

This Agreement constitutes the entire agreement between the parties hereto; and this Agreement shall not be modified, amended, altered, or changed except by a written agreement signed by the party sought to be charged. However, change orders may be made by an oral agreement as enumerated in the "Alterations and Changes" section above.

APPENDIX B: CANCELLATION

Buyer may by written notice to Seller within five (5) days of the merchandise received date cancel any contract or agreement arising here under, for other than the default of the Seller and at its convenience, in which the Buyer shall pay the Seller twenty percent (20%) of the above total price for all products and accessories as a restocking charge.

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