

ISI - Internet Serial Interface
Version 2.29.2

Hark Technologies

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Chapter 1

Introduction

1.1 Conventions used in this manual

- Names of keys are shown in `<>`. For example, `<TAB>`, `<ENTER>`, `<SHIFT>`, and `<CTRL>`.
- Certain actions require the simultaneous use of multiple key strokes. For example, `<CTRL>+<A>` means that you must hold down the Control key while you press the A key.
- Certain functions are to be performed from the command line. The command to be types will be displayed in the Courier font. For example, type `cat /etc/hosts`, means to type 'cat /etc/hosts' from the command line.
- Any time you see a line ending with `\`, it is a continuation line. You may see these in a configuration file listing. It means that the line should be entered as a complete line without pressing `<ENTER>` between the lines. There may be more than one line ending with `\` if the line is very long.

1.2 Functional Overview

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 asynchronous 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 Systems 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 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.

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.

1.3 Features and Benefits

- Convert Incoming Serial TAP to Simple Network Paging Protocol (SNPP), Short Message Peer to Peer (SMPP), SMTP, or WCTP.
- WCTP SSL supported for encrypted network connections
- The ISI-LX converts serial data to TCP/IP and vice-versa.
- The ISI-LX connects to the Internet using an ethernet network connection or PPP.

- If using the built-in ethernet port, the 4-port 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.
- Embedded Linux for quick boot and minimal maintenance.
- No fans or hard drives to wear out and fail.

1.4 Support Services

If you have any questions about the ISI, please refer to this manual first.

The support email address listed in the beginning of this manual is the best way to contact us for non-emergency technical support.

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

For technical support between the hours of 8:30 AM and 4:30 PM Eastern Time, Monday through Friday, excluding holidays, call 843-821-6888. For technical support outside of normal business hours or on holidays, call 843-821-6888. 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 technicians 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 will return your call.

Phone: 843-821-6888
Fax: 843-821-6894
Web: <http://harktech.com>
Sales email: sales@harktech.com
Support email: support@harktech.com

Chapter 2

Installation

2.1 Hardware

The ISI comes in a small enclosure and doesn't require any special mounting procedures. Included is a 5VDC wall transformer. The power supply uses a special screw on connector to prevent accidental unplugging.

CAUTION! Use only the 5 volt power supply provided with the ISI-LX device. Use of a higher voltage power supply will cause serious damage to the equipment and will void the warranty

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.
2. If using a dialup ISP, connect the modem to the PORT4 located on the rear of the ISI-LX device.
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. 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.
4. Connect a laptop or dumb terminal to the CONSOLE port located on the front of the ISI-LX device. 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 115200 baud. The laptop or dumb terminal will be used to access the configuration, setup, and diagnostic applications.

5. On the 4-port ISI, 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. 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 38400 baud to communicate with the Aux port.
6. On single port ISI's the Aux port is used to connect to the paging terminal. Make sure to edit the communication port settings and change the device for port1 from `/dev/tts/0` to `/dev/ttyAM1`.

2.2 Operating System

The ISI uses the Linux Operating System. The system is preconfigured from the factory and most operating system configuration can be performed from the main menu.

2.2.1 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.
2. Verify that the following indicator lights are illuminated on the front of the ISI-LX device:
 - The PWR indicator light is a green LED and must be lit.
 - If using an Ethernet interface, the LNK 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.
 - Starting with version 2 the green RDY LED has been replaced by a red alarm LED. When the ISI is first powered on the alarm LED will be dimly lit. Once the ISI server process starts, the red alarm LED will go out. If for any reason the ISI server should exit, or if you restart the ISI daemon process the red LED will be lit until the ISI server process is finished restarting.
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. Refer to the “Logging in” section, for details on logging into and configuring the ISI-LX. Refer to Section 4.6 for more information about logging in remotely using SSH.

2.2.2 Logging in

In order to perform any maintenance or setup procedure in the ISI, you must first login. You may login directly through the console port on the front of the ISI using a terminal or terminal emulation software running on a computer like HyperTerminal. The console port on the front of the ISI uses standard PC DB-9 pinout so you will need a null modem cable. To login remotely you will need to use an ssh client. Ssh is an encrypted shell access that works over the network connection. Most Unix and Linux systems include an ssh client now. A Windows ssh client is available at <http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html> .

The username for logging in is **root**. At the

```
Hark Technologies
http://harktech.com
```

```
isi.harktech.com login:
```

prompt enter **root**. Next you will see:

Password:

Enter the password written on the temporary sticker on the ISI chassis. If your system doesn't have a temporary sticker, call Hark support for the password. Each shipment of ISI's use different passwords for security reasons.

Once logged in you will see the main menu. For example:

```
ISI version...: 2.29
Host name....: isi.harktech.com (Please update hostname)
IP address...: 10.100.1.108
Netmask.....: 255.255.255.0
MAC address...: 00:d0:69:40:34:42
Date/time....: 2006/05/05 20:37:39 TZ=EST5EDT,M3.2.0/2,M11.1.0/2
```

- 1) Stop Syslog and View Errors
- 2) Stop Syslog and View Debug
- 3) Edit Routing Entries
- 4) Edit Protocol Profiles

- 8) System Utilities
- 9) System Configuration

Enter selection (or L to Log Off):

2.2.3 Configuration

To configure the ISI system settings enter 9 from the Main Menu to get to the System Configuration menu show below:

System configuration menu

- 1) Ethernet Settings
- 2) PPP Settings
- 3) Backup PPP Settings
- 4) Port Settings
- 5) Modem Settings
- 6) Syslog Settings
- 7) Set date/time and timezone
- 8) General Settings

Enter selection (or Q to quit):

Single-port ISI will not have menu option 2 or menu option 3.

Date and time

The date and time are set to US/Eastern by default. You may need to adjust the time and/or time zone for your installation. To do this select menu option 4 From the System Configuration Menu. You will see the following prompt:

The system will automatically be rebooted after setting the timezone.
Do you wish to continue (Y/N) [N]:

Enter Y to continue. Entering anything else will abort. Next you will see:

Enter date (yyyy/mm/dd) [2006/05/05]:

The date must be entered with the 4-digit year first then a two-digit month number and two-digit day-of-month using / for the separator. The value in the square brackets is the default. Just press <ENTER> to use the value in brackets. Next the time is entered.

Enter time (HH:MM) [20:42]:

The time is entered as a two-digit hour and two-digit minute with a colon separating them. Next you will see:

```
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 saving time. For example, EST5EDT
```

```
NOTE: EST is always 5. If your location honors Daylight Saving
      enter EST5EDT otherwise enter EST5EST
```

```
Enter timezone [EST5EDT]:
```

Now you should see:

```
About to set the clock to 2006/05/05 20:42 EST5EDT and reboot
Are you sure (Y/N) [N]:
```

Network settings

The network configuration is also in the System Configuration menu. Select option 1 for Ethernet settings. The following shows the ethernet configuration prompts with values:

```
Enable Ethernet Interface (Y/N) [Y]:
Ethernet device name (normally eth0) [eth0]:
Use DHCP (Y/N) [Y]:
```

Save changes?

If you choose to enter static IP information you will see something similar to the following:

```
Enable Ethernet Interface (Y/N) [Y]:
Ethernet device name (normally eth0) [eth0]:
Use DHCP (Y/N) [Y]: n
IP Address []: 10.100.1.108
Netmask []: 255.255.255.0
Default gateway []: 10.100.1.254
Nameserver 1 []: 10.100.1.1
Nameserver 2 []: 10.100.1.2
Ping address []:
Ping interval (in secs) (10-300) [30]:
```

Save changes?

2.2.4 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.

2.2.5 System security and auditing

The Linux system chosen has proven to be secure against typical attacks. First, only essential system services are enabled. The `sshd` daemon provides a secure shell for remote access. Unlike `telnet`, the username and password are encrypted before being sent. Ssh can also be used to copy files using the companion utility `scp`. `Scp` also uses encrypted username and password unlike `ftp`. To see a list of ports currently listening, type the following:

```
netstat -ln
```

You should see something similar to the following:

Proto	Recv-Q	Send-Q	Local Address	Foreign Address	State
tcp	0	0	0.0.0.0:10001	0.0.0.0:*	LISTEN
tcp	0	0	0.0.0.0:10002	0.0.0.0:*	LISTEN
tcp	0	0	0.0.0.0:10003	0.0.0.0:*	LISTEN
tcp	0	0	0.0.0.0:10004	0.0.0.0:*	LISTEN
tcp	0	0	0.0.0.0:22	0.0.0.0:*	LISTEN

The Local Address shows the IP address and the port the system is listening on. For example, if you see `127.0.0.1`, the system is listening on the local interface only and will not be able to receive any connections from outside computers. If you see `::`

or 0.0.0.0, the system is listening on all interfaces. This includes the local interface (lo0), and all of the ethernet ports (eth0 and eth1). The port number the system is listening on comes after the last .:

In the above example the 0.0.0.0:10001 shows that the ISI is listening for passthrough connections on port 10001 as a server. The same for ports 10002, 10003, and 10004, The 0.0.0.0:22 shows the sshd program is listening on all interfaces.

2.3 Application

The ISI consists of a few applications working together to route packets and maintain the system configuration.

2.3.1 isiconfig

The operating system config portions of the main menu have been described in the “Operating System” section. The isiconfig program is the menu that is displayed when you first login.

For more information on what each of the fields mean see the “isi.ini” section below.

To setup the serial communication ports, select #9 System Configuration then #4 Port Settings.

Upon first entering the port settings menu you will see the following prompt:

```
Enter Port to Edit (l=list, q=quit) (1234QL) [1]: 1
```

At this point you may enter a port number from 1 to 4 (for the 4-port ISI), or L to list the ports, or Q to return to the System Configuration Menu.

When entering the serial port parity, make sure you use upper-case letters.

The following set of prompts are displayed when the port is set to the TAP protocol:

```
Enable this Port (Y/N) [Y]:
Enter modem name []:
Enter protocol (? for list) [1]:
Enable TAP Transparent Characters (Y/N) [N]:
Enable TAP Extension Blocks (Y/N) [Y]:
Disable TAP 1.6 response codes (Y/N) [N]:
Port Baudrate (300-115200) [9600]:
Port Parity (NEO) [E]:
```

```
Port Data Bits (7-8) [7]:
Port Stop Bits (1-2) [1]:
```

Save changes?

The following set of prompts are displayed when the port is set to the TNPP protocol:

```
Enable this Port (Y/N) [Y]:
Enter modem name []:
Enter protocol (? for list) [1]:
Enable TNPP Transparent CRC (Y/N) [N]:
Enable TNPP Simplex (Y/N) [N]:
TNPP Source ID [0001]:
TNPP TICT in ms (1-120000) [2000]:
TNPP TNRI in ms (1-120000) [10000]:
TNPP TNRE in ms (1-120000) [10000]:
TNPP TIDLE in ms (1-120000) [60000]:
TNPP CENQMAX (1-20) [6]:
TNPP CHOLDMAX (1-30) [24]:
TNPP CRETRYMAX (1-20) [6]:
Port Baudrate (300-115200) [9600]:
Port Parity (NEO) [N]:
Port Data Bits (7-8) [8]:
Port Stop Bits (1-2) [1]:
```

Save changes?

The following is a list of the supported protocols:

- 1 TAP
- 2 TNPP
- 3 PASSTHROUGH
- 9 GCP

After changing a serial port, go into #8 System Utilities from the main menu. You will see a menu like the following:

System utility menu

- 1) Update system network files and 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
- 6) Reboot ISI
- 7) Shutdown ISI
- 8) Display Config File (isi.ini)

9) Upload Config File (isi.ini)

Enter selection (or Q to quit):

Select option #2 to restart the communication port that was just modified.

To setup the general settings, select #9 System Configuration then #5 General Settings.

Max Com Ports (1-4) [4]:

TNPP Dial backup keep-up time (in minutes) (0-120) [0]:

TAP Dial backup inactivity time (in seconds) (0-86400) [0]:

TAP dial backup packet action (0=wait, 1=reject, 2=drop) (0-2) [0]:

SMTP/SNPP connection keepup time (in minutes) (1-10) [1]:

Debug level (0-65535) [65535]:

Our fully-qualified internet hostname [isi.harktech.com]:

Email from address [isi1.example.com]:

Email subject [ISI message]:

Save changes?

As of version 2.20 protocol profiles are supported. These act as a quick and easy way to change protocol timings and other features as a group without needing to make the change to each port. Multiple ports may use the same profile if needed.

To setup the protocol profiles, select #4 Edit Profiles from the main menu.

The following menu will be displayed:

Profile menu

1) Passthrough profiles

2) TAP profiles

3) TNPP profiles

4) Destination profiles

Enter selection (or Q to quit):

The passthrough profile will display the following menu:

Passthrough Profile menu

(A)dd entry

```
(M)odify entry
(D)elete entry
(L)ist entries
```

Enter selection (or Q to quit and save changes):

The following is an example of the prompts when adding or modifying a passthrough record:

Num	Name	Option	Buffsize	Inittime	Sectime	Int	Tries
1	default	00000002	1024	200	200	0	0

```
Modify this record? (or Q to quit)y
Profile name [default]:
Enable network encryption (Y/N) [N]:
Enable ISI Link Tests (Y/N) [Y]:
Buffer size (1024-16384) [1024]:
Initial read timeout (in ms) (100-30000) [200]:
Secondary read timeout (in ms) (100-10000) [200]:
Link test interval (in seconds) (1-120) [60]:
Link tries (1-5) [3]:
```

The TAP profile will display the following menu:

```
TAP Profile menu
(A)dd entry
(M)odify entry
(D)elete entry
(L)ist entries
```

Enter selection (or Q to quit and save changes):

The following is an example of the prompts when adding or modifying a TAP record:

Num	Name	Option	T1	T2	T3	T4	T5	N1	N2	N3
1	default	00000003	2000	1000	10000	4000	8000	3	3	3

```
Modify this record? (or Q to quit)y
Profile name [default]:
Enable TAP Transparent Characters (Y/N) [Y]:
Enable TAP Extension Blocks (Y/N) [Y]:
Disable TAP 1.6 response codes (Y/N) [N]:
T1 (cr for ID= interval in ms) (500-10000) [2000]:
```

T2 (time after cr to send ID= in ms) (0-5000) [1000]:
 T3 (time to wait for packet response in ms) (500-60000) [10000]:
 T4 (time to wait for next packet in ms) (500-60000) [4000]:
 T5 (time to wait for response to ID=) (500-60000) [8000]:
 N1 (number of CR to send looking for ID=) (1-10) [3]:
 N2 (number of packet resends allowed) (1-10) [3]:
 N3 (resend ID= up to this number) (1-10) [3]:

The TNPP profile will display the following menu:

```
TNPP Profile menu
(A)dd entry
(M)odify entry
(D)elete entry
(L)ist entries
```

Enter selection (or Q to quit and save changes):

The following is an example of the prompts when adding or modifying a TNPP record:

Num	Name	Option	tict	tnri	tnre	tidle	thold	cenqmax	choldmax	cretryma
1	default	00000000	200	10000	10000	60000	10000	6	24	

```
Modify this record? (or Q to quit)y
Profile name [default]:
Enable TNPP Transparent CRC (Y/N) [N]:
Enable TNPP Simplex (Y/N) [N]:
TNPP TICT in ms (1-120000) [200]:
TNPP TNRI in ms (1-120000) [10000]:
TNPP TNRE in ms (1-120000) [10000]:
TNPP TIDLE in ms (1-120000) [60000]:
TNPP THOLD in ms (1-120000) [10000]:
TNPP CENQMAX (1-20) [6]:
TNPP CHOLDMAX (1-30) [24]:
TNPP CRETRYMAX (1-20) [6]:
Simplex transmits (1-5) [1]:
```

As of version 2.28 destination profiles are supported. Destination profiles offer a quick an easy way to use the same destination for multiple route entries. This saves a lot of typing long destination strings for each route.

The Destination profile will display the following menu:

Destination Profile menu

- (A)dd entry
- (M)odify entry
- (D)elete entry
- (L)ist entries

Enter selection (or Q to quit and save changes):

The following is an example of the prompts when adding or modifying a destination record:

Num	Name	E	T	PROT	PORT	IDFORMAT	MAXLEN	TRIES
1	SNPP output	Y	N	SNPP	10.100.1.100:444	%10i	240	1
2	TAP backup	Y	S	TAP	port4	%7i	240	1

Modify this record? (or Q to quit)y

Profile name [SNPP output]:

Enabled (Y/N) [Y]:

Port type (1=serial, 2=network) (1-2) [2]:

Protocol (GCP, SMTP, SNPP, TAP, TNPP, WCTP) [SNPP]:

Remote hostname [10.100.1.100]:

Remote portnum (1-65535) [444]:

ID format (e.g %7i) [%10i]:

Max message len (8-1024) [240]:

Max tries (1-5) [1]:

Username (optional) []:

Password (optional) []:

The ISI-LX has two main features. The first is to act as a passthrough device transporting RS-232 traffic over the internet to another ISI or one of our Omega systems. The second major feature is as an RS-232 to internet protocol converter. This feature is used to convert from the TAP paging protocol to SNPP over the internet, for example. In order to use the protocol conversion routines, routing entries need to be setup.

To setup the routing entries, select #3 Edit Routing Entries from the main menu.

The following menu will be displayed:

Routing Entry menu

- (A)dd Route Entry
- (M)odify Route Entry

(D)elete Route Entry
(L)ist route entries

Enter selection (or Q to quit and save changes):

Modifying an existing route will display the first route and ask if you want to modify it. If you do, enter a Y and you will be prompted for the changes. If the route displayed is not the one you want to modify enter N, and the next route will be displayed. This will continue until there are no more routes to be displayed.

When adding or modifying the following prompts are displayed:

Starting ID or (dn, sub, or tnppdest) []:
Ending ID or (Dialed Number / Subscriber ID / TNPP dest) []:
Enabled (Y/N) [Y]:
Destination [1-8]:
Backup dest (0=no backup dest) [0-8]:

If you wish to enter a range of numbers enter the starting and ending ID for the range you wish to route. The other options are to route based on the dialed number (for outgoing TAP modem handling), sub (for individual subscriber ID override), or tnppdest for routing based on the TNPP destination ID. When using one of these keywords, enter the value to be matched for the ending ID. For example, to add an override for pager ID 1234567 enter sub for the Starting ID and 1234567 for the Ending ID.

Chapter 3

isi.ini

All ISI configuration settings are stored in `/usr/local/etc/isi.ini`.

There are multiple sections in the `isi.ini` file. First is the `[Common]` section. This stores settings that are common to multiple programs. Next is `[ethernet]`. This section stores the network configuration settings. 4-port ISI's will also have sections for `[PPP]` and `[BACKUP_PPP]`. The `[route]` section contains the ID block routing entries. The `[modem]` section describes the modem init strings used when a serial port is set to modem. Finally there are the `[port]` sections. These are individually numbered with a logical port number. For example, `[port1]` is the first logical port.

3.1 [Common]

<code>BACKUP_TIME</code>	The amount of time in minutes to keep the TNPP dialbackup connection open. Once this time is reached the outgoing TNPP dial connection is dropped.
<code>DEBUG_LEVEL</code>	Sets the amount of debugging information logged to the debug directory. The following is a list of the values for each type of information that can be logged. Add the values together for the value to set the <code>DEBUG_LEVEL</code> .

	0	No debug
	1	Logging (a lot of miscellaneous debug info)
	2	Functions (log entering functions)
	8	Queues
	16	Semaphores
	32	ComLib (log serial port calls and info)
	64	NetLib (log network calls and info)
	128	Read
	256	Write
	4096	Tap Library logging
	8192	Tnpp Library logging
	16384	Thread information
HOST_NAME		Our fully qualified internet hostname. For example, isi.example.com.
EMAIL_FROM_ADDRESS		The full email address to use as the from address for outgoing email.
EMAIL_SUBJECT		The subject to use on outgoing email messages.
INACTIVITY_TIME		The amount of time in minutes to keep the TAP dialbackup connection open without any traffic. Message traffic will reset this timer.
DBU_PACKET_ACTION		Action to take for incoming TAP packets while the modem is dialing out for dialbackup. 0=wait for modem connect, 1=reject incoming packets, 2=flush incoming packets without responding to TAP client.
CONN_TIME_LIMIT		Limit the outgoing persistent connections for SMTP and SNPP to this amount of time in minutes. Nextel has recently introduced time limits on their SNPP server and does not send back a disconnect failure so all messages were failing, but they wouldn't close the connection. Recommended values are 1 minute for Nextel, others can be whatever you would like from 1 to 30 minutes.

3.2 [ethernet]

ENABLED	Should always be set to Y to enable the ethernet interface.
DEVICE_NAME	The ethernet device name. Should always be eth0.

USE_DHCP	Enable the DHCP client so the individual IP address settings will not need to be specified.
IP_ADDRESS	Specifies the IP address if DHCP is not being used.
NETMASK	Specifies the network mask if DHCP is not being used. Typically 255.255.255.0.
GATEWAY	Specifies the default router for this subnet.
NAMESERVER1	The first name server's IP address for internet domain lookups.
NAMESERVER2	The second name server's IP address for internet domain lookups. This is optional and is used as a backup in case the first name server is not available.
PING_ADDRESS	The IP address to ping for connection tests. If three sequential pings to this IP address fail, the system will attempt to dial backup if PPP or TNPP dial backup are enabled.
PING_INTERVAL	The time in seconds to wait after receiving a successful ping response before testing the link again.

3.3 [route]

The route section is different from most of the ini settings. This section specifies multiple values per line. The line format is:

```
startid|endid|enabled|name|primarydestprofile|backupdestprofile
```

The startid is the first number of a number range to allow for this route. The endid is the ending number. If two ID blocks overlap the block with the smaller range will be used.

Enabled may be set to 0 to disable this range, or 1 to enable the range.

Name is a descriptive name for this ID block.

Destination is the destination profile number to use.

Backupdest is the backup destination to use if the primary connection is unavailable. This is typically a modem on port 4 used for TAP dial backup. This requires a four port ISI with modem support. Leave this value empty to not specify a backup destination profile.

3.4 [modem]

The modem section is also formatted like the route section. Its fields are:

```
modemname|init1|init2
```

The modemname for modem types defined for outgoing dial backup using TAP or TNPP must start with out-. This will define the modem as an outdial modem. For incoming TAP modem connections the modemname must start with in-. The modemname for incoming emulated modem connections (e.g. Answering service equipment TAP outdial) needs to be em-modem. Modem names should be all lower-case.

For example, a US Robotics modem would be named out-usr for dial backup or in-usr for incoming TAP modem. The init1 field specifies the first init string to send to the modem, and init2 specifies the second init string to send to the modem.

The following is a list of init strings for some popular modems:

Multitech:

```
init1: AT&FE
init2: ATE0&K0&Q6%CO S7=30 S10=1&W
```

US Robotics Sportster:

```
init1: AT&FE
init2: ATE0&H0&IO&K0&MO&R1&W
```

UDS 2440:

```
init1: AT&FE
init2: ATE0&C1&D2%KOS7=30&W
```

UDS v.3225/v.3229

```
init1: AT&FE
init2: ATE0&C1&D2%BO%CO\NO\QOS7=30&W
```

Lucent external modem

```
init1: AT&FE
init2: ATE0&K4&Q6%CO S37=6&W
```

This should work as both input strings and output strings. If the modem string does not have S0= in it the ISI will automatically issue an ATA after the first RING detected. Otherwise, set the number of rings you wish to answer in the in-??? modemname by added S0=x. Where x is the number of rings you wish the modem to auto-answer after.

All of the 0 in the above init strings are the number 0, not the letter O.

The ISI supports up to 8 defined modems (including the em-modem name if used). If you need a different init string and already have 8 defined, you will need to delete an unused entry in order to add it.

3.5 [passprofile]

Passthrough profiles consist of a single line per profile. Each line contains the various settings for the profile. Its fields are:

```
number|name|option|buffersize|inittime|sectime|link_interval|link_tries
```

Number is the profile number to use in the PASSTHROUGH_PROFILE setting for the port. Name is a description for the profile. Option are the protocol options. Currently the only option for passthrough is ISI linktest. To set the linktest option use the value of 0x02. The configuration menu makes setting the options easier. Buffersize is the maximum number of characters to buffer before sending to the remote. A typical value is 1024. The inittime is the amount of time in milliseconds to wait for data to become available. This should be set very low so it doesn't prevent the other end from sending. A typical value is 200. Sectime is the amount of time in milliseconds to wait for additional data once we start reading. This is also a very small value, typically 200. Link interval is the time in seconds between sending link tests if protocol option 0x02 is set. Link tries is the number of times to send the link test if there is no response before closing the port.

3.6 [taprofile]

TAP profiles consist of a single line per profile. Each line contains the various settings for the profile. Its fields are:

```
number|name|option|t1|t2|t3|t4|t5|n1|n2|n3
# option 0x01=transchar, 0x02=extblock, 0x04=norespcode
```

Number is the profile number to use in the PASSTHROUGH_PROFILE setting for the port. Name is a description for the profile. Option are the protocol options. Currently the options are: 0x01=transchar, 0x02=extblock, 0x04=noresponse. transchar enables TAP transparency character insertion. extblock allows more than 240 characters to be sent in a single message. The sending software will need to support this option. This is described on Page 7 of the TAP 1.8 protocol specification in the fourth full paragraph on the page. (See <US>). This option can be enabled even if the sending software does not support extension blocks. norespcode disables the sending of the TAP response code to the client software. This feature was also

added in TAP version 1.6. For more information see TAP 1.8 Appendix A. This option may be disabled for client software that can not handle the response codes.

3.7 [tnppprofile]

TNPP profiles consist of a single line per profile. Each line contains the various settings for the profile. Its fields are:

```
number|name|option|tict|tnri|tnre|thold|tidle|cenqmax|choldmax|cretrymax|simplextransmits
```

Number is the profile number to use in the PASSTHROUGH_PROFILE setting for the port. Name is a description for the profile. Option are the protocol options. Currently the options are: 0x01=transcrc, 0x02=simplex. tict is the TNPP inter-character timer. The amount of time once we receive a character we will wait for the next character. This is specified in milliseconds. The default is 2000. tnri is the TNPP no response idle timer. The amount of time after sending a packet before waiting for a response times out. There is also a TNRB timer in TNPP, but we don't use it because our transmitter is never busy. The Omega sends an entire packet at once and will not look for an incoming character until it is done. Hence the transmitter is never busy. The default value for TNRI is 10000 milliseconds. tnre is the TNPP no response ENQ. The amount of time to wait for a response after sending and ENQ (link test). The default value is 10000 milliseconds. thold is the amount of time in the future to reschedule the packet when an RS is received. The default value is 10000 milliseconds. tidle is the amount of time the link is idle before a link test will be sent. cenqmax is the maximum number of link test failures before the port is marked faultoff. The default is 6. choldmax is the maximum number of times a packet may be RS'd by the remote before it is discarded. The default is 24. cretrymax is the maximum number of times a packet may be resent before it is discarded. The default is 6. simplextransmits is the number of times to send a packet in simplex mode. This is typically used for satellite links which may not have a way of sending an ACK or NAK response.

3.8 [destprofile]

Destination profiles consist of a single line per profile. Each line contains the various settings for the profile. There are two separate formats for the destination profile line. One for serial destinations and one for network destinations. The fields for the two types are:

Serial:

```
number|name|enabled|1|protocol|comport|idformat|maxlen|tries|
mdmtype|mdmnum|baud|parity|databits|stopbits|[tappass/tnppdest]
```

Network:

```
number|name|enabled|2|protocol|hostname|portnum|idformat|maxlen|tries|
username|password
```

Number is the profile number to use in the primarydestprofile and/or backupdestprofile in each routing entry. Name is a description for the profile. Enabled is whether the profile is allowed to be used for destinations or not. The next field is 1 for serial connections or 2 for network connections. Protocol may be GCP, TAP, or TNPP for serial connections or SMTP, SNPP, WCTP or WCTPS for network connections.

Serial connections specify the comport (e.g. port1) next followed by the idformat (e.g. %10i), the maximum message length, the number of tries, the modemtype (one of the modems listed in the [modem] section or none for direct connections), the modem number (or none for direct connections), the baud, parity, databits and stopbits, and the TAP password for TAP connections or the TNPP destination ID for TNPP connections.

Network connections specify the remote hostname (or IP address), the remote port number, the idformat, maximum message length, the number of tries, and an optional username and password for WCTP and WCTPS connections.

The idformat allows certain formatting variables to specify how the incoming pager ID is formatted for output. For example, if your TAP output expects 7 digits, use %7i. The caller can send 7 or more digits in the ID and this will take the last 7 digits of the id for the output. If your callers typically send 7 digits and your paging terminal expects 10 digits you may prefix a number. For example, to prefix 843 use 843%7i. The 7 used in these examples can be other values. Some typical values are 4, 5, or 10. maxlen is the maximum number of characters to send in a message. maxtries is the maximum number of attempts before trying the backup destination if one exists. mtype is the modem type as defined in the modem section. This field is case-sensitive. Make sure that you use lower-case names like in the modem section. If this is a direct connection specify none for the modem type. dial is the modem number to dial. If this is a direct connection specify none for the number to dial. baud, parity, dbits, and sbits are the communication settings for the modem. Typically you will only change the baud rate as the TAP protocol specifies that the data bits will be 7 with even parity and one stop bit, and TNPP specifies that the data bits will be 8 with no parity and one stop bit. You do need to specify all of the

values though.

The backup destination allows the message to be sent to another destination if the primary is down.

Serial ports used in either primary or backup destination, must not be enabled in the port settings. If the serial port is enabled in the port settings the outgoing connection attempt will fail.

3.9 [port...]

This is where each logical port is defined. There are several fields which control different aspects of the port and its settings. The following is a list of the port fields and their function:

ENABLED	Enable or disable the port.
DEVICE_NAME	The actual device used by this port. For example, /dev/tts/0.
DEVICE_UART	The UART type on the serial I/O board. Currently this is always 4.
DEVICE_PORT	The UART port address. For the Hark 4-port serial port the port addresses are: port1=0x89c00200, port2=0x89c00208, port3=0x89c0210, port4=0x89c00218.
DEVICE_IRQ	For the Arm-based systems, PC/104 IRQ5=22, IRQ6=33, and IRQ7=40. ISI's shipped from the factory using IRQ6, so this value should be set to 33.
PROTOCOL	This is either GCP, PASS, TAP or TNPP.
BAUD	The baud rate of the serial port.
PARITY	The parity of the serial port. The TNPP standard is to use no parity (N). For TAP, even parity (E) should be used.
DATABITS	The number of data bits for the serial port. The TNPP standard is to use 8 data bits. For TAP, 7 data bits should be used.

STOPBITS The number of stop bits for the serial port. This will almost always be 1.

The following parameters are only used for Passthrough ports:

PASSTHROUGH_HOST The remote host to connect to. Leave blank to act as a server connection.

PASSTHROUGH_PORT The remote port to connect to. For server connections this is the port number to listen on.

PASSTHROUGH_PROFILE One of the profiles listed in the [passprofile] section. This field may be set to 0 if protocol is not passthrough.

The following parameters are only used for TAP ports:

TAP_PROFILE One of the profiles listed in the [tapprofile] section. This field may be set to 0 if protocol is not TAP.

The following parameters are only used for TNPP ports:

TNPP_PROFILE One of the profiles listed in the [tnppprofile] section. This field may be set to 0 if protocol is not TNPP.

TNPP_SOURCE_ID The TNPP source ID to use in the TNPP packet.

3.10 Example isi.ini

```
[Common]
BACKUP_TIME=0
DEBUG_LEVEL=65535
HOST_NAME=isilx.harktech.com
EMAIL_FROM_ADDRESS=isimessage@example.com
EMAIL_SIGNATURE_FILE=sig.txt
EMAIL_SUBJECT=ISI message
EMAIL_ERRORS_TO=isiadmin@harktech.com
INACTIVITY_TIME=0
MAX_COMPORTS=4
DBU_PACKET_ACTION=0
CONN_TIME_LIMIT=1
```

```
[Ethernet]
ENABLED=1
DEVICE_NAME=eth0
USE_DHCP=1
PING_INTERVAL=30
PING_ADDRESS=10.100.1.253
```

```
[PPP]
ENABLED=0
DEVICE_NAME=/dev/tts/3
USE_DHCP=1
BAUD_RATE=115200
MODEM_INIT=at&f
MODEM_NUMBER=
USERNAME=
PASSWORD=
```

```
[BACKUP_PPP]
ENABLED=0
DEVICE_NAME=/dev/tts/3
USE_DHCP=1
BAUD_RATE=115200
MODEM_INIT=
MODEM_NUMBER=
USERNAME=
PASSWORD=
```

```
[modem]
out-usr|AT&FE|AT&H0&IO&K0&M0&R1S7=45S10=1S12=0&W|0|0
out-mt|AT&FE|AT&K0&Q6%CO&W|0|0
out-uds24|AT&FE|ATE0&C1&D2%KOS7=30&W|0|0
out-uds96|AT&FE|ATE0&C1&D2%B0%CO\N0\QOS7=30&W|0|0
out-xecom92|AT&H4%CO\N0||1|1
out-xecom24|ATE0\N0||1|1
em-modem||1|0
```

```
[passprofile]
#number|name|option|buffersize|inittime|sectime|link_interval|link_tries
# option 0x02=linktest
1|default|2|1024|200|200|60|3
```

```
[tapprofile]
#number|name|option|t1|t2|t3|t4|t5|n1|n2|n3
# option 0x01=transchar, 0x02=extblock, 0x04=norespcode
1|default|3|2000|1000|10000|4000|8000|3|3|3
```

```
[tnppprofile]
#number|name|option|tict|tnri|tnre|thold|tidle|cenqmax|choldmax|cretrymax|simplextrans
# option 0x01=transcrc, 0x02=simplex
1|default|0|200|10000|10000|10000|60000|6|24|6|0
```

```
[destprofile]
#serial format
#num|name|en|1|prot|comport|idfmt|maxlen|tries|mdmtype|mdmnum|baud|par|data|stop|[tap
#network format
#number|name|enabled|2|prot|hostname|portnum|idformat|maxlen|tries|username|password
1|main|1|2|SNPP|snpp.example.com|444|%10i|240|1||
2|backup|1|1|TAP|port4|%7i|240|1|out-usr|5551212|9600|E|7|1|000000
```

```
[port1]
DEVICE_NAME=/dev/tts/0
DEVICE_UART=4
DEVICE_PORT=0x89c00200
DEVICE_IRQ=33
ENABLED=1
DIRECTION=IN
PROTOCOL=PASS
PASSTHROUGH_PROFILE=1
PASSTHROUGH_HOST=
PASSTHROUGH_PORT=10001
TAP_PROFILE=0
TNPP_PROFILE=0
TNPP_SOURCE_ID=
MODEM_TYPE=
MAX_MESSAGE_LENGTH=240
BAUD_RATE=9600
PARITY=N
DATA_BITS=8
STOP_BITS=1
```

```
[port2]
DEVICE_NAME=/dev/tts/1
DEVICE_UART=4
DEVICE_PORT=0x89c00208
DEVICE_IRQ=33
ENABLED=1
DIRECTION=IN
PROTOCOL=PASS
PASSTHROUGH_PROFILE=1
PASSTHROUGH_HOST=
PASSTHROUGH_PORT=10002
```

```
TAP_PROFILE=0
TNPP_PROFILE=0
TNPP_SOURCE_ID=
MODEM_TYPE=
MAX_MESSAGE_LENGTH=240
BAUD_RATE=9600
PARITY=N
DATA_BITS=8
STOP_BITS=1
```

```
[port3]
DEVICE_NAME=/dev/tts/2
DEVICE_UART=4
DEVICE_PORT=0x89c00210
DEVICE_IRQ=33
ENABLED=1
DIRECTION=IN
PROTOCOL=PASS
PASSTHROUGH_PROFILE=1
PASSTHROUGH_HOST=
PASSTHROUGH_PORT=10003
TAP_PROFILE=0
TNPP_PROFILE=0
TNPP_SOURCE_ID=
MODEM_TYPE=
MAX_MESSAGE_LENGTH=240
BAUD_RATE=9600
PARITY=N
DATA_BITS=8
STOP_BITS=1
```

```
[port4]
DEVICE_NAME=/dev/tts/3
DEVICE_UART=4
DEVICE_PORT=0x89c00218
DEVICE_IRQ=33
ENABLED=1
DIRECTION=IN
PROTOCOL=PASS
PASSTHROUGH_PROFILE=1
PASSTHROUGH_HOST=
PASSTHROUGH_PORT=10004
TAP_PROFILE=0
TNPP_PROFILE=0
TNPP_SOURCE_ID=
MODEM_TYPE=
```

```
MAX_MESSAGE_LENGTH=240
BAUD_RATE=9600
PARITY=N
DATA_BITS=8
STOP_BITS=1
```

```
[port5]
```

```
DEVICE_NAME=/dev/tts/5
DEVICE_UART=4
DEVICE_PORT=0x89c002a8
DEVICE_IRQ=22
ENABLED=0
DIRECTION=IN
PROTOCOL=TAP
PASSTHROUGH_PROFILE=0
PASSTHROUGH_HOST=
PASSTHROUGH_PORT=
TAP_PROFILE=0
TNPP_PROFILE=0
TNPP_SOURCE_ID=
MODEM_TYPE=
MAX_MESSAGE_LENGTH=240
BAUD_RATE=9600
PARITY=E
DATA_BITS=7
STOP_BITS=1
```

```
[route]
```

```
0|999999999|1|Default|1|2
```

Chapter 4

Change summary

4.1 Changes for 2.29.2

- update all PPP configuration for PAP support
- ppp config is in `/etc/ppp/options,pap-secrets,chat/isp,peers/isp`

4.2 Changes for 2.29.1

- config in destprofile check wctps before wctp

4.3 Changes for 2.29

- increase maximum destprofile entries from 8 to 16
- support entering UART I/O port in hex
- isiconfig support displaying and uploading isi.ini

4.4 Changes from 2.27 to 2.28

- change route destination/backupdestination to use destprofile profiles

4.5 Changes from 2.26 to 2.27

- TAP input modem support fixes and improvements

4.6 Changes from 2.25 to 2.26

- only one connection per listen socket

4.7 Changes from 2.24 to 2.25

- support new timezone rules
- update hardware clock with new date/time

4.8 Changes from 2.23 to 2.24

- support connection time limit for SMTP/SNPP output

4.9 Changes from 2.22 to 2.23

- support username/password for WCTP servers requiring login
- support 8 serial ports for dual quad modem TAP server
- support setting serial port IRQ, UART, and I/O port
- support 6 serial ports for having 4-port plus dial backup

4.10 Changes from 2.21 to 2.22

- support WCTP SSL for encrypted connections over the internet

4.11 Changes from 2.20 to 2.21

- add `link_interval` and `link_tries` to passthrough profile config

4.12 Changes from 2.19 to 2.20

- support profiles for consolidating passthrough, tap, and tnpp settings
- configuration routines redone for new comport structure
- drop net connections on config change
- increase size of inactivity timer variable for longer inactivity times

4.13 Changes from 2.18 to 2.19

- configurable TAP timeouts

4.14 Changes from 2.17 to 2.18

- Now supports Hark modem board for dial backup with single-port systems
- Support skipreset and hangupmethod for Xecom embedded modems
- Merge ComReadTime and ComReadBlock(s) into ComRead
- isilib/parse_dest support specifying device in addition to port

4.15 Changes from 2.16 to 2.17

- Support TAP password in destination string
- Support rejecting or ignoring packets while dialing backup modem

4.16 Changes from 2.15 to 2.16

- Support TAP dial backup keepup time

4.17 Changes from 2.14 to 2.15

- TNPP input - TAP dial backup fixes
- improvements in SNPP output if remote server fails while the ISI is in the process of sending a message

4.18 Changes from 2.13 to 2.14

- bugfix-isicom/process_tnpp process id format before checking connection
- updated for latest TNPP library changes
- User Manual update
- isilib/bin2str no longer log trailing NULLs

4.19 Changes from 2.12 to 2.13

- taplib/TapInProc use TapReadBlocks instead of TapReadTime
- bugfix-isiconfig/main fix setting passthrough settings (broke in 2.11)
- Now supports specifying the modem type in the route destination. This will require that all serial port destinations be re-entered. This does not affect TCP destinations (i.e. SMPP, SMTP, SNPP, and WCTP).
- bugfix-process_tap don't attempt backup connection unless a backup connection is defined.
- isiconfig/route now supports displaying backup connection help.

4.20 Changes from 2.11 to 2.12

- bugfix-isicom/connect_output always try out_checkid if not null and connected.
- feature-isicom/gcp created to accept paging via Glenayre Computer Protocol.
- isilib/route clear cx->dest and cx->backupdest in case route dne
- isicom/snpp send RESE after sending message
- isicom/smtp send RSET after sending message

4.21 Changes from 2.10 to 2.11

- bugfix-isicom/tap send ID= (taplib change 04.15.06)
- feature-support encryption on passthrough ports

4.22 Changes from 2.9 to 2.10

- bugfix-isid if forked process exec fails exit child process

Chapter 5

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 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 \$25.00 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.

Chapter 6

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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