

USB Paging Encoder  
Version 1.1

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.
- Some programs such as `rtview` require cursor navigation. This is performed with the arrow keys. Up arrow will go up a line, and down arrow will go down one line. If there are more ports defined than can fit on the screen, the Page Up and Page Down keys can be used to go a page up and a page down respectively. Also the Home and End keys can be used to go to the first entry on the screen and the last entry on the screen respectively.
- 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 Hark Network Paging Encoder accepts packets from a serial or network connection for encoding and sending to a paging transmitter.

In addition, the several beneficial applications are provided, but are not limited to the following:

- FIXME

### 1.3 Features and Benefits

- Supports Two-tone and Five-tone tone only and voice paging.
- Supports Pocsag and Golay Tone only, Numeric and Alphanumeric paging.
- Supports up to 8 paging zones.
- Paging traffic received using an open protocol based on TNPP over a network connection so the encoder can be located near your transmitter (or link transmitter).
- Supports voice paging when paired with an Omega UMS.

### 1.4 Support Services

If you have any questions about the UPE, 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 8:00 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 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 will return your call.

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



# Chapter 2

## Installation

The upe will already be installed and configured for a basic system. All that is required for initial setup is to plug in the network connection and assign the IP address and network settings. In addition connect the paging transmitter to the DB-25 connector.

DB-25 Pinout:

<b>Pin</b>	<b>Description</b>
1,14	Audio 600ohm transformer
2,15	Digital TTL levels (15=Ground reference)
3,16	Digital RS232 levels (16=Ground reference)
4,17	Key contact closure (Bit0)
5,18	Key contact closure (Bit1)
6,19	Busy in, can be strapped for contact closure, voltage input or common collector ground
7,20	Audio 600ohm transformer
8,21	Digital TTL levels (21=Ground reference)
9,22	Digital RS232 levels (22=Ground reference)
10,23	Key contact closure (Bit2)
11,24	Key contact closure (Bit3)
13,24	Calibrate Switch
15,16,21,22	Ground

## **2.1 System Requirements**

## **2.2 Hardware**

## **2.3 Operating System**

The upe supports the Linux Operating System.

### **2.3.1 Linux**

FIXME System updates:

## **2.4 System servers**

The upe does not depend on any system servers.

## **2.5 Application**

The upe consists of a master server which has a thread that listens for incoming connections. As connections are received they are sent to the queue handling the communication to the USB-attached paging encoder. Real-time stats are available to see the activity for each thread.

# Chapter 3

## Configuration

### 3.1 System

#### 3.1.1 IP addresses

IP address configuration in CentOS (and other RedHat-based Linux) is defined in several scripts in the `/etc/sysconfig` directory. First, the hostname and default gateway is set in `/etc/sysconfig/network`.

The following is an example:

```
NETWORKING=yes
NETWORKING_IPV6=yes
HOSTNAME=upe.harktech.com
GATEWAY=10.100.1.254
```

Next the individual network interfaces are setup in the `/etc/sysconfig/network-scripts` directory. There will be a file for each ethernet interface (plus other miscellaneous scripts). The filename is in the form of `ifcfg-dev` where *dev* is the name of the device (i.e. `eth0`). Systems with more than one network interface will have additional files that start with `ifcfg-`.

The following is an example `ifcfg-eth0`:

```
# Intel Corporation 82541PI Gigabit Ethernet Controller
DEVICE=eth0
BOOTPROTO=static
HWADDR=00:1B:21:02:66:01
ONBOOT=yes
TYPE=Ethernet
IPADDR=10.100.1.215
NETMASK=255.255.255.0
```

DHCP is also supported and would look like the following:

```
# Intel Corporation 82541PI Gigabit Ethernet Controller
DEVICE=eth0
BOOTPROTO=dhcp
HWADDR=00:1B:21:02:66:01
ONBOOT=yes
TYPE=Ethernet
```

### 3.1.2 DNS server

The DNS server is specified in `/etc/resolv.conf`. The following is an example:

```
search harktech.com
nameserver 10.100.1.254
```

Multiple `nameserver` lines may be specified. It is recommended to have at least two `nameservers`.

## 3.2 upe.ini

This is the main configuration file. It is structured like a Microsoft Windows ini file. There is a common section which applies to all programs and a section for each area of the application. Refer to the “Program Descriptions” chapter for more information on the programs referred to in this section.

### 3.2.1 [common]

Common settings for all programs.

DEBUG_LEVEL	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 DEBUG_LEVEL.
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
32768	Telephony switching
65536	Web page template parsing
131072	Log reads of zero bytes also (not recommended)
262144	Message data (may create extremely large files)
524288	Telephony dial tokens
1048576	bin2str
2097152	Modem capabilities
4194304	HTTP admin sessions (not recommended)
8388608	Database open/close
16777216	Parse line
33554432	Interprocess communication
67108864	Trim silence
MASQUERADE_AS	Fully qualified host name to masquerade as when sending email. For example, if your domain name was example.com and your published hostname is pager.example.com, but the Omega's hostname is omega1.example.com. Enter pager.example.com for this field and all email will look like it came from pager.example.com not omega1.example.com. This field may be up to 80 characters long.

TRAFFIC_INTERFACE	The name of the main traffic ethernet interface. Typically eth0.
SYSPAGE_PORT	The TCP port number of the syspage server. This value must match the LISTEN_PORT in the [settings] section of the syspage.ini file installed on the system. See the syspage docs for more information.
CLEAR_STATS	Controls whether the remote IP address and last number are cleared from the real-time stats viewer. If you want to see the last connection in the real-time stats viewer set this to N (or 0) and the last IP address (for network connections) and last pager ID will remain on the screen until the next call comes in.
RLIMIT_MSGQUEUE	The maximum number of bytes allowed for all message queues opened by the real user id of the process. Typical Linux default is 819200. This value may need to be raised if there are many SMPP and/or TNPP port threads. The maximum value currently allowed in the upe is 67108864 (64 megabytes). Shortcuts are supported. For example, the M suffix can be used for Megabytes and G for Gigabytes. To specify 64 megabytes, you can use 64M.
DROP_PRIVILEGES	Drop super-user privileges and run as a non-privileged user soon after starting up.
LOG_PERIOD	The amount of time to write to a billing log file. This is typically set to DAILY to create a new billing log each day. Other allowable values are WEEKLY and MONTHLY. WEEKLY will create a new billing log every seven days of the month. At the end of the month a new weekly file will be created for the next month even if there are not exactly 28 days in a month. MONTHLY will create a new billing log each month.

BILLING_FIELDS	Specify fields to write to billing logs. See the “Billing logs” chapter for the format and definition of this field.
BILLING_FORMAT	Specify the format of the fields to write to billing logs. See the “Billing logs” chapter for the format and definition of this field.

### 3.2.2 [encode]

Encoder configuration.

DEBUG_LEVEL	Level of debugging information to write to the debug directory. See the [common] section for a description of the values.
LISTEN_PORT	Specify the port used for internal UPE packet forwarding. This port must not be used for any other service. Typically this is set to 1259.
BUFFER_SIZE	Specifies the size of the read buffer. This value will be used if one is not specified in the service table for the device. Shortcuts are allowed, so 16384 can also be entered as 16k. A value of 256k will allow a 30 second voice message.
PROTOCOL_OPTION	Specifies the . Typically this is set to 0.
READ_TIMEOUT	Specifies the initial character and inter-character timeout values. Typically this is set to 30000:2000
MAX_QUEUE_ENTRIES	Specifies the number of open queues allowed at one time. Typically this is set to 16
MAX_VOICE_QUEUE_ENTRIES	Specifies the number of voice pages may be queued at one time. Typically this is set to 25
MAX_KEY_TIME	Specifies the maximum time (in seconds) the Encoder will keep the channel keyed. A value of 0 disables the max timer. Typically this is set to 0

SERIAL_PORT	Specifies the port to use to communicate with the UPE. An example would be <code>/dev/ttsUSB0</code> .
SERIAL_BAUD	Specifies the serial baud rate of the USB connection. This needs to be set to 460800 for proper operation.
TWOTONE_GAP	Specifies that TwoTone pages have a gap between the tones.
TWOTONE_GAP_TIME	Specifies that length of the gap between the tones in milli-seconds. This is typically 200 ms
TWOTONE_PAGE_GAP	Specifies that length of the gap between each Two-Tone (Tone Only) page in milli-seconds. This is typically 250ms.
TWOTONE_TIMEOUT	Specifies the time in seconds to hold a TwoTone page in queue waiting for other pages of the same type for batching purposes.
TWOTONE_DEFAULT_A_TIME	Specifies the time in milli-seconds for the A tone (using the Glenayre TNPP paging format). This is typically set to 1000.
TWOTONE_DEFAULT_B_TIME	Specifies the time in milli-seconds for the B tone (using the Glenayre TNPP paging format). This is typically set to 3000.
TWOTONE_DEFAULT_GROUP_TIME	Specifies the time in milli-seconds for the Group Page tone (using the Glenayre TNPP paging format). This is typically set to 8000.
TWOTONE_GLGROUP_EXTRA_GAP	Specifies the extra GAP time after a Group Tone-Only page in milli-seconds (using the Glenayre TNPP paging format). This is typically set to 1700.

FIVETONE_TIMEOUT	Specifies the time in seconds to hold a FiveTone page in queue waiting for other pages of the same type for batching purposes.
POCSAG_TIMEOUT	Specifies the time in seconds to hold a Pocsag page in queue waiting for other pages of the same type for batching purposes.
GOLAY_TIMEOUT	Specifies the time in seconds to hold a Golay page in queue waiting for other pages of the same type for batching purposes.
GOLAY_INVERT	Specifies that the Golay paging data is inverted with respect to the POCSAG paging format. This is typically set to N.
PING_INTERVAL	Specifies the time in seconds to check the communication link to the UPE while it is transmitting.
VOICE_ALERT_TIME	Specifies the silence period in milliseconds after a tone page is sent before sending the voice data (the time that the pager beeps). This is typically set for 2000.
56_WAKE_TIME	Specifies the time in milliseconds to send an additional preamble tone to Wake-up the pagers. Set to 0 to disable this feature.
56_WAKE_GAP	Specifies the time in milliseconds to be silent after sending the WAKE_TONE. Set to 0 to disable this feature.
56_PRE_TIME	Specifies the time in milliseconds to send the preamble tone. This is typically set to 690.
56_PRE_GAP	Specifies the gap time in milliseconds after the preamble tone. This is typically set to 45.
56_TONE_TIME	Specifies the time in milliseconds to send the other tone of a 5/6 tone page. This is typically set to 33.

56.IDT_GAP	Specifies the time in milliseconds to send silence between the 5/6 tone tones. This is typically set to 0.
56.FUNC_TIME	Specifies the time in milliseconds to send the 5/6 tone Function tone. This is typically set to 52.
56.PAGE_GAP	Specifies the time in milliseconds to send silence between the 5/6 tone pages. This is typically set to 52.
56.SPCL_REPEAT	If this is enabled, the Repeat tone will be used for the first tone after the preamble tone if the tones are the same. This is typically set to N.
POC512_XCOMMA	Each count adds 8 additional comma bits to the Pocsag 512 batch. This is typically set to 0.
POC1200_XCOMMA	Each count adds 8 additional comma bits to the Pocsag 1200 batch. This is typically set to 0.
POC2400_XCOMMA	Each count adds 8 additional comma bits to the Pocsag 2400 batch. This is typically set to 0.
EC.STATIONID	Specifies the morse code data sent to identify the channel.
EC.IDINTERVAL	Specifies the station ID interval in seconds. For example set the value to 3600 for one hour intervals.
EC.ITONEDELTA	Specifies the morse tone frequency used for station ID and is typically set for 1800.
EC.KEYUPDELAY	Specifies the time in milliseconds to delay after keying the transmitter before paging data is sent.
EC.KEYDIGITAL	Specifies the time in milliseconds to delay after switching the transmitter from Analog to Digital mode.

EC_KEYANALOG	Specifies the time in milliseconds to delay after switching the transmitter from Digital to Analog mode.
EC_KEYDOWNDELAY	Specifies the hold time in milliseconds to keep the transmitter active after the paging data is complete.
EC_MAXPACKET	Specifies the USB data packet size in bytes and must be set to 1024 for proper operation.
EC_WATCHDOG	Specifies the time in seconds that a page must be received. The Encoder Hardware will reset itself if a page is not seen in this time period. It should only be used if a periodic page is in-use on your system. Typically this is set to 0 to disable this feature.
EC_MTONEHI	Specifies the SPACE Tone frequency in HZ of the modem tones used for signalling digital data over the audio output. Typically this is set to 2200.
EC_MTONELO	Specifies the MARK Tone frequency in HZ of the modem tones used for signalling digital data over the audio output. Typically this is set to 1200.
EC_MHILO	Specifies if Modem Tones are sent at the High or Low level output. Typically this is set to 0 for Low Level.
EC_VHILO	Specifies if Voice messages are sent at the High or Low level output. Typically this is set to 1 for High Level.
EC_DATAINVERT	Specifies if the Digital data is inverted on the channel.

### 3.2.3 [zone...]

Zone configuration. Each system must have at least 1 zone configured for proper operation. The ... above is replaced with the numbers 1-8. Each zone has configurable keying and tone formas.

EC_KEYSTATES	Specifies the key configuration for each state of the encoder. It is a binary string and defines the key states for Unkeyed, KeyDigital and KeyAnalog. It is in the hex format BADU where B indicates the Busy or COR input busy state level (1 or 0), A defines the key states for Analog paging, D defines the key stats for digital paging and U defines the unkeyed states. Each key value may be 0-9 or A-F and control the four key outputs for each zone. A value of 1 closes the contact, and 0 opens it.
EC_GUARDTONE	Specifies the Tone Keying type used in the encoder. A value of 0 uses no tone keying. A value of 1 specifies a tone specified in GTONEDELTA is used to key up the transmitter (Tone Keying). A value of 2 specifies PURC tone keying.
EC_GTONEDELTA	Specifies the Guard tone frequency and is typically set to 2175.
EC_PURC	Specifies the PURC tone sequence for keying the transmitter. Each tone is comma separated. An example would be 2175,1950.
EC_HLGT_TIME	Specifies the length for the first PURC tone (HLGT) time in milliseconds. This value would need to be increased for each link transmitters. Set this to 120 for no link transmitters. Add 100 - 300 ms for each link transmitter.

### 3.2.4 [rtview]

Real-time statistics viewer.

SCAN_TIME	The amount of time in milliseconds between screen refreshes in the rtview program. This value is typically 1000. Setting to 500 will set the refresh rate to 1/2 second. Values less than 200 are not recommended.
-----------	--

VERBOSE\_LEVEL           Set to 1 to show ports which are currently not active, but have processed a connection previously. Set to 2 to show all ports whether or not they have had any activity.

### 3.3 Example upe.ini

```
[common]
DEBUG_LEVEL=0x0000ffff
MASQUERADE_AS=
# set to 0 to use syslog
SYSPAGE_PORT=1250
CLEAR_STATS=N
RLIMIT_MSGQUEUE=16M
THREAD_STACK_SIZE=256k
DROP_PRIVILEGES=N
MAX_MESSAGE_LENGTH=990
BILLING_PORT=/dev/tts/3
BILLING_FIELDS=ymdhisSrFPoeCEaRZ+lt
BILLING_FORMAT="Xxxx-Xx-Xx", "Xx: Xx: Xx", "X", "X", "X", "X", "X",
               "X", "X", "X", "X", X, X, "X", X, "X"
```

```
[encode]
DEBUG_LEVEL=0x0000ffff
LISTEN_PORT=1259
BUFFER_SIZE=256k
PROTOCOL_OPTION=0
READ_TIMEOUT=30000:2000
MAX_QUEUE_ENTRIES=16
MAX_VOICE_QUEUE_ENTRIES=25
MAX_KEY_TIME=0
SERIAL_PORT=/dev/ttyUSB0
SERIAL_BAUD=460800
TWO_TONE_GAP=N
TWO_TONE_GAP_TIME=200
TWO_TONE_PAGE_GAP=250
TWO_TONE_TIMEOUT=5
TWO_TONE_DEFAULT_A_TIME=1000
TWO_TONE_DEFAULT_B_TIME=3000
TWO_TONE_DEFAULT_GROUP_TIME=8000
TWO_TONE_GLGROUP_EXTRA_GAP=1700
FIVE_TONE_TIMEOUT=5
```

```
POCSAG_TIMEOUT=4
GOLAY_TIMEOUT=4
GOLAY_INVERT=N
PING_INTERVAL=5
VOICE_ALERT_TIME=2000
56_WAKE_TIME=690
56_WAKE_GAP=45
56_PRE_TIME=690
56_PRE_GAP=45
56_TONE_TIME=33
56_IDT_GAP=0
56_FUNC_TIME=52
56_PAGE_GAP=52
56_SPCL_REPEAT=N
POC512_XCOMMA=0
POC1200_XCOMMA=0
POC2400_XCOMMA=0
EC_STATIONID=Hark UPE
EC_IDINTERVAL=900
EC_ITONEDELTA=1800
EC_KEYUPDELAY=250
EC_KEYDIGITAL=100
EC_KEYANALOG=100
EC_KEYDOWNDELAY=50
EC_MAXPACKET=1024
EC_WATCHDOG=0
EC_MTONEHI=2200
EC_MTONELO=1200
EC_MHILO=0
EC_VHILO=1
EC_DATAINVERT=0
```

```
[zone1]
```

```
EC_KEYSTATES=0x0320
EC_GUARDTONE=0
EC_GTONEDELTA=2175
EC_PURC=2175,1950
EC_HLGT_TIME=120
```

```
[rtview]
```

```
SCAN_TIME=500
VERBOSE_LEVEL=2
```

# Chapter 4

## Program Descriptions

The following sections describe the executables that make up the upe application. For Linux systems the base directory is /opt/upe.

### 4.1 Introduction

The main application that listens for connections and sends the encoded packets to the USB paging encoder is uped. It is located in /opt/upe/sbin.

Real-time viewer rtview displays statistics for each of the ports.

When first entering rtview a list of the currently enabled Omega applications is displayed.

The up and down arrows are used to move between ports. The space bar can be pressed to get more detail about the port you are currently on. Press space again to get back to the port list. Certain port setting changes will require a thread restart before the change takes effect. An example of this is changing the baud rate of a serial port. In order to minimize downtime, the Omega allows individual threads to be restarted so that the other ports may continue processing packets, while you make changes. To stop a thread, use the cursor navigation keys to highlight the thread you want to change. The press <F6> to stop the thread. You should see the status change to PAUSE and then to STOPPED. Once the thread says STOPPED, you may press <F7> to restart it. It is now possible to clear the stats for the current port. Just press the DEL key to clear the counters. To clear the stats for ALL ports, press <SHIFT><DEL>. If for some reason the screen gets out of sync, pressing <CTRL><R> will redraw the screen.



# Chapter 5

## Billing logs

Each call processing application creates and maintains its own billing log file. Voice calls are logged in `vmail.in.txt`, tap is in `tapd.in.txt`, tnpp is in `tnppd.in.txt`, http is in `httpd.in.txt`, snpp is in `snppd.in.txt`, and smtp is in `smtpd.in.txt`. Outgoing pages are logged in files named after the protocol used. For example, email out will be in `smtp.out.txt`, snpp will be in `snpp.out.txt`, etc. These files can be found in the `logs` sub-directory of the Omega installation directory.

There are two variables to control the billing format and field configuration. These are `BILLING_FIELDS` and `BILLING_FORMAT`. Each program has its own settings for these fields in their respective section of `omega.ini`.

`BILLING_FIELDS` controls which logentry fields are written to the log file. This field can be up to 80 characters long. Not all tokens are supported by all protocols. The following are valid `BILLING_FIELDS` tokens:

S	subscriberid
f	senderid
F	remoteip
W	forwardedip
r	status
y	year (uses 2 digit year if field width < 4)
m	month
d	day
h	hour
i	minute
s	second

T	service
t	messagetext (up to 128 characters)
b	baudrate
l	messagelength
P	physicalport
L	logicalport
o	tnppsource
e	tnppdest
C	capcode (or ID if TNPP ID packet)
E	pagertype (encoding)
a	pagerclass (A=alpha, N=numeric, etc)
R	rfchan
Z	rfzone
+	callerid (ANI)
~	calledid (DNIS or DID)
#	messageid

BILLING\_FORMAT specifies the locations and widths of each billing field. This field can be up to 512 characters long. Any non 'X' character is included in the billing record. The first character of each field is designated by an uppercase X and trailing characters by lowercase x's. The x's specify the width of each field in the billing record. Use a single uppercase X to output the field without padding or truncating. This is most useful for delimited files, otherwise extra characters (if wider than the specified billing width) are truncated.

Examples:

---

```
[smtpd]
BILLING_FIELDS=SFrhislLt
BILLING_FORMAT=XXXXXXXXXX XXXXXXXXXXXXXXXXXXXX Xxx Xx:Xx:Xx XXXXX Xxx \
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

Would log the following to smtpd\_in.txt on an incoming email from localhost:  
5551212 127.0.0.1 ACC 08:20:13 00004 1 Test

---

```
[smtpd]
BILLING_FIELDS=SFrhislLt
BILLING_FORMAT=XXXXXXXXXX,XXXXXXXXXXXXXXXXXX,Xxx,Xx:Xx:Xx,XXXXX,Xxx,\
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

Would log the following to smtpd\_in.txt on an incoming email from localhost:  
5551212,127.0.0.1 ,ACC,08:20:13,00004,1 ,Test

---

```
[smtpd]
BILLING_FIELDS=SFrhislLt
BILLING_FORMAT=X,X,X,Xx:Xx:Xx,X,X,X
```

Would log the following to smtpd\_in.txt on an incoming email from localhost:  
5551212,127.0.0.1,ACC,08:20:13,4,1,Test

---

```
[smtpd]
BILLING_FIELDS=SFrhislLt
BILLING_FORMAT='X','X','X','Xx:Xx:Xx','X','X','X'
```

Would log the following to smtpd\_in.txt on an incoming email from localhost:  
'5551212','127.0.0.1','ACC','08:20:13','4','1','Test'

---

Status codes:

ACC = accepted  
REJ = rejected

tapd:  
E = database error  
I = mailbox invalid  
S = successfully accepted  
T = timeout  
C = bad checksum  
B = bad block  
F = TAP send failure  
A = TAP send accepted

tnppd:  
T = timeout  
A = TNPP out - packet ACKed  
n = TNPP receive - packet NAKed  
2 = TNPP receive - duplicate packet (only if LOG\_DUPS enabled)  
f = TNPP receive - packet filtered CAN sent  
a = TNPP receive - packet ACKed  
d = TNPP receive - mailbox ID does not exist  
i = TNPP receive - mailbox invalid  
e = database error  
c = TNPP receive - no output route for this destination  
r = TNPP receive - all output queues full

R = TNPP send - received RS  
N = TNPP send - received NAK  
C = TNPP send - received CAN  
F = faulted input

# Chapter 6

## System Integration

### 6.1 Encoder Input Protocol

The encoder listens on a TCP packet for a specially formatted packet. Some of the fields in the packet are TNPP-like, but the packet is not compatible with TNPP packet.

The incoming packet may be up to the `BUFSIZE` in the encoder section of `upe.ini`. A value of 256k can be used to allow for enough space for a 30 second voice message.

Below is a description of the incoming packet:

Field	Format	Description
Packetsize	uint32	Packet size (length of data to follow)
Pagetype	printchar	P=P512,p=P1200,Q=P2400,G=Golay,T=GolayIIA, F=Flex,5=5tone,2=2tone
Pageclass	printchar	B=tone,N=numeric,A=alpha,V=voice
Channel	01ABCDEF	channel 0-63 (or with 0x40 to make printable)
Function	0100ABCD	function 0-15 (Golay auto-adds 1 to make 1-4)
Repeat/Priority	01AVPPPP	A=repeatpage,V=repeatvoice,priority 0-15
Capcode length	010ABCDE	length of capcode field (0-31)
Capcode	variable	(F12345 for 5-tone no preamble)
Message	variable	message text or binary audio data

The Packetsize is a 4-byte unsigned integer in network byte order (use `htonl` to convert host to network byte order). It is the length of the data to follow the 4-byte packetsize and does not include the 4-byte packet size header.

To send a voice message the Message field must contain the binary audio data in the following format: 8-bit unsigned linear, 8000 samples per second, mono.

Send your messaging packets to the upe on the LISTEN\_PORT defined in the [encoder] section of upe.ini.

# Chapter 7

## Troubleshooting

The Omega systems can be configured to keep very detailed logs for troubleshooting customer or connectivity issues. These logs are stored in the `/var/opt/upe/debug` directory in a sub-directory using a format of `YYYY-MM-DD` named for the date the debug information was written. For example, April 14th, 2006's debug logs are stored in the directory `/var/opt/upe/debug/2006-04-14`. Inside this sub-directory there are files for each thread of each program running.

### 7.1 Operating system

#### 7.1.1 Bootup Issues

First determine if it is a computer issue or boot issue. Does the computer power on? Does the system appear to startup, but cannot find the operating system?

#### 7.1.2 Network issues

By default the Omega is setup to obtain an IP address and domain settings automatically from a DHCP server. In order to use the Omega to accept connections from the Internet, a static IP should be used. This static IP address may be assigned by a DHCP server or in the Omega configuration files. See the “Network settings” section in the “Installation” chapter for information on setting the IP address and verifying that it is setup correctly. For more information you may use the following commands:

```
man netstat
man ping
man traceroute
man tcpdump
```

## 7.2 Application

### 7.2.1 Interpreting the debug logs

The debug logs contain a wealth of information for troubleshooting customer or port setup issues. All debug entries are prefixed with a timestamp. This timestamp has millisecond accuracy for determining with sub-second accuracy how much time has elapsed between each event in the log. When `DEBUG_FUNCS` is enabled each time a function is called a debug entry is added showing the name of the function and some possibly important parameters. These lines can be recognized because they start with `in` after the timestamp. Other important lines are the `ComRead`, `ComWrite`, `NetRead`, and `NetWrite` lines. These come in various forms like `ComWriteString` and `NetReadBlock`. The `Com` functions handle RS-232 port routines and the `Net` functions handle network connections. Other lines are also logged that show additional information.

### 7.2.2 Alarms

Application alarms are sent to the syspage server running on the Omega. Syspage accepts alarms from the TNPP programs and sends alerts based on the settings in the `[syspage]` and `[alarm]` sections of the ini file. Syspage will log a copy of the alarm in the `/var/opt/upe/errors` directory in a file named after the program that generated the alarm. For example, `httpd.err` or `tnppd.err`. Syspage now supports also sending a copy of this alarm message to a serial port so you can send a copy to a separate alarm device if you wish. Alarm pages will also be sent based on settings in the `[alarm]` section of the ini file. These alarms can be paged out with the SMTP, SNMP, SNPP, or WCTP protocols.

Alarms are sent at various alarm levels. The following is a list of alarm levels:

32	Informational
64	Notice
128	Error
196	TNPP port fault-off and recover messages
240	Critical

Most systems are setup to email a copy of the alarms at error level 64 and above and set to page out alarms at error level 128 and above. It is recommended that error level 196 and above are paged out as these are alarms that indicate a degraded service level.

### 7.2.3 Message queues

The OMEGA-LX uses POSIX Message Queues for internal communications in the TNPP and SMPP servers. To view certain message queue information type the following:

```
mkdir /dev/mqueue  
mount -t mqueue none /dev/mqueue
```

Additional information on the system message queues is in the `/proc/sys/fs/mqueue` directory.

## 7.3 Syslog server

Unix and Linux systems include a centralized system logger called syslog. The Omega includes a system logging and paging program called syspage, so we don't log much to syslog. The syslog logs are stored in `/var/log` and may be in sub-directories under `/var/log`. Syslog messages can also be forwarded to another system acting as a centralized logging server. Our ISI and IPG boxes, make much more use of syslog as they do not have an alarm pager such as syspage in them.



# Chapter 8

## Maintenance

To keep your system running at peak performance there may be certain maintenance procedures which should be routinely performed.

### 8.1 Backups

To backup the Linux configuration files, place a floppy in the floppy drive and type the following:

```
tar czvf /dev/fd0 --files-from /root/backup_files
```

The application directory may also be backed up using a writable CD. First make sure that the directory will fit on a CD by typing the following:

```
du -sk /opt/upe
```

Once the `du -sk` returns less than approx 650000 (or 700000 for 80 minute CDs), you can copy the entire `/opt/upe` directory to CD with the following command:

```
mkisofs -R /opt/upe | cdrecord -v fs=6m speed=32 dev=ATA:1,0,0 -
```

The 1,0,0 may be different on your system. Type the following to see what the three numbers are for the CD burner in your system:

```
cdrecord -scanbus dev=ATA
```

### 8.2 Daily maintenance

None at this time

## 8.3 Weekly maintenance

### 8.3.1 Software and Security Updates

There will not necessarily be software or security updates each week, but you may wish to check for them each week. See the “Operating System Updates” section for more information on the update procedure.

## 8.4 Monthly maintenance

### 8.4.1 Filters

Depending on the installation site, the filter in the front of the Omega may need to be vacuumed. Use the following procedure if you need to remove the filter to clean it:

- Open the front of the Omega chassis by turning the key knob to the horizontal position (you may need to use the key).
- Using a #2 phillips screwdriver remove the two screws on each side of the front cover which hold the cross-hatched plastic filter retainer in place.
- Remove the cross-hatched plastic filter retainer and filter.
- Clean the filter.
- Reinstall filter by reversing the steps used to remove it.

# Chapter 9

## Change summary

### 9.1 Version 1.0-1 2009.04.14

- Initial release



# Chapter 10

## 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 11

## 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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