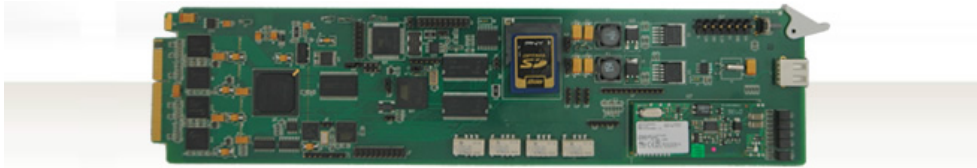


EEG HD1490

HD Encoder Frame Card



Product Manual

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HD1490 HD Encoder Frame Card

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The revision date for this manual is May 8, 2018.

1 Introduction

1.1 Product Description

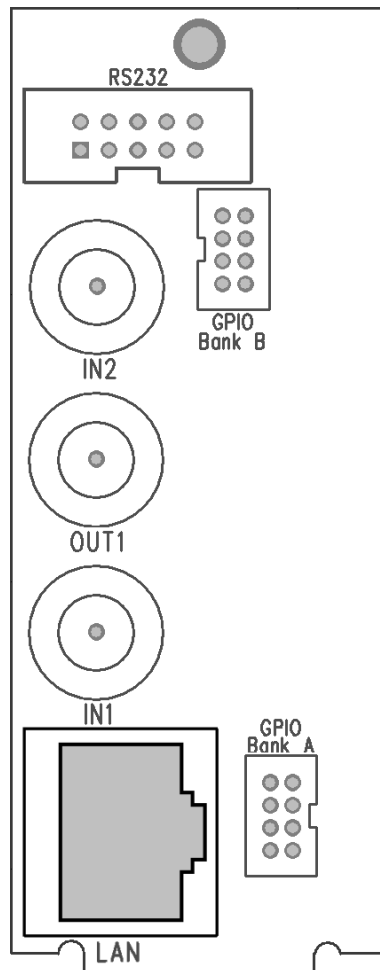
The HD1490 Encoder Card brings the functionality of EEG's industry standard Smart Encoder to the openGear®platform, providing closed captioning and XDS encoding in a single modular frame card operating on the openGear®platform. The frame card utilizes the user friendly DashBoard software, which is available for Windows, Mac and Linux operating systems and streamlines setup of the HD1490.

Like the 1RU HD492, the HD1490 streamlines and integrates the Line 21/HD-VANC encoding process into one powerful solution, supporting a wide variety of powerful ancillary data software on-board. Ideal applications for the HD1490 include local newscasts performing captioning through a teleprompter, A/V events with an in-person transcriptionist, and caption encoding onto video signals that will go direct-to-streaming. Easily updatable, the HD1490's capabilities can be expanded as needed with new features and drivers as needed.

2 Installation

2.1 BP121 Back Panel

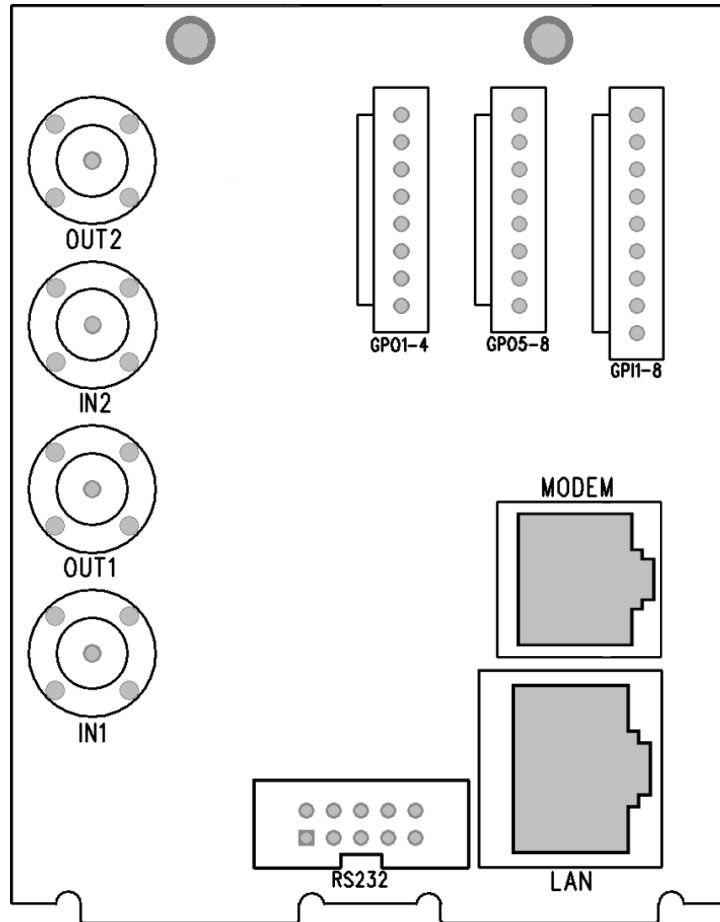
There are two back panel configurations available for the HD1490. The BP121 rear panel is shown here, followed by a guide to the connectors it contains. Below the BP121 back panel is the second option, the BP111.



IN1	Master video input. Accepts SD-SDI, HD-SDI, and 3G-SDI.
IN2	Auxiliary video input. Can be used as a source of caption data when connected to a captioned 3G-SDI, HD-SDI or SD-SDI video source. Caption data from the Aux Video In will be up-converted or down-converted as necessary for encoding onto the Master Video signal. If caption data is present at both the Master Video In and the Aux Video In, the signal with HD data will take precedence.
OUT1	Program video output with relay-bypass protection.
GPIO Banks A and B	Two Molex 87831-0841 connectors, each containing 4 GPIOs which can be configured to be inputs or outputs. See Appendix A for more information regarding GPIO usage.
RS232	Connector for cable containing two DB-9 (RS-232) serial ports labeled P1 and P2. Both serial ports can be used as inputs for configuration.
LAN	100-Base Ethernet port for connection to LAN. After configuring your HD1490's network settings in DashBoard (see below), you can view the Web Configuration site for your card by navigating to its local IP address in your web browser.

2.2 BP111 Back Panel

The BP111 back panel provides additional I/O, as compared to the BP121, and takes up 4 card slots in the openGear® frame, instead of 2.

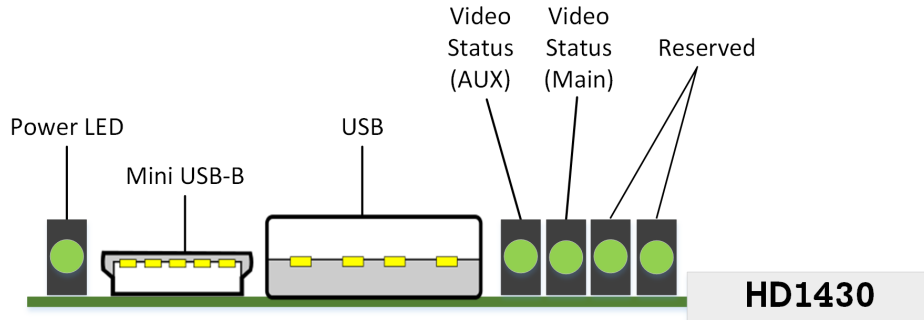


IN1	Master video input. Accepts SMPTE 259M SD-SDI or SMPTE 292M HD-SDI.
IN2	Auxiliary video input. Can be used as a source of caption data when connected to a captioned HD-SDI or SD-SDI video source. Caption data from the Aux Video In will be up-converted or down-converted as necessary for encoding onto the Master Video signal. If caption data is present at both the Master Video In and the Aux Video In, the signal with HD data will take precedence.
OUT1	Program video output with relay-bypass protection.
OUT2	Auxiliary video output with relay-bypass protection.
GPI 1-8	See Appendix A for more information regarding GPI usage.
GPO 1-4, 5-8	See Appendix A for more information regarding GPO usage.
RS232	Connector for cable containing two DB-9 (RS-232) serial ports labeled P1 and P2. Both serial ports can be used as inputs for configuration.
LAN	100-Base Ethernet port for connection to LAN. After configuring your HD1490's network settings in DashBoard (see below), you can view the Web Configuration site for your card by navigating to its local IP address in your web browser.
Modem	Standard phone jack data port. Connect to a phone line to enable dial-up captioning. This feature is optional on the HD1490.

3 HD1490 Operation

3.1 Front Panel

The front of the HD1490 card is depicted in the following diagram:



Power LED

The power LED will be green when the card is receiving power from the frame. Reserved for future use.

USB Connectors

Video Status (AUX)

This LED will be off when there is no video present on the auxiliary input. When HD or 3G video is present, it will be green, and when SD video is present, it will be orange.

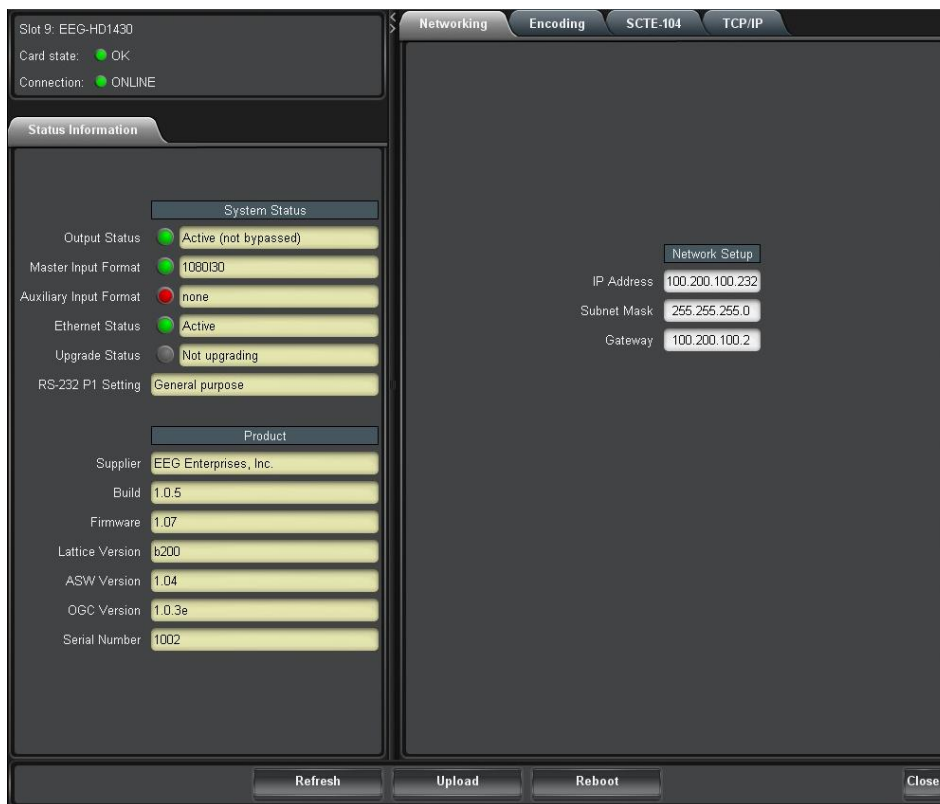
Video Status (Main)

This LED will be red when there is no video present on the main input. When HD or 3G video is present, it will be green, and when SD video is present, it will be orange.

3.2 DashBoard Menus

The DashBoard software is used to configure encoder settings, networking and perform additional basic configuration for the frame card. It can be downloaded from Ross Video: <https://www.rossvideo.com>

Once you have successfully installed the DashBoard tool, open the program to find information about the HD1490 and to configure your card.



There are two main sections in the Dashboard interface: the Status information on the left side and the Setup menu on the right side. At the bottom of the interface, you will find the **Upload** button, which can be used to upgrade your HD1490's software, and the **Reboot** button, which can be used to reboot your HD1490.

The upper section on the left shows the Card State and the Connection status, each of which has an indicator light and description of the card's status. There is a more detailed tab labeled **Status Information** below the two basic indicators that provides information about the card's version and its current setup configurations.

The **System Status** section shows what video types are present and the current status of the Ethernet connection. Output Status displays the mode that the encoder is operating in; the icon will be green when

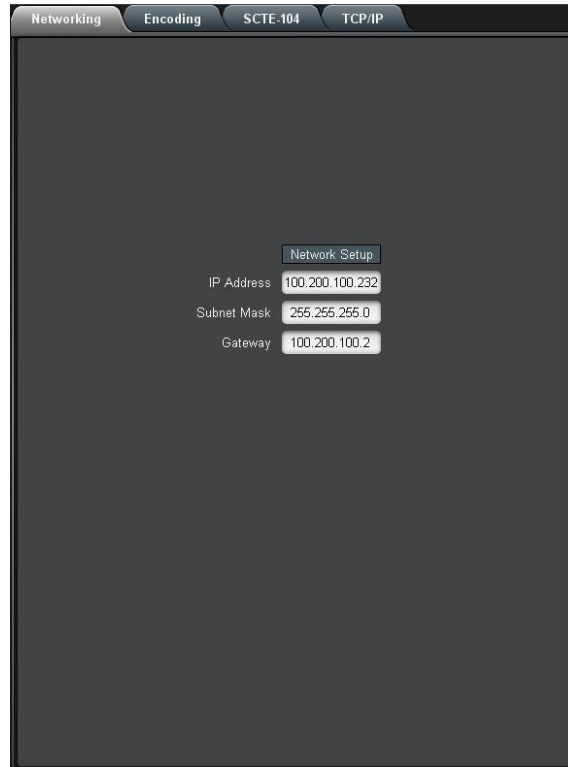
the unit is in active operating mode and will be red when the Encoder is in Relay Bypass mode. Master Input Format displays the video type detected on the master video input, including format information for HD video, while Auxillary Input Format indicates the video type detected on the auxillary video input, including format information for HD video. The Upgrade Status field displays information about whether the encoder is currently loading an upgrade.

The lower section entitled **Product** displays identifying information about the hardware and software versions of the card. This section displays the supplier, the build number, the firmware number, and the ASW version to identify the software installed and the serial number of the card.

The setup section in the right half of the tool is broken up into multiple tabs: Networking, Encoding, SCTE-104, and TCP/IP. Note that the SCTE-104 tab will only be present if your HD1490 has been licensed to use that feature.

3.2.1 Networking

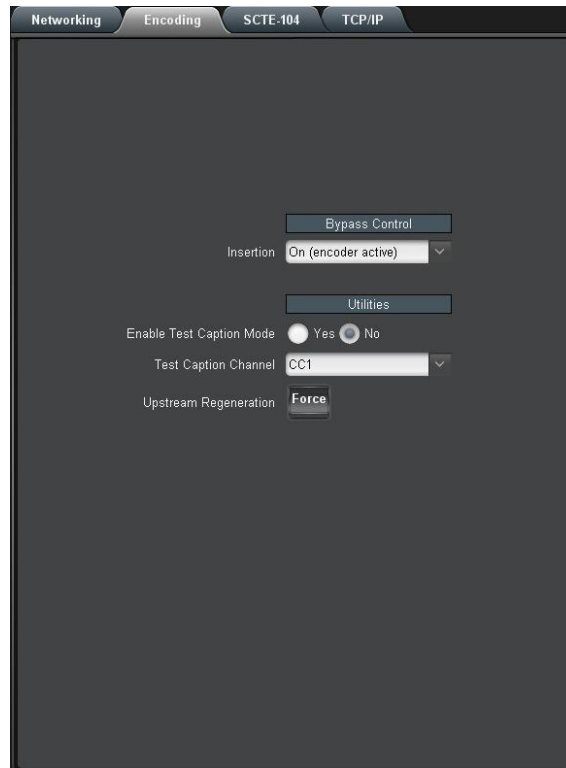
The Networking tab contains the IP address and subnet mask that the encoder will use when connected to a local network.



- | | |
|--------------------|---|
| IP Address | Selects the network address that the unit will be assigned on your LAN. |
| Subnet Mask | Selects the bit mask used. This should match the bit mask used on your LAN. |
| Gateway | Selects the address of the computer or device that the unit will use to communicate outside of your local network, when applicable. |

3.2.2 Encoding

Various aspects of the operation of your encoder can be configured here.



Insertion

Selects the operating mode of the encoder and specifies whether data is being inserted.

Test Caption Mode

Allows you to enable a stream of caption text on the 608 channel selected below. The test captions will stop if any other port enters caption mode on the same channel and will automatically change the mode to **Disabled**.

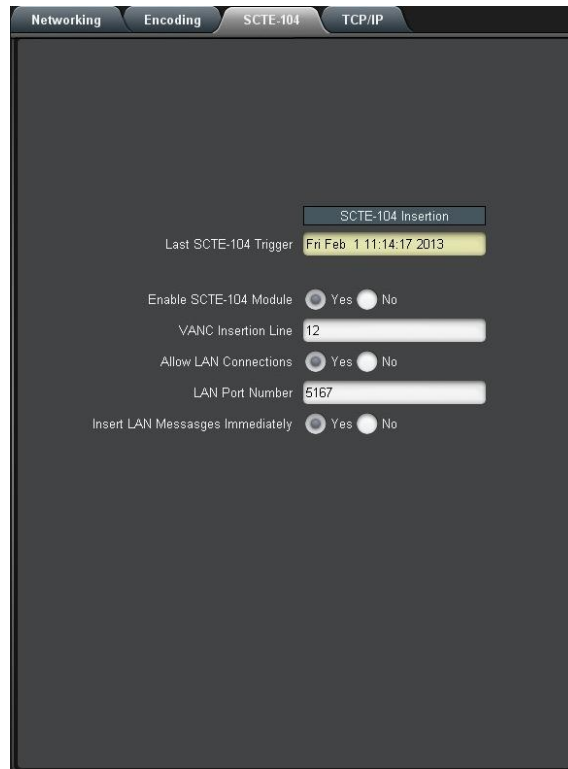
Test Caption Channel

Sets the 608 channel on which test captions will appear if they are enabled.

Force Upstream Regeneration Manually returns the encoder to upstream "Regeneration" mode. This command can be used to resume passing of upstream caption data whenever it is being blocked by locally input caption data. Any captioners or devices inserting local data will be removed from caption mode immediately.

3.2.3 SCTE-104

If your HD1490 is licensed to use SCTE-104 insertion application, the **SCTE-104** tab will be visible and will contain controls and status information for that application.

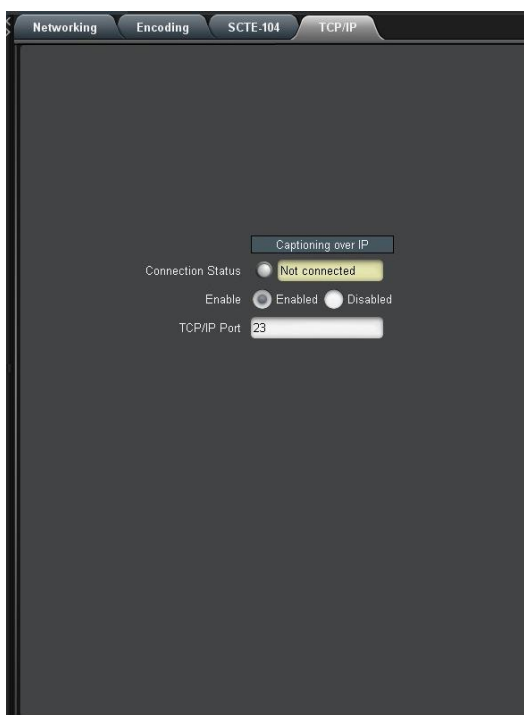


- | | |
|---|--|
| Date/Time of Last Trigger | Displays the date and time of the last SCTE-104 insertion trigger received. |
| IP/Port of Last Client | Displays the IP address and port of the last client to connect to the card over the LAN. |
| Num. Clients Currently Connected | The number of network clients currently connected to the SCTE-104 module will be displayed here. |
| Enable Module | Controls whether the SCTE-104 insertion application is active. |

VANC Insertion Line	Determines which VANC line SCTE-104 packets will be inserted on.
Allow LAN Connections	If set to Yes , SCTE-104 insertion can be triggered via LAN connection on the port specified below.
LAN Port	If the Allow LAN Connections setting is turned on, this field determines the port on which LAN connections will be accepted.
Insert Immediately	If set to Yes , a SCTE-104 packet will be inserted into VANC immediately when the application receives a LAN trigger.

3.2.4 TCP/IP

This tab allows you to configure an optional TCP/IP connection into your encoder, which provides an additional means of captioning, data entry, and monitoring via Smart Encoder commands.



- | | |
|--------------------------|---|
| Connection Status | When a connection into the specified TCP/IP port is active, this field will display Connected , with a green icon. |
| Enable | Must be set to Enabled for connections to be accepted on the specified TCP/IP port. |
| TCP/IP Port | This is the port on which remote connections to the encoder will be allowed, if you have enabled this feature; you can only change this value while the port is disabled. |

3.3 Web Configuration

The Web Configuration interface enables you to access configurations for your HD1490 applications from any computer on your local network. Several web applications are installed at the factory for all HD1490 encoders: a Startup Setting editor, a web-based serial-emulation Terminal for entering Smart Encoder commands, system date/time configuration, and a documentation library.

Once you have configured your HD1490's network settings in Dashboard and connected it to your LAN via the port on the rear module, you can leave your encoder and open up a web browser on any PC on the same local network. Navigate to the IP address that you configured in Dashboard; for example, type 192.168.1.15 into the address bar of the browser if that is the address you entered into Dashboard. If you cannot navigate to the page in your web browser, check with your network administrator that the IP Address and Subnet Mask you entered in Dashboard are valid parameters for your network, since individual settings vary.

Once the page has loaded, you will see a list on the top panel of the different web applications installed on your encoder. Click any of these links to navigate to the page for that application.

3.4 Using Smart Encoder Commands

Advanced configuration of the HD1490 can be set through the RS-232 serial ports labeled P1 and P2. The settings for these ports default to 1200 baud, 7 data bits, odd parity, and one stop bit. The HD1490 uses the EEG Smart Encoder command set. Encoder commands are recognized by a leading control code of <CTRL+A>, also represented by the ASCII hex code 01. The <CTRL+A> character is non-printing on most terminal screens, but on some it appears as a smiley face. An Encoder control command must end with a carriage return, which can be entered with the <ENTER> key on a keyboard or by 0D in ASCII hex.

To send the encoder commands through the serial input ports, connect a standard 9-pin straight cable between your PC's serial port and one of the DB9 connectors marked P1 or P2. You can now send commands to the encoder, from your PC, using a communications application such as HyperTerminal, which is bundled with most versions of Windows. The most basic Smart Encoder command, useful for checking the operation of your communication setup, is **<CTRL+A>?<ENTER>**. If your setup is working correctly, the Encoder will respond with its model name, firmware version, and serial number. If you have trouble communicating using HyperTerminal, always check to make sure that the settings in the Port Settings menu in HyperTerminal match the settings for the Encoder port you are connecting to.

In this manual, Encoder commands will be distinguished from other text by use of a bold font. Optional parameters will be enclosed in square brackets. Possible parameter values and default settings will be described in text or bullet points after the command is introduced.

3.4.1 Local Entry Modes

Caption data entered into the Encoder must be associated with a particular Line 21 Data Channel, NTSC field, or HD caption Service. The table below identifies the commonly used NTSC (SD) Line 21 data channels.

Data Channel	Description
CC1	Primary language Closed Captioning in Field 1
CC2	Secondary language Closed Captioning in Field 1
CC3	Secondary language Closed Captioning in Field 2
T1, T2	Field 1 Text services, including Interactive TV URLs
XDS	Extended Data Services such as Program Rating, Type and Length. Appears in Field 2.

In HD captioning, Services are designated instead of Channels. Service 1 is assigned for primary language captioning, and Service 2 is assigned for secondary language captioning. When 608 data is up-converted to create 708 data, CC1 data is assigned to Service 1, and CC3 data is assigned to Service 2. Text and XDS data is preserved in 608 down-compatibility bytes, but is not up-converted.

The Local Entry Modes described in this section are used for local insertion of data into caption channels only; see the next two sections of the manual for modes to insert Text or XDS data.

3.4.2 Regeneration Mode

Upstream regeneration is used when no other local entry mode is enabled for a caption channel. The Encoder's default action is to regenerate the caption data recovered from the HD video input. If no upstream HD captioning is present, data from the SD input will be used instead.

The default Regeneration response is configurable by using the commands listed in this section, and also by setting the Block 608 Upconversion GPI switch.

Regenerate Upstream VANC: <CTRL+A>! [ON/OFF] <ENTER>

Instructs the Encoder to either detect and potentially regenerate (default) or ignore incoming VANC data from the HD video input. If the encoder is set to ignore upstream VANC data, output signals will include only caption data recovered and regenerated from the SD video input. Use OFF to ignore upstream VANC caption data, and ON to resume detecting upstream VANC caption data.

Ignore Upstream L21 Channel: <CTRL+A>6 Channel <ENTER>

Return Upstream L21 Channel: <CTRL+A>7 Channel <ENTER>

Instructs the Encoder to ignore incoming Line 21 data from the SD video input in the specified caption channel. When Line 21 data in a channel is ignored, output signals will not contain any caption data recovered from the SD video input in that channel, even if there are no other data sources available.

Channel Channel sets the incoming Line 21 channel to be turned off. This parameter may be set for any NTSC Caption or Text channel. Upstream XDS data cannot be turned off with this command.

Begin PassThru Mode: <CTRL+A>3 [Field] <ENTER>

End PassThru Mode: <CTRL+C>

Displayed as PTHRU. When a port enters the command to begin PassThru for a field, caption data received through that port will replace upstream caption data for that field. PassThru mode is for use with complete CEA-608 formatted data streams, including control and formatting codes, such as would be provided by captioning software packages. If PassThru is engaged but no valid data is being entered, pairs of null data bytes (0x80 0x80) will be inserted into output signals. When PassThru mode is ended, the field will return to upstream Regeneration.

Field Field specifies which NTSC field the locally entered caption data is intended for. Field 1 (enter as F1) is for primary language captioning and text, and Field 2 (F2) is for secondary language captioning and text. The parameter defaults to Field 1.

Begin RealTime Mode: <CTRL+A>2 [Channel] [Rollup] [bBase] <ENTER>

End RealTime Mode: <CTRL+C>

Displayed as RTCAP. When a port enters the command to begin RealTime mode, text entered through that port will be encoded into a rollup caption display and replace upstream caption data for the specified channel. The HD1490 Encoder will automatically create all necessary control and formatting codes. When RealTime mode is ended, the channel will return to upstream Regeneration.

Data entered in RealTime must be in ASCII text format with a carriage return (0x0D or <ENTER>) at the end of each line of data. Because a line of data is processed only upon receipt of a carriage return, text may be edited by use of a backspace (0x08 or <BACKSPACE>) at any time before the carriage return.

The input text may be formatted to fit on 32 character lines by sending a carriage return at word boundaries approaching the 32 character limit. If sufficient data to fill a line is not available within a reasonable amount of time, a carriage return should be sent to ensure timeliness for the queued data.

Channel	Channel specifies which NTSC caption channel the ASCII data that will be entered is intended for. Enter CC1 for primary language captioning or CC3 for secondary language captioning. If no parameter is entered, CC1 will be assumed.
Rollup	Rollup sets the number of rows in the rollup caption display that will be created. Possible values are 2, 3, and 4. If no setting is entered, 3 will be assumed.
Base	Base sets the row from which the caption display will begin rolling up. The parameter value must be entered with a leading 'b'. Possible values range from b2 (top of the screen) to b15 (bottom of the screen). The default value is b15. Always set the Base value at least as large as the number of rows in the rollup display, or else the uppermost row(s) of the display will not be visible.

3.5 XDS Insertion

Extended Data Services (XDS) is an NTSC Field 2 data channel that provides information to viewers about the program that is being aired. XDS is used to transmit FCC-mandated program ratings to allow viewer V-chip filtering. XDS is a part of the CEA-608 standard for SD broadcasts, and should be included in the 608 compatibility bytes of CEA-708 compliant HD broadcasts.

XDS data packets can be loaded into the Encoder's queue with one simple command, and be held for any specified time period. Each individual packet type can be independently set for upstream or local priority, and permanent packets can be stored in Non Volatile Memory and inserted

automatically whenever the Encoder is operating.

Packets are inserted into output video signals using EEG's proprietary Stochastic Scheduling Algorithm. The Stochastic Scheduling Algorithm is a finely tuned solution to the Field 2 bandwidth limitations that cause difficulties in XDS packet transmission. A Priority level is automatically assigned to each packet based on its XDS Class and Type. The Stochastic Scheduling Algorithm ensures both that high priority packets like V-chip data and program names are transmitted frequently enough to be instantly accessible for new viewers, and that lower priority packets are guaranteed to be inserted periodically, and not preempted completely.

As per CEA-608B specifications, all available Field 2 space is filled, rescheduling and regeneration are automatically performed on all upstream packets, and packet continuations are applied when necessary. Additionally, upstream XDS program packets will continue to transmit for five minutes after any non-clearing upstream interruption, such as a commercial break or undesired outage.

Enable XDS Entry: <CTRL+A>O XDS O <ENTER>

This command must be entered to enable a port for XDS input. A port must be enabled for XDS input in order to accept XDS data and control commands. The character repeated in the command is a capital o and not a zero.

Set Active Port: <CTRL+A>O Px XDS O <ENTER>

Used to request or yield Active status. The 'Px' argument specifies the port that XDS activity will be set to, i.e. P1. Port P3 can set the Active status of any port. The other ports can only request active status for itself and so does not need to enter the Px parameter. Active status can only be obtained if the port has been authorized in the Permission List.

Only one port can be active for each Data Type at a time. If another port is already active the E1 error message will be returned. If the command is entered with the override parameter O, the port entering the command will become active in place of the previous active port.

Load XDS Packet: <CTRL+A>P Packet Duration Content [Priority] <ENTER>

Creates an XDS packet and loads it into the XDS queue. The Encoder will begin inserting the packet immediately.

Packet Packet sets the XDS Class and Type of the packet that will be created. If a new packet is loaded with the same Packet ID as an existing packet in the queue, the pre-existing packet will be deleted; if the new packet is a Program Name or Program ID packet, all program-specific packets will be deleted from the queue. A packet loaded into the Encoder with the Load XDS Packet command has local priority; in output signals, it will replace all upstream packets of the same Class and Type. The Packet parameter should be entered as Class immediately followed by Type in the way shown in the table below. Leading zeroes may be omitted. The Class and Type of a few of the most commonly used XDS packets are shown in the following table; for a complete list refer to CEA-608B.

Class/Type	Content
0102	Current Program Length
0103	Current Program Name
0105	Current Program Rating
0501	Network Name
0502	Station ID (Call Letters)
0504	TSID

- Duration** Duration sets the transmission duration of the newly created packet. When a packet's duration period expires, it will be deleted from the XDS queue. A duration setting of -1 will cause the packet to be inserted until it is deleted by a future command. An integer setting (i.e. 100) will be interpreted as the number of times to output the packet before deleting it. An Elapsed Time setting (i.e. 00.45.00), will cause the packet to be inserted for that length of time, beginning when the command is entered, and then deleted.
- Content** Content sets the information content of the packet. Content can be entered in ASCII text enclosed in curly braces, or in ASCII Hex notation. If you enter data in ASCII hex mode, you must only use ASCII hex characters between 0x20 and 0x7f. A checksum need not be enclosed, as the Encoder will calculate it automatically before insertion.
- Priority** Priority is an optional parameter that allows the output priority of a packet to be customized. The parameter should not be used for standardized, commonly used packets, which the Encoder automatically assigns appropriate priorities. The parameter is useful for custom, user-defined packets. The default priority for packets that the encoder does not recognize is 115, which corresponds to a fairly low priority. A typical high priority value is 30. A packet's numerical priority is inversely proportional to the frequency with which it is inserted.

Two sample XDS entries follow.

<CTRL+A>P 103 -1 Evening News <ENTER> will load and begin insertion for a current program name packet reading "Evening News." The packet will be output until a new packet is entered.

<CTRL+A>P 105 00.30.00 4844 <ENTER> will load and begin insertion for a current program rating packet of TV-PG. The packet will be

inserted for the next thirty minutes. Refer to CEA-608B for a listing of hex codes for other possible program ratings.

Load Default XDS Packet: <CTRL+A>P LPacket Duration Content [Holdoff] <ENTER>

Loads an Upstream Priority XDS packet. This is called a "default" packet because it will be output only when no XDS packet of the specified Class and Type is present in the incoming video signal. When an upstream packet is discontinued without a replacement or a Clear packet (two Space characters), the Encoder will continue insertion of the discontinued packet for a time-out period of 5 minutes to ensure continuity during commercial breaks or replacement delays. The default packet will then be transmitted until the upstream packet is replaced.

The Packet, Duration, and Content parameters are the same as for the local priority Load XDS Packet command explained on the previous page, except the Packet Class/Type must be entered with a leading "L".

Holdoff Holdoff sets the number of seconds after which the default packet will begin transmission once the five minute upstream time-out period expires. The default is zero.

Example: <CTRL+A>P L105 -1 4840 <ENTER> will create a default program rating packet of None. This packet will be inserted beginning 5 minutes after an interruption in upstream program rating data, and will continue to be transmitted indefinitely until upstream data resumes.

Report XDS Queue: <CTRL+A>e [Packet] <ENTER>

Reports the contents and settings for the packet of the specified Class/Type loaded in the XDS queue. An asterisk after the packet ID indicates that max time-based preemptive priority has been set. If the Packet parameter is omitted, the entire XDS queue will be displayed. The following information is displayed:

ID is the packet's Class and Type. Default packets are displayed with a leading "L".

Format and **Ending** describe the packet's duration. A Format value of RE indicates an indefinite or integer duration, and a value of EL indicates an Elapsed Time duration. Ending displays the duration value.

Priority displays the packet's Priority rating. Packets with smaller numerical priorities go out more frequently than packets with larger numerical priorities, with an approximately inverse proportional relationship between numerical Priority and insertion frequency.

Frames displays the number of frames the packet occupies. Larger packets take up more frames and more bandwidth.

Source indicates whether the packet is locally inserted (Loc) or upstream regenerated (Up).

A report on an individual packet includes the packet's hex byte representation, decoded content for common packets, and checksum in addition to the above information.

Delete XDS Packet: <CTRL+A>P Packet <ENTER>

Deletes the packet of the specified Class and Type from the XDS queue. If the packet is a Program Name or Program ID packet, all other program-specific packets will also be deleted, and the Encoder will insert a Clear packet for downstream databases and decoders.

Delete XDS Queue: <CTRL+A>L -all <ENTER>

Deletes all packets in the XDS queue.

Block Upstream XDS: <CTRL+A>T -Class00 <ENTER>

End Blocking: <CTRL+A>T Class00 <ENTER>

Blocks all incoming packets of the specified Class. Entering all instead of Class00 as the parameter will cause all upstream packets to be blocked. Omitting the Class parameter will cause the block/pass status for each Class to be reported.

Example: **<CTRL+A>T -0100 <ENTER>** blocks all upstream XDS packets in the Current Program Class. **<CTRL+A>T 0100 <ENTER>** will resume normal XDS operation.

4 Additional Features

4.1 Serial Port Configuration

Change Baud Rate: <CTRL+A>I P2 Baud Bits Parity <ENTER> Changes the baud rate on P2, the AUX RS-232 input port. A change in communication settings takes effect immediately; thus, after entering this command, you must immediately begin communicating at the new settings you entered.

Baud	Sets the new baud rate for the port. Supported rates are 1200, 2400, 4800, and 9600.
Bits	Sets the number of data bits. Choose either 7 or 8.
Parity	Sets the parity bit. Choose either o for odd, e for even, or n for none.

4.2 Encoder Status Commands

Report Identification: <CTRL+A>? <ENTER>

Returns the Encoder's model, serial number, and firmware version.

Report HD Status: <CTRL+A>f <ENTER>

Returns the Encoder's current HD operation setting (334M VANC Insertion, 333M VANC Recovery, or GA VANC Recovery) and the availability of an HD video source (HD-SDI Present or HD-SDI Not Present). If an HD signal is present, the video format of the source and whether or not VANC caption data is present are also reported.

Recovery Status: <CTRL+A>A <ENTER>

Returns the data recovery status of each Line 21 channel for incoming SD video. ON indicates that data on the channel is being recovered and processed. OFF indicates that the channel has been turned off and incoming data is being ignored.

SD Video Presence: <CTRL+A>b <ENTER>

Reports either Video Present or No Video Present to indicate whether or

not the Encoder is receiving an SD video signal.

Report Switch Setting: <CTRL+A>S <ENTER>

Returns the current setting of the ENCODER ON bypass switch.

Monitor Line 21: <CTRL+A>5 [Channel] [I/O] <ENTER>

End Monitoring: <CTRL+C>

Monitors and displays the EIA-608B caption data encoded in the specified channel. The I/O parameter determines whether the incoming (enter as I) or outgoing (O) data is monitored. The default settings are incoming and CC1.

A General-Purpose I/O

BP121 Back Panel

Each of the 2 GPIO banks, Bank A and Bank B, has the following pinout:

7	8
5	6
3	4
1	2

Bank A provides GPIO 1-4:

GPIO	Pins
4 (D)	7, 8
3 (C)	5, 6
2 (B)	3, 4
1 (A)	1, 2

Bank B provides GPIO 5-8:

GPIO	Pins
8 (H)	7, 8
7 (G)	5, 6
6 (F)	3, 4
5 (E)	1, 2

If a given GPIO is configured as an input (GPI), it is activated when closed (connected to ground), and inactive when open (left floating). The even-numbered pin in a given GPI pair is its ground. For example, if GPIO 1 were configured as an input (GPI), you could activate it by connecting pins 1 and 2 of Bank A, thereby grounding pin 1. If pin 1 were left floating, GPI A would be inactive.

If a given GPIO is configured as an output (GPO), its pins form a switch that is on when closed and off when open. For example, if GPIO 5 were configured as an output, pins 1 and 2 of Bank B would form a switch that were closed when GPO 5 were active, and open when it were inactive.

BP111 Back Panel

General-Purpose Inputs

The 9-pin connector labeled **GPI1-8** contains one pin for each of the 8 general-purpose inputs (GPIs), plus one ground pin:

GPI H
GPI G
GPI F
GPI E
GPI D
GPI C
GPI B
GPI A
Ground

A given GPI is activated when closed (connected to ground), and inactive when open (left floating).

General-Purpose Outputs

Each of the BP111's 2 general-purpose output (GPO) connectors has the following pinout:

8
7
6
5
4
3
2
1

The first connector is labeled **GPO1-4**:

GPO	Pins
4	7, 8
3	5, 6
2	3, 4
1	1, 2

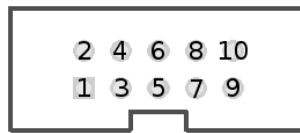
The second connector is labeled **GPO5-8**:

GPO	Pins
8	7, 8
7	5, 6
6	3, 4
5	1, 2

The two pins of a given GPO form a switch that is on when closed and off when open. For example, pins 1 and 2 of the connector labeled **GPO5-8** form a switch that is closed when GPO 5 is active, and open when it is inactive.

B Serial Port Connector

The BP111 and BP121 rear modules both contain a single IDC-10 connector, providing the interface for RS-232 serial ports P1 and P2. The following image and table describe the pin mapping from the IDC-10 connector to the two DB9 connectors that can be used to communicate with ports P1 and P2:



IDC	DB9, P1	DB9, P2
1		
2		2
3		3
4		
5		5
6		
7	2	
8	3	
9		
10	5	

The pin assignments of a DB9 connector are as follows:

Pin	DB9 Adapter
1	
2	Tx
3	Rx
4	
5	Ground
6-9	

These ports can be connected directly to a standard PC serial port with a 9-pin, 3-wire straight serial cable. A 'null modem' cable MAY NOT be used for this purpose as it will reverse the connections of pins 2 and 3.

C Video/Connector Specifications

SDI Video Inputs	
Number of Inputs	2
Connector	BNC per IEC 169-8
Format	2.97 Gb/s SMPTE 424M (3G), 1.485 Gb/s SMPTE 292M (HD), or SMPTE 259M 270 Mb/s (SD)
Input Level / Impedance	800 mV p-p \pm 10% / 75 Ohm
Equalization	Automatic up to 100m @ 1.5Gb/s with Belden 1694 or equivalent
SDI Video Outputs	
Number of Outputs	1 relay bypass protected (BP121 module) or 2 relay bypass protected (BP111 module)
Connector	BNC per IEC 169-8
Output Level	800 mV p-p \pm 10%
Output Impedance	75 Ohm
Format	1.485 Gb/s SMPTE 292M or SMPTE 259M 270 Mb/s (matches input format)
DC Offset	0V \pm 0.5V
Rise/Fall Time	200pS nominal
Overshoot	< 10% of amplitude
Wide Band Jitter	< 0.2 UI
Data Input/Output Characteristics	
Data Ports	2 DB-9 (RS-232)
Serial Data Format	7 data bits, odd parity, 1 stop bit, 1200 baud default
GPIO (BP111 rear module)	8 inputs on one 9-pin connector; 8 outputs, split into 2 sets of 4 pairs pins each
GPIO (BP121 rear module)	Two 8-pin Molex 87831-0841 connectors, each containing 4 GPIOs; each GPIO can be configured as an input or output
Electrical	
Power	115/230V AC 50/60Hz
Power Consumption	6 W
Physical	
Dimensions	12.75" long x 3" wide x 1" tall
Weight	< 1 lb.