

**HD Caption Legalizer /
Relocating Bridge
MODEL CB515**

EEG Enterprises, Inc.
586 Main Street
Farmingdale, New York 11735
TEL: (516) 293-7472 FAX: (516) 293-7417

**Copyright (c), EEG Enterprises, Inc. 2009-2014
All rights reserved.**

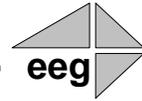
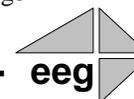


Table Of Contents

Introduction	3
Product Description	3
Features Overview	3
Installation	4
Front Panel	4
Rear Panel.....	6
Configuration	7
Front Panel Menus.....	7
Web Configuration	9
Using Smart Encoder Commands	12
Caption Port Serial Output Modes	13
Caption Processing Control.....	14
XDS Insertion.....	15
Additional Features	20
Serial Port Configuration.....	20
GPIO Configuration	21
Legalizer Status Commands.....	24
Appendices	25
Grand Alliance Interface	25
Technical Specifications	26
References	27

Copyright 2009-2014, EEG Enterprises, Inc. All rights reserved. The contents of this manual may not be transmitted or reproduced in any form without the written permission of EEG.

The revision date for this manual is **January 21, 2014**.



Section 1: Introduction

Product Description

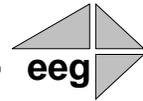
The CB515 HD Caption Legalizer / Relocating Bridge is a powerful solution for broadcasters that virtually eliminates HD captioning problems by fixing common upconversion errors and maximizes interoperability by ensuring that all data complies completely with DTV captioning standards. The CB515 regenerates all input caption data to create a fully-compliant data stream with standardization of line number, scaling attributes, and packetization style.

Supported caption bridging capabilities are: HD to HD, HD to SD, SD to SD, and SD to HD. The CB515 can tolerate video inputs that are not in sync.

The CB515 is also a relocating HD caption bridge which can bridge caption data between video sources in a wide variety of HD video formats, including 1080i, 720p, 24/23.98p, and 24/23.98psf, and relocate HD caption displays. Relocation is enabled by programmable GPI triggers and can be set to avoid emergency crawls across an adjustable region at the top or the bottom of the HD picture.

Features Overview

- Compliant with all FCC mandated EIA-608B and CEA-708 standards
- GPI-triggered closed captioning relocation to satisfy emergency alert accessibility requirements
- Transparent upconversion of captions from an SD video source to an HD video master
- Transparent downconversion of captions from an HD video source to an SD video master
- RS-232 SMPTE 333M caption output port
- Relay-bypassed master and source video paths
- Supports a wide variety of HD transmission and mastering formats including 1080i, 1080p, 720p, 480p, 24/23.98p and 24/23.98psf.
- Eliminates common DTV captioning errors that reduce compatibility with ATSC encoders and consumer decoders



Section 2: Installation

Front Panel

The CB515 front panel is shown in the figure below.



The front panel has the following elements:

Power LEDs

Each LED corresponds to one of the two power supplies the CB515 can be equipped with; note that the second supply is a paid option. Green indicates that the given power supply is active, and red indicates that it is inactive.

Reset

Performs a hardware reset. The unit will reboot, all operations will be cleared, and status will return to the default settings stored in Startup Settings.

Active

Controls relay bypass for the master and source video paths. In bypass, the indicator LED will be off, and the unit will pass video directly from the Master In connector to the Master Program Out connector, and from the Source In connector to the Source Out connector. All other functions are inactive.

USB

Software and firmware updates can be applied by inserting into this port a USB flash drive containing an update file. Note that updates can also be applied via the unit's web configuration page.

LCD Controls

The control pad provides menu navigation for the front panel configuration menus. The control pad buttons are: **ENTER** (marked by a check), **CANCEL** (marked by an 'X'), **LEFT**, **RIGHT**, **UP**, and **DOWN**.

Front Panel LCD When none of the control panel buttons have been pressed in the last 30 seconds, the front panel LCD display is divided into sections as shown below:

Master Video Standard	LAN Connection Indicator
Source Video Standard	Closed Caption Activity

Master Video Standard displays the video type detected on the master video input, including format information for HD video. If no video is present on the Master input, this area will be blank.

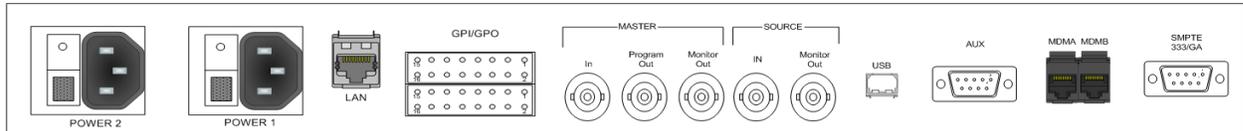
Source Video Standard indicates the video type detected on the source video input, including format information for HD video. If no video is present on the Source input, this area will be blank.

LAN Connection Indicator displays “LAN” if an Ethernet connection is present, and is blank otherwise.

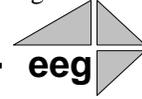
Closed Caption Activity indicates the source of valid closed captioning, if it is present. If the data is coming from the Master input, this display will start with “M:”, and if it is coming from the Source, it will start with “S:”. If the active data source is VANC captioning (whether HD or SD), it will display “ANC”, and if it is VBI (most commonly line 21 in SD-NTSC, or line 22 in SD-PAL), it will display “L21”. If no valid caption data is present, this area displays “NO CC”.

Rear Panel

The Legalizer’s rear panel is shown below.



- Power 1** AC power input, 120–240 V, 50–60 Hz tolerant. Connect to the unit’s primary power source. Turn on/off with switch next to connector.
- Power 2** AC power input, 120–240 V, 50–60 Hz tolerant. Connect to the unit’s primary power source. Turn on/off with switch next to connector. Note that this supply is a paid option, and is not present by default.
- Master In** Master video input. Accepts SMPTE 259M SD-SDI or SMPTE 292M HD-SDI.
- LAN** Connect the CB515 to your local network to access web-based configuration and status monitoring, using the IP address configured through the LCD menu.
- GPI** IDC-16 connector with 8 independent GPI input switches. See appendix for GPI pin outs and configuration.
- GPO** IDC-16 connector with 8 independent GPO output switches. See appendix for GPO pin outs and configuration.
- Master Prog Out** Program video output with relay-bypass protection.
- Master Mon Out** Video output for monitoring. This signal will not be generated if the unit is bypassed.
- Source In** Source video input for caption bridging. Accepts SMPTE 259M SD-SDI or SMPTE 292M HD-SDI.
- Source Mon Out** Source video output with relay-bypass protection.
- USB** Reserved for future use.
- AUX** RS-232 input for configuration.
- MDMA/MDMB** Reserved for future use.
- SMPTE 333/GA** RS-232 input for configuration; can also be configured for use as an output for serial delivery of captions to an ATSC encoder.



Section 3: Configuration

Front Panel Menus

The front panel LCD screen and Control Pad are used to configure Legalizer settings and networking, perform flash updates, and access many add-on software features installed in the unit. The interface is organized in a series of hierarchical menus; use the **LEFT** and **RIGHT** keys to scroll between menu options and the **ENTER** or **DOWN** keys to select options or enter sub-menus. Press the **CANCEL** key from any menu screen to return to the top of the menu hierarchy.

In the CB515, when the front panel menu is inactive, the display will revert to the status screen, described in the previous section. Press any key on the Control Pad to return to the top-level menu from the status screen.

System Setup Menu

LCD Display

The LCD Display menu contains display options for the front panel LCD screen.

- **LCD Contrast** sets the contrast level of the display screen. The value ranges from 0 (lightest) to 20 (darkest). Use the **UP** and **DOWN** keys to make changes, which will take effect on the screen immediately. When you are finished making changes, use the **ENTER** key to exit the menu and save changes, or the **CANCEL** key to exit the menu and reject changes.
- **LCD Backlight** sets the brightness level of the display screen's backlighting. The value ranges from 0 (darkest) to 50 (brightest). Use the **UP** and **DOWN** keys to make changes, which will take effect on the screen immediately. When you are finished making changes, use the **ENTER** key to exit the menu and save changes or the **CANCEL** key to exit the menu and reject changes.

Version

View the current versions of hardware, firmware, and all software modules installed on the unit. Use the **UP** and **DOWN** buttons to scroll through the list and **ENTER** or **CANCEL** to exit.

Network Configuration

The Network Configuration menu contains the IP address and subnet mask that the Legalizer will use when connected to a local network.

- **Set Config** is used to choose between static IP address configuration, which allows you to set specific network settings (as described below), or DHCP-based configuration, which will cause the CB515 to communicate with your local DHCP server to determine network settings.
- **IP Address** selects the network address that the unit will request on your LAN. Use the **LEFT** and **RIGHT** keys to move the cursor between digits and the **UP** and **DOWN** keys to change the selected digit. When you are finished making changes, use the **ENTER** key to exit the menu and save changes or the **CANCEL** key to exit the menu and reject changes.
- **Subnet Mask** should be set to match the bit mask used on your LAN.
- **Gateway** should be set to the address of the computer or device that the unit will use to communicate outside of your local network, when applicable.

Firmware Update

The Firmware Update utility provides a fast, simple, and convenient way to upgrade your Legalizer to the latest version of the EEG firmware or add additional software modules. Begin by downloading a firmware update file from the EEG website and transferring the file to any standard USB memory device. Insert the memory stick into the front panel USB port, navigate to the Update option in the System Setup menu, and press **ENTER**. The update utility will find the installation file on the memory device, display the revision number, and prompt you to continue. Press **ENTER** to proceed and install the new firmware, or **CANCEL** to end the utility. A message will appear on the LCD screen when the update utility has finished. **Do NOT remove the memory device while the update utility is running.** When the update utility is finished, the new firmware has been installed. Some updates will require a power-cycle before they take effect.

Updates can also be applied over your LAN on the CB515 Web Configuration page.

Utilities

Capture VANC

Captures VANC data of the selected DID/SDID from the Master video input and loads it onto a USB storage device. Use the **UP** and **DOWN** keys to select the desired DID/SDID and insert a USB device into the box. Press **ENTER** to begin downloading the VANC data or **CANCEL** to exit. To stop capturing VANC data press any front panel key. Depending on the size and type of memory device used, there may be a momentary delay before the device is detected. If you see “Failed: Insert USB Disk”, wait a few seconds and try again.

Capture All VANC

Captures VANC data of all DIDs/SDIDs from the Master video input and loads it onto a USB storage device. Insert a USB device into the box and press **ENTER** to begin downloading the VANC data or **CANCEL** to exit. To stop capturing VANC data press any front panel key. Depending on the size and type of memory device used, there may be a momentary delay before the device is detected. If you see “Failed: Insert USB Disk”, wait a few seconds and try again.

Capture 608

Captures CEA-608 data from the Master video input and loads it onto a USB storage device, creating separate files for field 1 and field 2 data. Insert a USB device into the box and press **ENTER** to begin downloading the VANC data or **CANCEL** to exit. To stop capturing VANC data press any front panel key. Depending on the size and type of memory device used, there may be a momentary delay before the device is detected. If you see “Failed: Insert USB Disk”, wait a few seconds and try again.

Web Configuration

The Web Configuration interface enables you to access configurations and log files for your CB515 from any computer on your local network. Several web applications are installed at the factory for all CB515 Legalizers: a Startup Setting editor, a web-based serial-emulation Terminal for entering Smart Encoder commands, and a documentation library.

To use Web Configuration, first connect the Ethernet connector on the rear panel of the CB515 to your local network. Then, use the front panel LCD and button pad to give the Legalizer a valid IP address and subnet mask for your network by navigating to **System Setup | Network Setup | IP Address** and **System Setup | Network Setup | Subnet Mask**.

Once you have set up the front panel IP settings, you can leave your Legalizer and open up a web browser on any PC on the same local network. Navigate to the IP address that you configured on the Legalizer's front panel; for example, type **192.168.1.15** into the address bar of the browser if that is the address you entered into the front panel. 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 on the Legalizer front panel are valid parameters for your network, since individual settings vary.

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

Update

The Update page enables you to load and apply a software update to the CB515 through the web interface. First, download the update file to your local computer. Then, from the Update page, select 'Choose File' to navigate to the update file path, and 'Upload' to apply the update. Follow any on-screen instructions to complete the update, and note that some updates may require a reboot to take effect.

Date/Time

The Date/Time page allows you to manage the CB515's system time. The time can be set manually (including the option to copy the system time from the computer being used to access the web configuration page), or it can be set via NTP; for the latter, you can enter and save up to three NTP server addresses. Note that the CB515 will maintain an accurate system time even when the unit is powered off, as it is equipped with an internal battery to power its clock.

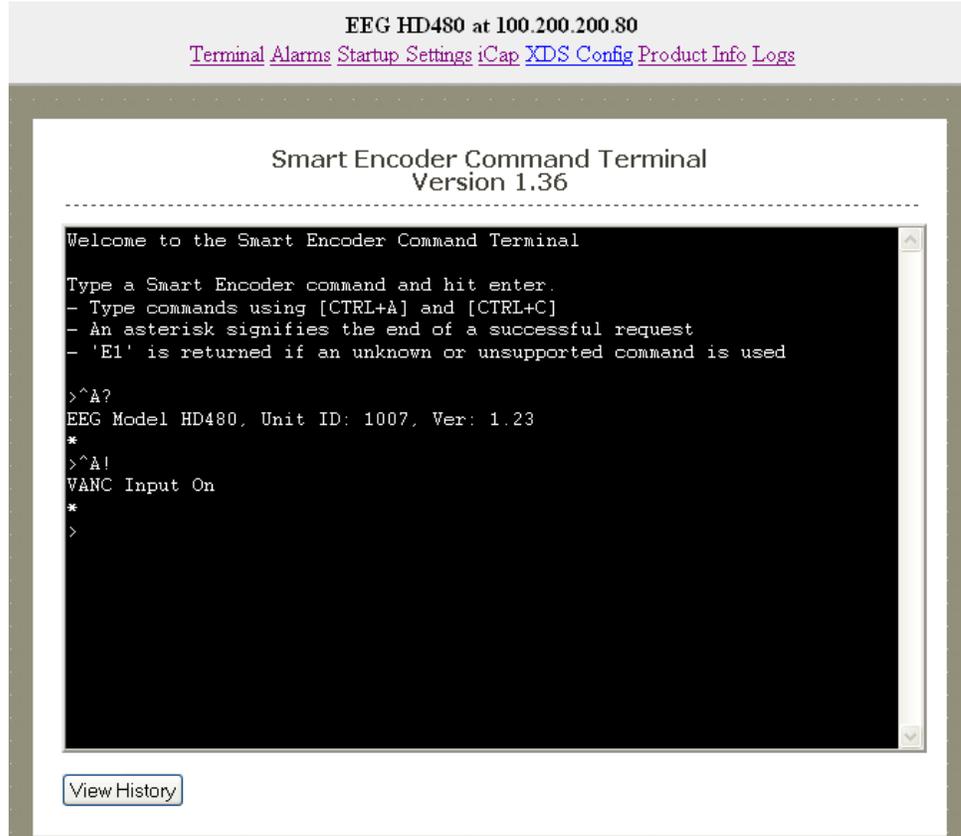
Product Info

The Product Info page contains PDF files of the CB515 manual as well as software manuals for any installed modules. These files can be downloaded or viewed in your web browser with a PDF reader such as Adobe Acrobat Reader.

Terminal

The Terminal page gives you access to a Smart Encoder command terminal that emulates the serial port interface to the Legalizer. You can enter any of the commands detailed in this manual into the Web Terminal, just as you would through a serial port terminal, using <CTRL+A> and <CTRL+C>.

The Terminal page also has a feature that saves the past twenty-five commands and responses from the web terminal, which can be seen by clicking on the ‘View History’ button below the active web terminal. This feature is useful for recalling past commands even after you navigate away from the Terminal page or reset your CB515. To hide the history window, click on the ‘Hide History’ button located between the active web terminal and the open history window.



Startup Settings

The Startup Settings Editor enables entry of Smart Encoder commands that will be run every time the Legalizer starts up. Use Startup Settings whenever you want a setting to be “sticky”; settings entered through the Web Terminal or the serial port only are not sticky and will revert to defaults when the Legalizer is power-cycled.

To use the Startup Settings editor, type any Smart Encoder command into the command box. Omit the <CTRL+A> character entirely- this character is implied at the beginning of each line. To add additional commands, press the ‘+’ button and more lines will appear.

When you have entered commands for all the settings that you want to make sticky, click Update Startup Settings. The configuration changes will take the next time the Legalizer starts up.



The ‘Description’ field provides a human-readable description for future reference for many commonly used startup commands.

Using Smart Encoder Commands

The Legalizer’s configuration is set through the RS-232 serial port marked AUX on the rear panel. The settings for this port are 1200 baud, 7 data bits, odd parity, and one stop bit. The CB515 uses a subset of 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. A Smart 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 Smart Encoder commands through the serial input ports, connect a standard 9-pin straight cable between your PC’s serial port and the DB9 connector marked AUX on the rear panel. You can now send commands to the Legalizer, 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 Legalizer 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 Legalizer port you are connecting to.

In this manual, Smart Encoder commands will be distinguished from other text by use of a bold font. The parameters for each command will be listed in italics. 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.

Caption Port Serial Output Modes

The RS-232 port marked SMPTE 333/GA on the rear panel is a general-purpose input port by default; however, it can be configured to be used as an output port for sending serial caption data to an ATSC encoder, via either the SMPTE 333 or the Grand Alliance protocols.

When either of these modes is in use, no VANC caption data will appear on the HD-SDI video outputs.

333 Serial Output

In 333 serial output, the CB515 sends its 708 caption output to a serial output queue for transport to an ATSC encoder supporting SMPTE 333M protocol. 333 is a “pull” protocol; the ATSC encoder sends synchronization requests (SYNs) to the Legalizer, which then sends the requested data bytes out through the serial port. The SMPTE 333M specification should be referred to for complete information about the protocol.

When in 333 serial output mode, the caption output port defaults to the proper communications settings for 333 (38400 Baud, 8 data bits, no parity, and one stop bit). The command to manually set the Legalizer for 333 output and reset the caption port to these settings is **<CTRL+A>f 333 <ENTER>**. To set the CB515 for 333 serial output, simply connect the caption output port to the caption input port of a SMPTE 333M ATSC encoder. When the CB515 begins receiving SYNs it will automatically begin 333 output.

GA Serial Output

In GA serial output, the CB515 sends its 708 caption output to a serial output queue for transport to an ATSC encoder supporting Grand Alliance (GA) protocol. Grand Alliance is a “push” protocol; the CB515 sends data out through P1 as it becomes available, and the ATSC encoder synchronizes the data upon reception. The Grand Alliance transport protocol in use by EEG equipment is described on page 25 of this manual.

Since the caption device initiates data transfer with a Grand Alliance ATSC encoder, GA output must be initialized manually. The command to set the CB515 for GA output is **<CTRL+A>f ga <ENTER>**. This command will begin the GA serial output operation and set the caption output port to the

proper communication settings (19200 Baud, 8 data bits, no parity, and one stop bit).

Each time the CB515 is power cycled, it will return to its default mode of writing caption output to HD VANC. If GA serial output is always desired, the GA output initialization command should be stored in Startup Settings to reduce setup time. If the command is stored in Startup Settings, GA output will automatically begin each time the Legalizer is power cycled.

Caption Processing Control

The default caption processing behavior of the CB515 is to create a legalized output stream based on the caption data found in the Master video input. If no caption data is found in the Master, data from the Source input will be used, with any necessary format conversions performed automatically. The one exception to this behavior is that if VANC caption data is present on the Source input and VBI-based CEA-608 captions are present on the Master input, data will be obtained from the Source input.

This default processing behavior is configurable using either the commands in this section.

Upstream VANC Enable <CTRL+A>!*[ON/OFF]* <ENTER>

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

Disable Upstream L21 Channel <CTRL+A>*6 Channel* <ENTER>
Re-enable Upstream L21 Channel <CTRL+A>*7 Channel* <ENTER>

Instructs the Legalizer to ignore any incoming Line 21 data 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** 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. The options are cc1, cc2, cc3, cc4, t1, and t2.

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.

The CB515 Legalizer includes all of the XDS functionality of the broadcast industry's leading XDS solution, the HD490 Smart Encoder. XDS data packets can be loaded into the Legalizer'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 Startup Settings and inserted automatically whenever the Legalizer 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 Legalizer will begin inserting the packet immediately.

- **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 Legalizer 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.

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

- **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** 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** 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 Legalizer 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 L*Packet 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 Legalizer 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** 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.

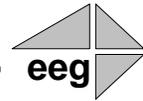
Delete XDS Queue <CTRL+A>L -all <ENTER>

Deletes all packets in the XDS queue. Packets loaded from Startup Settings will be removed from the queue but will remain in Startup Settings storage.

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.



Section 4: Additional Features

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.

Serial Port Pin Assignments

Serial ports 1 and 2 use 9-pin DB9 connectors with the following pin assignments:

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, three wire straight serial cable. A “null modem” cable MAY NOT be used for this purpose since it will reverse the connections of pins 1 and 2.

GPIO Connector Pin Numbering

The GPIO pins are located on the two 16-pin connectors on the rear panel of the CB515. The top connector is used for the GPI switches and the bottom is used for the GPO switches, with the pins numbered in the following manner on each connector:

15	13	11	9	7	5	3	1
16	14	12	10	8	6	4	2

GPI Pin Assignments

The GPIs use the upper 16-pin connector, which mates to a female IDC-16 connector. The pin assignments are given in the table below:

Pin(s)	Input
1,3,5,7,9,11,13,15	Ground
2	GPI-A
4	GPI-B
6	GPI-C
8	GPI-D
10	GPI-E
12	GPI-F
14	GPI-G
16	GPI-H

GPO Pin Assignments

The GPOs use the lower 16-pin connector, which mates to a female IDC-16 connector. The pin assignments are given in the table below:

Pins	Output
1,2	1
3,4	2
5,6	3
7,8	4
9,10	5
11,12	6
13,14	7
15,16	8

GPI Switch Functions

Each GPI Switch is activated when closed (connected to ground), and inactive when open (left floating). The default GPI function mappings are defined as follows (see below for further explanation of the protection functionality):

GPI-A: Protect Top 2 Rows

GPI-B: Protect Top 3 Rows

GPI-C: Protect Bottom 2 Rows

GPI-D: Protect Bottom 3 Rows

GPI-E through GPI-H: No functionality currently defined

The GPI switches can be used to perform caption display relocation. Caption displays can be remapped to avoid either the top rows or bottom rows of the television screen to avoid blocking emergency information, news crawls, or other important graphics. These functions provide compliance with FCC requirements that emergency alert information be visible to closed caption viewers.

Configure GPI Switches <CTRL+A>R *GPI-A GPI-B GPI-C GPI-D* <ENTER>

Each of the four parameters assigns a function to the respective GPI switch. Each parameter should be set to either – (subtract sign), to indicate that the switch should perform its default function, or a two character string that will create a new caption relocation function. The first character of a caption

relocation function should be either **t** to protect an area at the top of the screen by bumping captions down, or **b** to protect an area at the bottom of the screen by bumping captions up. The second character should be an integer between 2 and 4, indicating the number of SD captioning rows that should be protected (HD captions will avoid an approximately equivalent portion of the screen). Once a caption remapping function has been created, simply close the corresponding GPI switch to activate it.

Example: **<CTRL+A>R - b3 t2 - <ENTER>** assigns the second GPI switch to bump captions up from the bottom 3 SD rows and the third switch to bump captions down from the top 2 SD rows, and leaves the first and fourth switches to perform their default operations.

GPO Switch Functions

Each GPO consists of a pair of pins, forming a switch that is CLOSED when the output is ON, and OPEN when the output is OFF. The GPOs on the CB515 do not currently have any behavior defined and are reserved for future use.

Legalizer Status Commands

Report Identification <CTRL+A>? <ENTER>

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

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

Returns the Legalizer'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>

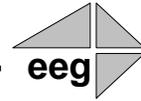
Returns the data recovery status of each Line 21 channel for incoming SD video. ON indicates that data on the channel is being recovered and processed. OFF indicates that the channel has been turned off (see page 14) and incoming data is being ignored.

Report Switch Setting <CTRL+A>n <ENTER>

Returns the current setting of the front panel ENCODER ON bypass switch.

**Monitor Line 21
End Monitoring** <CTRL+A>5 [*Channel*] [*I/O*] <ENTER>
<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.



Appendices

Appendix A: Grand Alliance Interface Protocol

The following table describes the Data Packet Structure used by EEG equipment to send caption data to Grand Alliance protocol ATSC encoders. This protocol has been proven compatible with encoders from all major manufacturers supporting GA protocol.

<u>Byte</u>	<u>Name</u>	<u>Value</u>	<u>Meaning</u>
0	SOH	0x01	ASCII SOH, start of packet
1	Type	0x41	ASCII "A", ATVCC data
		0x31	ASCII "1", NTSC field 1 data
		0x32	ASCII "2", NTSC field 2 data
2	Count	5+n	Packet size, in bytes, including header and trailer bytes.
3	Data 1	EIA-708 data bytes.	
4	Data 2		
2+n	Data n		
3+n	Checksum	<varies>	1 byte checksum. The sum of all bytes in the packet must be zero, modulo 256.
4+n	EOT	0x04	ASCII EOT, end of packet

Notes:

1. The maximum packet size is 128 (0x80).
2. Because the packet size (Count) includes the header and trailer bytes, the minimum valid count is 5. This corresponds to a packet with zero data bytes.
3. This packet structure is applied only to the data for the closed caption serial stream input to the ATSC encoder. Outgoing bytes in the ATSC stream follow the EIA-708B standard.



CB515 Specifications

SDI INPUT VIDEO CHARACTERISTICS

Number of Inputs	2
Connector	BNC per IEC 169-8
Format	SMPTE 292M 1.485 Gbit/s 1080i, 720p, 480p, 24psF or SMPTE 259M 270 Mb/s
Input Impedance	75 Ohms
Equalization	Automatic up to 100m @ 1.5 Gb/s w/ Belden 1694 (or equivalent)
Video Input Level	800 mV p-p \pm 10%, Master Out and Source Monitor Out bypass protected

HD-SDI OUTPUT VIDEO CHARACTERISTICS

Number of Outputs	2 Program Outputs (one bypass relay protected), 1 Source Output (bypass relay protected)
Connector	BNC per IEC 169-8
Format	SMPTE 292M 1.485 Gbit/s or SMPTE 259M 270 Mb/s (matches input format)
Output Impedance	75 Ohms
Output Level	800 mV p-p \pm 10%
DC Offset	0V \pm 0.5V
Rise/Fall Time	200pS nominal
Overshoot	< 10% of amplitude
Wide Band Jitter	< 0.2 UI

DATA INPUT CHARACTERISTICS

Data Ports	Two serial DB-9 jacks, RS232C Serial Data Format 7 data bits, odd parity, 1 stop bit, 1200 baud default
GPIO Input	Eight switches on IDC-16 connector
GPIO Output	Eight switches on IDC-16 connector

FRONT PANEL CONTROLS & DISPLAY

Display	Back-lit LCD display and six-button keypad with navigable menu system and status display
Power Supply Status	For each of two power supplies, green LED indicates active supply and red indicates inactive
Encoder ON	Push-button switch controls bypass state, LED lit for non-bypassed state
Reset	Flush momentary switch, resets the Legalizer

PHYSICAL CHARACTERISTICS

Height	1.75 inches (4.4 cm)
Width	19 inches (48.3 cm)
Depth	10 inches (25.4 cm)
Mounting	Designed for rack mounting with or without chassis slides
Weight	9 lbs. (4.1kg)
Ambient Operating Temp	0° C to 50° C

POWER REQUIREMENTS

Line Voltage	117 VAC 10%
Line Frequency	50/60 Hz
Line Current	0.3 A maximum
Input Power	36 W
Circuit Protection	Internal to On/Off switch, 0.4 A
EMI/RFI	Complies with FCC Part 15 Class A, EU EMC Directive

References

The following specifications have been incorporated into the design of all EEG closed captioning products. They are the definitive sources for additional information regarding the respective technologies that they describe.

ATSC A/53B, ATSC Digital Television Standard, 2001.

EIA/CEA-608-B, Line 21 Data Services, 2000.

EIA-708-B, Digital Television (DTV) Closed Captioning, 1999.

SMPTE 259M, 10-bit 4:2:2 Component and 4fsc Composite Digital Signals – Serial Digital Interface, 1997.

SMPTE 291M, Ancillary Data Packet and Space Formatting, 1998.

SMPTE 292M, Bit-Serial Digital Interface for High Definition Television Systems, 1998.

SMPTE 333M, DTV Closed Caption Server to Encoder Interface, 1999.

SMPTE 334M, Vertical Ancillary Data Mapping for Bit-Serial Interface, 2000.