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REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.1	First Release Edition	Jan 04
1.2	Revised Edition	Jun 04
1.3	Added features & updated block diagram	Oct 04
1.4	Revised Edition	Feb 05
1.5	Revised Edition	Oct 05
1.6	Revised Edition	Dec 05
1.7	Updated standard EIA-608/EIA708 to CEA-608/CEA-708	Dec 06
1.8	Modified DIP switch settings, menu items, and added VistaLINK screens	Nov 07

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1. OVERVIEW

The 7760CCM-HD Closed Caption card is a CEA-608/CEA-708 translator and extends the signal monitoring capabilities of the Evertz monitoring product line by focusing on closed captioning (CEA-608 & CEA-708) and Extended Data Service (XDS). The 7760CCM-HD has the capability to translate CEA-608 captions to CEA-708 captions supporting SMPTE 333M and Grand Alliance format for RS-232 transfer. The 7760CCM-HD also converts SMPTE 334M VANC captions to SMPTE 333M or Grand Alliance format for RS-232 transfer.

The auto detect program input supports both standard definition and high definition formats. The 7760CCM-HD's CEA-608 decoder is capable of decoding VBI line 21, field 1 and 2 and displaying the information on the monitoring output. One of four caption channels (CC1-CC4) and one of four text service channels (T1-T4) can be simultaneously displayed on the monitoring output. In addition, the scrolling XDS display supports all data packets including TSID, CGMS-A, V-Chip, Station Name and Station ID. The CEA-708 decoder is capable of decoding all HD closed caption service channels and displaying the open options on the monitoring output.

The 7760CCM-HD occupies one card slot and can be housed in either a 1RU frame which will hold up to three modules, a 3RU frame which will hold up to 15 modules, or a standalone enclosure which will hold one module.

The built-in CEA-708 caption decoder does not support the full feature set of CEA-708 advance captions and is provided for monitoring & verifying captions only.

Features

- CEA608 / CEA708 translator provides SMPTE 333M or Grand Alliance format output for RS-232 raw caption data transfer
- Supports SMPTE 333M and Grand Alliance Protocol for convenient interface to most ATSC Encoders
- Built in bypass relay on program output video path
- Auto-detect SMPTE 259M (143 to 540 Mb/s), SMPTE 292M (1.5Gb/s) signal input
- Monitoring output decodes and displays upstream CEA-608 and CEA-708 captions
- Decodes and displays closed captions & XDS information on field 1 and 2 for the CEA-608 standard
- Decodes and displays closed caption information for the CEA-708 standard
- Decodes XDS packets containing TSID, CGMS-A, Program ID, Time in Show, Program Name, Program Type, V-Chip Rating, Program Description, Network Name, Station ID, Time of Day and Time of Zone
- VistaLINK® capable for remote monitoring and control via SNMP (using VistaLINK® PRO) when installed in 7700FR-C frame with 7700FC VistaLINK® Frame Controller

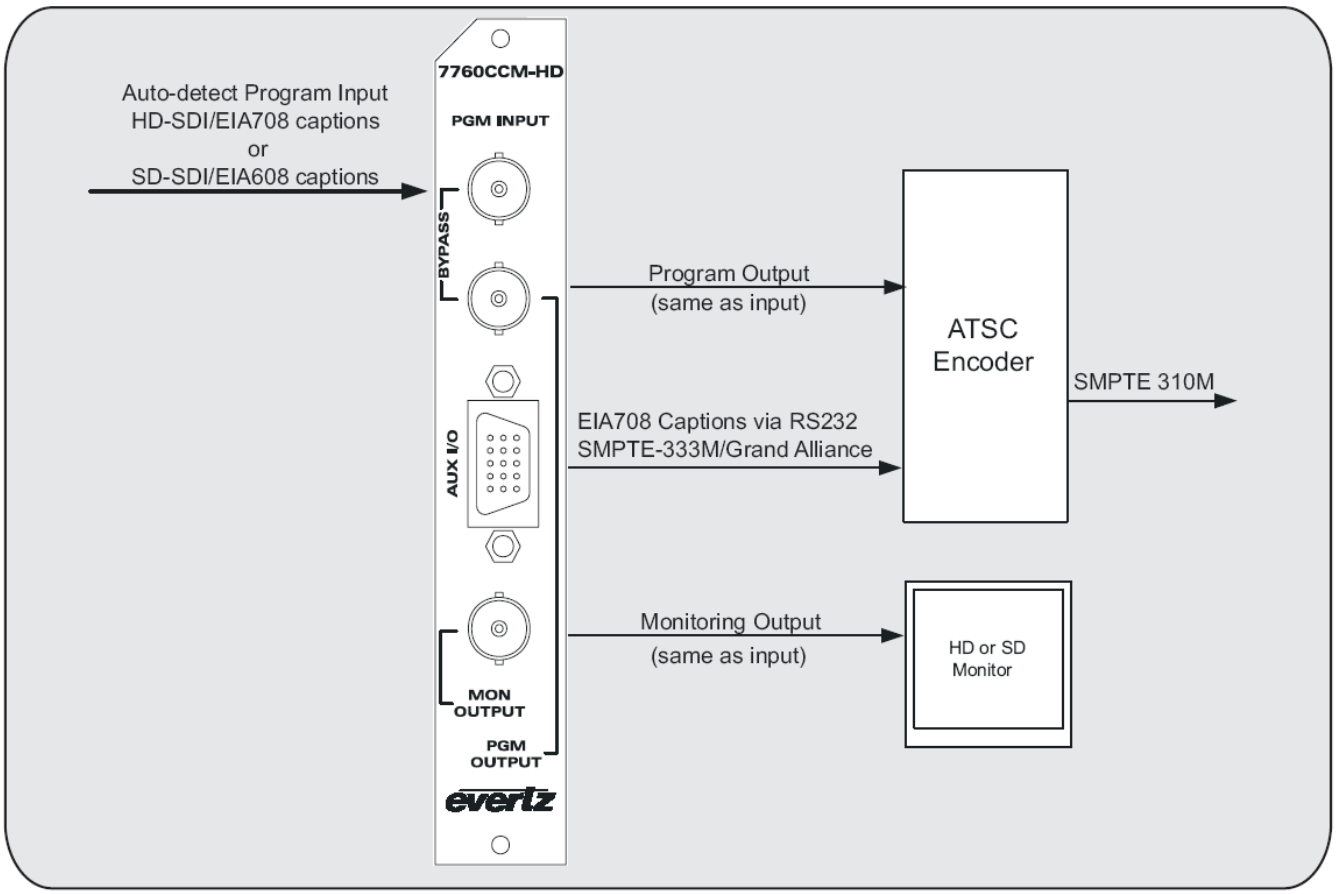


Figure 1-1: 7760CCM-HD Block Diagram

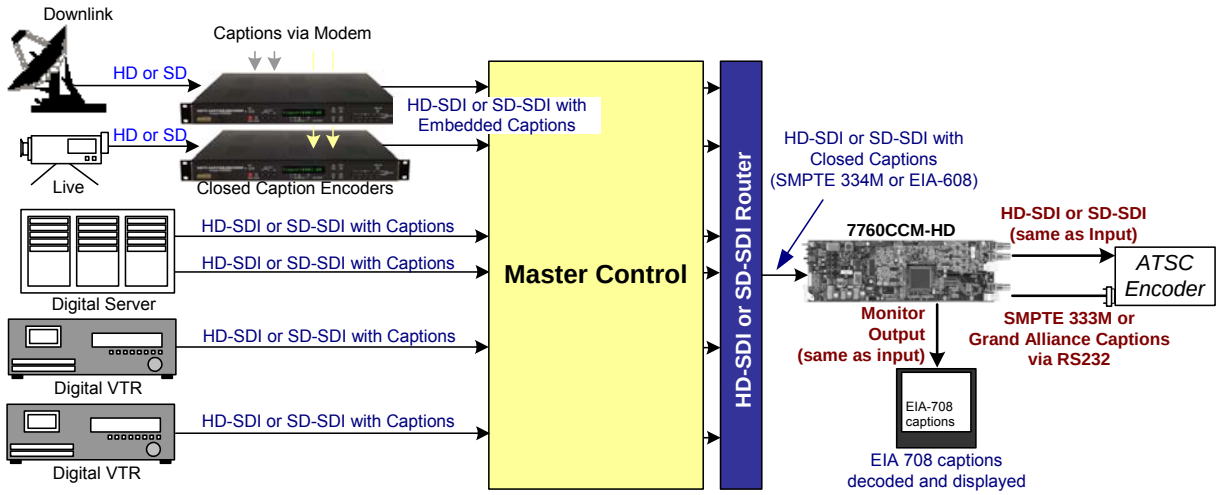


Figure 1-2: 7760CCM-HD Application Diagram

2. INSTALLATION

The 7760CCM-HD module comes with a companion rear plate that has 3 BNC connectors, one high-density female DB-15 and occupies one slot in the 7700FR frame. A DB-15 to DB-9 cable (WCCMTIO) is also included for port communication. For information on mounting the rear plate and inserting the module into the frame see section 3 of the 7700FR chapter.

The 7760CCM-HD card must be inserted into the slot with the correct rear panel. Some cards have physical differences and some have functional differences, therefore the associated labels maybe misleading.

2.1. VIDEO IN AND OUT

Connect a source of HD-SDI or SD-SDI video to the top BNC labeled PGM INPUT. The Input of the 7760CCM-HD will auto detect if the upstream video is SD-SDI or HD-SDI. Unprocessed, re-clocked video output is available on the PGM OUTPUT BNC. Monitoring video with text burn is available on the MON OUTPUT BNC. The output video standard of the PGM and MON output will be the same as the PGM INPUT video. If the card is not present, there will be no signal on any of the outputs. If the card is present, and the power is off, the Bypass relay will be enabled and pass the PGM INPUT to the PGM OUTPUT.

2.2. GENERAL PURPOSE INPUTS AND OUTPUTS

The GPI's are active low with internal pull up resistors (4.7k Ohms) to +5V. To make an input active, lower the signal to near ground potential (i.e. connect to shell or chassis ground). This can be done with a switch, relay, TTL drive, GPO output or other similar method. Figure 2-1 shows the input circuit for the General Purpose inputs.

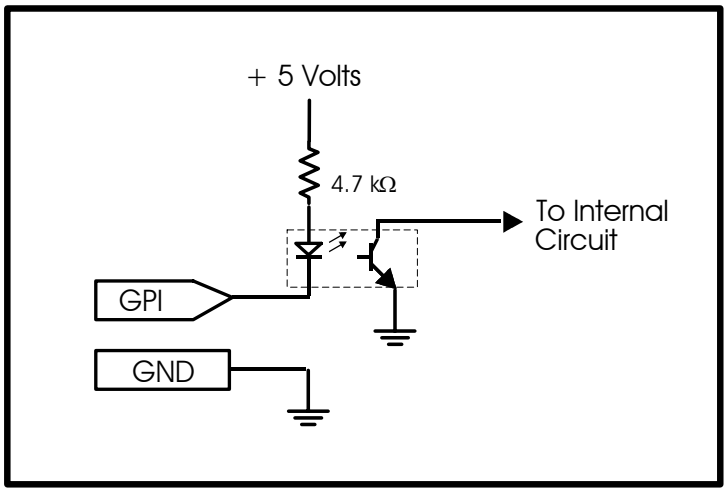


Figure 2-1: GPI Input Circuitry

The GPO's are software programmable active high or low with internal pull up (18kΩ) resistors to +5V. When the output goes low it is able to sink up to 10mA. When high, the signal will go high (+5V). Do not draw more than 100μA from the output. Figure 2-2 shows the circuit for the General Purpose output.

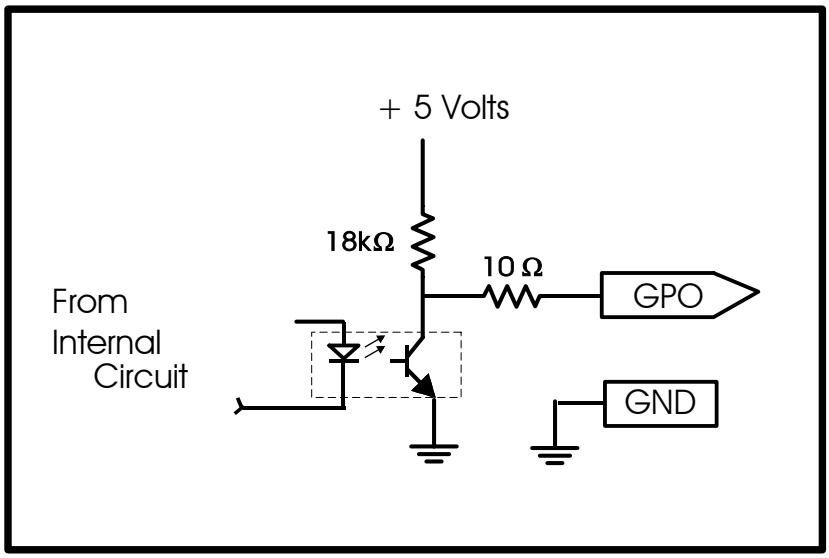


Figure 2-2: GPO Output Circuitry

2.3. HDDB-15 TO DB-9 7760CCM-HD COMMUNICATIONS PORT CABLE

This cable (Evertz Part #: WPCCMTIO-0-6F) is designed to connect the Evertz 7760CCM-HD products to a captioning product. The 7760CCM-HD has a HD-DB-15 "AUX I/O" connector while the user application end will be a male DB-9 configured as a RS-232 DTE without hardware flow control.

2.3.1. AUX I/O Cable End

The comm port and GPI inputs/outputs are available on the female high density DB-15 connector labeled "AUX I/O". The cable must have a male connector. Table 2-1 describes the pin-out of the HD-DB-15 connector.

HB DB-15	Name	Description
1	GPI4	GPI input 4
2	TxD	RS-232 Transmit Output
3	GPI3	GPI input 3
4	GPI1	GPI input 1
5	GND	Ground
6	RxD	RS-232 Receive Input
7	N/C	Not connected
8	GPI2	GPI input 2
9	GND	Ground
10	N/C	Not connected
11	N/C	Not connected
12	GND	Ground
13	GPO1	GPI Output 1
14	GPO2	GPI Output 2
15	N/C	Not connected
Shell	GND	Ground

Table 2-1: 7760CCM-HD AUX I/O Pin-out

The physical layout looks similar to the following:

			6	RxD			
1	GPI4		7	N/C		11	N/C
2	TxD		8	GPI2		12	GND
3	GPI3		9	GND		13	GPO1
4	GPI1		10	N/C		14	GPO2
5	GND					15	N/C

Connect to the shell for ground.

Table 2-2: 7760CCM-HD AUX I/O Physical Layout

2.3.2. DB-9 Communication and GPI/O Cable End

The male DB-9 connector has RS-232 DTE connections.

Name	Description	DB-9
GPI1	N/C	1
GPI2	N/C	4
GPO1	N/C	6
GPO2	N/C	9
RxD	RS-232(from CCM-HD to equipment)	2
TxD	RS-232 (from equipment to CCM-HD)	3
RTS	RS-232 (tied to pin 8)	7
CTS	RS-232 (tied to pin 7)	8
Gnd	Ground	5, Shell

Table 2-3: COM and AUX I/O Pin-out

The physical layout looks similar to the following:

1	N/C		6	N/C
2	TxD		7	RTS
3	RxD		8	CTS
4	N/C		9	N/C
5	Gnd			

The shell is also grounded.

Table 2-4: COM and AUX I/O Physical Layout

2.3.3. Cable Connections

Pins 7 and 8 are shorted together to simulate hardware flow control for those devices that need it. The connectors are connected as follows:

Name	Description	DB-9 Pin #	HD DB-15 Pin #
RxD	RS-232 (from CCM-HD to equipment)	2	2
TxD	RS-232 (from equipment to CCM-HD)	3	6
RTS	RS-232	7 *	NONE
CTS	RS-232	8 *	NONE
GND	Ground	5, Shell	5, Shell

Table 2-5: Cable Connections

3. SPECIFICATIONS

3.1. HD/SD SERIAL DIGITAL INPUT

Standard:	SMPTE 259M-C, SMPTE 292M
Connector:	1 BNC per IEC 169-8
Termination:	75 ohm
Equalization:	Automatic to 100m @ 1.5Gb/s with Belden 1694 (or equivalent) Automatic to 250m @270Mb/s with Belden 1694 (or equivalent)
Return Loss:	>10dB up to 1.5 Gb/s

3.2. RECLOCKED OUTPUT

Standard:	Same as input
Number of Outputs:	1
Connector:	BNC per IEC 169-8
Signal Level:	800mV nominal
DC Offset:	0V ±0.5V
Rise and Fall Time:	200ps nominal
Overshoot:	< 10% of amplitude
Return Loss:	> 10db up to 1.5 Gb/s
Wideband Jitter:	< 0.2 UI

3.3. MONITORING OUTPUT

Standard:	Same as input
Reclocked Outputs:	1
Connector:	BNC per IEC 169-8
Signal Level:	800mV nominal
Rise and Fall Time:	740ps nominal (SD-SDI) 200ps nominal (HD-SDI)
Output Impedance:	7$\tilde{5}$ Ω
Return Loss:	>15dB up to 270Mb/s

3.4. GENERAL PURPOSE INTERFACE (GPI) INPUT/OUTPUT

Number of Inputs:	4 (behavior is assigned via on screen menu items)
Number of Outputs:	2 (behavior is assigned via on screen menu items)
Type:	Opto-isolated, active low with internal pull-ups to +5V
Connector:	Female High Density DB-15
Signal Level:	+5V nominal

3.5. SERIAL PORT

Standard:	RS-232
Connector:	Female High Density DB-15
Baud Rate:	19200/38400/57600
Format:	8-bits, no parity, 1 stop bits and no flow control

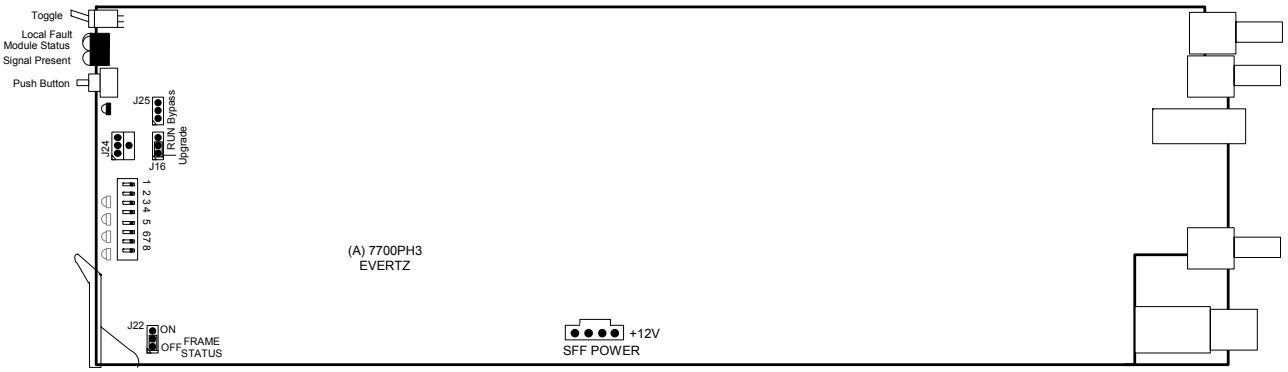
3.6. ELECTRICAL

Voltage:	+12V DC
Power:	12 Watts
EMI/RFI:	Complies with FCC Part 15 Class A EU EMC Directive

3.7. PHYSICAL

Number of Slots:	1

4. STATUS LEDS



4.1. 7760CCM-HD MODULE STATUS LEDS

The 7707CCM-HD module has 8 LED Status indicators on the front card edge to show operational status of the card at a glance.

Three large LEDs on the front of the board indicate the general health and status of the module.

LOCAL FAULT: This Red LED indicates poor module health and will be On if a board power fault exists (i.e.: a blown fuse). The LOCAL FAULT indication can also be reported to the frame through the FRAME STATUS jumper.

MODULE OK: This Green LED indicates good module health. It will be On when the board power is good.

SIGNAL PRESENT: This Green LED will be on when there is a valid HD-SDI or SD-SDI video signal present at the module PGM input.

Five Small LEDs on the front of the board have not yet been assigned any functionality.

5. ON SCREEN MENUS

5.1. NAVIGATING THE ON SCREEN MENU SYSTEM

A toggle switch and pushbutton allow card edge navigation for a set of on-screen menus used to configure the card.

To enter the on-screen menu system, press the pushbutton once. This will bring you to the main setup menu where you can use the toggle switch to move up and down the list of available sub-menus. An arrow (>) moves up and down the left hand side of the menu items to indicate which item you are currently choosing. Once the arrow is on the desired item, press the pushbutton to select the next menu level.

On all menus, there are two extra selectable items: *Back* and *Exit*. Selecting *Back* will take you to the previous menu (the one that was used to get into the current menu) while *Exit* will return the display to its normal operating mode. On the main menu, BACK and EXIT will both take you to the normal operating mode.

Once in a sub-menu, there may be another menu layer, or there may be a list of parameters to adjust. If there is another set of menu choices, use the toggle switch to select the desired menu item and press the pushbutton.

To adjust any parameter, use the toggle switch to move up or down to the desired parameter and press the pushbutton. The arrow will move to the right hand side of the line (<) indicating that you can now adjust the parameter. Using the toggle switch, adjust the parameter to its desired value. If the parameter is a numerical value, the number will increase if you lift the toggle switch and decrease if you push down on the toggle switch. If the parameter contains a list of choices, you can cycle through the list by pressing the toggle switch in either direction.

When you have stopped at the desired value, depress the pushbutton. This will update the parameter to the selected value and move the arrow back to the left side of the parameter list (>). Continue selecting and adjusting other parameters or use the BACK or EXIT commands.

5.2. CHANGING TEXT FIELDS

Some of the controls of the OSD menu allow you to adjust a text-based field. Editing a line of text can be a little tedious with a toggle switch and a pushbutton, but it can be done with the following procedure:

1. Select the text to edit by pressing the pushbutton when the menu item is selected. This will take you to a screen that has the label/name of the text being edited and a white box. The white box contains the text to change and is drawn to the maximum size of the text field.
   SAMPLE TEXT
   ^
   Note the arrow (^) under the character. This indicates which character you will be changing with the toggle switch.

2. Use the toggle switch to change the first character of the text message.

3. Once you have selected the desired character, press the pushbutton. This will advance the arrow to the next character. Continue changing the remainder of the characters in the same way.

4. There are two special characters to help you enter the text: a backspace character (left pointing arrow), and an end of line character (stop sign):

Left Arrow: If you have accidentally advanced to the next character and want to go back, select the left arrow with the toggle switch. When you press the pushbutton, you will go back to the previous character. This will save you from having to finish editing the text and then going back to re-edit it to change the mistake.

Stop Sign: If you are done changing the text, and the new text is shorter than the old text, you can terminate the line with a stop sign. When you use the pushbutton after selecting the stop sign, any remaining characters in the text field will be erased and you will return to the menu structure.

Your editing is complete when you reach the end of the field (maximum length), or you select the *stop sign* and press the pushbutton.

5.3. ON SCREEN DISPLAY – MAIN MENU

The OSD menu is arranged in a layered structure that groups similar configuration items together. The following section gives a brief description of the first level of menus that appear when you enter the OSD screens. Selecting one of these items will take you to the next menu level.

Video	Control for video processing operation.
On Screen Display	Configures On screen display. 608 decoder, 708 decoder, and status display.
SD Line Encoder	Sets CGMS and Program Ratings. Controls Keyer function and closed caption SHIFT feature.
608-708 Translator	Options to map CC and text channels to CEA-708 standard.
Fault configuration	Definition of the fault conditions. Configuration of the fault message windows.
GPIO Setup	Setup General Purpose Inputs and Outputs.
Serial Link Setup	RS232 Serial output setup.
Utilities	Options for storing and recalling presets, firmware version, upgrade, and factory reset.

5.4. CONFIGURING THE VIDEO CONTROLS

The *Video* menu is used to configure parameters associated with the video input and output features.

SD Video	Selects the SD-SDI input video standard.
HD Video	Selects the HD-SDI input video standard.

5.4.1. Setting the SD-SDI Video Standard

Video *SD Video* *525*	The SD-SDI input video standard is selected with this control.

5.4.2. Setting the HD-SDI Video Standard

Video *HD Video* *Auto* *1035i/59.94* *1035i/60* *720p/50* *720p/59.94* *720p/60* *1080p/23.98sF* *1080p/24sF* *1080p/25sF* *1080p/29.97sF* *1080p/30sF* *1080i/50* *1080i/59.94* *1080i/60*	The HD-SDI input video standard is selected with this control

5.5. CONFIGURING THE ON SCREEN DISPLAY

The On Screen Display Setup menu allows the user to configure the 608 and 708 decoder, and status display.

Open Captions on Output	Allows the user to enable the On Screen Display on the Program Output.
OSD Display	Configures the output of the OSD display.
CEA-608 Decoder	Configures the CEA-608 decoder display.
CEA-708 Decoder	Configures the CEA-708 decoder display.
Status Disp	Displays the Status of the selected Faults.

5.5.1. Setting the OSD on Program Output

On Screen Display *Open Captions on Output* *Off* *On* *GPI 1 to 4*	Allows the user to enable or disable the On Screen Display on the program output. This includes enabling CEA-608 or CEA-708 caption burn in on the program output.

5.5.2. Setting the OSD Display

- *On Screen Display*
  - *OSD Display*
    - *Off*
    - *Decode CEA-608*
    - *Decode CEA-708*
    - *Status Display*

Selecting one of the four display options will configure the monitoring output.

Off turns the OSD off.

The *CEA-608 Decoder* is configured under the CEA-608 Decoder menu outlined in section 5.5.3.

The *CEA-708 Decoder* is configured under the CEA-708 Decoder menu outlined in section 5.5.10.

The *Status Display* is configured under the Status Display menu outlined in sections 5.5.11 to 5.5.15.

5.5.3. Configuring the CEA-608 Decoder Closed Caption Channel

- *On Screen Display*
  - *CEA-608 Decoder*
    - *CC Channel*
      - *1 to 4*
      - *Off*

Selects the CEA-608 caption channel that the decoder will decode. Channels 1 through 4 can be selected or the function can be turned off.

5.5.4. Configuring the CEA-608 Decoder Text Channel

- *On Screen Display*
  - *CEA-608 Decoder*
    - *Text Channel*
      - *1 to 4*
      - *Off*

Selects the CEA-608 text channel that the decoder will decode. Channels 1 through 4 can be selected or the function can be turned off.

5.5.5. Configuring the CEA-608 Decoder Text Window Position

- *On Screen Display*
  - *CEA-608 Decoder*
    - *Text Window Top Row*
      - *1-15*

This feature allows the user to anchor the position of the Text Window displayed on the OSD. Anchor points 1-15 are available.

5.5.6. Configuring the CEA-608 Decoder Text Window Height

- *On Screen Display*
  - *CEA-608 Decoder*
    - *Text Window Height*
      - *2-15*

Allows the user to select the height of the Text Window displaying the Text Channel information on the OSD. The text window height can be adjusted from 2-15.

5.5.7. Configuring the CEA-608 Decoder XDS Window Display Type

On Screen Display
CEA-608 Decoder
XDS Display
Fixed Position Scrolling Display Off

The information display of the XDS window can be configured three different ways. The fixed position window is at a constant height and will display the XDS information within the selected area. Scrolling Display will display the XDS information as it is received by the card. Selecting Off will disable the XDS feature.

5.5.8. Configuring the CEA-608 Decoder XDS Anchor Point

On Screen Display
CEA-608 Decoder
XDS Window Top Row
1-15

This feature allows the user to anchor the position of the XDS Window displayed on the OSD. Anchor points 1 through 15 are available.

5.5.9. Configuring the CEA-608 Decoder XDS Window Height

On Screen Display
CEA-608 Decoder
XDS Window Height
2-15

Allows the user to select the height of the XDS Window displaying the XDS information on the OSD. The height of the window can be adjusted from 2 to 15.

5.5.10. Configuring the CEA-708 Decoder Channel Select

On Screen Display
CEA-708 Decoder
CEA-708 Service= 1 through 63

This allows the user to select the CEA-708 CC service to be decoded. Services 1 through 63 can be selected.

5.5.11. Configuring Status Display CDP Faults

On Screen Display
Status Disp
CDP Faults

The Status Disp menu allows the user to configure the Faults that will be displayed in the Status Display Window. The CDP Faults display shows all upstream CDP faults on the Program Input.

5.5.12. Configuring the Status Display SMPTE 333M Faults

On Screen Display
Status Disp
SMPTE 333M Faults

The Status Disp menu allows the user to configure the Faults that will be displayed in the Status Display Window. The SMPTE 333M Fault setting reports communication and interoperability errors between the 7760CCM-HD and the ATSC encoder. Please note the errors reported before calling the factory for troubleshooting.

5.5.13. Configuring the Status Display XDS Status (Old)

On Screen Display
Status Disp
XDS Status (old)

The Status Disp menu allows the user to configure the Faults that will be displayed in the Status Display Window.

5.5.14. Configuring the Status Display XDS Status/Faults

On Screen Display
Status Disp
XDS Status/Faults

The Status Disp menu allows the user to configure the Faults that will be displayed in the Status Display Window. The XDS Status/Faults window displays information about the upstream XDS data. The Status section summarizes the XDS packets inserted, and the faults display errors found in the XDS.

5.5.15. Configuring the Status Display CC/Text Status

On Screen Display
Status Disp
CC/Text Status

The Status Disp menu allows the user to configure the Faults that will be displayed in the Status Display Window. The CC/Text Status shows the presence of upstream closed caption and text data.

5.6. SD LINE 21 ENCODER

The SD Line 21 Encoder menu allows the user to manipulate the upstream SD Captions.

SD CC Encode Line	Controls the line number to encode CEA-608 CC on SD-SDI video.
Field 1 Keyer	Allows the user to enable or disable the keyer function for field 1 only.
Field 2 Keyer	Allows the user to enable or disable the keyer function for field 2 only.
CC Shift Up	The CC shift up feature shifts the closed caption data up 2 lines.
CC Shift Down	The CC shift down feature shifts the closed caption data down 2 lines.
Set Ratings	Static insertion of program rating.
Set CGMS	Static insertion of CGMS data.
Set TSID	Sets Transmission ID packet.
TSID Number	Sets Transmission Signal ID to insert into the SD signal.
Set Net Name	Enables the user to edit the Network Name packet data.
Name	Allows the user to create and edit the Network Name.
Set Call Letter	Controls the insertion of the call letters into the SD video stream.
Call Letters	Enables the user to edit the station call letters (ie. The station ID packet data)

5.6.1. SD CC Encode Line

SD Line 21 Encoder
SD CC Encode Line
10 –25

This control enables the user to control the line number of the output SD video that is encoded with the CEA-608 captioning.

5.6.2. Field 1 Keyer

- *SD Line 21 Encoder*
  - *Field 1 Keyer*
    - *Off*
    - *On*
    - *GPI 1-4*

The Field 1 Keyer function is controlled via the card edge menu or via GPI's 1 through 4. Enabling the keyer permits the 7760CCM-HD to encode XDS Caption data. Disabling the keyer will pass all upstream data.

5.6.3. Field 2 Keyer

- *SD Encoder Setup*
  - *Filed 2 Keyer*
    - *Off*
    - *On*
    - *GPI 1-4*

The Field 2 Keyer function is controlled via the card edge menu or via GPI's 1 through 4. Enabling the keyer permits the 7760CCM-HD to encode XDS Caption data. Disabling the keyer will pass all upstream data.

5.6.4. Closed Caption Shift Up

- *SD Encoder Setup*
  - *CC Shift Up*
    - *Off*
    - *On*
    - *GPI 1-4*

The Closed Caption Shift function Shifts the closed caption data by 2 lines. The CC Shift Up feature will shift the closed captions up 2 lines from the bottom of the screen. The feature can be enabled via the card edge or through GPI's 1 through 4.

5.6.5. Closed Caption Shift Down

- *SD Encoder Setup*
  - *CC Shift Down*
    - *Off*
    - *On*
    - *GPI 1-4*

The Closed Caption Shift function Shifts the closed caption data by 2 lines. The CC Shift Down feature will shift the closed captions down 2 lines from the top of the screen. This feature can be enabled via the card edge or through GPI's 1 through 4.

5.6.6. Set Program Rating

- *SD Encoder Setup*
  - *Set Ratings*
    - *Pass Upstream*
    - *Block Upstream*
    - *(MPAA Ratings)*
    - *(USTV Ratings)*
    - *(CDN Ratings)*

The Program rating for the CEA-608 data can be inserted via card edge. The Pass upstream and Block Upstream will pass or block the upstream Program Rating data. The following Ratings can be inserted statically with the 7760CCM-HD:
MPAA Ratings
USTV Ratings
CDN Ratings

5.6.7. Set CGMS Data Insertion

SD Encoder Setup
Set CGMS
Pass Upstream
Block Upstream
Copy Permitted
Copy Permitted ASB
One Generation
One Generation ASB
No Copy
No Copy ASB
PSP SB: Off
PSP SB:Off ASB
PSP SB: 2ln
PSP SB: 2ln ASB
PSP SB: 4ln
PSP SB: 4ln ASB

The CGMS (Copy Generation Management System) packet can be inserted statically via card edge. The *Pass Upstream* and *Block Upstream* will pass or block upstream CGMS data. Use the toggle switch to scroll to the desired CGMS packet to insert and press the pushbutton to enable.

5.6.8. Set TSID

SD Encoder Setup
Set TSID
Pass Upstream
Block Upstream
Insert Packet

This control enables the user to control whether the Transmission signal ID is passed from an upstream source, blocked from an upstream source, or if the card inserts a TSID into the video stream.

5.6.9. TSID Number

SD Encoder Setup
TSID Number
0 – 65535

This control enables the user to set the TSID Number to be inserted into the video stream using the above control.

5.6.10. Set Net Name

SD Encoder Setup
Set Net Name
Pass Upstream
Block Upstream
Insert Packet

This control enables the user to control whether the Network Name is passed from an upstream source, blocked from an upstream source or if the card inserts the Network Name into the video stream.

5.6.11. Name

SD Encoder Setup
Name
2-2 Characters
A-Z, 0 to 9

This control enables users to create and edit a Network Name. The Name can be alphanumeric with a minimum of 2 characters and a maximum of 25 characters.

5.6.12. Set Call Letters

SD Encoder Setup	
Set Call Lett	
Pass Upstream *Block Upstream* *Insert Packet*	

This control enables users to control whether the call letters are passed from an upstream source, blocked from an upstream source, or if the card inserts call letters into the video stream.

5.6.13. Enabling Call Letters

SD Encoder Setup	
Call Letters	
A – Z; 0 to 9	

This control enables users to create and edit the Station Call Letters (Station ID). The packet can be alphanumeric with a minimum of 4 characters and a maximum of 6 characters.

5.7. CONFIGURING THE 608-708 TRANSLATOR

The 608-708 Translator menu is used to configure parameters associated with the CEA-608 to CEA-708 translator.

608/708 Delay Queue
CC (1-4) to 708 Service
T (1-4) to 708 Service

Allows the user to add delay to the captions between the 608 to 708 translation process.

Allows the user to select the CEA-708 service that the Closed caption data will be translated to.

Allows the user to select the CEA-708 service that the Text data will be translated to.

5.7.1. Configuring the 608-708 Delay Queue

608-708 Translator	
608/708 delay queue	
0 frames *1-30*	

Configures the number of frames of delay introduced when translating captions from CEA-608 to CEA-708.

5.7.2. Close Caption to Service Translation

608-708 Translator	
CC (1 to 4) to 708 Service	
Off *1 - 63*	

The CC to 708 service parameter allows the user to select which CEA-708 service the CEA-608 CC channels will be mapped to. Services 1 through 63 are available. For simplicity, only CC is shown. CC1 to CC4 are configurable separately.

5.7.3. Text Channel to 708 Translation

608-708 Translator	
T (1 to4) to 708 Service	
Off *1 - 63*	

The T to 708 service parameter allows the user to select which CEA-708 service the CEA-608 Text channels will be mapped to. Services 1 through 63 are available. For simplicity, only T is shown. Text 1 to Text 4 are configurable separately.

5.8. FAULT CONFIGURATION PARAMETERS

Fault Condition 1	Configures the parameters that will enable Fault Conditions
Fault Condition 2	Configures the parameters that will enable Fault Conditions
Fault Condition 3	Configures the parameters that will enable Fault Conditions
Fault Condition 4	Configures the parameters that will enable Fault Conditions

5.8.1. Configuring Fault Condition 1 Video Absent

Fault Configuration
- *Fault Condition 1*
  - *Video Absent*
    - *Enable*
    - *Disable*

Enabling this parameter will trigger Fault Condition 1 when video is absent upstream to the 7760CCM-HD. Select Disable to turn this feature off. Fault Conditions two, three, and four are configured the same way as Fault Condition 1.

5.8.2. Configuring Fault Condition 1 CC Waveform Absent

Fault Configuration
- *Fault Condition 1*
  - *CC Waveform Absent*
    - *Enable*
    - *Disable*

Enabling this parameter will trigger Fault Condition 1 when Closed Captions are not present in the upstream SD-SDI or HD-SDI video. Select Disable to turn this feature off. Fault Conditions two, three, and four are configured the same way as Fault Condition 1.

5.9. GPIO CONFIGURATION

GPIO Setup	Configures the active levels of the general purpose Inputs

5.9.1. Configuring the General Purpose I/O's

GPIO Setup
- *GPI (1 to 4) Active level*
  - *Low*
  - *High*

The GPIO setup allows the user to configure the active level of the GPI's. Active low will trigger the Input when the GPI is grounded. Active high will trigger the GPI when +5V is applied. GPI's 1 through 4 can be configured.

5.10. CONFIGURING THE SERIAL LINK SETUP

Serial Link Setup
- *Off*
- *SMPTE 333M*
- *Grand Alliance*
- *CEA-608 Transmit*

The Serial output of the 7760CCM-HD can be configured for SMPTE 333M, Grand Alliance or CEA-608 Transmit protocols. Please ensure the Serial Link setting is configured properly to communicate with your ATSC encoder. Selecting Off will disable RS232 communication.

5.11. USING THE 7760CCM-HD UTILITIES

The tools in the utilities menu allow the user to gather, save, and restore information and configurations for the 7760CCM-HD card.

About…	Provides information about your 7760CCM-HD card.
Store Presets 1 to 4	Stores the configurations of the 7760CCM-HD card.
Recall Presets 1 to 4	Recalls the configurations that were saved with the Store Presets control.
Upgrade	Upgrades the firmware to a newer version.
Factory Reset	Resets all parameters to factory defaults.

5.11.1. Using the About Parameter

Utilities
- *About…*

The *About…* parameter provides information about the card regarding Software version, Board revision, Hardware version, and Serial Number.

5.11.2. Storing Presets

Utilities
- *Store Preset 1*
  - *Store*
  - *Cancel*

This feature allows the user to store the current settings of the 7760CCM-HD card. These presets can be recalled at any time using the Recall Preset function.

For the sake of simplicity in this manual, only *Store Preset 1* is described, however, Presets 2 through 4 are stored the same way as Preset 1.

5.11.3. Recalling Presets

Utilities
- *Recall Preset 1*
  - *Recall*
  - *Cancel*

This feature allows the user to recall the stored settings of the 7760CCM-HD card. These presets are stored using the Store preset function.

For the sake of simplicity in this manual, only *Recall Preset 1* is described, however, Presets 2 through 4 are recalled the same way as Preset 1.

5.11.4. Card Edge Upgrade

Utilities
- *Upgrade*
  - *Yes*
  - *Cancel*

This feature allows the user to upgrade the firmware of the unit through the RS-232 port located on the card edge (J24) without removing it from the frame. Select *Yes* to begin the upgrade procedure. See section 8.1.2 for detailed upgrade instructions.

5.11.5. Card Edge Upgrade

Utilities
Factory Reset
Yes
Cancel

This feature re-configures all parameters to default factory settings. Please note all card configuration will be lost.

6. DIP SWITCH CONTROL

6.1. DIP SWITCH SETTINGS

The 7760CCM-HD has DIP switches located near the card edge. DIP switch 6 controls whether the OSD selects the input video standard (up position) or if the DIP switches select the input standard (down position). Table 6-1 shows the DIP switch settings used to control the input video standard when DIP switch 6 is down. Any other switch settings are inapplicable and may block or corrupt the output video.

DIP Switch					Common Name	Pixels x Active Lines	Frame Rate	Progressive /Interlace
1	2	3	4	5				
Off	Off	Off	Off	Off	1080i/60	1920 x 1080	30	I
On	Off	Off	Off	Off	1080i/59.94	1920 x 1080	29.97 (30/1.001)	I
Off	On	Off	Off	Off	1080i/50	1920 x 1080	25	I
Off	Off	On	Off	Off	1080p/30sF	1920 x 1080	30	P (sF)
Off	On	On	Off	Off	1080p/29.97sF	1920 x 1080	29.97 (30/1.001)	P (sF)
Off	Off	Off	On	Off	1080p/25sF	1920 x 1080	25	P (sF)
Off	On	Off	On	Off	1080p/24sF	1920 x 1080	24	P (sF)
Off	Off	On	On	Off	1080p/23.98sF	1920 x 1080	23.98 (24/1.001)	P (sF)
On	Off	On	On	Off	720p/60	1280 x 720	60	P
Off	On	On	On	Off	720p/59.94	1280 x 720	59.94 (60/1.001)	P
On	On	On	On	Off	1035i/60	1920 x 1035	30	I
Off	Off	Off	Off	On	1035i/59.94	1920 x 1035	29.97 (30/1.001)	I
On	Off	Off	Off	On	720p/50	1280 x 720	50	P
Off	On	Off	Off	On	525i/59.94	1440 x 487	29.97 (30/1.001)	I
On	On	Off	Off	On	625i/50	1440 x 576	25	I

Table 6-1: Video Format Dip Switch Settings

6.2. CHANGING PARAMETERS USING THE DIP SWITCHES

1. Set DIP switch 1 to the open position.

2. Using the WPCCMTIO cable, connect DB15 on the rear panel of the 7760CCM-HD to the SMPTE-333M caption ingest port on the ATSC encoder. The pin-out of the DB9M is DTE. The null-modem cable is also required for some ATSC encoders, to convert the pin-out to DCE.

3. Connect HD-SDI video to the SDI INPUT BNC connector on the rear panel of 7760CCM-HD. Note that the video outputs of 7760CCM-HD are not yet functional.

4. Connect the 6-way ribbon cable from J24 (debug serial port) on the 7760CCM-HD card to an available RS-232 serial COM port on the PC.

5. On the PC, run a serial terminal program such as HyperTerminal to communicate with the 7760CCM-HD. COM setup is: 57,600 baud, 8 data bits, NO parity bits, 1 stop bit, NO flow control.

6. Apply +12V power to the 7760CCM-HD. You will see text appear in the terminal window similar to the following:

```
EVERTZ MCF5407 MONITOR 2.5 BUILD 9
COPYRIGHT 1997, 1998, 1999, 2000, 2001, 2002 EVERTZ MICROSYSTEMS LTD.
28F160C3B FLASH DETECTED
MCF5407 COLD BOOT> BOOTING...
(A)7700PH3 7760CCM-HD hardware build 1, S/N 0000000000.
7760CCM-HD software v1.00 build 1
Load virtex
Reset virtex
Init virtex
Init presets
Preset version is 0
Enable interrupts
Initialize UI
```

7. Use DIP5 to DIP8 to select the desired parameter. Use DIP switch Table 6-1 to select the parameters that need to be changed.

8. Use the toggle switch to select the desired option. The parameter will appear on the terminal program. Use the pushbutton to display what the parameter is set to.

7. JUMPERS

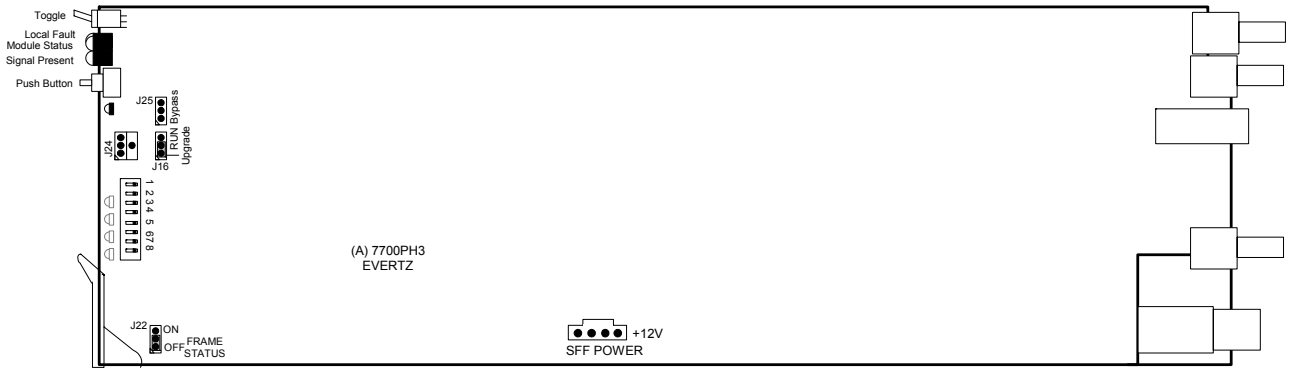


Figure 7-1: 7760CCM-HD Jumpers

7.1. SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

The FRAME STATUS jumper J22 determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

FRAME STATUS To monitor faults on this module with the frame status indicators (on the Power Supply FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper in the On position. (Default)

When this jumper is installed in the Off position local faults on this module will not be monitored.

7.2. SETTING THE 7760CCM-HD INTO RUN AND UPGRADE MODE

RUN/UPGRADE The Run/Upgrade jumper is set to Run during normal operation of the card. When the firmware needs to be upgraded, the jumper is set to the upgrade mode. Please see section 8 for instructions on how to upgrade the firmware.

8. FIRMWARE UPGRADE

8.1. FIRMWARE UPGRADE

1. Connect the 6-way ribbon cable from J24 (debug serial port) on the 7760CCM-HD card to an available RS-232 serial COM port on the PC.

2. On the PC, run a serial terminal program such as HyperTerminal to communicate with the 7760CCM-HD. COM setup is: 57,600 baud, 8 data bits, NO parity bits, 1 stop bit, NO flow control.

8.1.1. Upgrading using the Run/Upgrade Jumper

1. Set the Upgrade/Run Jumper to Upgrade mode, then power up the unit.

2. The following prompt will appear on the terminal program:

```
EVERTZ MCF5407 MONITOR 2.5 BUILD 9
COPYRIGHT 1997, 1998, 1999, 2000, 2001, 2002 EVERTZ MICROSYSTEMS LTD.
28F160C3B FLASH DETECTED
BRD=7700PH3
MODEL=BA7700PH3-CCMHD
PROD=7760CCM-HD
FRAME=7700FR
UPGRADE JUMPER INSTALLED

UPLOAD FILE NOW, CONTROL-X TO CANCEL
```

3. Send the .bin file to the 7760CCM-HD using the **Xmodem** protocol.

4. After the file is uploaded into the 7760CCM-HD, set the Upgrade/Run jumper back to the Run position and power cycle the unit.

8.1.2. Upgrading using the OSD Menu

1. The unit does not need to be powered down for this method of upgrade.

2. Select the Upgrade sub-menu under the Utilities menu and select YES to begin the upgrade. See section 5.11.4.

3. The following prompt will appear on the terminal program:

```
EVERTZ MCF5407 MONITOR 2.5 BUILD 9
COPYRIGHT 1997, 1998, 1999, 2000, 2001, 2002 EVERTZ MICROSYSTEMS LTD.
28F160C3B FLASH DETECTED
BRD=7700PH3
MODEL=BA7700PH3-CCMHD
PROD=7760CCM-HD
FRAME=7700FR
UPGRADE JUMPER INSTALLED

UPLOAD FILE NOW, CONTROL-X TO CANCEL
```

4. Send the .bin file to the 7760CCM-HD using the **Xmodem** protocol.

5. After the file is uploaded, the upgrade is complete.

9. *VISTA*LINK® REMOTE MONITORING/CONTROL

9.1. WHAT IS *VISTA*LINK®?

VistaLINK® is Evertz's remote monitoring and configuration platform which operates over an Ethernet network using Simple Network Management Protocol (SNMP). SNMP is a standard computer network protocol that enables different devices sharing the same network to communicate with each other. VistaLINK® provides centralized alarm management, which monitors, reports, and logs all incoming alarm events and dispatches alerts to all the VLPro Clients connected to the server. Card configuration through VistaLINK® PRO can be performed on an individual or multi-card basis using simple copy and paste routines, which reduces the time to configure each module separately. Finally, VistaLINK® enables the user to configure devices in the network from a central station and receive feedback that the configuration has been carried out.

There are 3 components of SNMP:

1. An SNMP manager, also known as a Network Management System (NMS), is a computer running special software that communicates with the devices in the network. Evertz VL-Fiber demo Manager graphical user interface (GUI), third party or custom manager software may be used to monitor and control Evertz *Vista*LINK® enabled fiber optic products.

2. Managed devices (such as 7707IT cards), each with a unique address (OID), communicate with the NMS through an SNMP Agent. Evertz *Vista*LINK® enabled 7700 series modules reside in the 3RU 7700FR-C MultiFrame and communicates with the manager via the 7700FC *Vista*LINK® frame controller module, which serves as the Agent.

3. A virtual database, known as the Management Information Base (MIB), lists all the variables being monitored, which both the Manager and Agent understand. Please contact Evertz for further information about obtaining a copy of the MIB for interfacing to a third party Manager/NMS.

For more information on connecting and configuring the *Vista*LINK® network, see the 7700FC Frame Controller chapter.

9.2. VISTALINK® GUI SCREENS

The following screen shots show the VistaLINK® GUI screens.

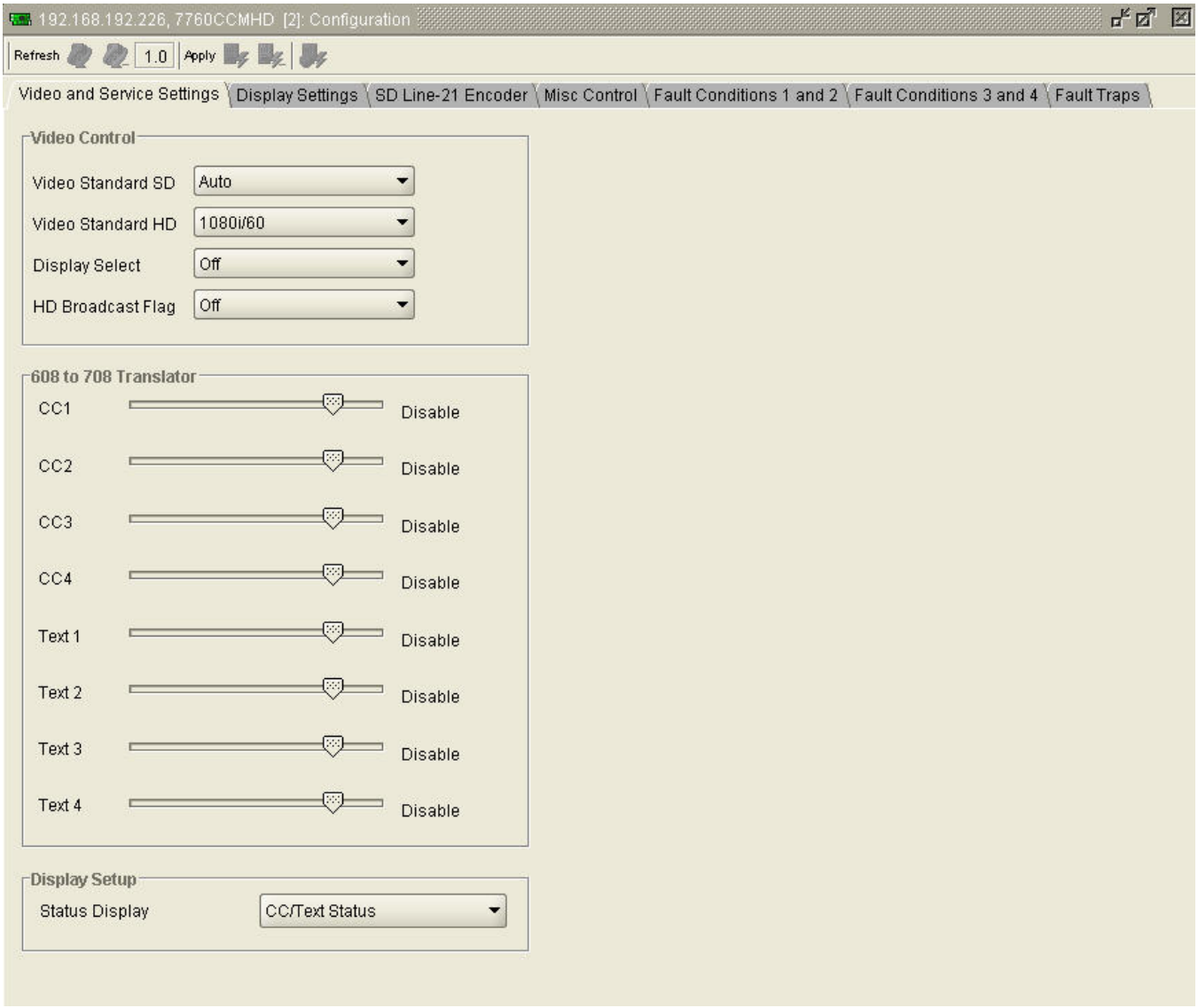


Figure 9-1: Video and Service Settings Window

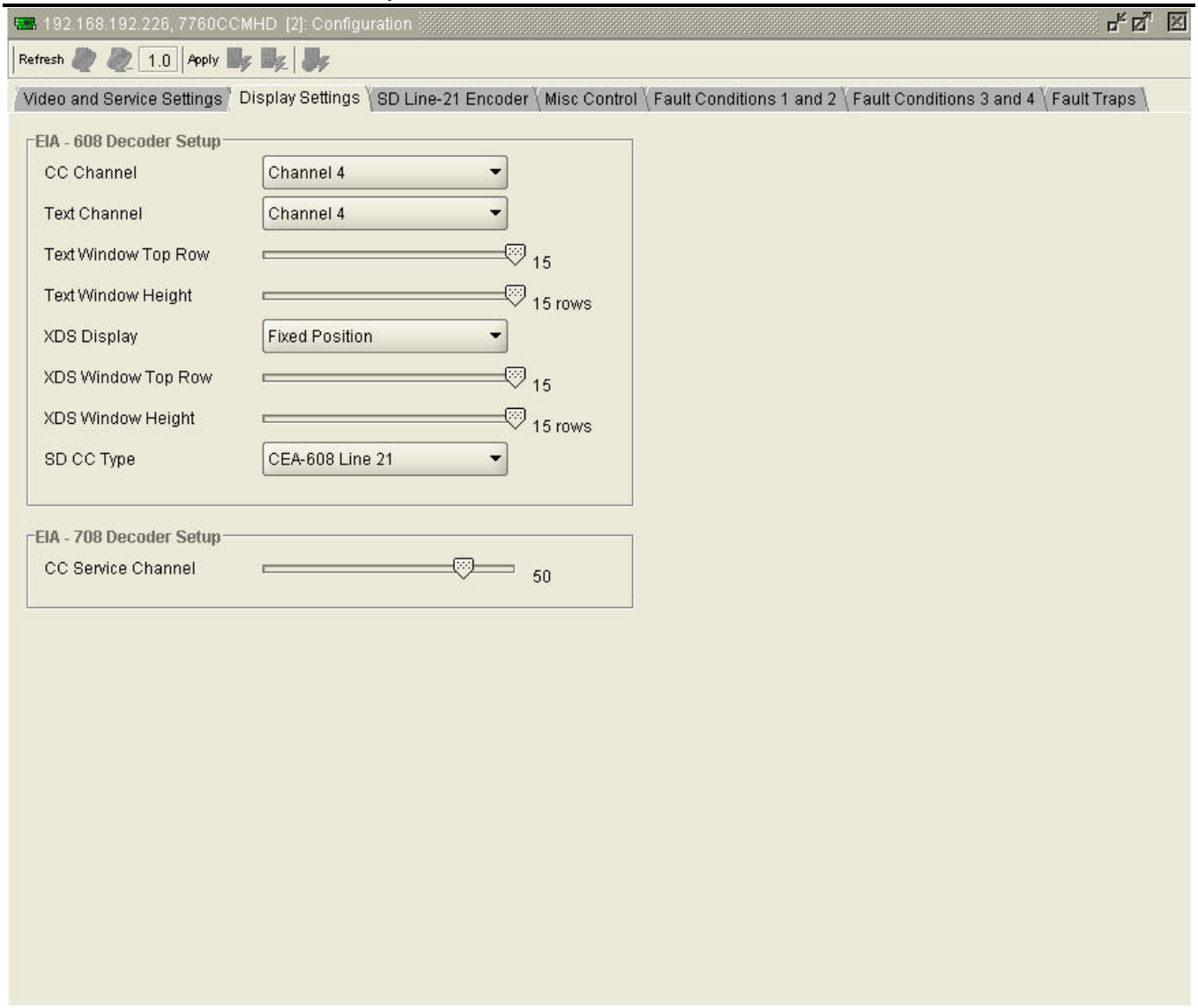


Figure 9-2: Display Settings Window

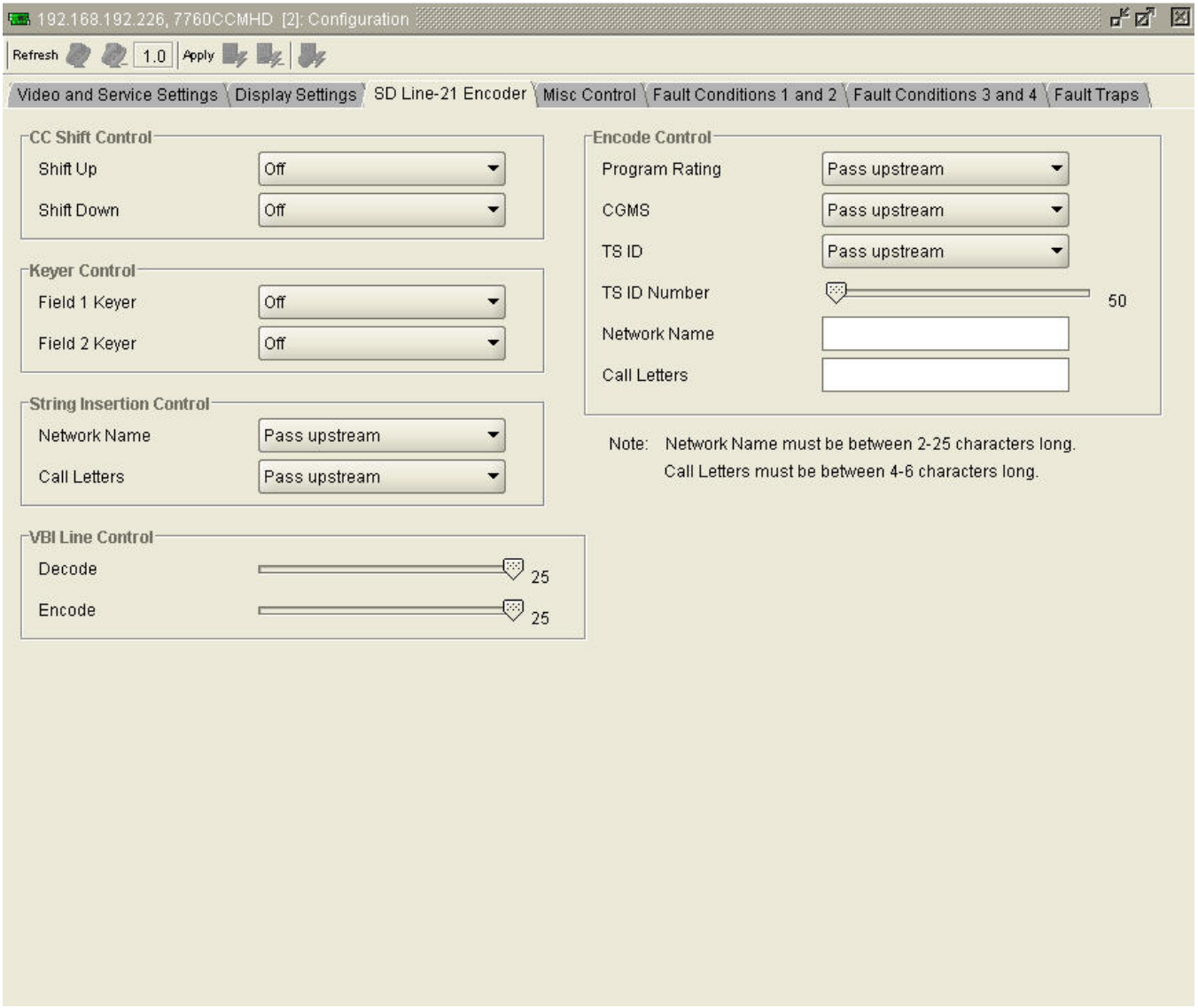


Figure 9-3: SD Line-21 Encoder Window

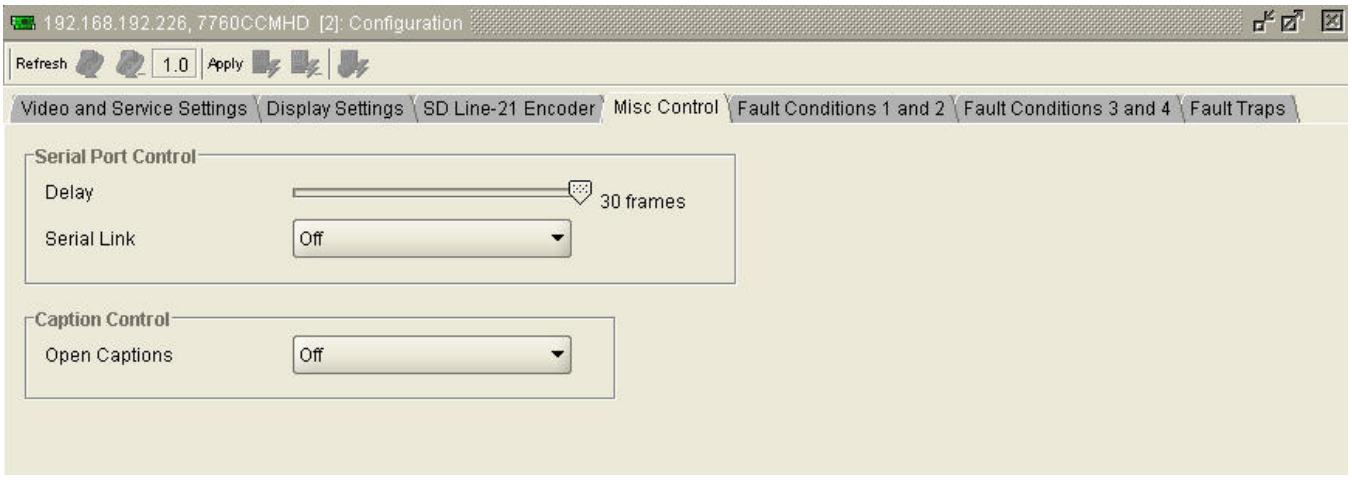


Figure 9-4: Misc. Control Window

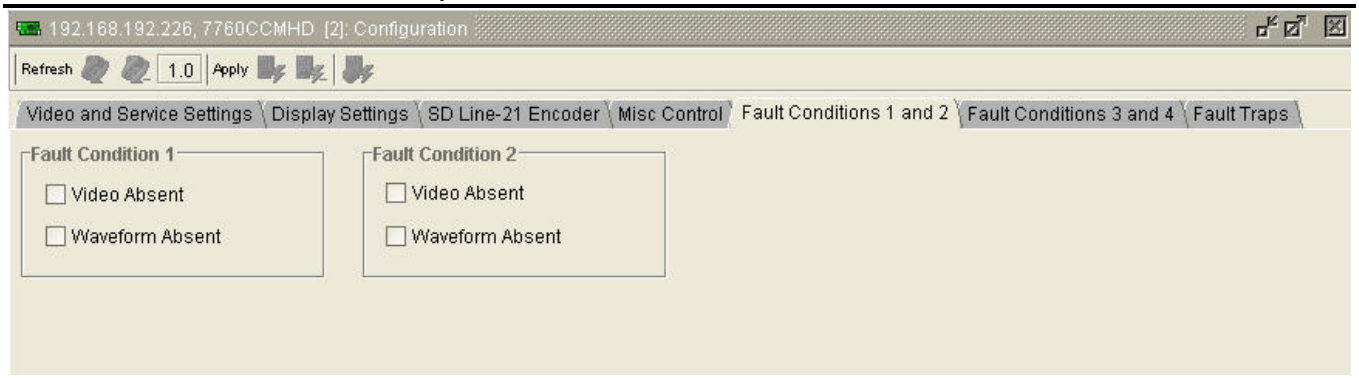


Figure 9-5: Fault Conditions 1 and 2 Window

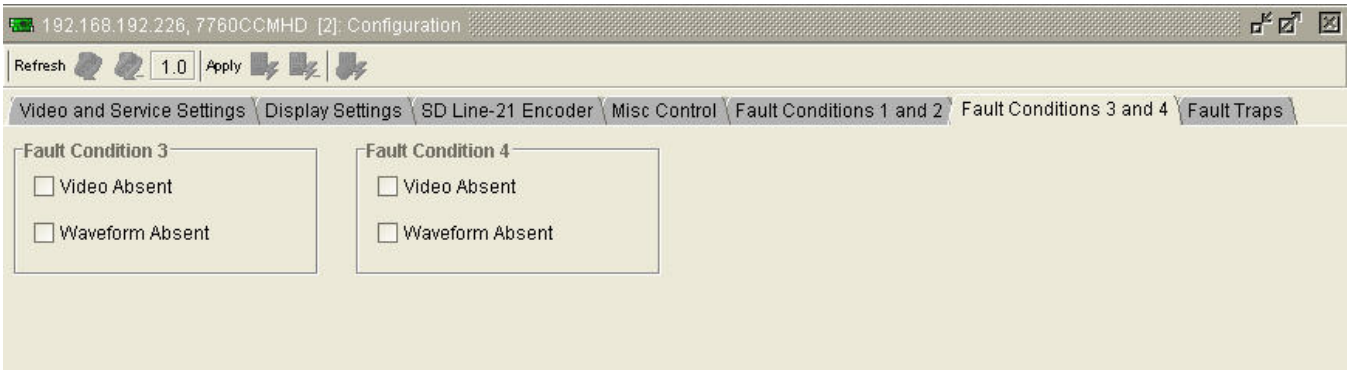


Figure 9-6: Fault Conditions 3 and 4 Window

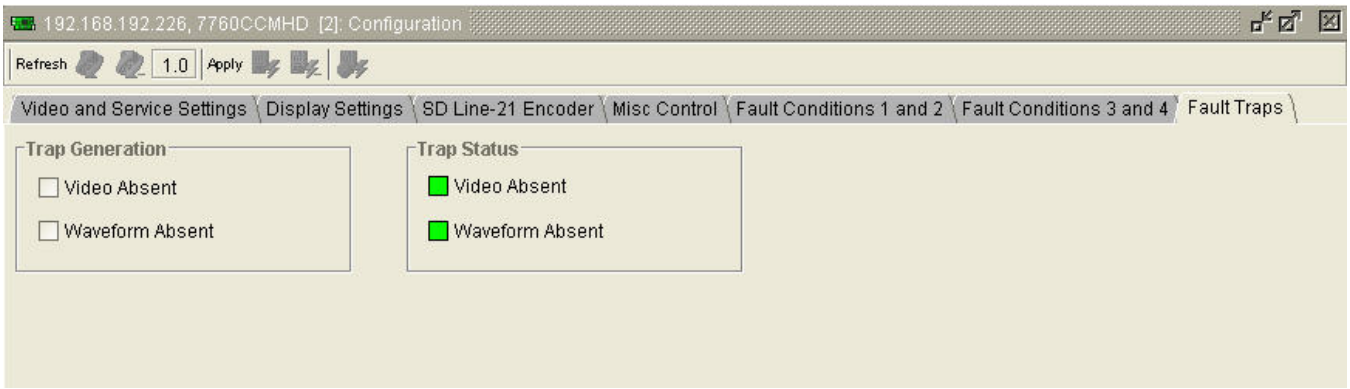


Figure 9-7: Fault Traps Window

10. MENU QUICK REFERENCE

VIDEO
- SD Video
- HD Video

ON SCREEN DISPLAY
- Open Captions on Output
- OSD Display
- CEA-608 Decoder
  - CC Channel
  - Test Channel
  - Text Window Top Row
  - Text Window Height
  - XDS Display
  - XDS Window Top Row
  - XDS Window Height
- CEA-708 Decoder
- Status Disp

SD LINE ENCODER
- SD CC Encode Line
- Field 1 Keyer
- Field 2 Keyer
- CC Shift Up
- CC Shift Down
- Set Ratings
- Set CGMS
- Set TSID
- TSID Number
- Set Net Name
- Name
- Set Call Lett
- Call Letters

608-708 TRANSLATOR
- 608/708 Delay Queue
- CC (1 to 4) to 708 Service
- T (1 to 4) to 708 Service

FAULT CONFIGURATION
- Fault Condition 1
  - Video Absent
  - CC Waveform Absent
- Fault Condition 2
  - Video Absent
  - CC Waveform Absent
- Fault Condition 3
  - Video Absent
  - CC Waveform Absent
- Fault Condition 4
  - Video Absent
  - CC Waveform Absent

GPIO SETUP
- GPI (1 to 4) Active Level

SERIAL LINK SETUP
- Off
- SMPTE 333M
- Grand Alliance
- CEA-608 Transmit

UTILITIES
- About…
- Store Presets 1 through 4
- Recall Presets 1 through 4
- Upgrade
- Factory Reset

11. GLOSSARY

11.1. GLOSSARY OF STANDARDS

CEA: (Consumer Electronics Association) An association of trade associations representing various facets of the electronics industry. Each of these CEA Sector Associations manages its own standard setting programs under CEA, the umbrella organization.

CEA-608-B: This CEA standard serves as a technical guide for those providing encoding equipment and/or decoding equipment to produce material with encoded data embedded in Line 21 of the vertical blanking interval of the NTSC video signal. It is also a usage guide for those who will produce material using such equipment.

CEA -708-B Defines the coding of DTV closed captions (DTVCC) as they are delivered in an ATSC signal, and also defines the Caption Distribution Packet (CDP). This structure contains fields that can hold: CEA-608-B data for use if the video is converted to standard definition analog; DTV captions for use in an ATSC program; Caption Descriptors; and Time Code. The CDP is the basic unit of data that is transported through the professional portion of a DTV plant. As such, it is central to the methods discussed in this document.

CEA -744-A: The CEA standard that defines the formatting of content advisory information accommodating either U.S. or Canadian systems, as well as the movie industry's MPAA rating system using the vertical blanking interval. CEA 744-A redefines the XDS Program Rating (content advisory) packet, 05h, currently contained in CEA-608-B, Current Class.

CEA -746-A: This document is a proposed amendment to CEA-608-A to insert Internet Uniform Resource. Locators (URLs) within the line-21 data system using the Text-2 (T-2) service. These URLs may be used by receiving devices in a variety of ways to associate Internet content with related television broadcast content.

SMPTE: (Society of Motion Picture and Television Engineers) A professional organization that recommends standards for the film and television industries.

SMPTE 12M: The SMPTE standard for linear time code.

SMPTE 125M: The SMPTE standard for bit parallel digital interface for component video signals. SMPTE 125M defines the parameters required to generate and distribute component video signals on a parallel interface.

SMPTE 244M: The SMPTE standard for bit parallel digital interface for composite video signals. SMPTE 244M defines the parameters required to generate and distribute composite video signals on a parallel interface.

SMPTE 259M: The SMPTE standard for 525 line serial digital component and composite interfaces.

SMPTE 269M: This SMPTE standard defines an opto-isolated fault tally output signal for connecting to user-defined equipment such as warning indicators.

SMPTE 291M: Defines the method of multiplexing ancillary data such as audio and captions to 292M and 259M signals.

SMPTE 292M: Defines the serial interface that is used for carriage of HDTV video signals. Its standard definition equivalent 259M provide a standard transport mechanism, not only for the video signal, but also for digitized audio and data such as captions.

SMPTE 309M: The SMPTE standard for encoding date information into the user bits of linear time code.

SMPTE 333M: The SMPTE standard for serially interfacing captioning equipment with ATSC caption encoders.

SMPTE 334M: Assigns addresses to be used to multiplex specific data services such as captioning into the vertical ancillary (VANC) space defined by 291M. It also specifies that the payload of a VANC packet used for captioning is CDP.

11.2. GLOSSARY OF TERMS

AES: (Audio Engineering Society) A professional organization that recommends standards for the audio industries.

AES/EBU: Informal name for a digital audio standard established jointly by the Audio Engineering Society and the European Broadcasting Union organizations.

ANALOG: An adjective describing any signal that varies continuously as opposed to a digital signal that contains discrete levels representing digits 0 and 1.

A-TO D CONVERTER (ANALOG-TO-DIGITAL): A circuit that uses digital sampling to convert an analog signal into a digital representation of that signal.

ATSC A/65: Defines information that describes the contents of an ATSC broadcast. Some of this information may pertain to the closed captioning.

BIT: A binary representation of 0 or 1. One of the quantized levels of a pixel.

BIT PARALLEL: Byte-wise transmission of digital video down a multi-conductor cable where each pair of wires carries a single bit. This standard is covered under SMPTE 125M, EBU 3267-E and CCIR 656.

BIT SERIAL: Bit-wise transmission of digital video down a single conductor such as coaxial cable. May also be sent through fiber optics. This standard is covered under SMPTE 259M and CCIR 656.

BIT STREAM: A continuous series of bits transmitted on a line.

BNC: Abbreviation of "baby N connector". A cable connector used extensively in television systems.

BYTE: A complete set of quantized levels containing all the bits. Bytes consisting of 8 to 10 bits per sample are typical in digital video systems.

CABLE EQUALIZATION: The process of altering the frequency response of a video amplifier to compensate for high frequency losses in coaxial cable.

CDP: Caption distribution Packet, defined in CEA-708.

CCIR (International Radio Consultative Committee): An international standards committee. (This organization is now known as ITU.)

CCIR-601: See ITU-R601

CCIR-656: See ITU-R656

CLIFF EFFECT: (also referred to as the 'digital cliff') This is a phenomenon found in digital video systems that describes the sudden deterioration of picture quality when doe to excessive bit errors, often caused by excessive cable lengths. The digital signal will be perfect even though one of its signal parameters is approaching or passing the specified limits. At a given moment however, the parameter will reach a point where the data can no longer be interpreted correctly, and the picture will be totally unrecognizable.

COMPONENT ANALOG: The non-encoded output of a camera, video tape recorder, etc., consisting of the three primary colour signals: red, green, and blue (RGB) that together convey all necessary picture information. In some component video formats these three components have been translated into a luminance signal and two colour difference signals, for example Y, B-Y, or R-Y.

COMPONENT DIGITAL: A digital representation of a component analog signal set, most often Y, B-Y, or R-Y. The encoding parameters are specified by ITU-R601. ITU-R656 and SMPTE 125M specify the parallel interface.

COMPOSITE ANALOG: An encoded video signal such as NTSC or PAL video, which includes horizontal and vertical synchronizing information.

COMPOSITE DIGITAL: A digitally encoded video signal, such as NTSC or PAL video that includes horizontal and vertical synchronizing information.

D1: A component digital video recording format that uses data conforming to the ITU-R601 standard. Records on 19 mm magnetic tape. (Often used incorrectly to refer to component digital video.)

D2: A composite digital video recording format that uses data conforming to SMPTE 244M. Records on 19 mm magnetic tape. (Often used incorrectly to refer to composite digital video.)

D3: A composite digital video recording format that uses data conforming to SMPTE 244M. Records on 1/2" magnetic tape.

DSO: (Daylight Saving time Observed)

DST: (DAYLIGHT SAVING TIME) The civil time observed when daylight saving time is adopted in a country or region. It is usually standard time + 1 hour. (see also *Standard Time*)

DTVCC: Digital Television Closed Captioning, defined in CEA-708.

EBU: (European Broadcasting Union) An organization of European broadcasters that among other activities provides technical recommendations for the 625/50 line television systems.

EBU TECH 3267-E: The EBU recommendation for the parallel interface of 625 line digital video signal. This is a revision of the earlier EBU Tech 3246-E standard that was in turn derived from ITU-R601.

EDH: Error Detection and Handling (EDH) is defined in SMPTE RP-165 as a method of determining when bit errors have occurred along the digital video path. Check words and flags are combined into a special error detection data packet that is included as ancillary data in the serial digital signal.

EMBEDDED AUDIO: Digital audio is multiplexed onto a serial digital video data stream.

EXTENDED DATA SERVICES: (XDS) XDS is a third data service in field 2 that is intended to supply program related and other information to the viewer. This information may include such items as program title, length of show, type of show and program content codes such as V-Chip program ratings.

ITU: The United Nations regulatory body governing all forms of communications. ITU-R (previously CCIR) regulates the radio frequency spectrum, while ITU-T (previously CCITT) deals with the telecommunications standards.

ITU-R601: (This document previously known as CCIR-601). An international standard for component digital television from which was derived SMPTE 125M and EBU 3246-E standards. ITU-R601 defines the sampling systems, matrix values and filter characteristics for Y, B-Y, R-Y and RGB component digital television signals.

ITU-R656 (This document previously known as CCIR-656). The physical parallel and serial interconnect scheme for ITU-R601. ITU-R656 defines the parallel connector pinouts as well as the blanking, sync and multiplexing schemes used in both parallel and serial interfaces. It reflects definitions found in EBU Tech 3267 (for 625 line systems) and SMPTE 125M (parallel 525 line systems) and SMPTE 259M (serial 525 line systems).

JULIAN DATE: The Julian day number is a count of days elapsed since Greenwich mean noon on January 1, 4713B.C. January 1st, 1993 was JD 2448989; January 1st, 2000 was JD 2451545.

MODIFIED JULIAN DATE (MJD): The Modified Julian Date is a continuous count of the number of days elapsed since 17 November 1858. It is often more useful than conventional calendar dates for record keeping over long periods of time, since the MJD's of two events can easily be subtracted to determine the time difference in days. Usually, the MJD is specified as a number with 5 significant digits. As an example, the MJD for 1 January 1995 is 49718, meaning that this many days have elapsed between 17 November 1858 and 1 January 1995. The Modified Julian date is calculated by subtracting 2400000.5 days from the Julian Date. Thus the Modified Julian Day 1 begins at Greenwich midnight.

LED: Light Emitting Diode.

LINEAR TIME CODE (LTC): A digital code used for timing and control purposes on videotape and associated audiotape machines. It is recorded on a longitudinal track with audio characteristics and is referred to as LTC (Sometimes this code is also referred to as longitudinal code or SMPTE). Each 80 bit code word is associated with one television frame, and consists of 26 time bits, 6 flag bits, 32 user bits and 16 sync bits. Date information may optionally encoded into the user bits. This code is often used for distribution time of day information to station clock displays and automation systems. The SMPTE 12M standard defines LTC.

PAC: Stands for Preamble Address Code. These codes are embedded into line 21 caption data. They define the caption text position on the screen, and set special features such as colour, italics and underline.

PIXEL: The smallest distinguishable and resolvable area in a video image. A single point on the screen, in digital video, a single sample of the picture. Derived from the words *picture element*.

PSIP: Program and System Information Protocol, defined in ATSC A/65.

RESOLUTION: The number of bits (eight, ten, etc.) determines the resolution of the signal. Eight bits is the minimum resolution for broadcast television signals.

SERIAL DIGITAL (SDI): Digital information that is transmitted in serial form. Often used informally to refer to serial digital television signals.

STANDARD TIME: The civil time adopted for a country or region. (See also *Daylight Saving Time*)

TIME ZONE OFFSET: The difference in time between the local time and UTC.

TRS: Timing reference signals used in composite digital systems.
(It is four words long).

TRS-ID: Abbreviation for "Timing Reference Signal Identification". A reference signal used to maintain timing in composite digital systems. (It is four words long.)

UNIVERSAL TIME, COORDINATED (UTC): Universal Coordinated Time (UTC) is an international time standard that defines a time that doesn't depend on where we are on Earth. Universal Time (UTC), Greenwich Mean Time (GMT), and Zulu Time (Z), are based at the prime meridian (0° longitude) of Earth and are used to avoid confusion of time zones.

VANC: Vertical Ancillary data. Data carried in serial digital video signal (SMPTE 259M or 292M), in accordance with SMPTE 291M, in the active portion of scan lines that are outside the active picture area.

VBI: Vertical Blanking Interval. The scan lines that are outside the active picture area of a standard definition video signal (analog or serial digital). These can be used for carriage of data, including closed captioning, in analog video broadcasting.

V-Chip: Abbreviation for "Viewer Chip" (commonly misread as "Violence Chip"). V-Chip-enabled television sets extract Program Rating packets from the XDS data stream in Field 2 captions to determine the rating of a show. Also see Extended Data Services.

WebTV: The encoding of URL (Uniform Resource Locators) normally used on the Internet, into line 21 caption style data. This URL string is made up with the familiar http:// followed by a target location on the Internet. The URL must be formatted to match the Electronic Industries Association specification CEA-746-A.

XDS: See Extended Data Services.

4:2:2 A commonly used term for a component digital video format. The details of the format are specified in the ITU-R601 standard. The numerals 4:2:2 denote the ratio of the sampling frequencies of the luminance channel to the two colour difference channels. For every four luminance samples, there are two samples of each colour difference channel.

4Fsc Four times sub-carrier sampling rate used in composite digital systems. In NTSC this is 14.3 MHz. In PAL this is 17.7 MHz

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