VBI Bridging of Closed Caption Data

Configuring Evertz Closed Caption Encoders to Bridge Caption Data Around A DVE Device

BRIEF

In a broadcast facility, it is common for video to pass through a piece of processing hardware that does not accurately preserve the caption data stored on line 21. One of the features of Evertz 8084 and 8084AD Closed Caption Encoders is the ability to extract and re-encode closed caption data around such devices. The configuration is typically referred to as a "VBI bridge". This application note describes several ways that a VBI bridge for caption data on SDI digital video can be implemented using Evertz captioning hardware.

BACKGROUND

In NTSC analog video, closed caption data exists as a waveform that resides on video line 21. This waveform carries the data that is extracted by closed caption decoders to produce the human-readable text on the viewer's screen.

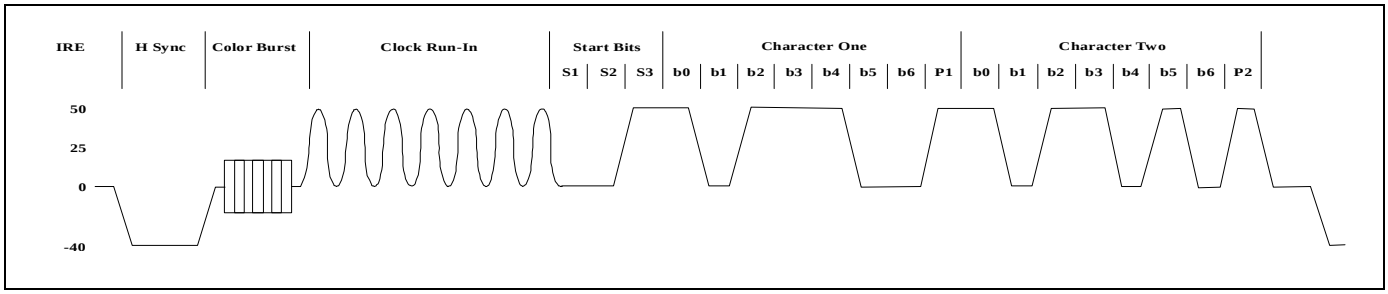

Figure 1: Typical Line 21 Closed Caption Analog Waveform

Figure 1 shows the typical waveform of the signal. The line 21 data signal consists of a sine wave clock burst, start bits, and two data characters. Each character consists of seven data bits with odd parity. The clock rate is 32 times the horizontal line frequency or 503.4 KHz. The signal amplitude is 50 IRE units peak to peak. The full specification for the caption data waveform is given in the EIA-608B standard.

Caption encoders for SDI digital video duplicate this waveform in the digital domain, so that digital-to-analog equipment at the point of transmission can process line 21 as if it were just another line of active video. However, digital video processing equipment in a broadcast facility may also treat line 21 as simply a line of active video, corrupting line 21 and damaging the caption data. An example would be a Digital Video Effects (DVE) device that shifts the picture either horizontally or vertically to display a text message or alternate video on the remainder of the screen.

The purpose of the "VBI bridge" is to extract data from the closed caption waveform before it is corrupted by a piece of video processing hardware, then re-insert the captions after the output of the offending hardware.

IMPLEMENTING THE VBI BRIDGE

Method 1: Single Evertz 8084AD Encoder

Figure 2 shows how the VBI bridge may be implemented using a single Evertz 8084AD Analog & Digital Closed Caption Encoder. The 8084AD has two separate video feeds, one composite analog video and one component digital video. A composite encoder device is required to convert the video from digital to analog ahead of the DVE.

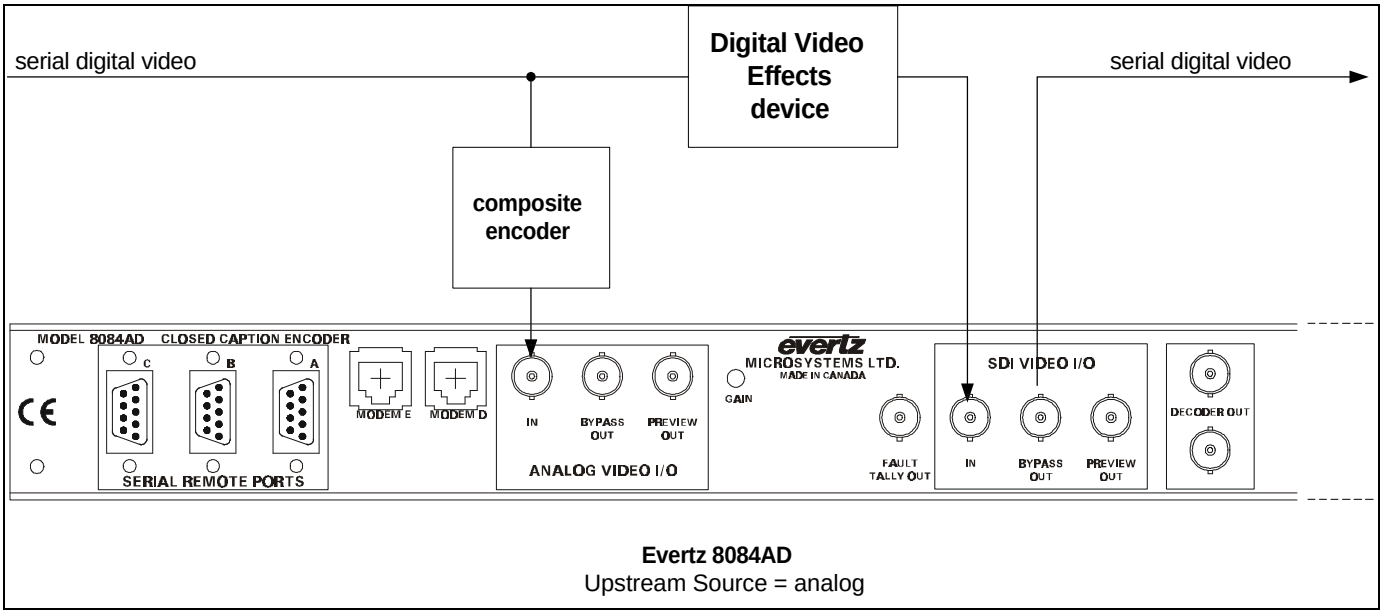

Figure 2: VBI Bridge using a single Evertz 8084AD encoder

The *UPSTREAM SOURCE* menu item in the 8084AD Setup Menu system allows the user to select whether captions will be extracted from the analog or digital video feed. The user would select the analog video feed as the caption data source. Caption data in fields 1 and 2 are extracted.

Unlike the other methods described herein, this configuration does not use a serial interface to transfer caption data, keeping all 8084AD serial ports free for other communications functions. All 8084AD units support the multiplexing of new caption, XDS, V-Chip and WebTV data with pre-existing captions using this method. Dial-up captioning is also possible. The user has full control of what data is passed or blocked on a stream-by-stream basis.

This VBI bridging method is significantly different than the other approaches depicted. There are tighter timing tolerances on the two video feeds relative to each other. Extracted caption data is not buffered very deeply in the 8084AD to minimize the delay created by the bridging process. The video entering the analog and digital feeds must be “frame-locked”. There may be delay between the two feeds, but it must be of a fixed duration. This is typically not a problem in the VBI bridge application since a single video source is used at the entry to the system.

To configure the 8084AD for VBI bridging using method 1 perform the following steps.

Upstream Source Selection:

- Enter the Setup menu system by pressing SETUP
- Press UP or DOWN arrows until display shows *)UPSTREAM SOURCE*
- Press LEFT or RIGHT arrows until display shows *Source analog*
- Press SELECT button. *analog* will now be flashing to indicate that this mode is selected.
- Exit the Setup menu system by pressing SETUP

Method 2: Two Evertz Encoders

Figure 3 depicts the typical wiring for two Evertz caption encoders to perform a VBI bridge function for SDI video. Captions on both fields 1 and 2 are transferred in this manner.

Using the encoder's Engineering Setup Menu system, the user can configure serial port B into different operating modes. Only serial port B supports these special modes. The encoder before the DVE extracts caption data from the video and transmits it out of port B. The encoder after the DVE receives caption data into port B and encodes this onto the SDI video passing through the unit.

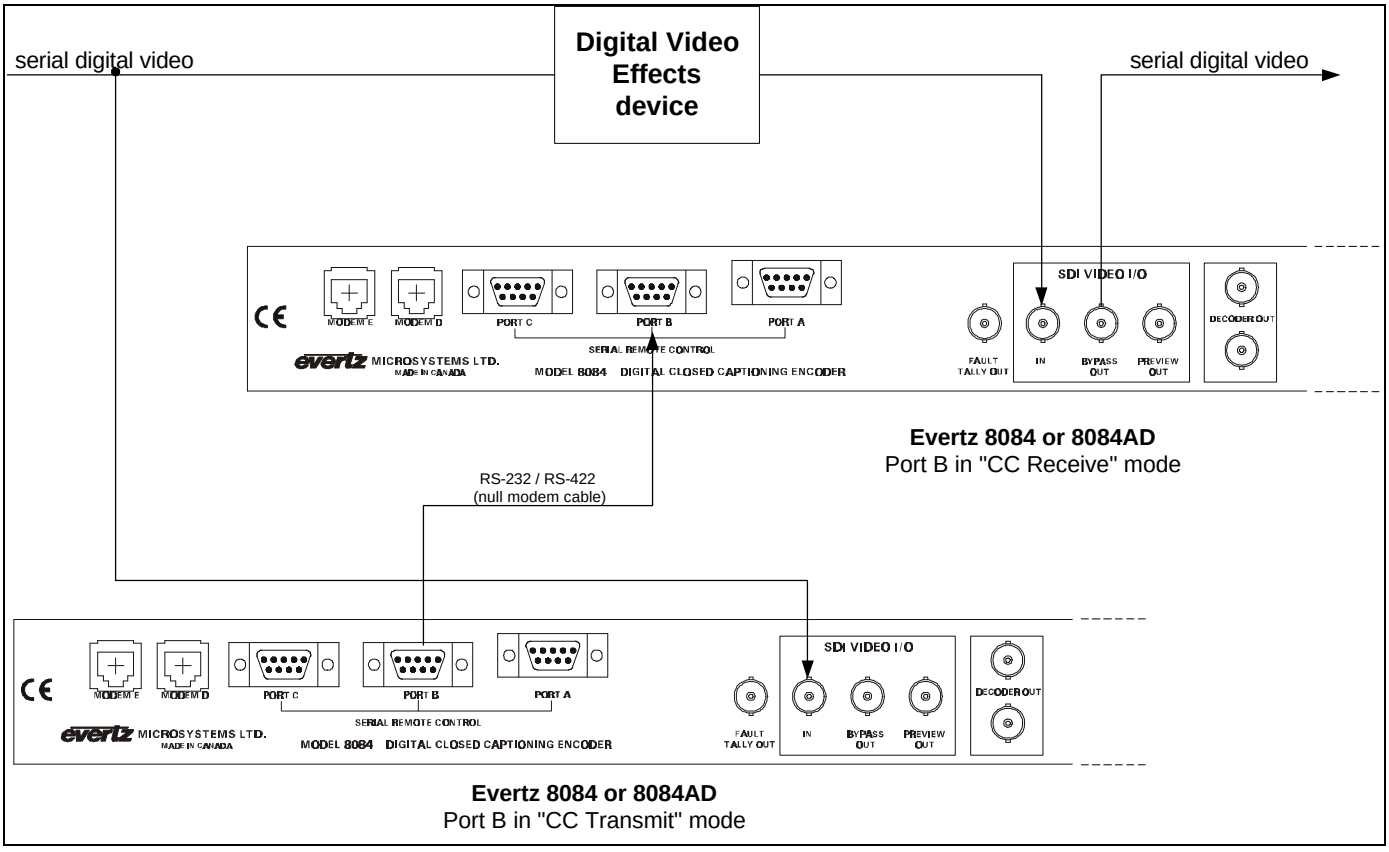

Figure 3: VBI Bridge using two Evertz encoders

The user must ensure that the port B baud rate of the two caption encoders is identical. 9600 baud is the minimum recommended speed. Data width and parity are set automatically in VBI bridge modes.

If the user's application requires that the pre-encoded captions must be multiplexed with new caption data, XDS, V-Chip or WebTV URLs, we recommend that the "CC transmit" encoder should be used for this purpose. Starting with 8084 and 8084AD firmware dated R010621, the "CC receive" encoder can also perform other captioning functions as well as re-encode data as a VBI Bridge. However, performing these functions in the transmit-side encoder will maintain maximum compatibility with our older 8074 line of closed caption encoders. These units also support the VBI bridge functionality, but a receive-side 8074 encoder cannot insert other new data when it is performing a VBI bridge function.

To configure the 8084 or 8084AD for VBI bridging using method 2 perform the following steps.

Set the upstream encoder to CC Transmit operation (to extract caption data prior to DVE):

- Enter Engineering Setup menu system by pressing SHIFT+SETUP
- Press UP or DOWN arrows until display shows *>PORT B FUNCTION*
- Press LEFT or RIGHT arrows until display shows *Funct B CC xmit*
- Press SELECT button. *CC xmit* will now be flashing to indicate that this mode is selected.
- Exit the Engineering Setup menu system by pressing SETUP

Set the downstream encoder to CC Receive Operation (to re-insert caption data after DVE):

- Enter Engineering Setup menu system by pressing SHIFT+SETUP
- Press UP or DOWN arrows until display shows *>PORT B FUNCTION*
- Press LEFT or RIGHT arrows until display shows *Funct B CC recv*
- Press SELECT button. *CC recv* will now be flashing to indicate that this mode is selected.
- Exit the Engineering Setup menu system by pressing SETUP

Set the Port B baud rates the same on the Transmit and Receive encoders.

- Enter Engineering Setup menu system by pressing SHIFT+SETUP
- Press UP or DOWN arrows until display shows *>PORT B BAUD*
- Pressing LEFT or RIGHT arrows will change the display to *BaudB=xxxx*
- Set the baud rate to 9600 baud or higher by pressing the LEFT or RIGHT arrow keys.
- Press SELECT button. The selected baud rate will now be flashing.
- Exit the Engineering Setup menu system by pressing SETUP

Method 3: Evertz Encoder and SoftTouch Hubcap

Figure 4 shows how the VBI bridge can also be implemented using a SoftTouch Hubcap[1] caption decoder to extract caption data, instead of an Evertz encoder. The Hubcap may be configured to extract only field 1 or both fields 1 and 2 data in this configuration. Please refer to documentation supplied by SoftTouch for configuring the Hubcap decoder. Because the Hubcap processes composite analog video, not digital video, a composite encoder device is required to perform the digital-to-analog conversion on the video feed to the Hubcap.

The single Evertz encoder is on the receive side of the VBI Bridge. Starting with 8084 and 8084AD firmware dated R010621, the receiving encoder can perform other captioning functions as well as re-encode data as a VBI Bridge. This allows the user to insert new XDS, V-Chip, WebTV or other data, and manipulate the re-insertion of the pre-existing data on a stream-by-stream basis.

[1] SoftTouch, Hubcap, MagHubcap names and image used with permission of SoftTouch, Inc. 6196 Oxon Hill Road, Oxon Hill, MD 20745-3100

The serial port on the Hubcap is fixed at 9600 baud, 8-bits data, 1 stop bit, no parity. The user must ensure that the caption encoder is also configured to 9600 baud. Other serial port settings in the Evertz encoder are changed automatically when the user selects CC Receive operation.

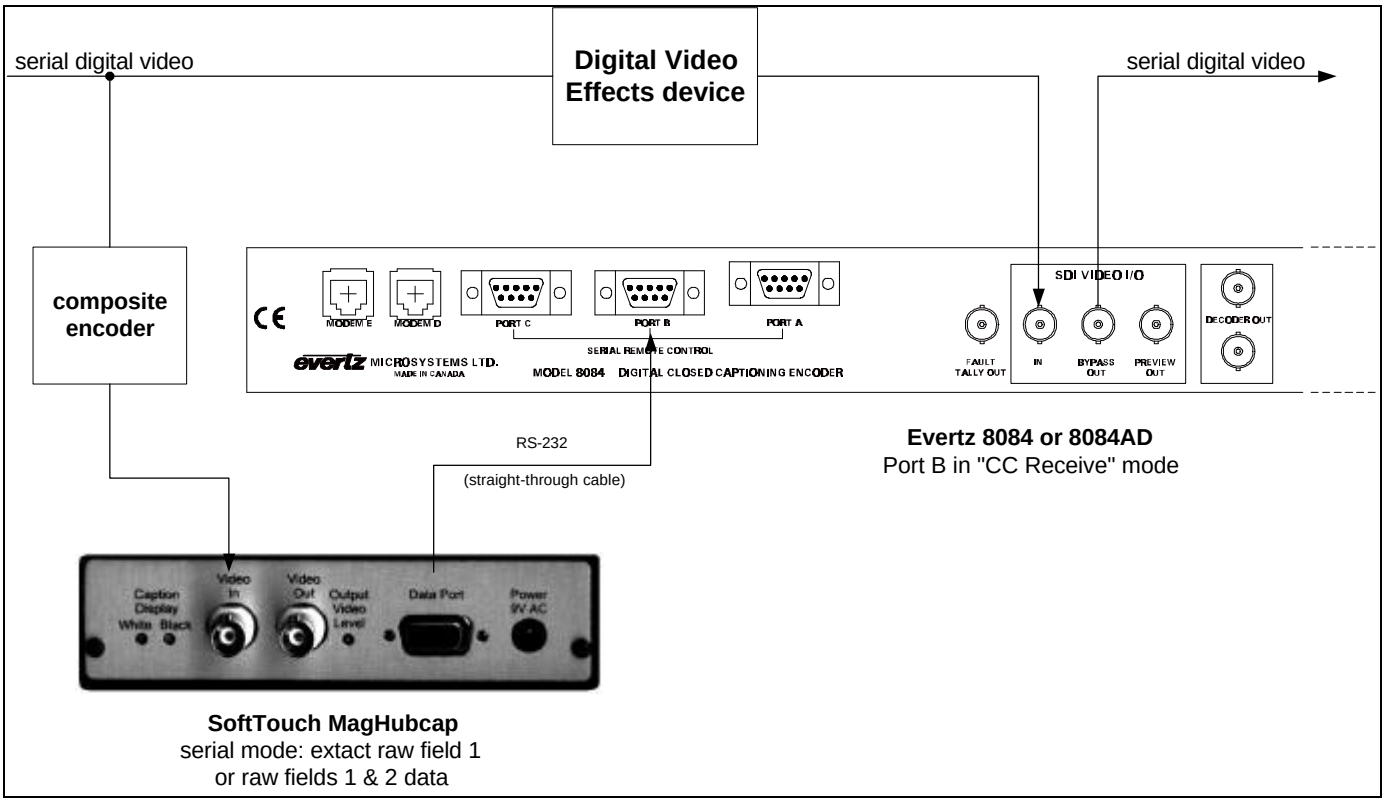

Figure 4: VBI Bridge using Evertz encoder and SoftTouch MagHubcap decoder

To configure the 8084 or 8084AD for VBI bridging in this application perform the following steps.

Set the Encoder to CC Receive Operation (to re-insert caption data after DVE):

- Enter Engineering Setup menu system by pressing SHIFT+SETUP
- Press UP or DOWN arrows until display shows *>PORT B FUNCTION*
- Press LEFT or RIGHT arrows until display shows *Funct B CC recv*
- Press SELECT button. *CC recv* will now be flashing to indicate that this mode is selected.
- Exit the Engineering Setup menu system by pressing SETUP

Set the Port B baud rate to 9600.

- Enter Engineering Setup menu system by pressing SHIFT+SETUP
- Press UP or DOWN arrows until display shows *>PORT B BAUD*
- Press LEFT or RIGHT arrows until display shows *BaudB=9600*
- Press SELECT button. The *9600* will now be flashing.
- Exit the Engineering Setup menu system by pressing SETUP

REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	Original Version	June 26, 2001