Model 8084
Digital Video Closed Caption Encoder

Model 8084AD
Analog & Digital Video Closed Caption Encoder

Model 8085
DTV Closed Caption Encoder

Instruction Manual

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EVERTZ MICROSYSTEMS LTD.
5288 John Lucas Drive, Burlington, Ontario, Canada, L7L 5Z9
Phone: 905-335-7570
Fax: 905-335-3573

Internet: Sales: sales@evertz.com
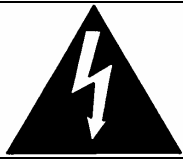   Tech Support: service@evertz.com
          Web Page: http://www.evertz.com

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IMPORTANT SAFETY INSTRUCTIONS

⚠	The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated "Dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.
⚠	The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (Servicing) instructions in the literature accompanying the product.

- Read these instructions
- Keep these instructions.
- Heed all warnings.
- Follow all instructions.
- Do not use this apparatus near water
- Clean only with dry cloth.
- Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than other. A grounding-type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles and the point where they exit from the apparatus.
- Only use attachments/accessories specified by the manufacturer
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

WARNING
TO REDUCE THE RISK OF FIRE OR ELECTRIC – SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE

WARNING
DO NOT EXPOSE THIS EQUIPMENT TO DRIPPING OR SPLASHING AND ENSURE THAT NO OBJECTS FILLED WITH LIQUIDS ARE PLACED ON THE EQUIPMENT

WARNING
TO COMPLETELY DISCONNECT THIS EQUIPMENT FROM THE AC MAINS, DISCONNECT THE POWER SUPPLY CORD PLUG FROM THE AC RECEPTACLE

WARNING
THE MAINS PLUG OF THE POWER SUPPLY CORD SHALL REMAIN READILY OPERABLE

INFORMATION TO USERS IN EUROPE

NOTE

This equipment with the CE marking complies with bother the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community.

Compliance with these directives implies conformity to the following European standards:

- EN60065   Product Safety
- EN55103-1   Electromagnetic Interference Class A (Emission)
- EN55103-2   Electromagnetic Susceptibility (Immunity)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to the European Union EMC directive. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

INFORMATION TO USERS IN THE U.S.A.

NOTE

FCC CLASS A DIGITAL DEVICE OR PERIPHERAL

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

WARNING

Changes or Modifications not expressly approved by Evertz Microsystems Ltd. could void the user's authority to operate the equipment.

Use of unshielded plugs or cables may cause radiation interference. Properly shielded interface cables with the shield connected to the chassis ground of the device must be used.

NOTICE TO MODEM USERS IN THE USA

The 8084 and 8084AD Caption Encoders comply with the FCC Rules Part 68. The caption encoder is designed to be used on standard device telephone lines. It connects to the telephone line by means of a standard jack called the USOC RJ11C and should be connected to the telephone network with a FCC compliant telephone cord and modular plug.

It is not necessary to notify the telephone company before connecting the modem in the caption encoder. However, the telephone company may request the telephone number to which the caption encoder modem is connected and the FCC registration number and ringer equivalence number (REN), both of which are on the label on the rear panel.

The REN is used to determine the number of devices you may legally connect to your telephone line. In most areas, the sum of the REN of all devices connected to one line must not exceed five (5.0). You should contact your telephone company to determine the maximum REN for your calling area.

The caption encoder may not be used on coin service provided by the telephone company. Connection to party lines is subject to state tariffs.

If the modem in the caption encoder is malfunctioning, it may affect the telephone lines. In this case, disconnect the modem until the source of the difficulty is traced.

IMPORTANT INSTALLATION NOTICE

FOR A RELIABLE TELEPHONE CONNECTION TO THE MODEM IN THIS CAPTION ENCODER A DIRECT TELEPHONE LINE MUST BE USED. THIS LINE MUST NOT PASS THROUGH A PBX OR SIMILAR KEY DEVICE.

REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	First Edition	Jan 00
1.1	Incorporated 8084AD functionality Features updated for firmware version 000823	Aug 00
1.2	Incorporated 8085 functionality Features updated for firmware version 001105 Expanded FAQ in Chapter 6	Nov 00
1.3	Incorporated Change Sheets 1.2-1 and 1.2-2 Features updated for firmware version 011205 Added V-Chip codes to FAQ	Jan 02
1.3.1	Added Application Notes 2 and 3	Feb 02
1.3.2	Updated Application 3	Mar 02
1.4	Corrected example in section 4.7.1, Move Glossary to chapter 1 Incorporated Change Sheets 1.3-1 and 1.3-2	May 05
1.5	Removed obsolete instructions	Aug 05
1.6	Typographical corrections, fixed some examples in Ctrl-A protocol	Jan 06
1.6.1	Added information on changing the battery	Aug 06
1.6.2	Added info for firmware update	Feb 07
1.6.3	Minor Corrections	Apr 07
1.6.4	Removed references to Field Mode	Aug 07
1.6.5	Changed RS-422 Tributary Serial Port pin out	Jan 08
1.6.6	Updated the Real Time State information	Oct 09

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CHAPTER 1: OVERVIEW

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1   OVERVIEW

This manual describes the operation of three different Closed Caption Encoder products manufactured by Evertz Microsystems. These products combine the capabilities our previous 807X caption encoder line with the latest advances in processor and memory architecture.

The Model 8084 Digital Video Closed Caption Encoder provides a cost-effective method of encoding closed captions into the digital video bitstream. It has been designed to meet the needs of both television broadcast and post-production facilities. The Model 8084AD Caption Encoder adds the capability of inserting captions directly into a composite video signal as well as a digital video bitstream. The Model 8085 DTV Caption Encoder performs transcoding and translation to EIA-708 "advanced" captions, in addition to typical captioning functions.

Generally, all of the features noted are available on all caption encoder models. Any exceptions are noted within the manual text.

The following table summarizes the major features and differences of the Evertz closed caption products covered by this manual:

Feature	8084 (w/ 8038)	8084 (w/ 8058)	8084AD	8085
Front Panel	8 buttons	10 buttons	10 buttons	10 buttons
SDI Video	4:2:2	4:2:2	4:2:2	4:2:2
Analog Video	N/A	N/A	composite	N/A
Serial Ports	3	3	3	3
RS-232 / RS-422	Port A selectable	all ports	all ports	all ports
Modems (14.4kbps)	1 or 2	1 or 2	1 or 2	1
Bypass Relay	Yes	Yes	Yes - both feeds	Yes
Power Supplies	1 or 2	1 or 2	1 or 2	1 or 2
Monitoring Decoder	Yes	Yes	Yes - both feeds	Yes
VBI Bridge	Yes	Yes	Yes	No
ATSC Comm.	No	No	No	Yes
XDS Insertion	Yes	Yes	Yes	Yes
WebTV URL Insertion	Yes	Yes	Yes	Yes
Text Article Insertion	Yes	Yes	Yes	Yes
Local Default V-Chip	Yes	Yes	Yes	No
LTC Reader	No	Optional	Optional	NO

Table 1-1: Closed Caption Encoder Feature Comparison

1.1 THE CLOSED CAPTION SYSTEM

The Closed Caption System provides for the transmission of data on line 21 of the NTSC composite signal, or Line 22 of the PAL composite video signal. The EIA-608-B standard specifies nine data channels or "streams" for line 21 data services. In each video field there are two caption streams and two text streams. Field two also contains the Extended Data Service (XDS) data stream. These are summarized in the chart below:

Field 1		Field 2	
CC1	Primary Synchronous Caption Service	CC3	Secondary Synchronous Caption Service
CC2	Special Non-synchronous Use Captions	CC4	Special Non-synchronous Use Captions
T1	First Text Service	T3	Third Text Service
T2	Second Text Service	T4	Fourth Text Service
		XDS	Extended Data Services

The separate data streams are independent of each other in content. Within each field, the streams are time-multiplexed. Control codes are transmitted to announce the transition to a different stream. Home viewers may generally select which data stream to display with their caption decoders.

The primary Synchronous Caption Service (CC1) is primary language captioning data that must be in sync with the sound. The Secondary Synchronous Caption Service (CC3) is an alternate captioning data channel in sync with the sound, usually used for a second language. Software applications such as the Evertz ProCap™ can be used to send caption data to the 8084. Contact the factory for further information on ProCap.

The special Non-Synchronous channels (CC2, CC4) carry data that is intended to augment information carried in the program and is not necessarily in sync with the sound.

Throughout this manual, the designators CC1, CC2, CC3, and CC4 are equivalent to C1, C2, C3, and C4 respectively.

The four text services are used to carry general text information that may not be related to the program content. Text stream T2 is often reserved to carry URL data for WebTV applications. A text article software loader program is supplied on the CD that came with your 8084. It may be used to conveniently upload text articles for insertion into one of the text services.

Extended Data Service stream contains information about the program such as program title, length, and V-Chip-compatible program rating information. The XDS Packet Control Windows 9x software application supplied on the CD with your 8084 provides a convenient method of inserting XDS data. See the XDS quick start pamphlet supplied with the software for information on installing the software on your PC.
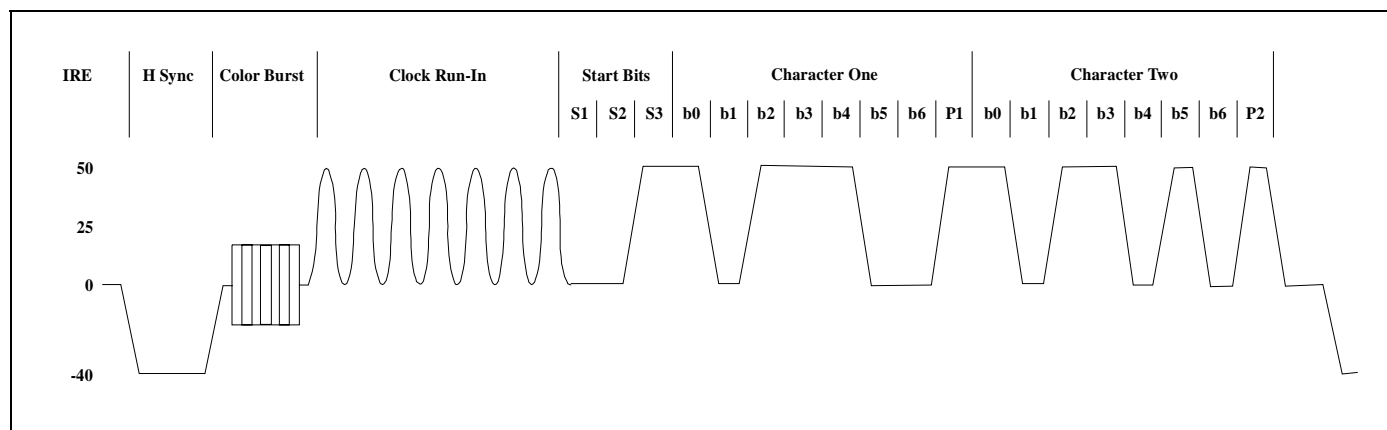
Figure 1-1: Typical Line 21 Closed Caption Signal

Figure 1-1 shows the typical waveform of the signal. The line 21 data signal consists of a 7 cycle sine wave clock burst, a start bit, 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. There is no setup on the line when the caption signal is present. When caption data is encoded into field 2, there must at least be null characters encoded into field 1. The full specification for the caption data waveform and data content is given in the EIA-608-B standard.

1.2   FEATURES

1.2.1   Hardware System Features:

- 3 RS-232 serial ports can be configured for direct connection to captioning computer.
- One built-in modem and an optional second modem for connection to remote captioning computers via the telephone network.
- Rack mountable chassis.
- 16 digit alphanumeric display, with 8 push buttons.
- Parallel remote port for GPI control of six important 8084 functions.
- Real-time clock and calendar with battery backup.
- Flash ROM program memory for easy in-system-programmable firmware upgrades.
- Optional redundant power supply.

1.2.2 Serial Digital Video Path Features:

- Keys directly into 4:2:2 (525 or 625 line) digital video bitstream.
- 8 or 10 bit SDI video resolution supported.
- Serial digital video input provides automatic cable equalization on cable lengths up to 200 meters of low loss coax such as Belden 8281.
- Two separate serial digital video outputs.
- Serial Digital Video bypass relay activates automatically on power failure to maintain the integrity of the program video path.
- Analog composite monitor output with caption decoder provides a means of verifying the caption information that is being encoded.

1.2.3 Component Analog Video Path Features (8084AD only):

- Keys directly into 1Vp-p component analog (525 or 625 line) video signal.
- User may select either analog or SDI video path as upstream caption source for data bridging applications.
- Captions may be encoded onto both video feeds simultaneously when the feeds are frame-locked.
- Studio-quality video output with bypass relay protection.
- Monitor output with caption decoder that provides a means of verifying the caption information that is being encoded.
- Video bypass relay activates automatically on power failure to maintain the integrity of the program video path.

1.2.4 Data Encoding Features:

- Data can be encoded into all caption and text channels in both video fields.
- Supports encoding of Extended Data Service (XDS) data packets including V-Chip-compatible program ratings into Field 2
- Supports encoding of WebTV-compatible URLs into Text Channel 2.
- EDH packet checksum correction.
- Keyer bypass mode allows video to pass through without keying any signal in
- Inserts Captions or Text articles into previously captioned material using the versatile Stream Mode.
- Data encoding line is selectable – 11 to 25 in NTSC, 6 to 25 in PAL.

1.2.5 Communications Features:

- Serial communications protocol emulates EEG 270, EEG 370 and EEG 470 Encoders.
- Supports Real-time and off-line captioning methods.
- Monitor mode extracts caption data from video and sends it out the serial port.
- Maximum compatibility with a wide variety of caption software packages.

1.2.6 Field Mode Operation: (Legacy Operation)

- All the data streams in a particular field will be passed, removed, or replaced with new data.
- Previously recorded captions in the same field will be removed.
- This mode is only suitable for encoding data on material that has not been previously captioned.

1.2.7 Stream Mode Operation:

- Each individual data stream can be manipulated independent of the other data streams.
- Incoming captions can be passed through on a channel by channel basis, or replaced with new data.
- New caption data may be inserted into existing data streams.

In stream mode, the unit can store text articles and insert them in any of the text streams on a repetitive basis. The user can program the frequency and number of times each article will be inserted. These articles replace any previously encoded data in the respective channels, and can be simultaneously encoded along with real time caption data. The 8084(AD) ships with a software utility to allow the user to load text articles easily.

In stream mode, the unit can also store Extended Data Service packets and insert them in the XDS data stream on a repetitive basis. The user can program the number of times each packet will be inserted. These packets replace any previously encoded data in the XDS channel, and can be simultaneously encoded along with real time caption data.

1.3 DAYLIGHT SAVING TIME ADJUSTMENT

Daylight Saving Time (DST) was instituted to take advantage of the later hours of daylight between April and October. In 1966, the U.S. Congress passed the Uniform Time Act that standardized the length of Daylight Saving Time. For those parts of the United States that observe Daylight Saving Time, it begins at 2 a.m. local time on the first Sunday of April. Time reverts to standard time at 2 a.m. local time on the last Sunday of October. In the spring clocks spring forward by 1 hour to 3 a.m.; in the fall clocks fall back by 1 hour to 1 a.m. Arizona, Hawaii and most of Indiana have chosen not to observe Daylight Saving Time.

People often consider daylight saving time to be an "event" that happens twice a year, setting their clocks ahead or back by one hour. In reality, DST is in effect (ON) for six months of the year and not in effect (OFF) for the other six months, in regions that observe DST.

The Caption Encoders will automatically switch their local time to Daylight Saving time at 2 a.m. local time on the first Sunday of April, and back to standard time at 2 a.m. local time on the last Sunday of October. The DST Observed control allows the user to enable or disable the DST adjustment of the local encoder time (the DSO flag). For regions that observe Daylight saving time, the DST Observed setting must be set to On, and for regions that do not observe Daylight saving time, the DST Observed setting must be set to Off. Regardless of whether DST is observed in a region, DST will be In effect between the first Sunday of April and the last Sunday of October. (The DST flag) The front panel time display shows the status of the DST and DSO flags as shown in Figure 3-7.

There are two XDS packets defined by EIA-608-B for encoding time and date information. The Time of Day packet (0701) encodes the UTC time and contains a flag bit (DST Flag) that is to be set when Daylight Saving Time is in effect (i.e. between the first Sunday of April and the Last Sunday of October). The Time of Day packet must be inserted locally at each affiliate station so that the correct time is encoded when programs are aired at different times across the network.

The Time Zone packet (0704) encodes the time zone offset from UTC time and contains a flag bit (DSO Flag) that is to be set when the entire area served by the signal observes Daylight Saving Time. When the DSO Flag bit is set to Off, it means that the VCR will ignore the DST Flag bit in the Time of Day packet. The Time Zone packet must be inserted locally at each affiliate in order to encode the correct time zone offset for the region. See application note AN3 at the back of this manual for more information about encoding time in XDS packets.

1.4 HOW TO USE THIS MANUAL

This manual is organized into 6 chapters: Overview, Installation, Operation, Serial Command Protocol, Technical Description, and Troubleshooting. There are also two application notes in the rear of the manual.

If you are confused by any terminology used throughout the manual, please refer to the Glossary of Terms in Chapter 1.

Some features described in the manual are specific to either the 8084,8084AD or 8085. Generally the text will identify which features are applicable.

Items of special note are indicated with a double box like this.

1.5   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.

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.

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, R-Y.

COMPONENT DIGITAL: A digital representation of a component analog signal set, most often Y, B-Y, 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, that 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.

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*)

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.

EIA (Electronic Industries Alliance): an association of trade associations representing various facets of the electronics industry. Each of these EIA Sector Associations manages its own standards-setting programs under EIA, the umbrella organization.

EIA-608-B: This EIA 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

EIA-744-A: The EIA 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. EIA 744-A redefines the XDS Program Rating (content advisory) packet, 05h, currently contained in **EIA-608-B**, section 6.5.1, Current Class.

EIA-746-A: This document is a proposed amendment to EIA-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

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 both 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.

LINEAR TIME CODE (LTC): A digital code used for timing and control purposes on video tape and associated audio tape 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 the 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*.

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.

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 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.

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 COORDINATED TIME
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.

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 EIA-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 subcarrier sampling rate used in composite digital systems. In NTSC this is 14.3 MHz. In PAL this is 17.7 MHz.

CHAPTER 2: INSTALLATION

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2   INSTALLATION

2.1   REAR PANEL

Figure 2-1: 8084 Rear Panel – Early versions
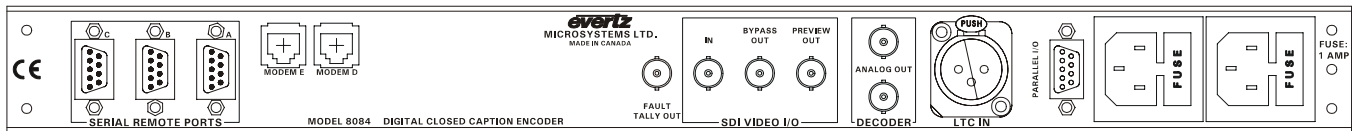
Figure 2-2: 8084 Rear Panel – Later versions
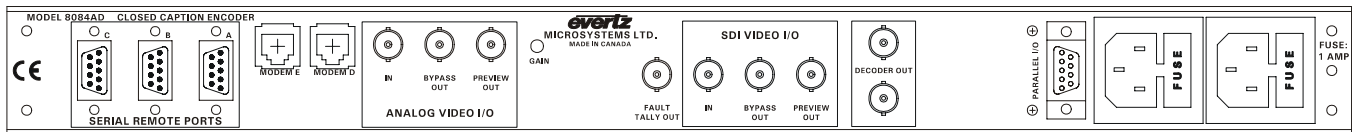
Figure 2-3: 8084AD Rear Panel
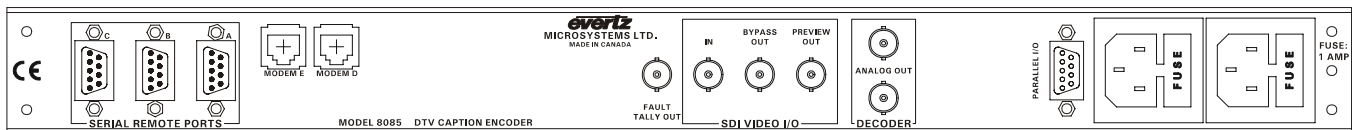
Figure 2-4: 8085 Rear Panel

The caption encoder will have a rear panel that closely resembles one of the four depicted in Figure 2-1 to Figure 2-4. The following sections describe the purpose of the rear panel connectors and describe the specific signals that should be connected to the encoder.

2.1.1   Program Video Connections

SDI IN: A BNC connector for input of 10 bit 4:2:2 component serial digital video signals compatible with the SMPTE 259M standard.

SDI BYPASS OUT: A BNC connector for output of 10 bit 4:2:2 component serial digital video signals compatible with the SMPTE 259M standard. The video data will normally be identical to the input video data, with caption data inserted onto it. When the bypass relay is activated (on power failure or by closing the Bypass GPI to ground) the SDI BYPASS OUT is a direct relay connection to the SDI IN.

FAULT TALLY OUT: A BNC connector for output of a SMPTE 269M fault tally. The output will be open circuit when the 8084 is processing video normally. The output will be grounded when the unit is bypassed.

ANALOG IN: A BNC connector for input of composite analog video signals compatible with the SMPTE 170M standard. Internally terminated by 75 ohms. (8084AD only)

ANALOG BYPASS OUT: A BNC connector for output of composite analog video signals compatible with the SMPTE 170M standard. The video signal will normally be identical to the input video, with caption data inserted onto it. When the bypass relay is activated (on power failure or by closing the Bypass GPI to ground) the ANALOG BYPASS OUT is a direct relay connection to the ANALOG IN. (8084AD only)

GAIN: This hole allows access to a multi-turn trimmer potentiometer for adjusting the output level of the ANALOG BYPASS OUT connector on the 8084AD. This trimpot is calibrated from the factory for $1V_{p-p}$ output. If adjustment is required in the field, we recommend using a small slot-style plastic screwdriver or one with a plastic guide over the tip. This will prevent possible shorting to nearby components on the circuit board if the screwdriver slips off the adjustment screw.

2.1.2   Preview Video Connections

SDI PREVIEW OUT: A BNC connector for output of 10 bit serial digital video signals compatible with the SMPTE 259M standard. This video will be the SDI video input with data inserted onto it when the bypass relay is NOT activated. If the bypass relay is activated, this connector will have NO video output.

DECODER OUT: Two BNC connectors for composite analog output of the SDI video signal, with the captions decoded and inserted as open captions over the video. The front panel menus are used to determine which data channel will be decoded. This output can be connected to any analog monitor to verify that the captions or XDS data has been encoded correctly on the SDI program path. If the bypass relay is activated, this connector will have NO video output.

ANALOG PREVIEW OUT: A BNC connector for output of the composite analog video signal, with the captions decoded and inserted as open captions over the video. The front panel menus are used to determine which data channel will be decoded. This video will be the analog video input with data inserted onto it when the bypass relay is NOT activated and can be connected to any analog monitor to verify that the captions or XDS data has been encoded correctly on the analog program path. If the bypass relay is activated, this connector will have NO video output.

2.1.3 Serial Port / Modem Connections

PORT A: A 9-pin male 'D' connector for connection to a computer with captioning or XDS control software. The front panel Engineering menus are used to set the correct baud rate, word size and parity for use with your captioning software. (See section 3.3) This port is also used to update the firmware in the Closed Caption Encoder. (See section 5.4)

As configured from the factory, the pinout of this connector is designed so that you can use a readily-available "null modem" cable to connect to your computer via RS-232 port. Jumper settings inside the unit may alter this pinout, and reconfigure for RS-422 communications. Please refer to Figure 2-8 and Figure 2-9 for typical port pinouts and connections to a computer.

> **Evertz does not recommend altering the jumper settings for port A, as it may make in-field reprogramming very difficult for the user.**

PORT B, C: These 9 pin male 'D' connectors may be used for connection to computers with captioning or XDS control software. The front panel Engineering menus are used to set the correct baud rate, word size and parity for use with your captioning software. (See section 3.3)

The pinout of this connector is designed so that you can use a readily available "null modem" cable to connect to your computer. If the rear panel of the encoder resembles that shown in Figure 2-1b, jumper settings inside the unit may alter this pinout and select between RS-232 and RS-422 communications. Please refer to Figure 2-8 and Figure 2-9 for typical port pinouts and connections to a computer.

MODEM D, E: These RJ11 jacks are used to connect the internal modems to the telephone line, so that computers at other locations that are running captioning or XDS control software can connect to the 8084(AD). Use of the MODEM E port requires the 8084-MDM2 option to be installed in your unit. If the option is not installed, this RJ11 jack will not be connected internally. The front panel Engineering menus are used to set the correct baud rate, word size and parity for use with your captioning software. (See section 3.3)

> **IMPORTANT INSTALLATION NOTICE: For a reliable telephone connection to the modem in this caption encoder, a direct telephone line must be used. This line must not pass through a PBX or similar key device.**

2.1.4 Parallel Remote Control Connections

PARALLEL: A 9-pin female 'D' connector for connection to 'closure to ground' remote control signals. Each input is optically isolated, and has an internal 47 K ohm pull-up to +5 volts. The pinout of the connector is as follows:

Pin	Description
1	Ground
2	Serial Port A Disable
3	Serial Port B Disable
4	Serial Port C Disable
5	Modem Port D Disable
6	Bypass Relay Enable
7	Caption Keyer Disable
8	Caption Shift Up
9	Ground

Figure 2-5: Parallel GPI Port Pinout

Refer to section 3.5 for details on the functions of each parallel port GPI pin.

Older 8084 firmware revisions assigned GPI pins 7 and 8 as separate 'master' and 'temporary' keyer disables. Existing installations using the 'temporary' keyer disable on pin 8 will need to be updated.

2.1.5 Power Connections

LINE: The Caption Encoder has one or two universal power supplies that operate on either 115v/60 Hz or 230v/50 Hz AC operation. (Redundant supply is optional). The power supplies auto sense the input mains voltage.

2.2 MOUNTING

The Closed Caption Encoder is equipped with rack mounting angles and fits into a standard 19 inch by 1 3/4 inch (483 mm x 45 mm) rack space. The mounting angles may be removed if rack mounting is not desired.

2.3   POWER REQUIREMENTS

The Caption Encoder has one or two universal power supplies that automatically sense the input voltage. (The redundant supply is optional.) It can operate on either 115 Volt / 60 Hz or 230 Volt / 50 Hz AC.

Power should be applied by connecting a 3-wire grounding type power supply cord to the power entry modules on the rear panel. The power cord should be minimum 18 AWG wire size; type SVT marked VW-1, maximum 2.5 m in length. The power entry module combines a standard power inlet connector, two 5 x 20 mm fuse holders and an EMI line filter.

> ⚠ **CAUTION - TO REDUCE THE RISK OF ELECTRIC SHOCK, GROUNDING OF THE GROUND PIN OF THE MAINS PLUG MUST BE MAINTAINED**

2.4   CONNECTING THE DIGITAL VIDEO

2.4.1   SDI Video Input

The 8084 and 8085 require a digital video source to be connected to the SDI video input. The 8084AD does not require an SDI video source when composite video is selected as the caption source.

The unit accepts either 525 or 625 line digital video in the component (4:2:2) format. Set the VIDEO TYPE parameter on the front panel menu to match the video input. (See section 3.2.1 for information on changing the video type setting.)

The 8084 has LEDs labeled 525 and 625 VIDEO IN on the front panel, these indicate which input is active and if there is video present. When either LED is blinking it indicates that there is no video present. The 8084AD has a single LED labeled SDI VIDEO IN. When it is on steady, there is SDI video present. When it is flashing, there is a problem such as incorrect video standard selected. When the LED is off, no input SDI video has been detected.

2.4.2   SDI Video Output

The two SDI outputs contain the input video with closed caption data keyed in. The SDI BYPASS OUT output is bypass protected in case of power failure or operator override. Normally this output should be used for the main program output of the caption encoder. A second non-bypassed output (SDI PREVIEW OUT) may be connected for preview applications. When the Bypass relay is active, this output contains no video signal. The Bypass relay will be activated on power failure and when the Bypass Relay GPI is closed to ground. It may also be manually activated using the front panel menus. The Fault Tally Output will be open circuit when the caption encoder is processing video normally, and will be grounded when the bypass relay is activated.

2.5 CONNECTING THE ANALOG VIDEO

2.5.1 Decoder Outputs (from SDI video path)

A composite monitor inside the caption encoder provides two composite DECODER outputs from the SDI video feed. The two identical outputs are typically connected to video monitors to verify that the captioning is being applied correctly. The front panel menus are used to select which data channel will be decoded (See section 3.2.4)

2.5.2 Composite Analog Video Input (8084AD only)

The 8084AD accepts either an SDI video source in the SDI IN BNC or a composite analog video source in the ANALOG VIDEO IN BNC or both sources simultaneously when these are frame-locked together.

> **For proper operation, the input analog video should be timebase corrected. For simultaneous analog and SDI operation, the video sources must also be frame-locked.**

The ANALOG VIDEO IN connector accepts either 525 or 625 line composite analog video. Set the VIDEO TYPE parameter on the front panel menu to match the video input. (See section 3.2.1 for information on changing the video type setting). The UPSTREAM SOURCE parameter should also be changed to match the type of video being input, even if the upstream video contains no caption data.

The 8084AD has an LED labeled COMP VIDEO IN. When it is on steady, there is composite analog video present. When it is flashing, there is a problem such as incorrect video standard selected, or the video is of poor quality. When the LED is off, no input SDI video has been detected.

2.5.3 Composite Analog Video Output (8084AD only)

The two composite outputs contain the input video with closed caption data keyed in. The ANALOG BYPASS OUT output is bypass protected in case of power failure or operator override. Normally this output should be used for the main program output of the caption encoder. A second non-bypassed output (ANALOG PREVIEW OUT) has a built-in caption decoder and may be connected for preview applications. When the Bypass relay is active, this output contains no video signal. The Bypass relay will be activated on power failure and when the Bypass Relay GPI is closed to ground. It may also be manually activated using the front panel menus.

2.6 CONNECTING THE ENCODER TO A CLOSED CAPTION COMPUTER

Figure 2-6 shows the typical connections required when using the 8084AD in conjunction with a computer running captioning software. Connections for the 8084 are similar, but have only the digital video path. Figure 2-7

shows the typical connections required when using the 8085 in conjunction with an ATSC encoder and a computer running captioning software.
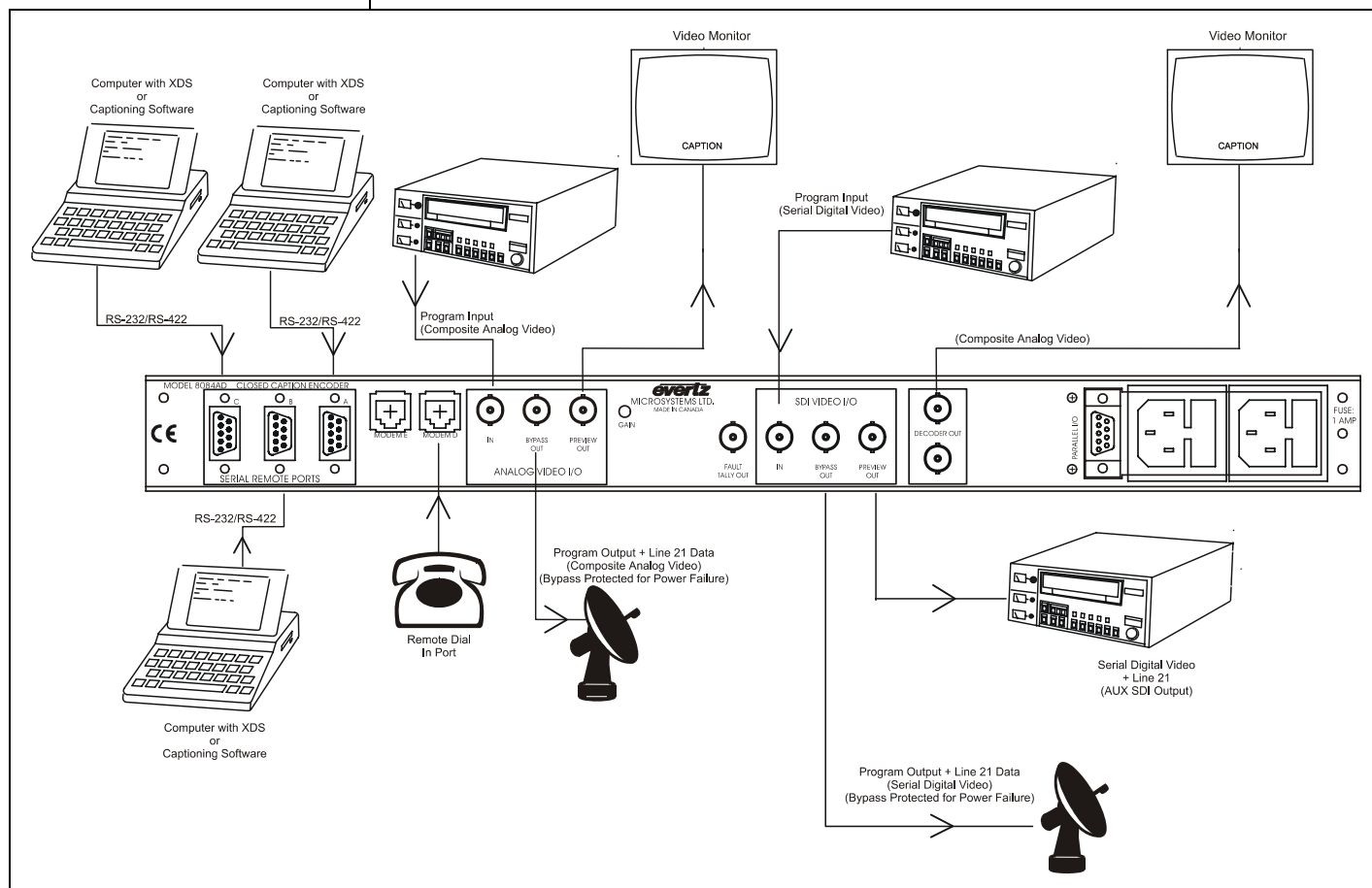
Figure 2-6: Typical Connections to the 8084AD Caption Encoder
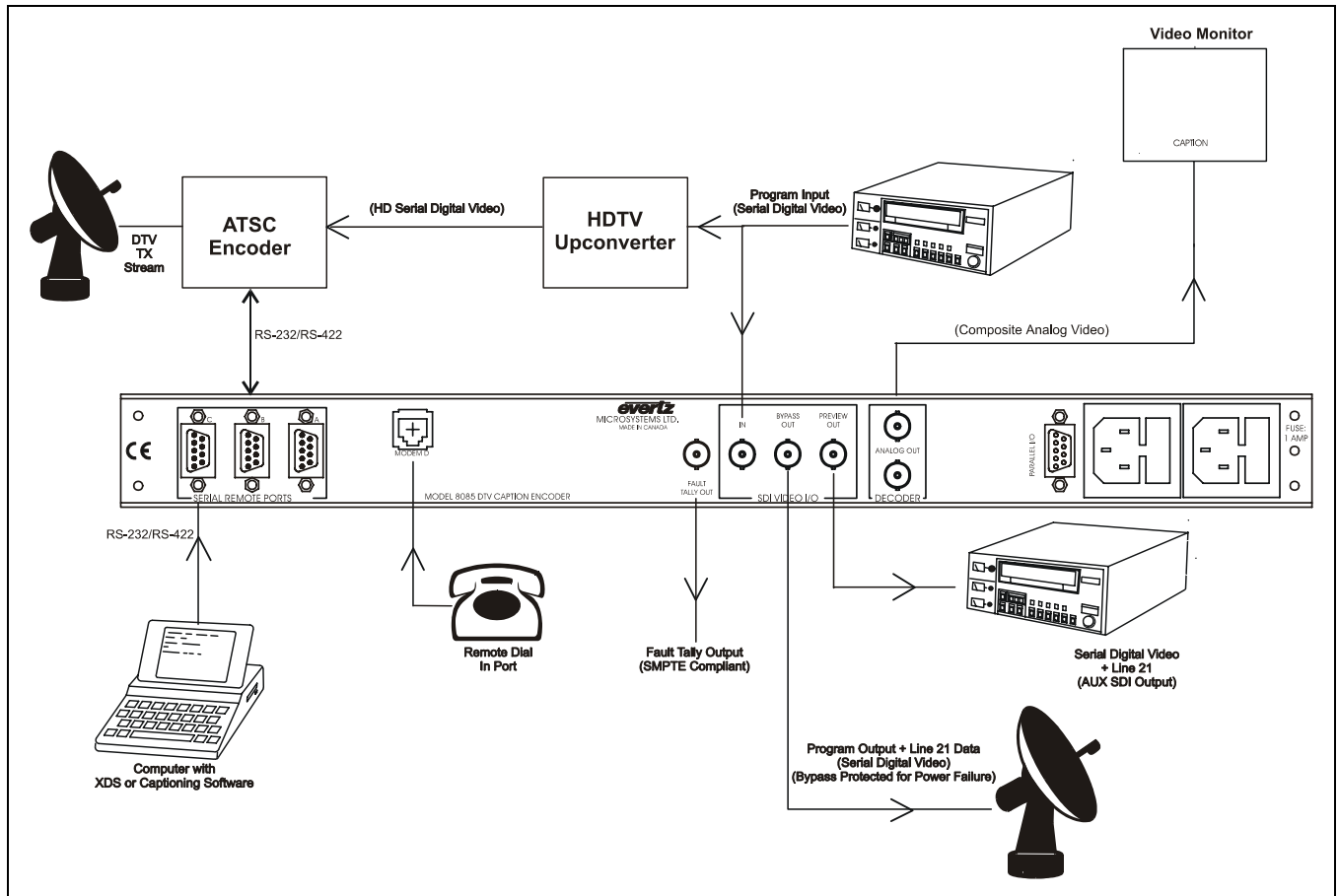
Figure 2-7: Typical Connections to the 8085 DTV Caption Encoder

Connect the PORT A, B or C connector of the Closed Caption Encoder to one of the serial ports (typically COM1 or COM2) of your computer. Figure 2-8 below shows the typical cable wiring diagram to connect Port A, B or C and a personal computer. If none of the ports have been altered from the factory settings, you can use a standard "NULL MODEM" cable to connect your PC to any port. If you are connecting only one computer running caption encoding software, we recommend connecting it to port C.

Serial I/O Port (A,B,C) Male (pins)		Computer End Male (pins)		
Description	DB-9	DB-25	DB-9	Description
Shield	-------------------			Shield
RS 232 Transmit	3 ----------------3		2	RS 232 Receive
Ground	5 ----------------7		5	Signal Ground
RS 232 Receive	2 ----------------2		3	RS 232 Transmit
RS 232 CTS	8 ----------------4		7	RS 232 RTS
RS 232 DTR	4 ----------------6		6	RS 232 DSR
RS 232 RTS	7 ----------------5		8	RS 232 CTS
RS 232 DSR	6 ---------------20		4	RS 232 DTR

Figure 2-8: Wiring RS-232 DTE Serial Port to Computer

Serial I/O Port (A,B,C) Male (pins) Description	DB-9	DB-9	Computer "Master" End Female Description
Shield	-------------------		Shield
Frame Ground	1 -----------------	1	Frame Ground
Transmit Common	6 -----------------	6	Receive Common
Transmit -	2 -----------------	2	Receive -
Transmit +	7 -----------------	7	Receive +
Receive +	3 -----------------	3	Transmit +
Receive -	8 -----------------	8	Transmit -
Receive Common	4 -----------------	4	Transmit Common
Frame Ground	9 -----------------	9	Frame Ground
not used	5 -----------------	5	not used

Figure 2-9: Wiring RS-422 Tributary Serial Port to RS-422 Master

The baud rate, word size and parity of the closed caption encoder must be set up to match your software configuration. The most common settings are 1200 Baud, 7 bits odd parity. The Engineering Setup menu BAUD RATE and SERIAL WORD menu items are used to configure these parameters. (See section 3.3.1)

2.7   CONNECTING TO AN ATSC ENCODER (8085 only)

The connection to the ATSC encoder must be done using the Port B connector of the 8085. The connection to a typical ATSC encoder system with a DTE type port is as follows (a standard 'Null Modem' cable can be used):

8085 Port B Male Description	DB-9	DB-9	ATSC Encoder End (DTE) Male Description
Shield	------------------		Shield
RS 232 Transmit	3 ------------------	2	RS 232 Receive
Ground	5 ------------------	5	Signal Ground
RS 232 Receive	2 ------------------	3	RS 232 Transmit
RS 232 CTS	8 ------------------	7	RS 232 RTS
RS 232 DTR	4 ------------------	6	RS 232 DSR
RS 232 RTS	7 ------------------	8	RS 232 CTS
RS 232 DSR	6 ------------------	4	RS 232 DTR

Figure 2-10: ATSC Cable Wiring Diagram Port B to DTE port

The connection to a typical encoder system with a DCE type port is as follows (a standard 'Direct Connect' cable can be used):

8085 Port B Male Description	DB-9	DB-9	ATSC Encoder End (DCE) Female Description
Shield	-------------------		Shield
RS 232 Transmit	3 ------------------	3	RS 232 Receive
Ground	5 ------------------	5	Signal Ground
RS 232 Receive	2 ------------------	2	RS 232 Transmit
RS 232 CTS	8 ------------------	8	RS 232 RTS
RS 232 DTR	4 ------------------	4	RS 232 DSR
RS 232 RTS	7 ------------------	7	RS 232 CTS
RS 232 DSR	6 ------------------	6	RS 232 DTR

Figure 2-11: ATSC Cable Wiring Diagram Port B to DCE port

CHAPTER 3: OPERATION

Key Functions in Normal Display Mode

Keys	Function	Relevant Sections
SHIFT + ↓	Toggle Stream Monitor Display	3.4
SHIFT + ↑ + →	Reset to Transparent State	3.3.12
SHIFT + SELECT	Show firmware revision	5.5.3
Menu System Entry		
SETUP	Enter SETUP menu system	3.1.1
SHIFT + SETUP	Enter ENGINEERING menu system	3.1.1
Caption Keyer Controls		
CAPTION ON/OFF	Toggle Caption Keyers ON or OFF	3.1.2
SHIFT + CAPTION ON/OFF	Lock Caption Keyers OFF	3.1.2
KEYER FLD 1	Toggle Field 1 Caption Keyer ON/OFF	3.1.2
KEYER FLD 2	Toggle Field 2 Caption Keyer ON/OFF	3.1.2
SHIFT + KEYER FLD 1	Lock Caption Keyers in present state	3.1.2
SHIFT + KEYER FLD 2	Lock Caption Keyers in present state	3.1.2
Caption Decoder Controls		
DECODER	Show current decoder channel	3.2.4
DECODER + ↑	Scroll UP through decoder channel list	3.2.4
DECODER + ↓	Scroll DOWN through decoder channel list	3.2.4
DECODER + ←	Shift decoder display to the left	3.2.4
DECODER + →	Shift decoder display to the right	3.2.4

Key Functions Within Setup or Engineering Menu Systems

Keys	Function	Relevant Sections
↑ , ↓	Move UP / DOWN main menu items	3.1.1
← , →	Show choices for current menu item	3.1.1
SETUP	Exit menu system	3.1.1
SELECT	Activate current choice for menu item	3.1.1

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3   HOW TO OPERATE THE DIGITAL CLOSED CAPTION ENCODER

3.1   AN OVERVIEW OF KEY AND DISPLAY FUNCTIONS
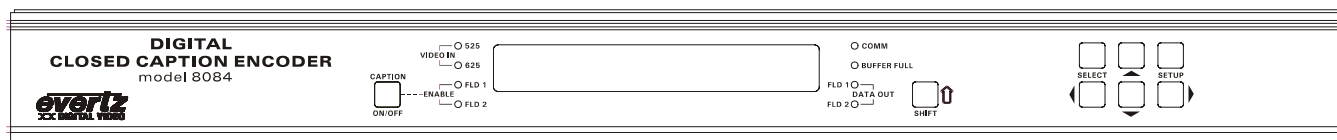
Figure 3-1: Original 8084 Front Panel Layout
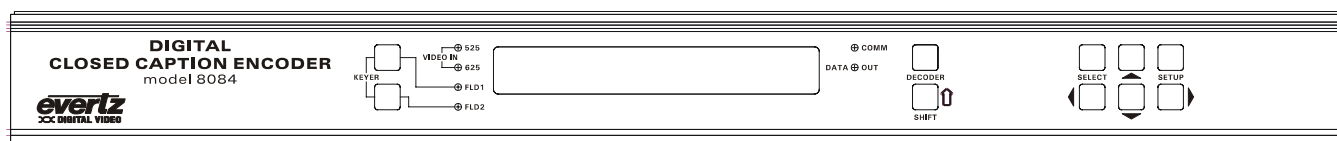
Figure 3-2: Newer 8084 Front Panel Layout
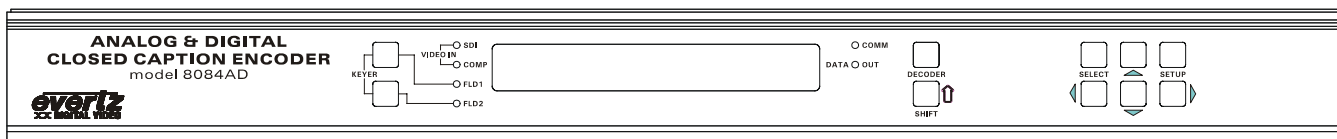
Figure 3-3: 8084AD Front Panel Layout
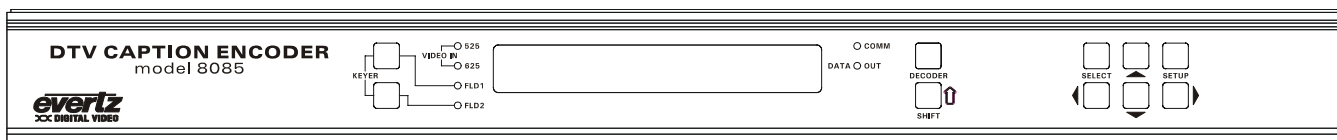
Figure 3-4: 8085 Front Panel Layout

The display area consists of a 16 digit alphanumeric display, six or eight LED status indicators and an eight or ten pushbutton keypad, depending on the model. The four possible front panel configurations are depicted in Figure 3-1 to Figure 3-4.

A menu system provides a quick and simple method of configuring the Closed Caption Encoder directly from the front panel. The keypad is used to control the menu system, and to provide a global Keyer disable. When the **SHIFT** key is held down, the meanings of some of the keys are modified, gaining quick access to a wider variety of functions.
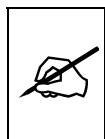
Throughout this manual SHIFT + indicates that you should hold down the SHIFT key while pressing a second key.

The remainder of section 3.1 gives an overview of the caption encoder operation. Sections 3.2 and following give detailed information on the specific operations required to control the device.

3.1.1 Navigating the Front Panel Menus -- The Setup Group

The menu systems use the 16 digit alphanumeric display and the Setup key group (**SELECT**, **SETUP, ← → ↑ ↓**) to configure the closed caption encoder.

There are two menu systems used to configure the closed caption encoder. Users will most often use the Setup menu, which is accessed by pressing the **SETUP** key. The Setup menu is used to configure the basic operation of the Closed Caption Encoder. There is also an Engineering menu, which contains items not normally required during normal operation. To enter the Engineering menu press the **SHIFT + SETUP** keys.

To navigate within the menu system, press the **↑** or **↓** keys to move to the next menu item. When you have chosen the desired menu item, press the **←** or **→** keys to view the options available for that menu item.   The currently selected setting will be flashing.   When you have chosen the desired setting for the menu item, press the **SELECT** key to save that value.

The currently active menu setting will be flashing.

When you have made all the desired changes, press the **SETUP** key to exit the menu system and return to the normal display mode.

The display will automatically return to the normal display mode if no key presses are made for several seconds. (See section 3.1.4)

The menu systems consist of a main menu with two or more choices for each menu item. A **")"** symbol is shown to the left of the main level Setup menu items. A **">"** symbol is shown to the left of the main level Engineering menu items. This allows them to be easily distinguished from each other and from the front panel operating messages. The sub-menu choices are shown in lower case to allow them to be easily distinguished from the main level items.

Figure 3-5 is an overview of the Setup menu system that shows all of the menu items and where you will find the menu choices. Figure 3-6 is an overview of the Engineering menu system that shows all of the Engineering menu items and where you will find the menu choices. In each figure, factory default choices for each menu item are shown in boldface.

Each of the Setup menu items is described in section 3.2 with an explanation of what each choice does. Each of the Engineering menu items are described in section 3.3 with an explanation of what each choice

does. Some menu items may not be available depending on the options installed in the caption encoder

```
) VIDEO TYPE
   Type 422 525
   Type 422 625
) OUTPUT LINE
   Line = 21
) MODEM D
   ModemD = disabled
   ModemD = enabled
   ModemD = hangup
) CHAR POSITION
   Ch pos = +00
) BYPASS RELAY
   Bypass = off
   Bypass = on
) UPSTREAM SOURCE
   Source digital
   Source analog
)LOC VCHIP CODE
   (US-TV) None
   (MPAA) N/A
   (CDN-E) E
   (CDN-F) E

)LOC VCHIP TIMER
   Insert disable
   Insert enable
   Insert @ 01 sec
   Insert @ 02 sec
   …
   Insert @ 97 sec
   Insert @ 98 sec
```

Figure 3-5: Overview of the Setup Menu System

> **PORT A BAUD**
BaudA = 1200
BaudA = 2400
BaudA = 4800
BaudA = 9600
BaudA = 19200
BaudA = 38400

> **PORT A WORD**
WordA 7 odd
WordA 7 even
WordA 8 none
WordA 8 odd
WordA 8 even

> **PORT A MAP**
A:CF1234 TF1234X

>**PORT B FUNCTION**
Funct B Normal
Funct B Echo PA
Funct B Echo PC
Funct B Echo PD
Funct B CC xmit
Funct B CC recv

> **PORT B BAUD**
BaudB = 1200
BaudB = 2400
BaudB = 4800
BaudB = 9600
BaudB = 19200
BaudB = 38400

> **PORT B WORD**
WordB 7 odd
WordB 7 even
WordB 8 none
WordB 8 odd
WordB 8 even

> **PORT B MAP**
B:CF1234 TF1234X

> **PORT C BAUD**
BaudC = 1200
BaudC = 2400
BaudC = 4800
BaudC = 9600
BaudC = 19200
BaudC = 38400

> **PORT C WORD**
WordC 7 odd
WordC 7 even
WordC 8 none
WordC 8 odd
WordC 8 even

> **PORT C MAP**
C:CF1234 TF1234X

> **PORT D BAUD**
BaudD = 1200
BaudD = 2400
BaudD = 4800
BaudD = 9600
BaudD = auto

> **PORT D WORD**
WordD 7 odd
WordD 7 even
WordD 8 none
WordD 8 odd
WordD 8 even

> **PORT D MAP**
D:CF1234 TF1234X

> **CAPTION SHIFT**
Shift off
Shift on

> **MODE**
Mode = field
Mode = stream

> **ERASE TIMER**
Erase timer on
Erase timer off

> **PASS UPSTREAM**
C1234 T1234X

> **SET UTC CLOCK**
Time = 00:00:00

> **LTC RDR CONFIG**
LTC = no input
LTC = local time
LTC = UTC time
LTC = local + date
LTC = UTC + date

> **LTC DST CONFIG**
LTC DST = system
LTC DST = on
LTC DST = off

> **TEST MESSAGE**
Test msg on
Test msg off

> **GPI IN MONITOR**
Gpi = 00 02 01 02

> **CLEAR LOCAL XDS**
Clear XDS? No
Clear XDS? Yes

> **TOTAL RESET**
Reset = no
Reset = yes

Figure 3-6: Overview of the Engineering Menu System

3.1.2 Caption Keyer Control Group

The 8084AD, 8085 and later 8084 caption encoder models have separate Field 1 and Field 2 caption keyer enable buttons (see section 3.1.2.1). The earlier 8084 encoders have a single global Caption On/Off button, which controls both Field 1 and Field 2 caption keyers (see section 3.1.2.2).

These controls are also used to "lock" the caption keyers. When the keyers are locked, neither the keyer control buttons nor software controls can change the state of the keyers. If the user attempts to turn a keyer on or off while the keyers are locked, the front panel will briefly display `KEYERS LOCKED`.

Lock the caption keyers off when you want to guarantee pass through of existing line 21 closed caption information that is already on the program material. See section 3.5.2 for information on controlling the bypass relay.

Even when the keyers are turned off, EDH packet checksum correction is still performed on the SDI video, and composite video level adjustment is performed where applicable.

3.1.2.1 Keyer Control on 8084AD, 8085 and later 8084 Encoders

KEYER FLD 1 Toggles the Field 1 caption keyer on or off. When the keyer is off, the device will merely clock the video through its internal registers and route it to the video output. The Fld 1 LED indicates if the Field 1 keyer is enabled or not. Software commands received by the 8084(AD) may also turn the keyer on or off.

KEYER FLD 2 Toggles the Field 2 caption keyer on or off. When the keyer is off, the device will merely clock the video through its internal registers and route it to the video output. The Fld 2 LED indicates if the Field 2 keyer is enabled or not. Software commands received by the 8084(AD) may also turn the keyer on or off.

SHIFT + KEYER FLD 1
SHIFT + KEYER FLD 2 Either of these key combinations will lock both Field 1 and Field 2 caption keyers in their current position. Software commands received via the serial ports will not change the keyer settings when they are in the locked mode.

Separate Field 1 and Field 2 caption keyer ON/OFF buttons were placed on the front panel to allow the insertion of XDS in field 2 without introducing delay in the field 1 captions through re-encoding. An operator could unknowingly use this feature to insert data in field 2 when there was no caption waveform present in field 1 at all. This is contrary to EIA-608-B, and will cause some XDS decoders to shut down.

If there is no field 1 caption waveform present upstream and the field 2 keyer is on, the field 1 keyer will be forced on and the FLD 1 LED will blink. This will cause a line 21 field 1 caption waveform to be present whenever line 21 field 2 caption waveform is present on the video consistent with EIA-608-B rules. When the field 1 keyer has been forced on and upstream Field 1 captions resume, the Field 1 Keyer will turn off again.

3.1.2.2 Keyer Control on Early 8084 Encoders

CAPTION ON / OFF Toggles the caption keyer on or off. When the keyer is off, the device will merely clock the video through its internal registers and route it to the video output. When the encoder is turned back on, both the Fld 1 and Fld 2 Enable LED's will indicate if the respective keyer is enabled or not. Software commands received by the 8084(AD) may turn the keyer on or off.

SHIFT + CAPTION ON / OFF Locks the caption keyers Off. Software commands received via the serial ports will not turn the keyers on when they are in the locked mode.

3.1.3 Status Indicator Lights

There are either six or eight status indicators, depending on the encoder model, located on the front panel. These show the operational status of the caption encoder at a glance. The meanings of all LEDs that may be found on the front panel are as follows:

525 VIDEO IN
625 VIDEO IN Shows the selected component digital video standard, the standard detected by the encoder, and whether video is present. If an LED is on steady, that is the current video standard and video is present. If it is blinking, it indicates that a valid video signal is not present. If one LED is on steady but the other is blinking, video is present but the encoder has detected that the video standard is not set correctly.

SDI VIDEO IN When lit, the caption encoder has detected incoming component digital video of the correct standard. When the LED is flashing, SDI video is detected but the video standard is not correct. When off, no incoming video has been detected at the SDI VIDEO IN connector.

COMP VIDEO IN   When lit, the caption encoder has detected incoming composite analog video of the correct standard. When the LED is flashing, there is a problem such as incorrect video standard, or the video is of poor quality. The 8084AD may still be able to key captions onto poor quality analog video, depending on the severity of the problems. When off, no incoming video has been detected at the ANALOG VIDEO IN connector.

FLD 1 ENABLE
FLD 2 ENABLE   Indicates that the device is keying caption information into Field 1 and/or Field 2 of the video when lit.

Null characters will be inserted if there is no incoming data from the communications ports, or if there is no upstream caption information for the particular field when in "stream" mode.

The front panel message will display LINE 21 KEY when either keyer is enabled.

COMM   Indicates that data is being received or transmitted on any of the communications ports. The LED will also be on during the Test Message Mode that simulates communications with captioning software.

BUFFER FULL   Indicates that one of the communications buffers is full. The caption encoder sends an XOFF command to the sending computer to temporarily stop the communications until the communications buffer is empty, at which time an XON command will be sent to the computer. RTS flow control is also used to temporarily stop the communications.

FLD1 DATA OUT   Indicates that non-null data being received on one of the communications port or from the upstream captions is being inserted into the Field 1 data queue. When the Field 1 captions are enabled, this data will be inserted on line 21 in field 1.

FLD2 DATA OUT   Indicates that non-null data being received on one of the communications port or from the upstream captions is being inserted into the Field 2 data queue. When the Field 2 captions are enabled, this data will be inserted on line 21 in field 2.

DATA OUT   Indicates that non-null data being received on one of the communications port or from the upstream captions is being inserted into the data queue for either field. When a caption keyer is enabled, this data will be inserted on line 21. This indicator is lit when FLD1 DATA OUT or FLD2 DATA OUT would otherwise be lit.

3.1.4 Front Panel Operating Messages

The front panel display is used to indicate the current operating mode of the caption encoder as shown below. On some of the displays a period (`.`) will be shown to the left of the display if upstream data is present on field 1. If incoming data is present in field 2 then a colon (`:`) will be shown to the left of the display. Figure 3-7 shows the front panel time display with the associated status indicators.

The normal front panel display alternates between these three messages.

✎ | **If the front panel display shows a message similar to `C1234 T1234E` instead of these alternating messages please refer to section 3.4.**

`LN 21 KEYER`   Caption Keyer(s) enabled. The video line number that captions are being encoded on will be displayed. The caption encoder is enabled for Field 1 or Field 2 as indicated by the FLD 1 Enable and FLD 2 Enable LEDs.

`23:59:59`   The current local time display shows the local time of the 8084's real time clock. The clock can be set from the serial port or using the optional LTC input. Please note that the encoder does not automatically change its clock for Daylight Saving Time.

The following special indicators are used in the time display:

DST Flag Indicator: If the 'Daylight Saving Time in effect' (DST) flag is set ON inside the encoder, the separator character between the hours and minutes will be a period (.). If the DST flag is OFF, this character will be a colon (:).

DSO Flag Indicator: If the 'Daylight Saving Time observed' (DSO) flag is set ON inside the encoder, the separator character between the minutes and seconds will be a period (.). If the DSO flag is OFF, this character will be a colon (:).

If your region observes Daylight Saving Time, you should set the DSO flag on permanently; otherwise it should be set to Off. Regardless of whether your region observes Daylight Saving Time or not, you should set the DST flag ON when Daylight Saving Time begins in the spring, and OFF when Daylight Saving Time ends in the fall. **This is a requirement in order to properly encode XDS Time of Day packets.** The MetaCast 2 software package allows you to easily set these flags automatically using your PC.

LTC Input Active: For units equipped with the optional LTC reader, a 'T' character may appear in the right-most character position when the time is being displayed on the character display. The 'T' indicates that the LTC reader has detected incoming time code that appears to be valid.

`JAN 15, 2002` The date display shows the local date of the 8084's real time clock. The date can be set from the serial port or by reading date information that has been encoded into the user bits using the optional LTC input.

The DST and DSO flag indicators, the LTC Input Active indicators and the date display are particularly useful diagnostic information for broadcasters that have chosen to encode Time-of-Day XDS packets in field 2.
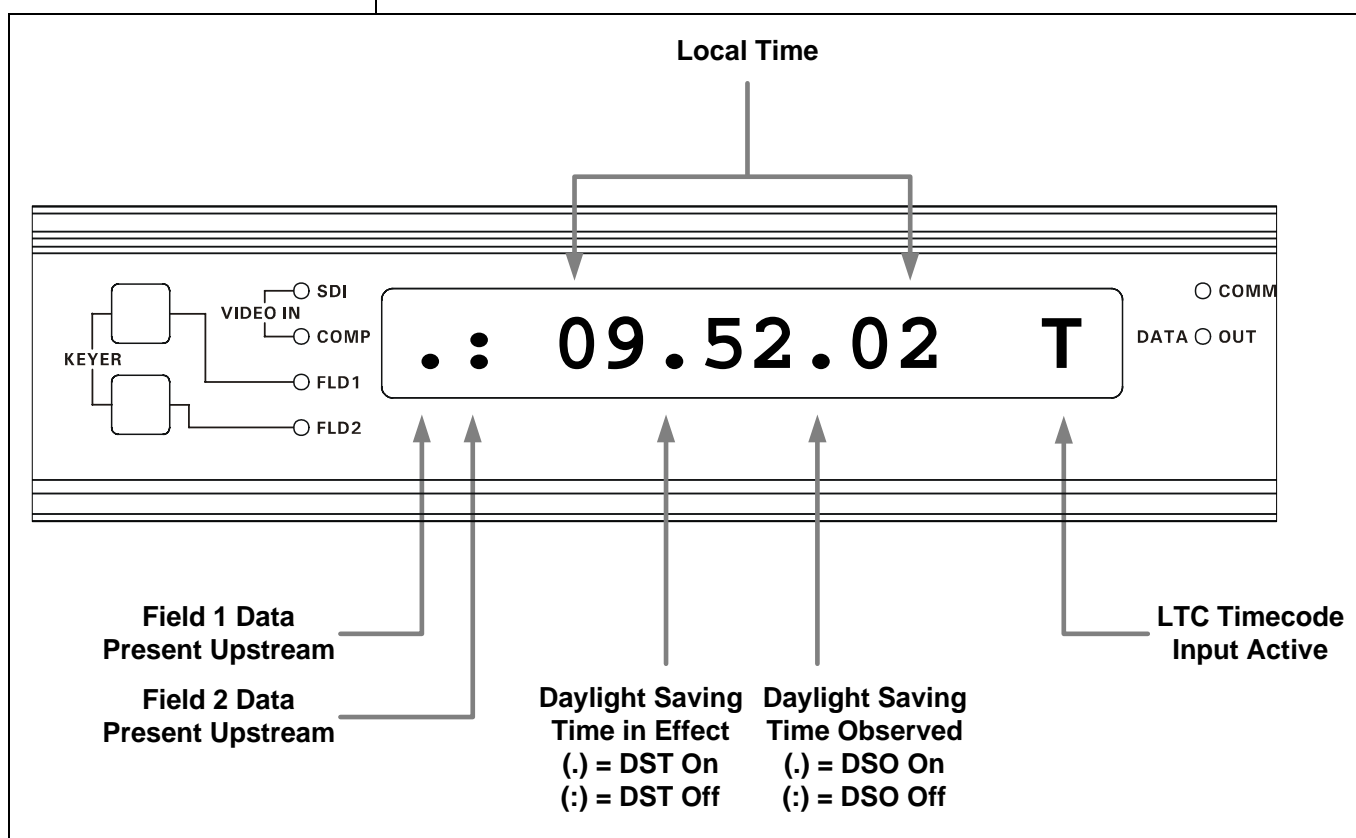
Figure 3-7: Front Panel Time Indicators

The following displays may be shown in certain modes of the 8084. In these modes, the normal cycling of the time and date and `LN 21 KEYER` displays is turned off.

`LN 21 KEY OFF` Keyers are disabled but may be enabled by the computer. Video will pass through the 8084 without modifying the caption line.

`525 LOCK OFF` 525 line video selected. Keyers are disabled and may not be enabled by the computer. Video will pass through the 8084 without modifying the caption line.

`625 LOCK OFF` 625 line video selected. Keyers are disabled and may not be enabled by the computer. Video will pass through the 8084 without modifying the caption line.

`LN 21 LOCKED` Caption Keyer(s) enabled and locked in their present state. The video line number that captions are being encoded on will be displayed. The caption encoder is enabled for Field 1 or Field 2 as indicated by the FLD 1 Enable and FLD 2 Enable LEDs.

`REMOTE OVERRIDE` Indicates that the caption keyers have been disabled by a GPI input on the parallel connector.

`EXTERNAL BYPASS` Indicates that the video has been bypassed due to a GPI input on the parallel connector.

`LOCAL BYPASS ON` Indicates that the video has been bypassed due to a front panel menu selection.

`LOCKED THRU` The caption encoder is disabled and may not be enabled by computer. Video will pass through the 8084 unmodified.

`C1234 T1234E` The channel monitor display is accessible by pressing the SHIFT + ↓ keys when the 8084(AD) is in stream mode. The four characters to the right of the **C** indicate what is happening to the four caption data streams. The four characters to the right of the **T** indicate what is happening to the 4 text data streams. The rightmost character indicates what is happening to the Extended Data Services stream. (See section 3.4.1 for further information). Return to the normal front panel displays by pressing the SHIFT + ↓.

F1KEY F2KEY The field monitor display is accessible by pressing the SHIFT + ↓ keys when the 8084(AD) is in field mode. The message to the right of the **F1** indicates what is happening to the data in Field 1. The message to the right of the **F2** indicates what is happening to the data in field 2. (See section 3.4.2 for further information). Return to the normal front panel displays by pressing the SHIFT + ↓.

MODEM D ONLINE This message will alternate with other displays to indicate that the 8084(AD) is on-line with the built-in modem D.

MODEM D DISABLED This message will alternate with other displays to indicate that Modem D is <u>not</u> in auto-answer mode, either because of the menu configuration or parallel port GPI.

A DISABLED This message will alternate with other displays to indicate that Port A is disabled because of a parallel port GPI. All input on Port A will be ignored while in this mode. Similar messages may appear for other ports.

NONSENSE CC F1
NONSENSE CC F2 Many caption commands consist of two-byte sequences when encoded in the video. These front panel error messages may appear when the encoder is reading upstream caption data. They indicate that the first byte of a first byte of a command was received, but the second byte was not a valid command value for any command.

KEYERS LOCKED will be displayed when the operator attempts to turn the caption keyers On or Off while they are locked.

When the modem is enabled, the front panel display will show various messages received from the modem such as **CONNECT 1200** or **NO CARRIER** or **OKOKOK**.

ATSC OVERFLOW The 8085 includes an additional error message: ATSC OVERFLOW, which indicates that the ATSC compression encoder has not polled the 8085 sufficiently often, and some caption data (null or otherwise) has accumulated to the point of overflowing the 8085's delay buffer. Some caption data has been lost due to the insufficient polling.

Some additional error messages related to serial port commands are described in section 4.2.5.

When in the Setup or Engineering menus, the front panel is used to display the current menu item and selected option.

3.2   SETUP MENU ITEMS

The Setup menu is used to configure the basic operational modes of the Closed Caption Encoder such as selecting which type of video is present, which data channel will be shown on the decoder output, etc. A **")"** symbol to the left of the main level menu items allows them to be easily distinguished from the front panel operating messages. The sub-menu choices are shown in lower case to allow them to be easily distinguished from the main level items. Items shown in **bold** are the factory default values.

3.2.1   Selecting The Type Of Video Being Used

VIDEO TYPE is used to select the correct digital video format.

> Select **Type 422 525** for operation with component video with a line rate of 525 lines per frame. (Conforming to SMPTE-125M)
>
> Select **Type 422 625** for operation with component video with a line rate of 625 lines per frame. (Conforming to EBU Tech-3267 E)

```
)VIDEO TYPE
   Type 422 525
   Type 422 625
```

3.2.2   Selecting the Line Caption Data Will be Encoded On

OUTPUT LINE is used to select the line that caption data will be encoded on. Normally caption data is encoded on line 21 in NTSC systems and line 22 in PAL systems. Using this function, the user may select one of lines 11 to 25 in NTSC and 6 to 25 in PAL. Press the ➜ key to see what line is currently selected. Use the ← and ➜ keys to change the line numbers. The output line number will immediately change when the ← and ➜ keys are pressed.

```
)OUTPUT LINE
   Line = 21
```

> **Note that the built-in monitoring caption decoder is fixed at Line 21 for NTSC and Line 22 for PAL captions, so it will not display captions if a non-standard caption line is selected.**

3.2.3   Selecting Whether the Internal Modem will Auto Answer

MODEM D is used to select whether the built in modem is enabled for receiving phone calls. When the second modem is installed there will be a similar menu item for Modem E.

```
)MODEM D
   ModemD = disabled
   ModemD = enabled
   ModemD = hangup
```

Select **ModemD=disabled** to configure the 8084(AD) to ignore incoming phone calls. The device will hang up the modem (if currently online) and configure the modem to *auto answer off* when this item is selected.

Select **ModemD=enabled** to configure the 8084(AD) for a dial up connection to the caption computer using the built-in modem. The device will configure the modem to *auto answer* when this item is chosen.

The 8084(AD) will display **ModemD=hangup** when the modem is currently connected to a remote modem. If this item is selected, the modem will hang-up the current connection and return to **ModemD=disabled** mode.

3.2.4   Configuring the Built-In Closed Caption Decoder

On earlier 8084 models without a dedicated **DECODER** pushbutton, two Setup menu items are used to configure the operation of the built-in closed caption decoder.

DECODER CHANNEL is used to select which channel (stream) the decoder will display. The chart below shows the menu settings to decode each of the channels.

)DECODER CHANNEL

Channel = cc1
Channel = cc2
Channel = cc3
Channel = cc4
Channel = t1
Channel = t2
Channel = t3
Channel = t4
Channel = XDS
Channel = VCHIP
Channel = off

Designator	Channel (Stream)	Field
CC1	Caption Channel 1	1
CC2	Caption Channel 2	1
CC3	Caption Channel 3	2
CC4	Caption Channel 4	2
T1	Text Channel 1	1
T2	Text Channel 2	1
T3	Text Channel 3	2
T4	Text Channel 4	2
XDS	Extended Data Services	2
VCHIP	Program Rating Code	2
Off	Disables decoder	

The XDS decoder will display the following XDS packet types simultaneously: Network Name, Network Call Letters, Program Name, Program Type, Program Length, Time In Show and the first four lines of the Program Description.

The VCHIP decoder can display all rating codes any of the rating systems defined in standard EIA-744A. The two undefined reserved rating systems will be displayed as "Other" if present in the video. These rating systems and rating codes are:

U.S. MPAA: N/A, G, PG, PG-13, R, NC17, X, Not Rated
U.S. TV-PG: None, TVY, TVY7, TVG, TVPG, TV14, TVMA, None
CDN English: Exempt, C, C8+, G, PG, 14+, 18+
CDN French: Exempt, G, 8+, 13+, 16+, 18+
OTHER: oth0, oth1, oth2, oth3, oth4, oth5, oth6, oth7

For the U.S. TV Parental Guidance rating system, the decoder display will also show the states of the (F)V, S, L and D bits.

CHAR POSITION   is used to adjust the horizontal position of the decoder display on the screen. Press the ➜ key to view the current position. Use the ← and ➜ keys to change the position and press the **SELECT** key to save the new position.

Ch pos = +00 is the default position
Ch pos = +12 is the leftmost position
Ch pos = -12 is the rightmost position

```
)CHAR POSITION
Ch pos = +00
Ch pos = -12
Ch pos = +12
```

On models equipped with a button marked **DECODER**, these menus are unavailable. Instead, hold down **DECODER** and press the ← or ➜ keys to shift the display left or right. Hold down **DECODER** and press the ↑ or ↓ keys to change the decoder channel. The front panel display will change briefly to indicate which data channel (stream) is presently being monitored. This allows easy configuration of the monitoring decoder without entering the menu system.

The model 8084AD Closed Caption Decoder has two caption decoders, one for monitoring the serial digital video stream and one for monitoring the composite analog video stream. Both decoders are configured identically by the operator controls.

3.2.5   Operating the Manual Bypass Relay

BYPASS RELAY is used to control the video bypass relay. This relay automatically engages on power failure and directly connects the VIDEO IN connectors to the BYPASS OUT connectors, effectively bypassing all processing circuitry. The relay can also be forced into bypass from the Bypass Relay Enable parallel port control pin. (See section 3.5.1)

```
)SDI BYPASS
Bypass = off
Bypass = on
```

Select **Bypass=off** to configure the encoder for normal operation.

Select **Bypass=on** to configure the encoder to be bypassed.

When the video is bypassed, no video will be routed through the video processing circuitry. Consequently the COMPOSITE DECODER, SDI PREVIEW and ANALOG PREVIEW outputs will not be active.

3.2.6   Selecting the Upstream Caption Source (8084AD only)

)UPSTREAM SOURCE

Source digital
Source analog

UPSTREAM SOURCE selects whether the 8084AD will read upstream captions from either the composite analog or component SDI video input. The 8084AD also synchronizes internal timing to whichever upstream source is selected, so it is important to always set this menu item correctly.

Select **Source digital** to extract captions from SDI video.

Select **Source analog** to extract captions from analog video.

If there is only one video source (digital or analog) entering the 8084AD, the UPSTREAM SOURCE <u>must</u> be set to that video source for the device to work properly.

3.2.7   Inserting "V-Chip" Ratings Locally (8084 and 8084AD)

The operator may specify a "V-Chip" XDS program rating packet from the front panel menu system. The encoder may be configured to insert a specified program rating locally, without any computer connection. The operator may also enable a timer to detect a loss of upstream program rating packets, and configure the unit to insert a "default rating" on timeout. All four rating systems presently defined are supported.

The United States T.V. Parental Guidelines (US-TV) system also defines four flags (V,L,S and D) to further categorize the program content. These are not supported, and are locked in the OFF setting.

Two menu items available from the front panel menu system allow the operator to configure a local V-Chip program rating (code) and the local V-Chip insertion timer

3.2.7.1   Inserting a Program Rating

)LOC VCHIP CODE

(US-TV) None
(MPAA) N/A
(CDN-E) E
(CDN-F) E

To begin inserting a program rating from the front panel, select the rating code that you wish to send using the *Local V-Chip Code* (LOC VCHIP CODE) menu. Then select "Insert enable" from the *Local V-Chip Timer* (LOC VCHIP TIMER) menu. The program rating will be inserted immediately, and will over-write any upstream program rating (V-Chip) code that may be present.

This feature is useful in broadcast facilities where there is no automation of program rating insertion, whenever a pre-encoded rating is to be replaced, or in post production facilities where the customer has specified that a program rating is to be included along with captioning.

```
)LOC VCHIP TIMER
  Insert disable
  Insert enable
  Insert @ 01 sec
  Insert @ 02 sec
  …
  Insert @ 03 sec
  Insert @ 98 sec
```

3.2.7.2 Inserting a "Default" Program Rating

The encoder can detect the presence or absence of program ratings in the upstream caption data. By enabling the Local V-Chip Timer, the encoder will begin to insert the specified program rating only after no upstream program rating has been detected for the specified time. If an upstream program rating is detected later, the local rating will automatically be disabled, allowing the upstream rating packets to pass through the encoder.

This feature is useful for automating V-Chip rating insertion in broadcast facilities where there may be a mix of sources that may or may not have ratings pre-encoded. It is important for broadcasters to always encode a program rating; some consumer decoders will simply remember the last rating packet received if the broadcaster simply stops transmitting rating packets altogether.

3.2.7.3 Compatibility With V-Chip Software

Automation software, such as the Evertz driver for Louth Automation, MetaCast 2 software, or Evertz XDS Packet Control software, has a higher priority than the local ratings. If external software sends a new program rating to the encoder, the Local V-Chip Timer will automatically revert to the "Insert disable" setting, turning it off. If the operator re-enables the local rating insertion, unexpected results may occur since two systems will then be attempting to control ratings insertion.

3.3 ENGINEERING SETUP MENU ITEMS

The Engineering menu is used to configure the advanced operational modes and hardware configuration items of the Closed Caption Encoder. This includes selecting baud rate for communications, type of command emulation, and enabling test message encoding. A **">"** symbol to the left of the main level menu items allows them to be easily distinguished from the main setup items and the front panel operating messages. The sub-menu options are shown in lower case to allow them to be easily distinguished from the main level items.

3.3.1 Setting the Serial Port Baud Rate and Data Format

Two menu items are used to set up the serial port connection parameters. There is a pair of menu items for each of the ports. A third menu item sets the port permissions for each port. There is another menu item associated with serial port B that allows it to be configured for several special functions.

```
>PORT A BAUD
  BaudA=1200
  BaudA=2400
  BaudA=4800
  BaudA=9600
  BaudA=19200
  BaudA=38400
```

```
>PORT D BAUD
  BaudD=1200
  BaudD=2400
  BaudD=4800
  BaudD=9600
  BaudD=auto
```

```
>PORT A WORD
  WordA 7 odd
  WordA 7 even
  WordA 8 none
  WordA 8 odd
  WordA 8 even
```

PORT A BAUD is used to set the baud rate of the communications port A (similar menu items are available to configure the baud rates for ports B and C). Adjust this setting to match the baud rate of your computer. If unsure what the baud rate is set it to 1200 baud (the factory default setting).

PORT D BAUD is used to set the baud rate of the built-in modem - port D. (Similar menu items are available to configure the baud rates for the optional modem - port E). Adjust this setting to match the baud rate of your computer. The modem will connect at the specified baud rate. When auto baud rate is selected, the modem will connect at any baud rate up to 14,400. You may want to choose a specific lower baud rate if your software does not properly respond to flow control and you are experiencing buffer overflow errors. If unsure what the baud rate is, set it to auto baud.

PORT A WORD is used to select the number of data bits and parity of the communications port A. (similar menu items are available to configure the data format for ports B, C, D and optional modem port E).

Select **WordA 7 odd** for 7 data bits, 1 stop bit odd parity.

Select **WordA 7 even** for 7 data bits, 1 stop bit even parity.

Select **WordA 8 none** for 8 data bits, 1 stop bit no parity.

Select **WordA 8 odd** for 8 data bits, 1 stop bit odd parity.

Select **WordA 8 even** for 8 data bits, 1 stop bit even parity.

3.3.2 Setting the Serial Port Access Permission

```
>PORT A MAP
  A:CF1234 TF1234X
```

PORT A MAP is used to permit port A to control the various data streams (similar menu items are available to configure permissions for ports B, C, D and optional modem port E). See section 4.7 for a discussion of port permissions.

The two digits to the right of the 'CF' indicates whether port A can control the caption streams in the respective field. The two digits to the right of the 'TF' indicates whether port A can control the test streams in the respective field. The rightmost digit indicates whether port A can control extended data services ('X'). A dash character in place of the numeral indicates that field is not permitted for port A. For example if CF1---TF----X is displayed, port A can only control the caption streams from field 1 (CC1 and CC2) and the Extended Data Services but not the caption streams from field 2 (CC3 and CC4) or any of the text streams.

Use the ← or → keys until the desired field is blinking, then press the **SELECT** key to toggle the enabled or disabled state.

3.3.3 Special Functions of Port B (8084 and 8084AD)

```
>PORT B FUNCTION
  Funct B Normal
  Funct B Echo PA
  Funct B Echo PC
  Funct B Echo PD
  Funct B CC xmit
  Funct B CC recv
```

PORT B FUNCTION is used to select special alternate functions available only to serial port B.

When **Funct B Normal** is selected, serial port B uses the same interface as all of the other serial ports on the unit for interfacing with computers running captioning software.

Select **Funct B Echo PA** to cause command data entered via port **A** to be echoed back out of port B. The **Funct B Echo PC** and **Funct B Echo PD** settings provide similar functions to echo the commands from ports C and D respectively. These modes allow two or more caption encoders to be connected in a daisy-chain fashion. The successive unit(s) will then receive the same serial commands as the first unit, after a slight propagation delay. The receiving unit does not need to be placed in a special operating mode, and may be another 8084, 8074, an 8075 or an 8070 unit. Figure 3-8 shows a typical application for port echo mode.

> **In Port Echo mode the user is responsible for configuring identical baud rates and data words on the serial ports of the transmitting and receiving units.**
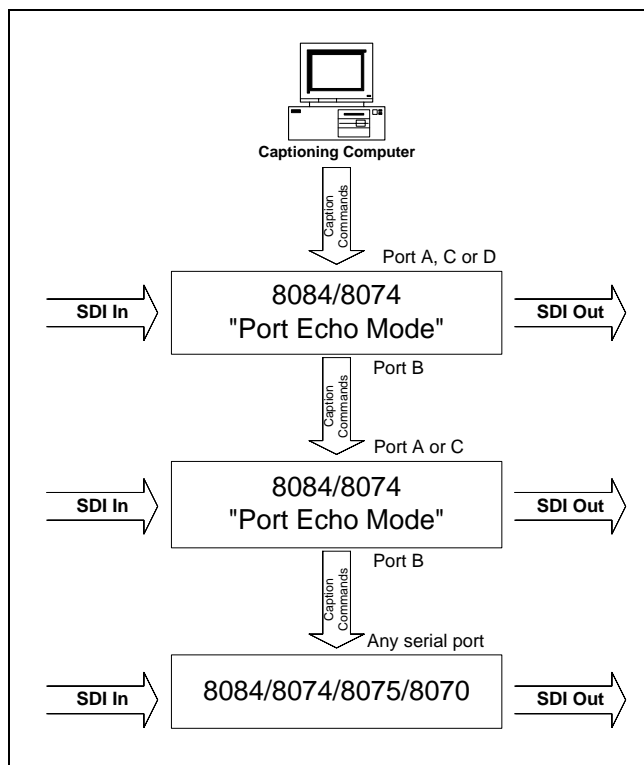
Figure 3-8: Connections for Port Echo Mode

The **Funct B CC xmit** and **Funct B CC recv** settings allow the 8084 or 8084AD to be configured as the transmit and receive sides of a "VBI bridge" around video processing equipment. For correct operation, one caption encoder must be configured as the transmitter (select **Funct B CC xmit)** and the other configured as the receiver (select **Funct B CC recv)**. The two caption encoders may be connected via null modem cable between ports B of each unit. When these modes are selected, the port B data word is set and locked to "8 none". The user is responsible for configuring identical baud rates on the transmitting and receiving units.

When **Funct B CC xmit** is selected, all caption data being encoded onto the video will also be transmitted out of serial port B as raw caption data.

When **Funct B CC recv** is selected, all upstream captions are blocked, and the data that appears at port B is encoded directly into the outgoing video. The internal test message is also disabled.

> **The VBI Bridge setup will introduce a delay in the captions on the receiver side, typically one to three frames. Other equipment in the SDI video stream also influences the length of this delay.**
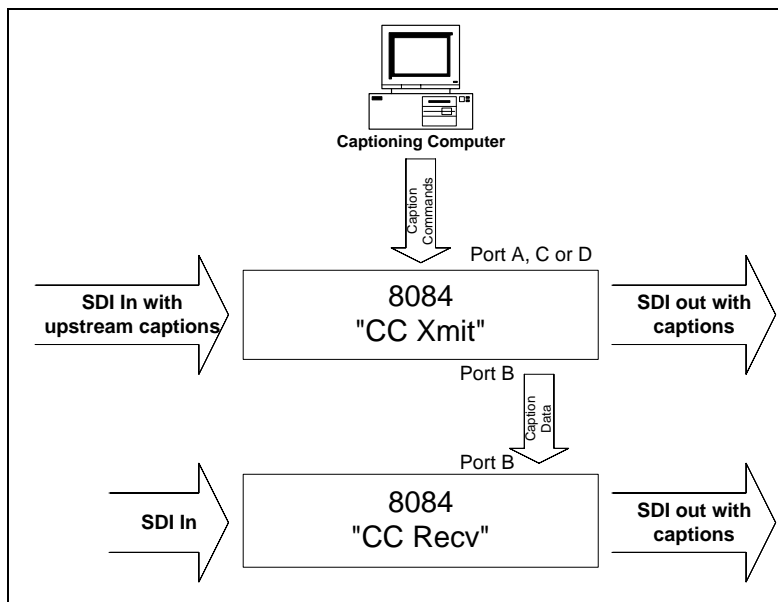
Figure 3-9: Connections to Copy Captions between Video Feeds

Figure 3-10 shows a typical application for the VBI bridge functionality:
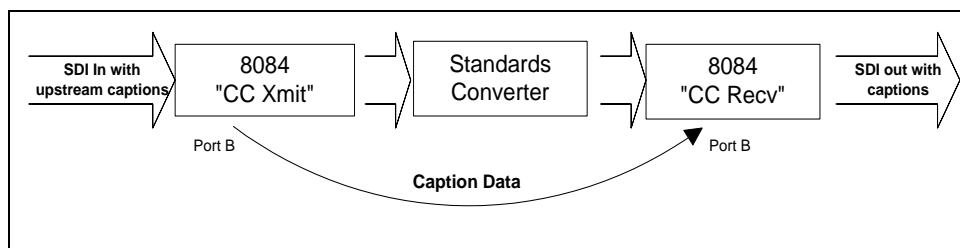
Figure 3-10: Reinserting Captions after Video Processing

3.3.4 ATSC Functions of Port B (8085 only)

The ATSC interface must be enabled at the 8085. A new Engineering Setup menu item has been added called >PORT B FUNCTION. This menu is accessed by entering the Engineering Setup menus using the SHIFT+SETUP key combination. Then use the UP ARROW until the >PORT B FUNCTION prompt is displayed.

```
>PORT B FUNCTION
  Funct B Normal
  Funct B ATSC
  Funct B ATSC GA
```

PORT B FUNCTION is used to select the operating mode of the Port B serial port.

Select **Funct B Normal** for standard interface to captioning computers and software.

Select **Funct B ATSC** for interfacing Port B to ATSC compression encoders using the SMPTE 333M protocol at 38400 bps. The 8085 Port B communication parameters will be changed to 38400 baud, 8 bits, No Parity. No other baud rate options or word options will be available while in this functional mode. The COMM light on the 8085 front panel will turn on when the ATSC encoder sends a valid polling character.

Select **Funct B ATSC GA** for interfacing Port B to ATSC compression encoders using the original, Grand Alliance, uni-directional protocol at 19200 bps. The 8085 Port B communication parameters will be changed to 19200 baud, 8 bits, No Parity. No other baud rate options or word options will be available while in this functional mode. The COMM light on the 8085 front panel will turn on continuously when this mode, since the 8085 is unilaterally broadcasting the packet data.

An additional delay may be added to the ATSC interface data. This delay can offset other processing delays in the ATSC video path. A new Engineering Setup menu item has been added called >PORT B DELAY. This menu is accessed by entering the Engineering Setup menus using the SHIFT+SETUP key combination. Then use the up arrow until the >PORT B DELAY prompt is displayed.

```
>PORT B DELAY
  Delay B = 31 fr
```

PORT B DELAY is used to select the ATSC packet data delay of the Port B serial port. When set to zero, the 8085 will encode and transmit the ATSC packet as soon as possible (there will likely be a small, unavoidable delay due to the 8085 processing, the transmission delay, and the ATSC processing). When set to the maximum of 31 frames, the 8085 will delay the ATSC packet data by 31 video frames.

Select **Delay B 0 fr** for minimum data delay through the 8085

Select **Delay B 31 fr** for maximum data delay through the 8085

3.3.5 Vertical Shift of the Caption Line Data

It is common for 4:2:2 component to NTSC video encoders to add setup to line 21 regardless of whether there is closed caption information on line 21 or not. Closed caption data generated at 0 IRE on component video will be translated to 7.5 IRE when setup is added by the video encoder.

The EIA 608-B waveform specification says that there should be no setup on line 21. In order to eliminate the setup when the encoding to NTSC video takes place, it is necessary to shift the caption data down by 7.5 IRE when it is generated by the caption encoder. Unfortunately, in order to shift the caption data down by 7.5 IRE it is necessary to use digital video values that are not legal according to the SMPTE 125M Component Digital Video specification.

```
>CAPTION SHIFT
  Shift off
  Shift on
```

CAPTION SHIFT is used to select whether the caption data encoded on the SDI video will be shifted to adjust for setup on line 21.

Select **Shift off** to encode captions at 0 IRE on 4:2:2 video signals. The resulting closed caption signal will contain legal SMPTE 125 data values but may have 7.5 IRE of setup added when it is encoded to a composite video signal. (Depending on the video encoder)

Select **Shift on** to encode captions at -7.5 IRE on 4:2:2 video signals. The resulting closed caption signal will contain illegal SMPTE 125 data values but may have the 7.5 IRE of setup cancelled out when it is encoded to a composite video signal. (Depending on the video encoder)

3.3.6 Configuring Whether Upstream Captions and XDS will be Passed or Blocked

```
>PASS UPSTREAM
  C1234 T234 X
```

The **PASS UPSTREAM** menu item allows the user to control whether individual Data streams will be passed or blocked. When you press the ← or → keys the display shows a character to represent each data stream, CC1 through CC4, T1 through T4 and XDS, as follows:

```
C1234 T1234 X
```

Pressing the ← or → keys will change which data stream is currently selected (blinking). The SELECT key toggles whether the selected stream is passed or blocked. If a particular data stream is being blocked, the character representing that stream will change to a dash '-'.

If the encoder being configured is the first XDS (including V-Chip) encoder in the video path, or the user does not want to preserve any upstream field 2 data, we recommend that *all of the data streams in field 2* (CC3, CC4, T3, T4, XDS) should be placed in the NULL (blocked) state.

This would appear as follows:
```
          C12-- T12-- -
```

3.3.7   SETTING THE ENCODER CLOCK

The **SET UTC CLOCK** menu item allows the user to set the internal real time clock directly from the front panel. Note that the time and date entered are the UTC time. Setting of the clock is done in four stages.

>SET UTC CLOCK
 Time 00:00:00

- Setting the UTC time
- Setting the UTC date
- Setting the local time zone offset from UTC
- Setting whether Daylight Saving time is observed in the local region.

When you press the ➔ key you will be prompted to set the time. Press the **SELECT** key to move from one stage to the next, or press the **SETUP** key at any time during the process to exit the clock setting function and return to the original clock settings.

3.3.7.1   Setting the Time

When you enter the time setting stage, the front panel display shows the current UTC time of the internal clock with the Hours digits blinking, indicating that they can be changed. E.g. Time = 04:06:53. Press the ↑ or ↓ keys to change the hours digits or press the ➔ key move to the minutes or the ← key to move to the seconds. Set the minutes and seconds the same way. When you have entered the correct UTC time press the **SELECT** key to move to the date setting stage.

3.3.7.2   Setting the Date

When you enter the date setting stage, the front panel display shows the current UTC date of the internal clock with the Month blinking, indicating that it can be changed. E.g. June 04, 2002 Tue. Press the ↑ or ↓ keys to change the month or press the ➔ key to move to the day of the month or the ← key to move to the year. Set the day and year the same way. As you change the month, day or year, the day of the week will automatically change. When you have entered the correct UTC date press the **SELECT** key to move to the time zone setting stage.

3.3.7.3   Setting the Time Zone

When you enter the time zone setting stage the front panel display shows the local time zone offset from UTC. E.g. Time zone = 05. The number shown is the number of hours between the standard time in the local time zone and UTC. For users in time zones west of Greenwich this number will be between 1 and 12. For users in time zones east of Greenwich, this number will be between 13 and 23. (E.g. for Eastern Time set the time zone to 05) Press the ↑ or ↓ keys to change the time zone. When you have entered the correct local time Zone offset from UTC press the **SELECT** key to move on to setting the Daylight Saving time observance.

3.3.7.4   Setting the Daylight Saving Time Observance

After you set the time zone, you need to select whether Daylight saving time is observed in your region or not. Press the ↑ or ↓ keys to select the correct setting for your region. When you have entered the correct setting press the **SELECT** key to complete setting the UTC Clock in the encoder.

The front panel display will show *CLOCK UPDATED* when the internal clock has been updated successfully. You will automatically exit the menu system and the front panel should show the new time and date settings after a few seconds.

3.3.8   Configuring the Linear Time Code Reader
(LTC Option Installed)

The LTC reader is a factory-installed hardware option for 8084 and 8084AD models that can be used to set the time and date of the real-time clock in the caption encoder. This is useful for broadcast facilities where Time-of-Day XDS packets are being encoded or updated in the video. This can also be used by V-chip and URL insertion software such as the Evertz *MetaCast 2*, thus eliminating the need for a time code reader card inside the PC.

```
> LTC RDR CONFIG

  LTC = no input
  LTC = local time
  LTC = UTC time
  LTC = local + date
  LTC = UTC + date
```

Units with the LTC reader installed will have a female XLR connector installed in the rear panel. This would typically be connected to the "house time code" that is used to synchronize the timing of devices in the broadcast facility.

LTC RDR CONFIG, is used to configure the LTC reader operation.

> Select **no input** to disable the LTC reader input.

> Select **local time** if the incoming time code is the local time at the encoder.

> Select **UTC time** if the incoming timecode is UTC.

> The LTC reader option also decodes date information that was encoded into the user bits using the Leitch CSD-5300 user bit protocol. This is a popular protocol for encoding the date in the LTC user bits. It is supported by Evertz 5010 and 5010-GPS time code generators.

> Select **local + date** if the incoming time code is the local time at the encoder and the date has been encoded

> Select **UTC + date** if the incoming time code is UTC and the date has been encoded

If one of the date modes is selected but the user bits do not contain a valid date, the clock time will be updated and the date will show Jan 1, 2000.

When a valid time code source is connected, a letter 'T' will appear on the right-hand side of the front panel display while the time is being displayed. When the encoder is confident that the extracted time is stable and accurate, it will update the internal clock and display the message **TIME UPDATED** on the front panel briefly. After initially connecting the time code source, this should take approximately eight seconds.

Whether the time code has local time or UTC, the front panel time display will show the local time and date. The time zone and "Daylight Saving Time in Effect" (DST) and "Daylight Saving Time observed" (DSO) flags must be configured correctly in the caption encoder so that the LTC reader will convert between UTC time and local time properly using MetaCast 2 or other software connected to one of the serial ports. The LTC DST CONFIG menu item should normally be left in the 'system' setting to use these flags.

3.3.9 Configuring the LTC Daylight Saving Time Support (LTC Reader Option Installed)

> LTC DST CONFIG

LTC DST = system
LTC DST = on
LTC DST = off

LTC DST CONFIG   This menu item is used in the conversion of local time being received on the LTC reader to UTC which is sent in the 'Time of day' XDS packets. It is also used to properly calculate the front panel display time.

Select **system** to use the DST and DSO flag settings in the real-time clock for converting from local time to UTC. This is the default setting and should be used in most circumstances. The system DST and DSO flags are set from the MetaCast 2 software or may be set manually using one of the serial ports.

Otherwise, the encoder will use the Daylight Saving Time setting specified by this menu item when converting from local time at the LTC input to UTC time for the real-time clock. This is useful for calibrating time calculations when the LTC time source has been offset for Daylight Saving Time but the encoder has not, or vice-versa.
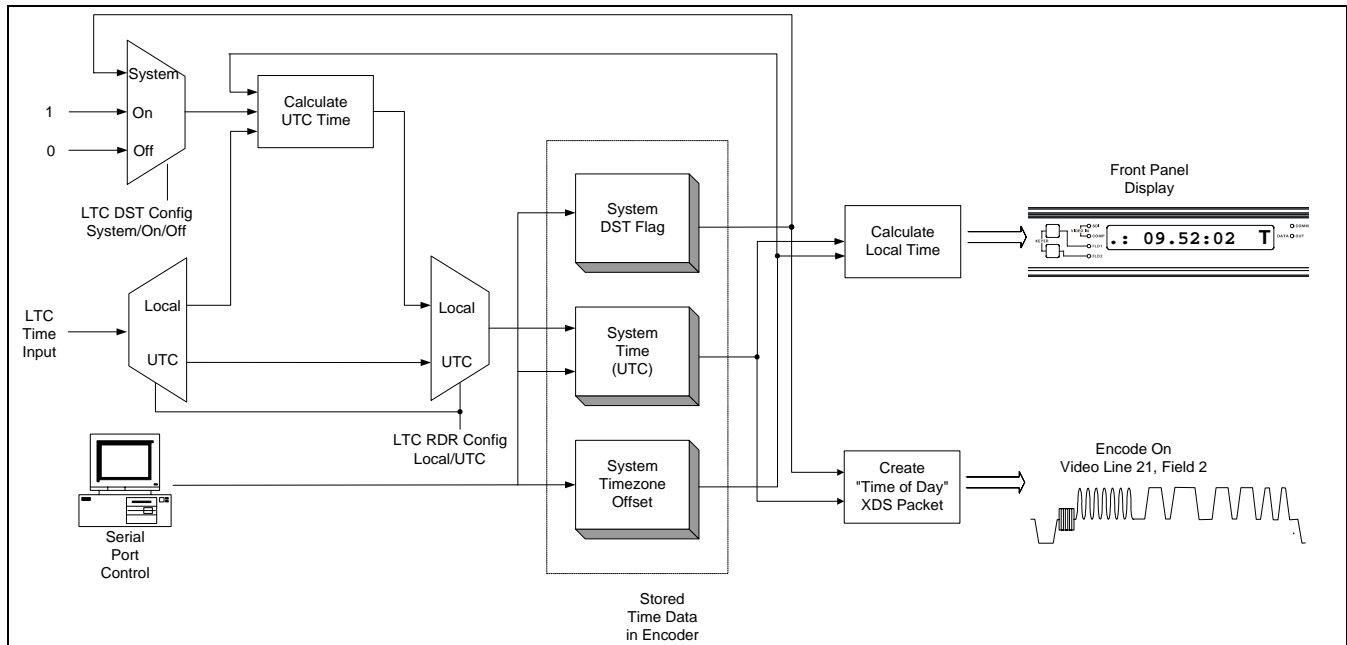
Figure 3-11: 8084 Local Time to UTC Conversion Block Diagram

3.3.10 Encoding a Test Message

During system setup and verification it is often desirable to have the caption encoder generate a test message. Data integrity and signal quality of the captioned signal may be verified using the test message.

TEST MESSAGE   is used to select whether the encoder will generate test messages or not.

> **>TEST MESSAGE**
>
> **Test msg off**
> Test msg on

Select **Test msg on** to enable test message encoding. The encoder will insert a test message that includes all 9 data channels. This is generated by simulating a data stream into the Port A communications buffer. The COMM LED will blink On and the Port A output will generate a stream of prompt characters ('*').

(e.g.: TST F2 C1) is encoded for the CC3 data stream

This will allow you to verify the setup of your system without having a computer sending data to the 8084(AD).

The test message mode will be automatically turned off whenever the keyer is turned off from the front panel, or when a Control-C character is received on any communications port from captioning software.

Select **Test msg off** to disable the encoder test message.

3.3.11 Using the 16 Second Erase Timer

When the Erase Timer is activated, the 8084(AD) will automatically encode a command to erase captions in the CC1 data stream (primary language captions) if no caption data has been received for 16 seconds. This will prevent unwanted caption text from remaining on the viewer's screen during long periods of uncaptioned material.

ERASE TIMER is used to select whether the erase timer is enabled or not.

>ERASE TIMER
Erase Timer on
Erase Timer off

Select **Erase timer on** to enable the Erase Timer.

Select **Erase timer off** to disable the Erase Timer.

3.3.12 CLEARING XDS PACKETS FROM MEMORY

In the 8084 and 8084AD, local XDS packets are kept in a non-volatile memory and are restored on power up. XDS packets can only be removed from memory using the serial port of the encoder, or by using the *Clear Local XDS* menu item.

>CLEAR LOCAL XDS
Clear XDS? No
Clear XDS? Yes

CLEAR LOCAL XDS allows the user to clear the XDS packet memory from the front panel. Setting this menu item to YES and pressing the **SELECT** key will erase the XDS Packet memory. Text articles will be preserved.

3.3.13 Monitoring the Status of the Parallel Remote Control Inputs

>GPI IN MONITOR
Gpi = 80 02 01 02

GPI IN MONITOR is used to monitor the current status of the parallel remote control inputs. When you press the ← or → keys, the display shows something similar to **Gpi = 06 02 01 02**. The left-most number is a hexadecimal representation of the bit mapped parallel input. Bit 0 is the least significant bit, bit 7 is the most significant bit. (See section 3.5 for a description of the remote control functions and bit-mappings of the pins).

This display is also used to show the revisions of the factory-programmed logic devices in the caption encoder. These are the other three values shown on the display. Chapter 5 describes the significance of these values in detail.

3.3.14 Resetting the Closed Caption Encoder to Factory Defaults

```
>TOTAL RESET
  Reset = no
  Reset = yes
```

TOTAL RESET is used to reset the configuration items that are normally saved in non-volatile memory will be restored to the factory defaults. The serial port buffers and the Article and XDS queues will be cleared. Articles and XDS packets will also be removed from memory. When you press the ➜ button, the display shows something similar to `Reset = yes`. Press the **SELECT** keys to reset the caption encoder. The caption encoder will exit the Engineering Setup Menu and the display will show `Reset Done`

3.3.15 Performing a Front Panel Reset to its Power-On State

Sometimes it may be desirable to perform a reset of the 8084(AD) back to its power-on, especially if a communications error has left one port active, which may cause an ACCESS ERROR when another port attempts to caption. To reset the 8084(AD) to the power-on state hold down the SHIFT +↑+➜ keys simultaneously. The 8084(AD) will be completely reset to the values stored in its non-volatile memory and the Article and XDS queues will be cleared. Articles and XDS packets will not be removed from memory. The display will show `Reset Done`.

3.4   MONITORING THE INCOMING DATA

There are two displays provided to allow the user to view how incoming data will be handled by the 8084 or 8084AD. The Stream monitor display is available when the device is configured for the 'stream' mode of operation. The Field monitor display is available when the device is configured for the 'field' mode of operation. To toggle in and out of the monitor displays, press the **SHIFT + ↓** keys when you are not in either of the menu systems.

3.4.1   Monitoring the Data in 'Stream Mode'

The stream monitor display shows each of the nine data streams and indicates how the caption encoder is processing the data in each stream.

The front panel display shows something similar to `C1234 T1234E` when it is in the stream monitor mode. The four characters to the right of the `C` show the status of the four caption streams. The four characters to the right of the `T` show the status of the four text streams. The rightmost character is used to monitor the Extended Data Services (XDS) stream. The character in each data stream monitor position can have several values, indicating different processing options in the caption encoder. The processing options are shown in Table 3-1.

Indicator	Description	Explanation
↓	Regen Upstream Through	Data in this stream will be decoded and regenerated in the encoder output.
X	Block Upstream	Data in this stream will be removed from the encoder output
1,2,3,4,E	Incoming Data	Indicates that the data stream is present at the encoder input. The number corresponds to the respective caption or text channel. The letter E corresponds to the Extended Data Services data stream.
D	Direct Control State	Direct Control state has been enabled for this data stream. Upstream captions will be replaced by the incoming captions from the serial port and will be encoded into the corresponding data stream at the encoder output.
R	Real Time State	Real Time state has been enabled for this data stream. Upstream captions will be replaced by the incoming captions from the serial port and will be encoded into the corresponding data stream at the encoder output.
A	Article State	Article state has been enabled for this data stream. Upstream data will be replaced by text Articles from the article queue.
|	Direct Wire	Data in this stream is copied directly to the output without regeneration.

Table 3-1: Front Panel Data Monitoring in Stream Mode

3.5 PARALLEL REMOTE CONTROL CONNECTIONS

The PARALLEL 9 pin female 'D' connector provides a method of connecting 'closure to ground' remote control GPI signals to control the caption encoder. Each input has an internal 47K ohm pull-up to +5 volts. The pin assignment of the connector is as follows:

Parallel Pin	Monitor Bit	Function
1		Ground
2	0	Serial Port A Disable
3	2	Serial Port B Disable
4	4	Serial Port C Disable
5	6	Modem Port D Disable
6	7	Bypass Relay Enable
7	1	Caption Keyer Disable
8	3	Caption Shift Up
9		Ground

3.5.1 Disabling the Caption Keyer using the Parallel Remote Control

The Caption Keyer Disable GPI has two possible modes: 'master' mode and 'temporary' mode. These are configurable using the DIP switch located inside the unit. From the factory, this GPI is configured for 'master' mode operation. Most users will prefer this configuration. See section 5.3.1 for instructions on changing the DIP switch settings.

Older 8084 firmware revisions assigned GPI pins 7 and 8 as separate 'master' and 'temporary' keyer disables. Existing installations using the 'temporary' keyer disable on pin 8 will need to be updated.

In 'master' mode, the keyer will be turned off when the Keyer Disable GPI input is low and turned on when this GPI input is high.

In 'temporary' mode, the keyer will be disabled while the GPI is held low and will remain disabled after the GPI input returns HIGH until the next byte of data is received on any serial remote control port.

3.5.2   Enabling the Bypass Relay using the Parallel Remote Control

The video input(s) will be connected directly to the Bypass Output(s) when the Bypass Relay Enable GPI is held low. The video input and outputs will return to normal when the Bypass Relay Enable GPI returns high.

3.5.3   Disabling the Serial Ports using the Parallel Remote Control

When the Port A Disable input is initiated low, Port A will be reset as though a ^F^F had been received. Further input on this port will be ignored until the Port A Disable input is released high. This input can be used to select which port will control the caption encoder.

Similarly, there are GPI signals to disable serial ports B and C as well.

When the Port D Disable input is initiated low, Port D will be reset as though a ^F^F had been received. If online, the modem will be forced to hang-up, and the modem will refuse to answer any further phone calls. Further input on this port will be ignored, until the Port D Disable input is released high. This input can be used to select which port will control the caption encoder.

On units equipped with a second modem Port E, there is no parallel port GPI signal to disable this port.

3.5.4   Shifting Caption Text Up using the Parallel Remote Control

When this GPI is held low, screen position codes (called PACs) in the caption data will be translated so that captions normally appearing on rows 12 through 15 will now appear on rows 1 through 4. This is intended to provide compliance with FCC rules, which state that caption text may not overlap emergency information that often appears at the bottom of the screen.

Decoded captions may not shift up immediately when this GPI is enabled, only when a new PAC is transmitted. Some real-time captioning software packages using roll-up style captions do not insert PACs at all, so these captions will not be shifted up even when this GPI is enabled.

CHAPTER 4: SERIAL COMMAND PROTOCOL

4   SERIAL COMMAND PROTOCOL

The following sections present the command protocol for the 8084, 8084AD and 8085 closed caption encoders. Section 4.1 gives a quick cross reference to the command set. Sections 4.2 to 4.7 give a full description of the commands with examples.

4.1   COMMAND CROSS REFERENCE

	Command	Function	Stream
Control & Status	^A?	Report Firmware Version	p. 4-9
	^Ac	Set/Report Time of Day	p. 4-10
	^Ad	Set/Report Date	p. 4-11
	^Au	Set Stream Mode	p. 4-9
	^AE	Set Output Line	p. 4-8
	^AI	Set Baud Rate	p. 4-6
	^AH	Command Help Message	p. 4-9
	^AM	Controlling the Caption Decoder	p. 4-8
	^AS	Report Bypass Status	p. 4-10
	^AY	Report Battery Status	p. 4-10
	^A5	Monitor Encoded Data	p. 4-8
	^F^F	Reset Encoder	p. 4-7
Captioning State	^A2	Real Time State	p. 4-14
	^A6	Null State	p. 4-13
	^A7	Transparent State	p. 4-12
Text Articles	^A0	Input Article	p. 4-16
	^A1	Output Article	p. 4-17
	^A4	Delete article	p. 4-18
	^A8	Queue Articles	p. 4-18
	^A9	Display Article Status	p. 4-18
	^AB	Display Output Queue	p. 4-19
XDS Encoding	^AP	Input XDS Packet	p. 4-20
	^AP	Block Upstream XDS Packet	p. 4-21
	^A8	Queue XDS Packets	p. 4-22
	^AP	Delete XDS Packets	p. 4-22
Comm. Port Control	^AQ	Show Port Permission Maps	p. 4-23
	^AQ	Alter Port Permission Maps	p. 4-24
	^AO	Show Ports Active Maps	p. 4-25
	^AO	Alter Ports Active Maps	p. 4-25
	^Ar	Reset Port	p. 4-26

4.2   COMMAND SYNTAX DESCRIPTION

The Command line shows the required information in **bold underlined text**. Optional parameters are shown in **bold normal text.** The default line shows the parameter values that will be invoked if the optional parameter(s) are omitted. Many of the commands use control characters which are indicated by a carat character '^' preceding a letter. (E.g. Control-A is shown as ^A). Other special characters are shown enclosed in <brackets>. (See section 4.2.1 for a description of the control characters and special characters and their ASCII values). (All ASCII values are shown in hexadecimal notation). Parameters are shown in lower case. (See section 4.2.2 for a description of the parameters and their values). All upper case alphanumeric characters that are not preceded by the carat or enclosed in brackets are to be interpreted as individual characters. (E.g. F1 is an 'F' followed by a '1').

4.2.1   Special Characters

Most commands use control characters to communicate with the encoder. The chart below shows the designators for the control characters and other special characters that are used in the command descriptions

Designator	Name	ASCII Values (Hex)
^A	Control-A	01
^B	Control-B	02
^C	Control-C	03
^F	Control-F	06
^G	Control-G	07
^H	Control-H (backspace)	08
^X	Control-X (delete line)	18
<sp>	Space	20
<cr>	Carriage Return	0D
<xon>	Halt transmission	11
<xoff>	Start Transmission	13

4.2.2   Parameters

Some commands use parameters with variable values. The command descriptions use a generic designator to indicate these parameters. The chart below shows each of the designators with their meanings and the permitted values. The values shown are the actual characters to be inserted into the command message. Normally parameters should be separated from each other by a <sp>.

Designator	Name	Values	Description
fx	Field Number	F1	Field 1
		F2	Field 2
dc	Data Channel	C1	Caption Channel 1
		C2	Caption Channel 2
		C3	Caption Channel 3
		C4	Caption Channel 4
		T1	Text Channel 1
		T2	Text Channel 2
		T3	Text Channel 3
		T4	Text Channel 4
		XD	Extended Data Services Channel

For compatibility with older software the following designators are also used to describe caption data channels

		CC1	Caption Channel 1
		CC2	Caption Channel 2
		CC3	Caption Channel 3
		CC4	Caption Channel 4
tc	Text Channel	T1	Text Channel 1
		T2	Text Channel 2
		T3	Text Channel 3
		T4	Text Channel 4

For compatibility with older software the following designators also refer to the text channels

		L1	Text Channel 1
		L2	Text Channel 2
		L3	Text Channel 3
		L4	Text Channel 4
name	Article Name	1 to 8 alphanumeric character article name	
edsid	XDS packet Id	input as 2 ASCII hex digit class followed by 2 ASCII hex digit type. (cctt)	

Valid class numbers are: 01, 03, 05, 07, 09, 0B, OD. Leading zeros of the class numbers are optional.

In cases where the class and type bytes are not sufficient to uniquely distinguish the packets, (such as for 0D05 packets) the first 2 digits of the packet data may also be appended to the end of the edsid. (ccttdd)

k/d	Keep/Delete	K	Keep article
		D	Delete article
o/h	Output/Hold	O	Place article in output queue
		H	Do not place article in output queue
n/l	Next/Last	N	Place article next in output queue
		L	Place article at the end of output queue
rc	Repeat Count	0 to 9998	Decimal number of times to repeat article
		9999	Repeat indefinitely
		FFFF	Repeat indefinitely
		hh:mm:ss	Repeat until this time is being requested by the computer (Current software treats this as equivalent to 9999)
ln	Output Line	10 to 25	
bl	Caption Base Line	1 to 15	Base line of caption rollup display
rl	Caption Rollup Lines	2 to 4	Number of lines of rollup captions
pn	Port Name	P1, PA, EN1, = port A	
		P2, PB, EN2, = port B	
		P3, PC, EN3, = port C	
		P4, MA, MD, EN4 = modem D	
		P5, MB, ME, EN5 = modem E (if installed)	
dt	Data Type	CF1	captions field 1
		CF2	captions field 2
		TF1	text field 1
		TF2	text field 2
		XDS	extended data services
ws	Word size	7	7 bit data word
		8	bit data word

par	Parity	O	Odd parity
		E	even parity
		N	no parity
tz	Time zone	0:00 to 23:59	time zone hours and minutes relative to UTC
ovr	Override	O	forces override

4.2.3   Flow Control Handshaking

When the encoder's input buffer is nearly full the device sends an XOFF for each character received. If the Caption software continues to send data and the input buffer fills completely the caption encoder will show the message **BUFFER OVERFLOW** on the front panel display. When the input buffer has overflowed some data may be lost. When the input buffer is nearly empty the caption encoder will transmit an XON character.

The 8084 and 8084AD also use hardware flow control to prevent lost data. The unit will turn off the RS232 RTS signal when the buffer is nearly full, and will turn RTS on when the input buffer is nearly empty.

4.2.4   Break Handling

A break character can be sent to the caption encoder to cause the content of the associated input buffer to be discarded. If the break character is sent to a modem port (Modem D or Modem E), the modem character buffers will also be discarded. This allows the user to circumvent a backlog of data input, and regain immediate control of the encoder. The best way to reset a communications port is to send a break followed by a Control-F – Control-F command.

4.2.5   Command Responses and Error Messages

When the 8084(AD) accepts any of the Control-A commands it will respond by sending back an asterisk '*' prompt with the following exceptions:
• When in real time mode it will respond with a colon ':' prompt.
• When an article is being defined, it will respond with a '>'.

COMMAND ERROR will be displayed on the front panel if the 8084(AD) receives a command from a serial control port that it does not understand. It will also respond by sending back an error code 'E1'.

CMD FMT ERROR will be displayed if the 8084(AD) receives invalid parameters for a serial command. It will respond by sending back an error code 'E2'.

CMD FMT ERROR will also be displayed if the 8084(AD) receives a request to delete an article that has not been defined. It will respond by sending back an error code 'E4' to the control port.

OUT OF MEMORY If the 8084(AD) has no more article/XDS memory available it will display this message on the front panel and respond by sending back an error code 'E6'.

PARITY ERROR If there is a problem with the serial communications baud rate, parity or word size the 8084(AD) will show this message on the front panel.

ACCESS ERROR If one of the control ports tries control a data stream, which is already being controlled by another port, or if the control port has not been given access privilege to the data stream, the 8084(AD) will respond by sending back an error code 'E9'.

4.2.6 Command Differences Between Operating Modes (Legacy Operation)

The 8084(AD) operates in one of two basic operating modes - Stream mode or Field mode. Use the MODE menu item on the Engineering Menu to select which operating mode is to be used.

When Stream mode is selected the 8084(AD) manipulates each data stream independently of each other. In Stream mode, each of the individual caption data streams can be passed through, removed, or replaced with new data by the caption encoder. New caption data may also be inserted into existing data streams. The commands available in Stream mode are discussed in section 4.4.

When Field mode is selected the 8084(AD) manipulates caption data on a field-wise basis. In Field mode, all the caption data in an entire field will be passed, removed, or replaced with new data.

Some of the commands are common to both operating modes. These commands are discussed in section 4.3.

4.3 COMMANDS COMMON TO OPERATING MODES

4.3.1 Set Baud Rate

The caption encoder's serial remote control ports may be set to operate at any standard baud rate from 1200 to 38400. When this command is executed the new baud rate will become immediately active, and the sending computer must immediately switch to the new rate. The new baud rate is stored in non-volatile memory and will be restored when the unit is powered up. The baud rate can also be set using the Engineering menu BAUD RATE item. (See section 3.3.1)

The modem ports may have a lower maximum baud rate that is related to the maximum baud rate of the built-in modems. The baud rate for the modem ports will also limit the maximum connection rate that the modems will allow.

Command: **^AI<sp>pn<sp>baud<sp>ws<sp>par<cr>**
    or   **^AI<cr>**

Default: none

The parameter **baud** specifies the baud rate that will be used. The permitted values of parameter **baud** are shown in the table below.

Parameter	Baud rate
12	1200
1200	1200
24	2400
2400	2400
48	4800
4800	4800
96	9600
9600	9600
192	19200
19200	19200
384	38400

If the optional port name parameter is missing, then the current control port will be assumed. If no parameters are specified, the 8084(AD) will respond with a report of the communication parameters of all the comm ports as shown below.

Port A: 1200 7 Odd
Port B: 9600 8 None
Port C: 1200 7 Odd
Port D: 4800 8 None
Examples: ^AI<sp>19200<cr>   Set baud rate to 19200
              ^AI<sp>P1<sp>96<sp>8<sp>N   Sets Port A to 9600,8,N

4.3.2   Reset Encoder

This command immediately clears the input and output data queues and resets the 8084(AD) to the Transparent State in Field 1 and Field 2. Article and XDS output queues are not reset by this command. They must be explicitly reset by using the queue articles and queue XDS commands. (See sections 4.5.4 and 4.6.3.) Because other control ports may be simultaneously sending data, this command only affects the fields and data types that have not been appropriated by other control ports.

Command: **^F^F<cr>**

Default: none

4.3.3   Set Output Line

The normal line for caption information is line 21 in NTSC and line 22 in PAL. This command allows the 8084(AD) to output caption information on different line numbers. This command also changes the line number used by the decoder.

Command: **^AE<sp>Lln<cr>**

Default: ^AE<sp>L21<cr>   for NTSC systems
                   ^AE<sp>L22<cr>   for PAL systems

The parameter **ln** specifies the line number that caption information will be output on. The permitted values of parameter **ln** are 11 to 25.

Examples: ^AE<cr>   Reset to default
                   ^AE<sp>L20<cr>   Set for line 20
                   ^AE<sp>?<cr>   Show current line

4.3.4   Monitoring the Line 21 Data on the Serial Port

This command allows the 8084(AD) to extract line 21 information from the input or output video and send it out the serial port. Enter a ^G to end monitor mode.

Command: **^A5<sp>fx<sp>o<cr>**

The parameter **fx** specifies the field that data will be extracted from
The parameter **o** specifies that the output data will be monitored.
Example: ^A5<sp>F1<cr>   Monitor Field 1 Input
                   ^A5<sp>F2<sp>O<cr>   Monitor Field 2 Output

4.3.5   Controlling the Caption Decoder

This command allows the unit to display line 21 information on the built-in caption decoder.

Command: **^AM<sp>dc<cr>**   Decode a specific channel
        or   **^AM<sp>OFF<cr>**   Turn Decoder off

The parameter **dc** specifies the data channel that will be decoded and displayed. In addition to the **dc** values shown in section 4.2.2 the following additional values are supported only for this command.

dc	Data Channel	VCHIP	V-Chip Decoder
		XDS	XDS Decoder
		XDSG	XDS Decoder
		XDSF	XDS Decoder

Note that there is only one XDS decoder mode so all 3 commands will accomplish the same effect. Support for the XDSG and XDSF strings added for compatibility with the EEG command set.

Examples: ^AM<sp>C1<cr>
              Display Caption Channel 1

              ^AM<sp>VCHIP<cr>
              Display V-CHIP rating

              ^AM<sp>XDS<cr>
              Switches decoder to XDS display mode.

4.3.6   Report Firmware Version

The caption encoder will respond with message identifying its firmware version and port name.

Command: **^A?<cr>**

Returns
```
Evertz 8084 Ver:CK88D5 U000427 -- Use ^AH{return} for
help
Port B
```

4.3.7   Command Help

This command returns a help message from the caption encoder.

Command: **^AH<cr>**

Default: none

Returns:
```
Cmds supported - ^C,^F,...
^A
+0,1,2,3,4,5,6,7,8,9,A,B,c,,E,H,I,M,O,P,Q,r,t,u,S,Y,?
```

4.3.8   Set Stream Mode

This command will place the encoder in STREAM operating mode.

Command: **^Au<cr>**

4.3.9   Report Bypass Switch Mode

This command returns a message that shows the status of the video bypass relay and the caption keyer.

Command: **^AS<cr>**

Example results:
REMOTE OVERRIDE	indicates keyer is disabled but video will be passed through the 8084
EXTERNAL BYPASS	indicates the SDI bypass relay has been activated by an external signal
LOCAL BYPASS ON	indicates the SDI bypass relay has been activated by the 8084 menu selection.

4.3.10 Report Battery Status

This command will return the status of the internal battery

Command: **^AY<cr>**

Example results: Battery OK

4.3.11 Set / Report Time of Day Clock

This command will return the current time of day or will allow the internal clock to be set. The unit will maintain the correct time even through power outages.

Command: **^Ac<cr>**

Example results:
Local time is 13:47:39, Time zone is 05:00, DST is ON, DSO is ON

Command: **^Ac<sp>U<cr>**

Example results:
UTC is 19:47:39, Time zone is 05:00, DST is ON DSO is ON

Command:
   ^Ac<sp>hh:mm:ss<sp>hh:mm<sp>dst<sp>DSO=dso<sp>U <cr>

   hh:mm:ss Local time or UTC time
   hh:mm   Time zone offset
   dst   OFF   Daylight Saving Time not in effect (DST Bit Off)
                  ON   Daylight Saving Time in effect (DST Bit On)
   dso   OFF   Daylight Saving Time not observed in this region (DSO Bit Off)
                  ON   Daylight Saving Time observed in this region (DSO Bit On)

U	Optional parameter to indicate that UTC time is requested or specified by the hh:mm:ss parameter

✎ **Although the time zone must be entered as hours and minutes, the XDS Time Zone packet will only transmit the time zone hours. This is a limitation of the definition of the time zone packet in EIA-608B.**

Example:
   ^Ac<sp>13:10:00<sp>5<sp>ON,<sp>DSO=ON<cr>
            Set local time to 1:10 pm in EDT (Daylight Saving Time in effect), Daylight Saving Time observed.

   ^Ac<sp>13:10:00<sp>5<sp>ON,<sp>DSO=OFF<cr>
            Set local time to 1:10 pm in EST (Daylight Saving Time in effect), Daylight Saving Time not observed. (e.g. as in Indiana)

   ^Ac<sp>06:10:00<cr>
            Set local time to 6:10 am. Time zone, DST and DSO unchanged.

   ^Ac<sp>13:10:00<sp>4:30<sp>OFF<sp>DSO=ON<cr>
            Set local time to 1:10 pm in Newfoundland Time Zone with Daylight Saving Time not in effect, but Daylight Saving time observed

The DST bit instructs the encoder whether Daylight Saving Time is currently in effect. The DSO bit instructs the encoder whether Daylight Saving Time is observed in this region. The encoder must know this information when converting between local time and UTC time internally. Most regions in North America observe Daylight Saving Time according to the following rule: ON in the summer, starting on the first Sunday in April. OFF in the winter, starting on the last Sunday in October. Other parts of the world follow different rules for DST.

4.3.12 Set / Report Calendar Date

This command will return the current calendar date or will allow the internal calendar date to be set. The encoder will maintain the correct date even through power outages.

Command: **^Ad<cr>**

Example results:
Local date is: Jan/09/2000 Mon.

Command: **^Ad<sp>U<cr>**

Example results:
UTC date is: Jan/10/2000 Mon.

Command: **^Ad<sp>mm/dd/yyyy<sp>day of week<sp>U<cr>**

   mm/dd/yyyy   Local date or UTC date
   day of week   Numeric day of week. Sunday is day 1
   U   Optional parameter to indicate that UTC date is requested or
                      specified by the mm/dd/yyyy parameter

Examples:
   ^Ad<sp>01/26/2000<sp>4<cr>
              Set local date to January 26, 2000 and day is Wednesday.

   ^Ad<sp>03/25/2001<cr>
              Set local date to March 25, 2001. No day of week indicated.

   ^Ad<sp>12/21/2001<sp>7<sp>U<cr>
              Set UTC date to December 21, 2001.

4.4   COMMANDS SUPPORTED IN STREAM OPERATING MODE

The following commands are supported when the closed caption encoder is set to stream mode. The front panel display will typically show **LINE 21 KEY** and both FLD1 and FLD2 ENABLE LED's will be on.

4.4.1   Transparent State

In Transparent state, incoming line 21 video in the respective data stream will be copied through to the output.

Command: **^A7<sp>fx<cr>**
                   ^A7<sp>dc<cr>

Default   ^A7<sp>F1<cr>

In the first form of the command, the optional parameter **fx** identifies the field (i.e. all streams in that field) that will be placed in the transparent state.

In the second form of the command the parameter **dc** identifies the data stream that will be placed in transparent state.

Examples: ^A7<sp>F1<cr>   Field 1 in transparent state
              ^A7<sp>C1<cr>   Captions 1 in transparent state
              ^A7<sp>T2<cr>   Text 2 in transparent state
              ^A7<sp>TX<cr>   XDS stream in transparent state

4.4.2 Null State

In the Null state, the encoder will insert Null characters for the selected data stream into line 21. Incoming line 21 video will not be copied through on the data stream.

Command: **^A6<sp>fx<u><cr></u>**
                      ^A6<sp>dc<u><cr></u>

Default   ^A6<sp>F1<cr>

In the first form of the command, the optional parameter **fx** identifies the field (i.e. all streams in that field) that will be placed in the Null state.

In the second form of the command the parameter **dc** identifies the data stream that will be placed in the Null state.

Examples: ^A6<sp>F1<cr>   Field 1 in Null state
                      ^A6<sp>C1<cr>   Captions 1 in Null state
                      ^A6<sp>T2<cr>   Text 2 in Null state
                      ^A6<sp>TX<cr>   XDS stream in Null state

4.4.3 Direct Control State

This command causes the encoder to enter the Direct Control state. Direct Control state is normally terminated by sending the End Of State command (^C) which will cause the encoder to revert to the Null state.

Command: **^A3<sp>n<sp>fx<u><cr></u>data . . . data^C**
        or   **^A3<sp>n<u><sp>dc<cr></u>data . . . data^C**

Default   ^A3<sp>4<sp>F1<cr>

In the first form of the command, the optional parameter **fx** identifies the field (i.e. all streams in that field) that will be placed in the Direct Control state. In the Direct Control state caption information is inserted into the appropriate video field in one of 4 modes which are described below. All upstream caption and text data in that field will be blocked. Any articles queued for insertion to that field will also be blocked. The computer supplies all the information for that field, formatting it with the appropriate stream control codes.

In the second form of the command, the optional parameter **dc** identifies the data channel that will be placed in the Direct Control state. All upstream caption and text data in the specified data channel will be blocked. Any articles queued for insertion to that data channel will also be blocked. The computer supplies all the information for that data channel, formatting it with the appropriate stream control codes. All caption information in the non specified data channels will be passed through.

The optional parameter **n** identifies which variation of the Direct Control state will be used.

n=1   provides the same processing as n=2.

n=2   means that legitimate line 21 control codes are aligned and delayed so that the two byte control code pairs are transmitted in the same field.

n=3   means that legitimate line 21 control codes are aligned and delayed so that the two byte control code pairs are transmitted in the same field. Each control code pair is sent twice.

n=4   provides the same processing as for n=3. No non-line 21 codes are transmitted and the control codes are converted (if necessary) to the correct equivalent code for the current video field.

Examples: ^A3<cr>   Field 1 in Direct Control mode 4
            ^A3<sp><cr>   Field 1 in Direct Control mode 4
            ^A3<sp>1<cr>   Field 1 in Direct Control mode 1
            ^A3<sp>F2<cr>   Field 2 in Direct Control mode 4
            ^A3<sp>3<sp>F1<cr>   Field 1 in Direct Control mode 3
            ^A3<sp>C1<cr>   Caption channel 1 in Direct Control mode 4
            ^A3<sp>3<sp>T1<cr>   Text channel 1 in Direct Control mode 3

4.4.4   Real Time State

In Real Time state, incoming data from the caption computer is transferred as it is typed into the appropriate data stream. The line may be edited using ^H (backspace) or ^X (delete line).   A delay of 1 to 9 seconds can be inserted by including ^Bn into the data (n is the number of seconds of delay desired).

If a caption data channel is specified, captions will be in rollup format with a specified number of lines. The default format is 3 line caption rollup for caption data channels, and text format for text channels.

When the data channel is put into the real time state, upstream data on the specified channel will be blocked from entering the output queue of the encoder. All subsequent data is part of the data stream until ^C is received or the encoder is reset. If the specified data stream is a text channel, articles will be suspended from the output queue while the real time state is active. All caption information in the non specified data channels will be passed through.

Real Time state is normally terminated by a ^C. Articles will be re-enabled into the output queue starting with the suspended article. If upstream data

was enabled prior to entering the Real Time State then it will be re-enabled when the Real Time state is terminated.

Command: **^A2<sp>dc<sp>rl<sp>Bbl<u><cr></u>**

Default   ^A2<sp>C1<sp>3<sp>B15<cr>

The parameter **dc** identifies the data channel that will be placed in the Real Time state.

The parameter **rl** identifies the number of rollup rows and the parameter **bl** identifies the base line if the **dc** parameter is one of the caption data channels.   If the base line is specified the roll up line must also be specified.

Examples: ^A2<cr>   Caption 1 in Real Time State with 3 line rollup at base line 15
            ^A2<sp>T2<cr>   Text 2 in Real Time State
            ^A2<sp>C3<sp>2<cr>   Caption 3 in Real Time State with 2 line rollup at base line 15
            ^A2<sp>C4<sp>3<sp>B10<cr>
                                                Caption 4 in Real Time State with 3 line rollup at base line 10

4.4.5   Display System Status

This command displays the upstream line 21 data channels that are turned on (i.e.: upstream data being passed through to the output) and the number of bytes of memory remaining to store articles and XDS packets.

Command: **^AAcr>**

Default   none

Examples: ^AAcr>

Returns:
Example with all channels On:
```
Memory Status: Avail-005453  # Segments-000011 Largest
Avail-005453
Channel Status:
Field 1:C1 C2 T1 T2 ON
Field 2:C3 C4 T3 T4 XD ON
```

Example with all channels On except T3:
```
Memory Status: Avail-005453  # Segments-000011 Largest
Avail-005453
Channel Status:
Field 1:C1 C2 T1 T2 ON
Field 2:C3 C4 T4 XD ON
```

4.5   TEXT ARTICLES (STREAM MODE ONLY)

When the Article state is active, text data can be entered and stored as complete messages. These messages can be transmitted in any order, any number of times in any of the text channels. Display attributes contained within the articles (such as colour, etc.) specifically coded for one data stream will be translated into the appropriate codes for the text channel they are ultimately inserted into.

The message can be kept in memory or deleted when you have finished transmitting it. Articles will be lost from the article memory in the event of a power loss. The 8084 and 8084AD use an advanced memory allocation scheme that allow them to store a virtually unlimited number of articles at one time. The only requirement is the maximum amount of random access memory available.

The command protocol allows editing of each line of the message by use of the ^H (backspace) and ^X (delete line) characters before the <cr> is input. A delay of 1 to 9 seconds can be inserted into the article by inserting ^Bn into the article. (n is the number of seconds of delay desired)

Once a text channel is put into Article state, upstream data on that channel will be blocked from the output queue. A data channel will be in the article state as long as any article is assigned to its output queue.

4.5.1   Input Article

This command allows the user to input an article to the article memory and assign it to the output queue of one of the text data channels.

Command: **^A0<sp>name<sp>tc<sp>rc<sp>k/d<sp>o/h<sp>n/l<cr>
              data<cr>data . . .data<cr>^C**

Default   ^A0<sp>name<sp>T1<sp>9999<sp>D<sp>O<sp>L<cr>

The parameter **name** identifies the name of the article. The article can subsequently be referred to by its name. If the article name already exists, the previous article with that name will be replaced by the new article.

The parameter **tc** identifies the text channel number that the article will be placed into.

The parameter **rc** identifies number of times the article will be repeated. Values of 9999 or FFFF indicate that the article should be repeated indefinitely. An article's repeat count will be decremented each time the article is output in each output data stream.

The parameter **k/d** identifies whether the article should be kept or deleted when it has been transmitted the specified number of times.

The parameter **o/h** identifies whether the article should be placed into the output queue or whether it should just be held in memory for later use.

The parameter **n/l** identifies whether the article should be placed as the first article in the output queue or the last article in the queue.

All subsequent data is part of the article until ^C is received. The encoder will respond to each line of the article with a '>' prompt while the article is being defined.

Examples: ^A0<sp>Test<sp>T1<sp>5<cr>
This is the first line<cr>
and this is the last line ^C

> A two line article called 'Test" which will be placed at the end of the Text 1 output queue. The article will be deleted after it is output 5 times.

4.5.2   Output Article

This command allows the user to put an existing article (defined by the Input article command) into the output queue of the specified text data channels. An article may be put into an output queue more than once.

Command: **^A1<sp>name<sp>tc<sp>rc<sp>k/d<sp>o/h<sp>n/l<cr>**

Default   tc: last text channel the article was sent to
rc   current repeat count
k/d   last keep/delete status specified for the article
o/h   O
n/l   last next/last status specified for the article

The parameters have the same meaning as for the Input article command. If the **o/h** parameter is H then this command may be used to change other attributes of the article without outputting it.

The parameter **name** specifies the name of a previously defined article.

If the parameter **k/d** is D, and the article is currently being output, it will not be removed until it has been completely output.

Examples: ^A1<sp>Test<sp>T2<sp>5<sp>D<cr>

> The article called 'Test" will be placed at the end of the Text 2 output queue. The article will be deleted after it is output 5 times.

^A1<sp>Test<sp>T2<sp>9999<sp>H<cr>

> The article called 'Test" will have its repeat count change to indefinite. It will not be placed into any of the output queues.

4.5.3   Delete Article

This command allows the user to remove an article from all output queues. If the article is currently being output, it will not be removed until it has been completely output.

Command: **^A4<sp>name<sp>k/d<cr>**

Default   k/d   last keep/delete status specified for the article

The parameter **name** identifies the name of the article.

The parameter **k/d** indicates whether the article will be deleted from memory or not.

Examples: ^A4<sp>Test<sp>D<cr>

> The article called 'Test" will be removed from all output queues and deleted from memory.

4.5.4   Queue Articles

This command will delete the entire specified output queue and replace it with the articles named (if any). The user enters the names of the articles separated by <cr> in the order that they are to appear in the output queue. The encoder continues to add articles to the queue until it receives a ^C. The article names may be edited by using the ^H (backspace) and ^X (delete line) characters before the <cr> is input.

Command: **^A8<sp>tc<cr>**
                    name<cr>name<cr>....name<cr>^C

Default   none

The parameter **tc** identifies the text channel number of the output queue the articles will be placed into.

The parameter **name** identifies the name of each article to be placed in the queue. If no article names are given, the specified article output queue is cleared and no articles will be output in that data stream.

Example: ^A8<sp>T1<cr>TEST<cr>TEST2^C

> Puts the previously defined articles named TEST and TEST2 into the output queue for Text Channel 1.

4.5.5   Display Article Status

This command allows the user to view the list of articles stored in the article memory and display their status.. The status includes the article name, repeat count, (9999 if infinite) the keep/delete status, and the memory storage needed for the article. The first line of the article will also be shown. A "..." will indicate multiple lines of text.

Command: **^A9<cr>**

Default   none

Examples: ^A9<cr>

Returns:
```
Article Status:
Name       Repeat K/D size text
test1      009999 D 000031 "this is a sample" ...
test2      009999 D 000014 "second article"
```

4.5.6   Display Output Queue

This command displays the articles in all 5 output queues in the order in which they reside in the queues.

Command: **^AB<cr>**

Default   none

Examples: ^AB<cr>

Returns a list of articles such as the following:
```
Output Q: T1
test1
Output Q: T2
test2  test2
Output Q: T3

Output Q: T4

Output Q: XDS
```

4.6   EXTENDED DATA SERVICES (STREAM MODE ONLY)

Extended Data Services (XDS) information is encoded into Field 2 and is intended to supply program related and other information to the viewer. XDS data can inform the viewer of such information as current program title, length of show, type of show, time left in show, and V-Chip-compatible program rating information.

The XDS output stream consists of a distinct XDS packet for each type of information. Each packet consists of a 1 byte class, a 1 byte type, one or more informational characters, a 1 byte end of packet code, and a 1 byte checksum.

XDS packets are stored in the article memory and output in the XDS data channel in Field 2. These packets are placed into the XDS output queue in the order specified by the user and inserted into Field 2 according to the space available. EIA-608-B specifies that when there is caption or XDS information in field 2, then there must be at least a null caption signal present in field 1 as well.   When encoding into field 2, the 8084AD automatically detects whether there is a caption signal present in field 1. If necessary It will turn on the Field 1 keyer automatically (the FIELD ! LED will blink) and turn it off again when upstream field 1 captions resume.

The computer uses an ASCII hex notation in describing the XDS packet id and data to the caption encoder. For example to specify the letter A enter a 4 followed by a 1 (the hex ASCII code for A is 41)

The XDS packets are deleted from memory when they have been transmitted the specified number of times. XDS packets will be lost from the encoder's memory in the event of a power loss. The 8084 and 8084AD use an advanced memory allocation scheme that allow them to store a virtually unlimited number of XDS packets at one time. The only limit is the total amount of random access memory available.

Upstream XDS packets will be blocked by packets of the same type in the output queue.

4.6.1   Input XDS

This command allows the user to input an XDS packet into the caption encoder's article memory

If an XDS packet with identical **edsid** exists it will be deleted and replaced with the new packet definition.

Command: **^AP<sp>edsid<sp>rc<sp>data...data<cr>**

Default   none

The parameter **edsid** identifies the XDS packet id. The XDS packet can subsequently be referred to by its packet id. If the XDS packet already exists, the previous XDS packet with that packet id will be replaced by the new packet. The **edsid** is entered in ASCII hex notation. For example to enter a packet id with a class of 01h and a type of 23h enter a 0 followed by a 1 followed by a 2 followed by a 3. The leading zero of the class is optional.

The parameter **rc** identifies number of times the packet will be repeated. Values of 9999 or FFFF indicate that the packet should be repeated indefinitely. A packet's repeat count will be decremented each time it is output.

The parameter **data** is the information bytes of the packet. This data is entered in ASCII Hex format. For example to enter the letter A enter a 4 followed by a 1 (the hex ASCII code for A is 41)

The XDS article length is checked for the following commonly used articles: Program ID (0101), V-Chip Content Advisory (0105), Station Call Letters (0502), and Time Zone (0704). If the article length is not in the valid range for the packet type, the encoder will reject it. This length checking does not apply to XDS packets from upstream, only XDS articles that are entered using the ^AP command from a serial port.

Examples: ^AP<sp>0103<sp>10<sp>41424344<cr>
                        Sets the program name packet to ABCD and repeat packet ten times.

                ^AP<sp>0701<sp>9999<sp>456A4548474A<cr>
                        Time Of Day packet indicating the current UTC time is 10:05 am on Saturday, August 5th, 2000. DST is ON. The packet will be repeated indefinitely.

> **Time of Day and Time Zone packets behave differently than other XDS articles when defined. The defined packet contents will be ignored; the encoder will generate the time of day packet data from the current internal time.**

                ^AP<sp>0105<sp>9999<sp>486D<cr>
                        Program rating packet setting the rating system to "TV Parental Guideline", rating of TV-14 with V and L bits set. The packet will be repeated indefinitely. Other V-Chip ratings may be encoded using the information in section 6.1.17.

4.6.2   Blocking Upstream XDS Packets

Upstream XDS packets can be removed entirely from the data stream, without having to insert new XDS data of the same type. This is accomplished using a variation of the ^AP serial interface command. This feature is particularly useful for removing unwanted Time-of-Day packets, Time Zone packets, etc. off of pre-encoded material.

To remove a specific XDS packet, use the ^AP command to enter an XDS article with the packet id of the packet you want to remove, a repeat count

of 9999 and article text consisting of the single character "R", or the equivalent ASCII HEX "52".

Examples: ^AP<sp>0701<sp>9999<sp>52<cr>
             ^AP<sp>0701<sp>9999<sp>R<cr>
                     Both variations block upstream Time Of Day packets

             ^AP<sp>0701<cr>
                     Allows upstream Time Of Day packets to be passed
                     through

Note that the upstream XDS blocking instructions are not saved through power loss.

4.6.3   Queue XDS Packets

This command will delete the entire specified XDS output queue and replace it with the packets named (if any). The user enters the packet ids of the XDS packets separated by <cr> in the order that they are to appear in the output queue. The user enters the packet id of each packet separated by <sp> in the order that they are to appear in the output queue.

Command: **^A8<sp>F2 edsid<sp>edsid...edsid<cr>**

Default   none

The parameter **edsid** identifies the packet id of each packet to be placed in the XDS queue. If no packet id's are given, the XDS output queue is cleared and no XDS information will be output.

4.6.4   Delete XDS Packet

This command allows the user to remove an XDS packet from the article memory. If the XDS packet is currently being output, it will not be removed until it has been completely output.

Command: **^AP<sp>edsid<cr>**

Default   none

The parameter **edsid** identifies the packet to be deleted.

Examples: ^AP<sp>0103<cr>   The program name packet will be
                                    removed from memory.

4.7 COMM PORT CONTROL COMMANDS (STREAM MODE)

The 8084 and 8084AD can allow simultaneous access by all the communication ports to the caption keyers. This can be the effective equivalent of multiple caption encoders, linked in series. By using a single video keyer, these encoder models provide the added advantage of minimizing the delays and the impact on the video quality.

Several commands are provided in order to prevent data conflicts and to allow the user to control which ports can affect the data.

The caption encoder maintains a permission list that indicates which ports will be allowed to alter various kinds of data. The permissions for each port can be set from the front panel menus (see section 3.3.2) or they may be set from the communication control ports. The permission list is maintained in non-volatile memory. The data types are denoted as follows:

Data Type		
	CF1	captions field 1
	CF2	captions field 2
	TF1	text field 1
	TF2	text field 2
	XDS	extended data services

When multiple ports are permitted access to a particular data type, conflicts will be resolved on a "first come, first served" basis. The caption encoder maintains a list of which ports are active for each data type.

Normally, the various keyer commands (such as ^A2, ^A3, ^A6, ^A7) will set and clear the active status automatically. To obtain maximum compatibility with existing software, these commands will exhibit the following special behavior:

If a port does <u>not</u> have permission for the full field 1, but does have permission for the captions in field 1, then the command will not be denied, but will revert to the C1 form of the command.

For example, if Port A has permission for CF1 only, and a ^A3<cr> or ^A3 F1<cr> is issued, then although Port A does not have permission for the full field 1, the command will not be rejected. Instead, the command will be treated as though ^A3 C1<cr> had been sent.

4.7.1 Show Port Permission Maps

This command will report the permission map for each port. The permission map controls what data types a port is allowed to become active in. (e.g., captions field 1, text field 2, XDS, etc.)

Command: **^AQ<cr>**

Example result:
```
Permission Map
```

```
PORT A: CF1 CF2 TF1 TF2 XDS
PORT B: CF1 CF2 TF1 TF2 XDS
PORT C: CF1 CF2 TF1 TF2 XDS
PORT D: CF1 CF2 TF1 TF2 XDS OFFLINE
```

This example shows all ports are permitted access to all data types (the factory default setting) and the Port D modem is offline.

```
Permission Map
PORT A:     CF2 TF1 TF2 XDS
PORT B: CF1     TF1 TF2 XDS
PORT C: CF1 CF2     TF2 XDS
PORT D: CF1 CF2 TF1 TF2     ONLINE
```

This example shows port A is denied access to captions in field 1, port B is denied access to captions in field 2, port C is denied access to text in field 1 and port D is online and is denied access to extended data services.

4.7.2   Alter Port Permission Maps

This command will alter the permission map for any port by adding or subtracting various data types.

Command: **^AQ<sp>pn<sp>-dt…dt…dt<cr>**

Default: none

Example:

    ^AQ PB – XDS –TF2 –CF2 CF1 TF1<cr>

> This command will disallow Port B from all field 2 data types, and enable Port B for captions and text in field 1.

    ^AQ CF1<cr>

> This command will allow the current port to access captions in field 1. Permissions for other data types remain as previously set.

    ^Au<cr>
    ^AQ PD – XDS –TF2 –CF2 –TF1 CF1<cr>
    ^AQ PB –XDS –TF2 –CF2 -CF1 TF1<cr>
    ^AQ PC –TF2 –CF2 -CF1 -TF1 XDS<cr>

> These commands show a typical application which places the 8084 in stream mode, allows modem Port D to process captions in Field 1, allows Port B to process text articles in field 1, and enables Port C for extended data services.

4.7.3   Show Port Active Maps

This command will report the active map for each port.   The active map controls what port has control of a data type.

Command: **^AO<cr>**   (capital letter 'O')

Example result:
```
Active Map
PORT A: CF1
PORT B:     CF2
PORT C:
PORT D:                 XDS ONLINE
```
This example shows Port A is actively controlling the captions in field 1, Port B is controlling the captions in field 2, Port C is not actively controlling any data, and the Port D modem is online and is controlling the extended data services.

4.7.4   Alter Port Active Maps

This command will alter the active map for any port by adding or subtracting various data types.   The optional override parameter ('O') forces other control ports to relinquish control of the specified data type.

Command: **^AO<sp>pn<sp>-dt…dt…dt<sp>ovr<cr>**

Default: none

Example:

   ^AO PB –CF1<cr>

        This command will remove the active indication for Port B from field 1 captions.

   ^AO CF1<cr>

        This command will indicate that the current port is active in the captions in field 1. Activity for other data types remain as previously set.

   ^AO CF1 O<cr>

        This command will forces the current port to be active in the captions in field 1. Activity for other data types remain as previously set. If any other control port is active in CF1 will be reset.

4.7.5   Reset Port

This command will reset a port. This command immediately clears the input and output data queues and resets the 8084(AD) to the Transparent State in Field 1 and Field 2. Article and XDS output queues are not reset by this command. They must be explicitly reset by using the queue articles and queue XDS commands. (See sections 4.5.4 and 4.6.3.) Because other control ports may be simultaneously sending data, this command only affects the fields and data types that have not been appropriated by other control ports.

Command: **^Ar<sp>pn<cr>**

Example: ^Ar PB<cr>   Resets Port B

CHAPTER 5: TECHNICAL DESCRIPTION

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5   TECHNICAL DESCRIPTION

5.1   OVERVIEW

The Evertz Closed Caption Encoders combine the latest LSI technology with sophisticated microcontroller firmware to provide a powerful, flexible system for encoding closed caption and XDS data onto either a digital video bitstream or a composite analog video feed. The Closed Caption Encoder receives closed caption data from a computer running captioning software and encodes the closed caption data into the digital video bitstream.

5.1.1   Block Diagrams
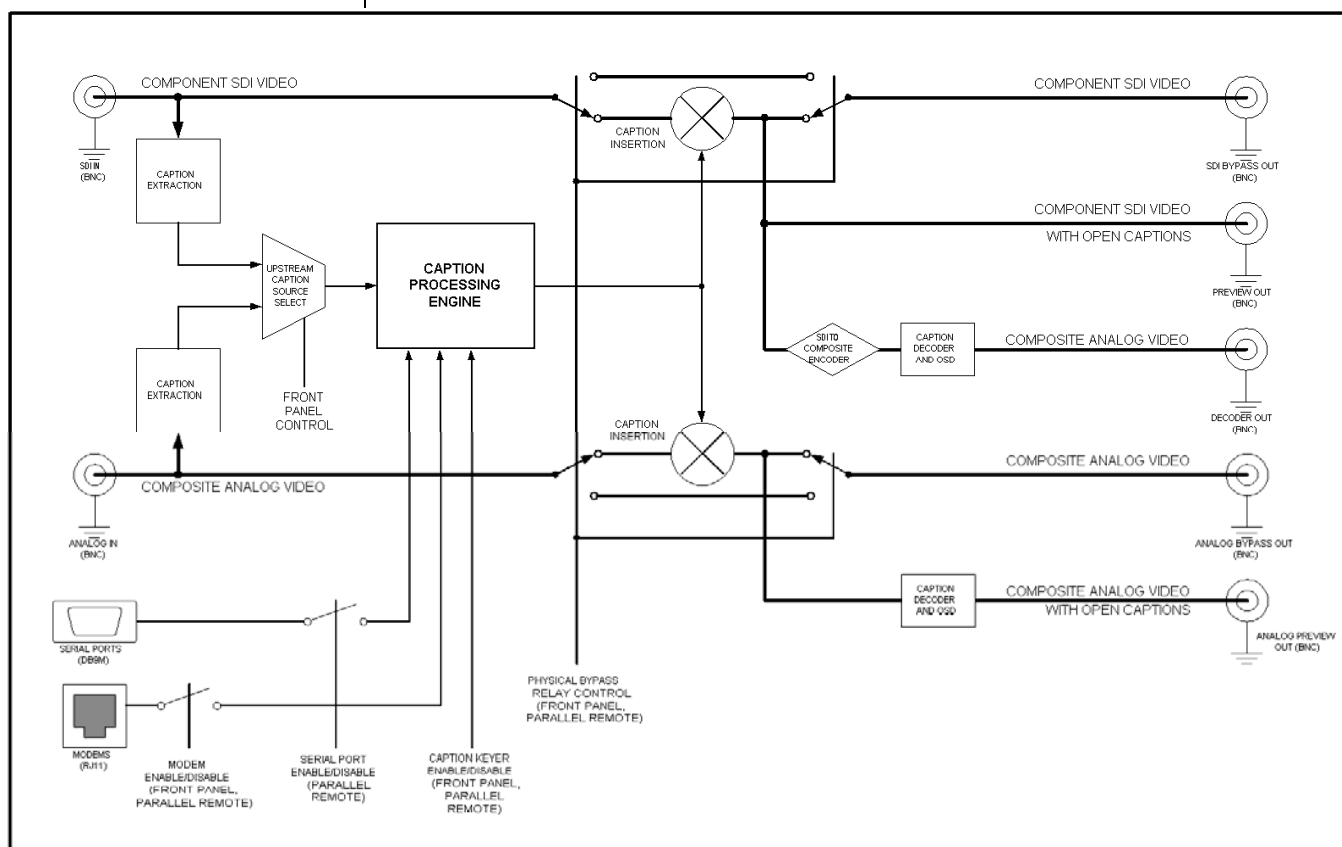
Figure 5-1: 8084AD Top Level Block Diagram

A functional block diagram for the model 8084AD Analog & Digital Closed Caption Encoder is shown above. The block diagram for the model 8084 Digital Closed Caption encoder is almost identical, lacking only the composite analog video path and upstream caption source selector.

Details of the "Caption Processing Engine" when operating in Stream mode are shown in Figure 5-2. The Caption Processing Engine is implemented entirely in device firmware. There are separate data source selectors for each of the nine data streams (CC1, CC2, CC3, CC4, T1, T2, T3, T4, XDS). Some of these have been omitted for clarity. The data source selectors are typically controlled via commands from the serial control ports.
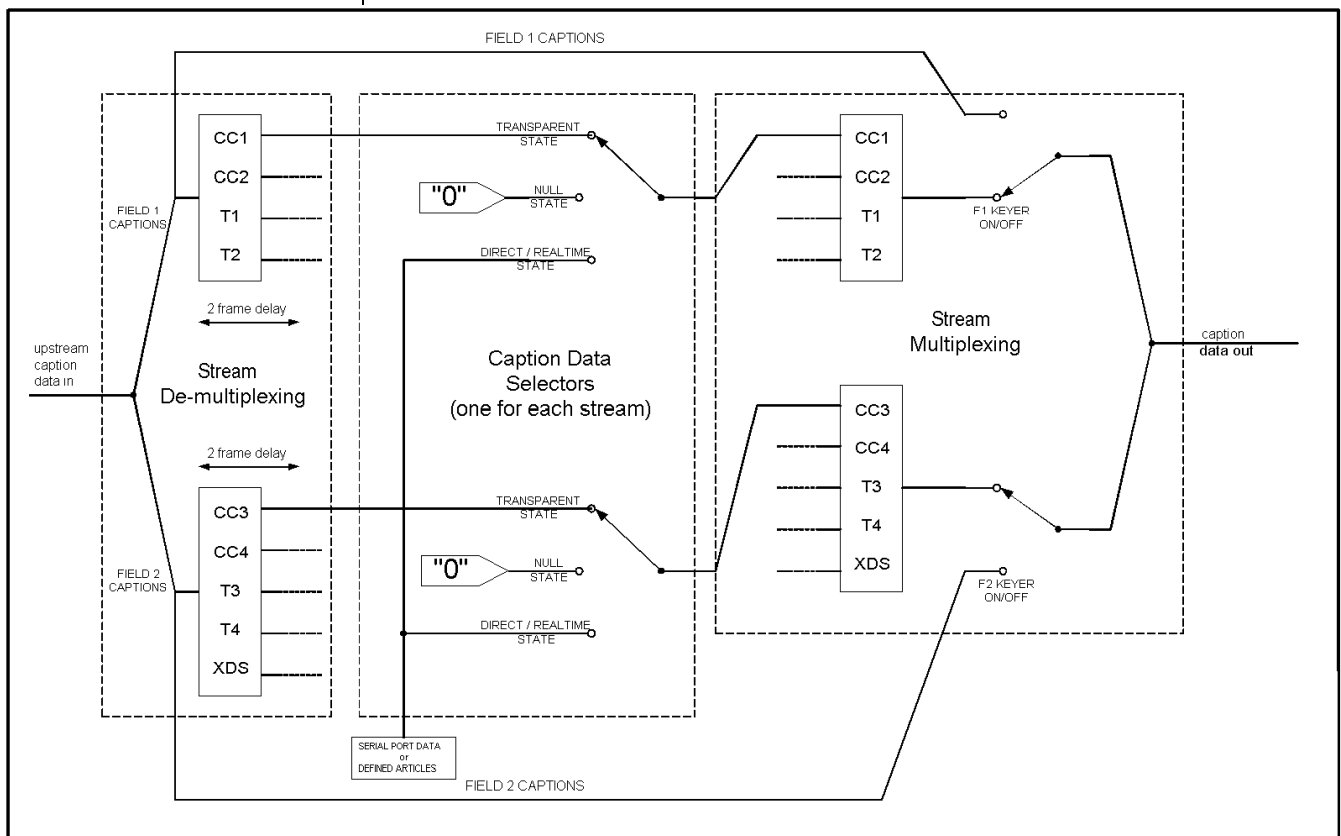
Figure 5-2: Caption Processing Engine (Stream Mode)

5.2 SPECIFICATIONS

5.2.1 Serial Digital Video Input

Standards:	SMPTE 259M (270 Mb/s)
Connector:	1 BNC input per IEC 169-8
Equalization:	Automatic 200m @ 270 Mb/s with Belden 8281 or equivalent cable
Return Loss:	> 15 dB up to 540 Mb/s

5.2.2 Serial Digital Video Outputs

Number of Outputs:	1 with relay bypass, 1 additional output.
Connector:	BNC per IEC 169-8
Signal Level:	800 mV nominal
DC Offset:	0V ±0.5V
Rise and Fall Time:	470 ps nominal
Overshoot:	<10% of amplitude
Return Loss:	> 15 dB up to 540 Mb/s
Wide Band Jitter:	< 0.2 UI

5.2.3 Composite Analog Video Input (8084AD only)

Standards:	SMPTE 170M
Connector:	1 BNC input per IEC 169-8
Input Impedance:	75Ω
Signal Level:	1V$_{p-p}$ nominal
Return Loss:	> 30dB up to 5 MHz

5.2.4 Composite Analog Video Outputs (8084AD only)

Number of Outputs:	1 with relay bypass, 1 monitoring output.
Connector:	BNC per IEC 169-8
Output Impedance:	75Ω
Signal Level:	1 V$_{p-p}$ nominal
User Gain Adj.:	±10%
DC Offset:	0 V ± 50 mV
Return Loss:	> 30 dB up to 5 MHz
Freq. Response:	±0.15 dB up to 5 MHz
Differential Gain:	< 0.6% up to 5 MHz
Differential Phase:	< 0.2 deg. up to 5 MHz
SNR:	> 75 dB$_{RMS}$ (blk field, 100 kHz to 5 MHz, unweighted)
Input-Output Delay:	< 100 ns
Chroma-Luma Gain:	< 0.4% up to 5 MHz
Chroma-Luma Delay:	< 5ns up to 5 MHz
Line-Time Distortion:	< 0.5%
Tilt:	< 0.5%

5.2.5   Electrical

Voltage:	110 - 230 Volts AC, 50/60 Hz
	– unit auto senses input voltage
Fuse Rating:	250 V, 1 amp, time delay
Power:	30 VA
Safety:	ETL Listed, complies with EU safety directives
EMI/RFI:	Complies with FCC Part 15 Class A regulations
	Complies with EU EMC directive
Modem:	Complies with the FCC Rules Part 68.

A composite monitoring output with built-in caption decoder is provided. This is an economical method of verifying the correct insertion of the captioning data. This is described in more detail in section 5.4.3. Refer to section 3.2.4 for instructions on configuring the caption decoder from the front panel.

The front panel is used to configure various items through two menu structures, the Setup menu and the Engineering menu. (See section 3.2 and 3.3 for a complete description of the menus). The front panel also provides helpful diagnostic information at a glance, using the alphanumeric display and indicator LEDs.

5.3   SERVICING INSTRUCTIONS

CAUTION – These servicing instructions are for use by qualified service personnel only. To reduce risk of electric shock do not perform any servicing instructions in this section of the manual unless you are qualified to do so.

CAUTION – If the unit is fitted with dual power supplies, make sure that power is removed from both supplies before performing any work on the unit.

5.3.1   Changing The Fuses

Check that the line fuse is rated for the correct value marked on the rear panel. Never replace with a fuse of greater value.

The fuse holder is located inside the power entry module. To change the fuses, pull out the fuse holder from the power entry module using a small screwdriver. The fuse holder contains two fuses, one for the line and one for the neutral side of the mains connection. Pull out the blown fuse and place a fuse of the correct value in its place. Use time delay 5 x 20 mm fuses rated for 250 Volts with a current rating of 1 amp. Carefully reinsert the fuse holder into the power entry module.

5.3.2   REPLACING THE BATTERY

The 8084 and 8085 Caption encoders are fitted with a 3V 20mm diameter Lithium battery type CR2032. This battery is used to power the clock and the article memory while power is removed from the unit. If the unit is not keeping time properly, or is not remembering the articles stored in memory when it is powered down, the battery should be replaced according to the procedure outlined in section 5.3.2.1.

Before attempting to change the battery remove power from the caption encoder.

CAUTION
Danger of explosion if battery is incorrectly replaced
Replace only with the same or equivalent type

5.3.2.1 Safety Guidelines and Precautions concerning the Use of 3V Lithium Batteries

Please observe the following warnings strictly. If misused, the batteries may explode or leak, causing injury or damage to the equipment.

- The batteries must be inserted into the equipment with the correct polarity (+ and -).
- Do not attempt to revive used batteries by heating, charging or other means.
- Do not dispose of batteries in fire. Do not dismantle batteries.
- Do not short circuit batteries.
- Do not expose batteries to high temperatures, moisture or direct sunlight.
- Do not place batteries on a conductive surface (anti-static work mat, packaging bag or form trays) as it can cause the battery to short.

5.3.2.2 Procedure for Replacing the Battery

When you replace the battery the menu settings of the unit will be lost. To facilitate restoring the menu settings it is recommended that you go through each menu item and write down the menu setting.

- Remove the top cover of the unit.
- Carefully lift out the old battery.
- Insert the new battery with the + side facing up. Make sure it is firmly inserted into the socket.
- Replace the top cover of the unit and apply power.
- Using the procedure outlined in section 3.3.14 reset the unit to its factory default settings. Using the front panel menu, restore the unit's configuration that you wrote down before removing the battery.
- Using the procedure in section 3.3.7 set the system time and date.

5.3.3 Changing DIP Switch Settings

The main circuit board contains an 8 position DIP switch (S1) that invokes setup and diagnostic functions. Most users will have no need to alter the factory switch settings. The functions of each switch are described below.

Switch	Name	Normal	Function when Open	Function when Closed
1	Modem Ring Select	Open	Modem answers on 1 ring	Modem answers on 3 rings
2	Port B	Open	Normal Port B Function	Engineering Function Only
3	Keyer Disable GPI	Open	Master Mode	Temporary (Sticky) Mode
4	Factory Reset	Open		Reset to factory defaults on power up
5	Modem E	Open	Modem Port E not installed	Modem Port E is installed
6	Quick Boot	Closed	Display boot messages	Faster boot up
7	Not used	Open		
8	Not used	Open		

Table 5-1: DIP Switch Functions

To gain access to the DIP switches you will have to remove the top cover.

Before removing the top cover of the unit make sure that both power cords are disconnected from the mains.

5.3.4 Configuring Serial Port A

Serial port A can be configured for various pinouts, as described in Chapter 2. During manufacture, port A is configured for RS-232 DTE. This allows port A to connect to a captioning computer using a typical null modem cable like ports B and C.

The 8084 now supports both RS-232 and RS-422 communications on port A. Earlier models that only supported RS-232 can have a hardware upgrade performed.

Newer units shipped with firmware "R000724" or later support RS-422 communications as well. Units with RS-422 support have an "IO PLD" revision number of "02" or higher. Otherwise, a factory hardware upgrade is required to support RS-422 voltage levels. To check for RS-422 support, follow the procedure given in section 5.5.3 "Viewing Firmware and PLD Revision Levels".

To reconfigure port A, it is necessary to unplug the caption encoder and remove the top cover. Figure 5-3 shows the settings of jumper block J9 on the main circuit board for the various configurations available. The pinouts corresponding to RS-232 DTE (factory setting) and RS-422 tributary configurations are given in Chapter 2.

To find out whether port A has been reconfigured for RS-422 logic levels, refer to section 5.5.3 "Viewing Firmware and PLD Revision Levels". It is impossible to tell whether the serial port pinout has been altered without opening the unit for inspection, however. This may complicate attempts to upgrade the firmware later. The instructions for downloading new firmware to the caption encoder assume that the serial port A configuration has not been altered from the factory settings.
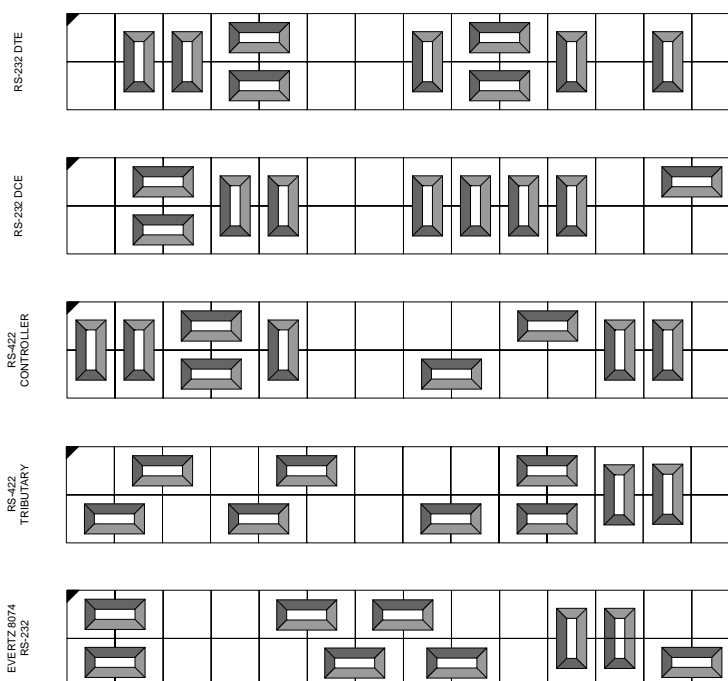
Figure 5-3: Jumper Settings for Port A Configurations

5.3.5 Configuring Serial Ports B and C

Caption encoders containing a model 8038 modem/UART submodule have fixed RS232-DTE pinouts for ports B and C. Caption encoders manufactured using the Evertz 8058 modem/UART submodule can be configured for RS232-DTE or RS422-tributary operation. Refer to section 5.5.3 to determine if your encoder contains an 8058 submodule or an 8038. These submodules are not interchangeable.

The pinouts corresponding to RS-232 DTE (factory setting) and RS-422 tributary configurations are given in Chapter 2. To change port B or port C between RS-232 DTE and RS-422 tributary pinouts and voltage levels, remove the top cover and locate J14, J15, J16 and J17 on the 8058 submodule. To change port B setting, you must move the jumper on J16 and the ribbon cable connector on J15. To change port C setting, you must move the jumper on J17 and the ribbon cable connector on J14. Figure 5-4 shows the ribbon cable position for either port, while Figure 5-5 shows the jumper positions for all four possible configurations of these two ports.

To find out whether ports B and C have been configured for RS-232 or RS-422 logic levels without opening the unit for inspection, refer to section 5.5.3 "Viewing Firmware and PLD Revision Levels".

Ribbon Cable Position
for RS-232 DTE

Ribbon Cable Position
for RS-422 Tributary
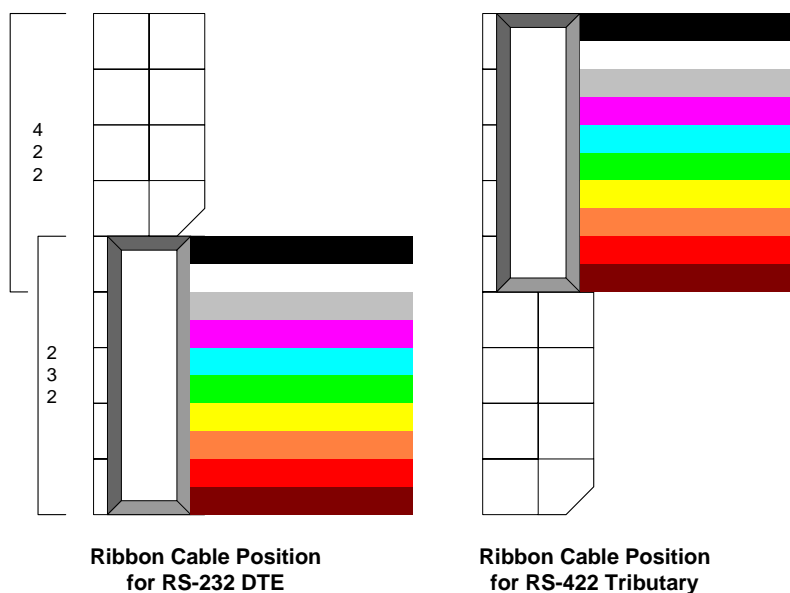
Figure 5-4: Port B or Port C Ribbon Cable Positions

| J16 | Port B RS-232 |
| J17 | Port C RS-232 |

| J16 | Port B RS-422 |
| J17 | Port C RS-232 |

| J16 | Port B RS-232 |
| J17 | Port C RS-422 |

| J16 | Port B RS-422 |
| J17 | Port C RS-422 |
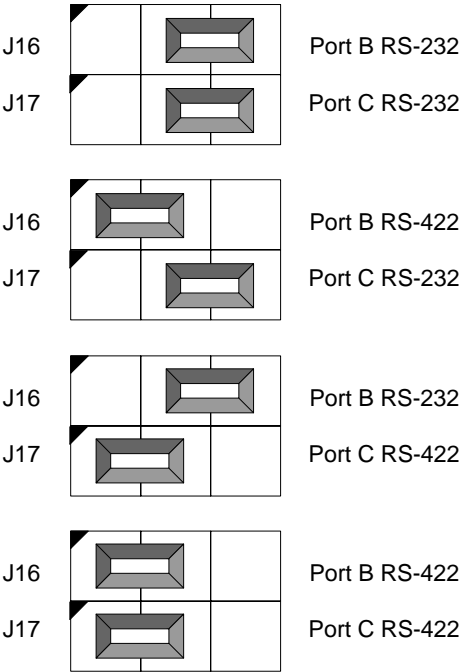
Figure 5-5: Jumper Settings for Ports B and C

5.4   CIRCUIT DESCRIPTION

5.4.1   Front Panel Display and Pushbuttons

A 16 digit alphanumeric display and a keypad with eight or ten buttons are contained on a separate circuit card (5220) which is connected to the main circuit board via a 20 conductor ribbon cable.

To perform a keyboard test and lamp test of the front panel LEDs hold down the SETUP key on power up. The front panel display will show:

```
00    KEY
```

As you press various key combinations, different LEDs will illuminate. The front panel display will show the keyboard scan codes for each key combination pressed. Table 5-2 below shows the SCAN code for each key. To exit this test mode, remove and re-apply power to the unit.

CAPTION ON/OFF	01	KEYER FLD 1	41
KEYER FLD 2	01	DECODER	42
SHIFT	02	SELECT	45
←	05	↑	46
↓	06	SETUP	47
→	07		

Table 5-2: Keyboard Scan Codes

5.4.2 Modems

The basic unit is fitted with Cermetek CH1794 modem known as port D. A second optional modem known as port E may be fitted at the factory. These modems are capable of baud rates up to 14400bps, but the actual connection rate parameters are set from the front panel menus or serial ports. The modems handle all the necessary interconnection between the caption encoder and a remote captioning station through the telephone network.

5.4.3 Analog Composite Monitor 9000CME

Digital video from the main circuit board is fed up the header to the 9000CME submodule, where it is converted to composite analog video. Two video output amplifiers are provided to drive analog monitors. The 9000CME is capable of encoding NTSC or PAL video types, depending on the input digital video format.

The 9000CME also contains a caption decoder capable of viewing all caption streams, text data streams and many XDS packet types, including:

- Program Rating Advisories (V-Chip) – separate display from other XDS
- Station Name and Call Letters
- Length of Show and Time Left in Show
- Program Type
- Program Description (4 lines)

5.5   UPGRADING THE FIRMWARE

5.5.1   Overview

The Caption Encoder contains firmware in a FLASH ROM device. From time to time firmware updates may be provided to add additional features to the unit. The following procedure will allow you to upload new firmware from your computer.

You will need the following equipment in order to update the Firmware:
- PC with available communications port. The communication speed is selectable between 9600 baud and 38,400 baud. A 486 PC or better with a 16550 UART based communications port is recommended.
- "Null-modem" serial extension cable (DB9 female to DB9 female) or (DB25 female to DB9 female). This assumes that the user has not changed the pinout of serial port A using the jumpers inside the Closed Caption Encoder.
- Terminal program that is capable of Xmodem file transfer protocol. (such as HyperTerminal)
- New firmware supplied by Evertz.

Most upgrades will cause user settings in the caption encoder to revert to factory defaults. Evertz recommends that you make note of your setup menu settings prior to upgrading the firmware. You will have to restore them manually after the firmware upgrade. You will also have to re-initialize any XDS packets and articles that you have in memory using the MetaCast 2 or CaptionWare software. (you may download a free demo copy of CaptionWare from http://www.evertz.com)

The caption encoder also contains instructions in programmable logic devices (PLDs). The PLDs are not field-upgradeable. Very rarely, a particular device upgrade may specify a minimum PLD revision number in addition to a firmware upgrade. If the PLD revision numbers in the caption encoder are lower than those specified for the upgrade, Evertz technicians must be service the encoder to perform the upgrade.

5.5.2   Procedure for Firmware Upgrades

1. With power disconnected, connect the null-modem cable between the Closed Caption Encoder serial port A and the PC.

2. Power-up the PC, and start the terminal software.

3. Configure the port settings of the terminal program as follows:

Baud	**38400** or **9600**
Parity	**None**
Data bits	**8**
Stop bits	**1**
Flow Control	**XON/XOFF (software)**

4. If you wish 38,400 baud communications, hold the ⬆ key on the front panel and apply power to the Closed Caption Encoder. For 9600 baud, hold the ⬇ key while applying power.

5. The front panel will display the word **PROGRAMMER** and the selected baud rate. You should also see a menu appear in the terminal window on the PC.

For example:

```
-------------------------------------------
8045 Flash ROM Programming Utility Ver 1.1
COPYRIGHT 2000 EVERTZ MICROSYSTEMS LTD.
-------------------------------------------
Code Bank: 0 1 2 3 4 5 6 7
BLANK?     N N N N N N N N
Flash ROM is valid

-- MENU -------------------------------
 1. <X>Modem download HEX file to Flash
 2. <A>SCII download HEX file to Flash
 3. production <T>est
 4. <Q>uit Programmer (Jump into Flash)
----------------------------------------
COMMAND:
```

6. The following is a list of possible reasons for failed communications:

    - Defective Serial Null modem cable.
    - Wrong communications port selected in the terminal program.
    - Connected to wrong communications port on Closed Caption Encoder. You must use serial port A for firmware upgrades.
    - Improper port settings in the terminal program. (Refer to step 3 for settings).
    - Arrow key (⬆ or ⬇) not being pressed correctly during power-up.

7. Press '1' or 'X' to initiate X-modem file transfer.

8. Upload the "*.HEX" file supplied using the X-Modem transfer protocol of your terminal program. If you do not start the upload within a short time the firmware loading operation will time out. You can restart the process by selecting '1' or 'X' from the menu again.

9. The boot code will indicate whether the operation was successful upon completion of the upload.

For Example:
        ********** Download Complete!**

10. The following is a list of possible reasons for a failed file transfer:
    - The supplied "*.HEX" file is corrupt.
    - Wrong file specified to be uploaded.
    - The PCs' RS-232 communications port can't handle a port speed of 38400bps.

11. To complete the upgrade, either select "Quit" from the terminal menu, or power-down the unit and reapply power without pressing any keys to resume normal operation. If the Flash ROM contains valid code, the unit will resume normal operations. If there is a problem in the new firmware, you will be prompted with an error message and remain in the bootloader.

5.5.3 Viewing Firmware and PLD Revision Levels

Your Evertz caption encoder does not need to be taken out of service to check the firmware or PLD revision levels. These can be checked from the front panel display. The serial port configuration and power supply status can also be checked from these front panel displays.

To view the firmware revision, the encoder should be running in the normal operating display. Press SHIFT+SELECT keys. The alphanumeric display will cycle through the following messages (or similar):

CK88D5   This is the name of the HEX file that was downloaded to the caption encoder.

000724   This is the file date of the last "released" version of firmware. In this case it is 2000, July 24.

R000724   This is the actual firmware revision for the closed caption encoder. If the first character is a 'U' instead of an 'R' then the caption encoder contains unreleased beta firmware. (Evertz does not ship unreleased caption encoder firmware, except where customers have requested special features.)

A232 B232 C232   Indicates the logic levels of the three internal serial ports for diagnostic purposes. These may be either "232" or "422" for each port. Port A may also display "???" because it was not possible to read-back this data from earlier revisions of the IO PLD.

--- PtE MON S12   This display shows features installed in the caption encoder. In this case, PtE stands for modem Port E, and MON is the 9000CME monitor/decoder (which is standard issue in 8084 and 8084AD). Units equipped with an 8058 submodule and dual power supplies also display the status of the power supplies here. The digits '1' and/or '2' appearing next to the 'S' indicate which supplies have power applied.

A feature was added to firmware revisions R000724 and later that allows the operator to view the PLD revision levels in the caption encoder. Follow these steps:

1. Enter the Engineering menu system using SHIFT+SETUP.
2. Press the ⬆ or ⬇ until **GPI IN MONITOR** is displayed.
3. Press ➔ to reveal the message **GPI= aa bb cc dd** where **aa bb cc** and **dd** are two-digit numbers.

"aa" is the value read from the parallel GPI port on the rear panel, as described in chapter 3.

"bb" is the revision level of the "IO PLD". At the time of writing, the current revision level is "03".

"cc" is the revision level of the "CORE PLD". At the time of writing, the current revision level is "01".

"dd" is the revision level of the "8058 PLD". At the time of writing, the current revision level is "01". If this has a value of "00" or there is no value displayed at all, the caption encoder has an 8038 submodule, not an 8058 submodule. Caption encoders containing an 8038 submodule cannot be upgraded to an 8058 submodule.

CHAPTER 6: TROUBLESHOOTING

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6   TROUBLESHOOTING

6.1   ANSWERS TO FREQUENTLY ASKED QUESTIONS

6.1.1   Which serial port should I connect to?

Any serial port can be used for typical captioning functions, since they all use the same serial protocol. In the 8084and 8084AD, all three serial ports are configured from the factory to work with an off-the-shelf null-modem cable. Port A has a configurable pinout, but comes from the factory ready to accept a null-modem cable. (In the 8074, Port A requires that a special cable be made according to the instructions in the manual.) In some models, serial ports B and C also have a configurable pinout and support for RS-422 as well as RS-232 communications. If the user wishes to use the special "port passthrough" or "VBI bridge" modes, serial port B must be reserved for this purpose.

6.1.2   There is no SDI video being output from the unit.

The 8074, 8084 and 8084AD include an SDI video bypass relay to ensure that SDI video is passed, even when the unit is powered-down. Make sure that your SDI source is connected to the BNC connector marked SDI IN, and the primary SDI video output is connected to the BNC connector marked SDI BYPASS OUT. If you still see no video, try the following:

- Unplug the power from the Closed Caption Encoder.
- Connect your SDI source to the SDI IN connector.
- Look for video out of the SDI BYPASS OUT connector.
- If there is no still no SDI video passing through the unit, then the problem is most likely not with the Closed Caption Encoder itself. Check for presence of SDI video upstream, and check for cabling problems.

6.1.3   There is valid input video but the front panel shows "VIDEO MISSING".

The 8084AD reads upstream captions from either the digital video or the analog video source, as determined by the UPSTREAM SOURCE setting in the Setup menu system. If there is only one video source, either analog or digital, it is important that UPSTREAM SOURCE is set correctly even if the input video is uncaptioned. The 8084AD also locks internal counters to the indicated video source.

6.1.4 What baud rate and port settings should I use?

While the unit is capable of running at 38.4kbaud on all internal serial ports, it is not necessary to run at the fastest baud rate possible for most captioning operations. NTSC captions are encoded at a maximum of 60 characters per second in each field and 50 characters per second per field for PAL. A serial port set to 1200 baud can transfer data at up to 120 characters per second including 7-bits of data, start, stop and parity bits. This is adequate for most captioning applications; the communications overhead is generally very low.

Some older PC's do not function correctly at over 19.2k baud, especially when running under Windows. Many PC's also have difficulties at 19.2k baud and above when using only the software (XON/XOFF) flow control method. Try turning on hardware (CTS/RTS) flow control on your computer if the captioning software supports it, and/or reducing your communications baud rate. Make sure that you alter your captioning computer's serial port settings to match those of the caption encoder.

6.1.5 I see "BUFFER OVERFLOW" or "PARITY BAD" messages on the front panel.

Please refer to the previous question, 6.1.4 "What baud rate and port settings should I use?"

6.1.6 How do I check the logic levels and pinouts of the serial ports?

The logic levels (RS-232 or RS-422) can be checked from the front panel without removing the caption encoder from service. Instructions are provided under 5.5.3 "Viewing Firmware and PLD Revision Levels". Since ports B and C only have two possible pinouts (with 8058 submodule), the logic level setting and pinout are generally synonymous. The only way to verify the pinout of port A is to remove the top cover and examine the locations of the jumpers in jumper block J9.

6.1.7 Why does my Port A logic level appear as "???"

Earlier revisions of the IO PLD did not have the ability to read-back this data. Your caption encoder will need to be sent to the Evertz factory for a PLD upgrade before this feature will function.

6.1.8 How do I check the status of my power supplies?

Power supply status can only be monitored on caption encoders with an 8058 submodule and dual power supplies. Refer to 5.5.3 "Viewing Firmware and PLD Revision Levels"

6.1.9   Captions are not being encoded at all.

If there is no option in the captioning/teleprompter software for the Evertz encoder, configure your software to communicate with an EEG 270, EEG 370 or EEG 470 model Smart Encoder. The Evertz caption protocol is compatible with these units.

Make sure that the caption encoder unit is set to the correct video type, 525-60 for component NTSC, 625-50 for component PAL, or 4FSC for composite NTSC (8074 only).

Check that the caption keyer is turned on. There are two green LEDs on the left of the front panel that indicate that the Field 1 and Field 2 caption keyers are enabled. The encoder will not encode new captions into the video if the keyers have been turned off.

Check your serial port communications settings. Make sure that these are identical between the caption encoder and the attached captioning computer.

Check that the unit is receiving data from the serial port or modem, and that the PARITY ERROR message does not appear on the front panel of the unit.

The front panel LEDs marked FLD 1 DATA OUT and FLD 2 DATA OUT (or simply DATA OUT on some models) will light whenever new caption data is being encoded into the respective field. If either LED is lit then caption data is being encoded.

Try enabling the built-in test message, as described in the manual. If you still cannot see captions, then it is likely that downstream equipment is corrupting the caption data, or your caption decoder is not functioning correctly.

6.1.10   Captions are not being encoded correctly.

If there is no option in the captioning/teleprompter software for the Evertz encoder, configure your software to communicate with an EEG 270, EEG 370 or EEG 470 model Smart Encoder. The Evertz caption protocol is compatible with these units.

Make sure that the caption encoder unit is set to the correct video type, 525-60 for component NTSC, 625-50 for component PAL.

Check your serial port communications settings. Make sure that these are identical between the caption encoder and the attached captioning computer.

Check that the unit is receiving data from the serial port or modem, and that the PARITY ERROR or BUFFER OVERFLOW messages do not appear on the front panel of the unit.

If certain accented and special characters do not display correctly, this is likely the fault of the caption decoder being used to display the captions. The optional caption decoder in the 8074 does not display some accented and special characters. The decoder in the 8084 and 8084AD do display the entire captioning character set.

Certain teleprompter software packages have been known to not encode accented characters correctly. Please contact your software provider for possible updates before contacting Evertz technical support.

6.1.11 My 8084AD sometimes drops or repeats caption characters.

If you are captioning to both analog and digital video simultaneously with the 8084AD, both video feeds must have frame-locked timing. The caption data being encoded is not deeply buffered in memory. This minimizes the delay introduced when inserting captions, but makes the device intolerant to video timing differences between the two video feeds. The feed that is not selected as the UPSTREAM SOURCE is free running, and will occasionally drop or repeat caption characters if the two feeds are not externally synchronized.

6.1.12 The Caption Shift Up GPI is not working properly.

The Caption Shift Up GPI on parallel remote control pin 8 moves caption text from rows 12 through 15 and repositions them to rows 1 through 4. It does this by translating the Preamble Address Codes (PACs) embedded in the caption data. A PAC control code is typically sent before each new line of text to position the display cursor. After the GPI has been activated, captions will not shift up until a new PAC is transmitted. A caption that is already displayed on the screen will not shift up when the GPI is activated.

Some real-time captioning software that uses roll-up captions does not encode PACs. There may be options in your captioning software to remedy this situation. If a show has been pre-captioned using roll-up captions without PACs, the Caption Shift Up GPI will be ineffective on this program material. There is presently no solution for this particular problem.

6.1.13 Why has the Keyer Disable GPI stopped working?

Older versions of 8084 firmware implemented two separate keyer disable GPIs that behaved slightly differently. The GPI on parallel remote control pin 8 has been replaced with the Caption Shift Up GPI. The remaining keyer disable GPI on pin 7 is now configurable for either mode using a DIP switch setting. If you have recently upgraded your 8084 firmware, or replaced a unit in your installation, you may need to modify the cable that connects to the parallel remote control port on the caption encoder. Depending on your application, you may also need to open the caption encoder to change the DIP switch setting.

6.1.14 Why doesn't my caption encoder have this button/LED/menu item?

The manual describes more than one model of Evertz closed caption encoder. These units are similar but different. The manual attempts to describe the product features "where applicable" without complicating the text with model exclusions where this is fairly obvious.

Evertz is constantly upgrading our products to increase functionality and reflect market demands. Most product improvements to a particular model are firmware upgrades, which can immediately benefit customers with units in the field.

6.1.15 How can I block upstream captions?

Depending on the user's specific needs, there are many ways to accomplish this. If all upstream captions are to be blocked, the recommended approach is to issue the serial port commands ^A6 F1 and ^A6 F2 to place both Field 1 and Field 2 into NULL STATE. Another solution is to place the Closed Caption Encoder in FIELD mode of operation from the front panel Engineering menu.

If only a particular data channel is to be blocked, such as Text Channel 2, use STREAM mode of operation, and execute the serial command ^A6 T2 to place this particular channel in NULL STATE. To block all upstream XDS material, issuing ^A6 TX will put only the XDS stream into NULL STATE. Presently there is no way to block specific XDS packet types, unless these are being replaced with updated packets of the same type by the caption encoder. If an entire field is to be blocked, use ^A6 F2 to place all of Field 2 in NULL STATE.

6.1.16 How can I pass upstream captions?

If upstream captions are being blocked, either the Closed Caption Encoder is in FIELD mode, or the user's captioning software has failed to relinquish control of the encoder so upstream captions may pass.
The recommended solution is to switch the unit to STREAM mode of operation.

If captioning software is leaving the unit in DIRECT STATE or REAL TIME STATE or NULL STATE when it is sitting idle, this issue must be resolved in the caption software itself.

2222222

6.1.17 How can I encode XDS / V-Chip "Content Advisory" or "Program Rating" packets?

See section 4.6 of this manual for instructions on how to enter any XDS packets into the XDS data stream. The manual does not attempt to provide a comprehensive list of valid XDS packet types. The reader is encouraged to refer to the EIA-608-B standard for the currently supported and required packet types. For the V-Chip program rating packet, EIA-744-A serves as an addendum to EIA-608-A.

If there is no automation system or XDS software controlling the insertion of V-Chip program rating packets, the 8084 and 8084AD have built-in facilities for inserting a default V-Chip program rating locally from the front panel setup menu system. Refer to section 3.2 for instructions on how to configure this feature. (This feature is not available in Model 8085 DTV Caption Encoder)

At the time of writing, Evertz Microsystems provides 808x Configware software free of charge that can be used with Evertz captioning encoders to manually encode many different XDS packet types. Evertz also sells MetaCast 2 software that allows you to create a play list that matches your program schedule, so that you can automatically encode different V-Chip and XDS packets for each program segment. See the Evertz Web site (www.evertz.com) for complete information.

If you want to encode V-Chip rating packets using the serial commands you can follow this procedure.

The command to enter V-Chip packet "articles" is ^AP (see full description in section 4.6.1 of this manual). The basic form of this command is:

^AP<sp>0105<sp>9999<sp>xxxx<cr> where ^A is control-A (0x01) character, <sp> is a space character, <cr> is a carriage return (0x0D), and "xxxx" would be replaced with the rating code as shown in the following table. There are four different rating systems, each with their own sets of codes.

MPAA* Rating System:

N/A	4040
G	4140
PG	4240
PG-13	4340
R	4440
NC-17	4540
X	4640
Not Rated	4740

* EIA-608-B also defines a "compatibility mode" MPAA system where the first byte has values 50 through 57.

U.S. TV Parental Guideline Rating System:

None	4840
TV-Y	4841
TV-Y7	4842
TV-G	4843
TV-PG	4844
TV-14	4845
TV-MA	4846
None*	4847

* EIA-608-B defines two distinct US-TV rating codes that are both named "None".

This rating system includes provision for flags to further define the program content. These have not been included in the table.

Canadian English Rating System:

E (exempt)	5840
C	5841
C8+	5842
G	5843
PG	5844
14+	5845
18+	5846

Canadian French:

E	7840
G	7841
8+	7842
13+	7843
16+	7844
18+	7845

6.1.18 When the caption decoder is set to XDS, the text sometimes disappears momentarily.

This behavior is intentional, and does not represent a problem with the encoding of XDS packets. In XDS display mode, the internal caption decoder has been configured to flush its memory and reacquire all XDS data every 16 seconds. This makes it easy for the operator to see if a particular XDS packet has been removed from the data stream altogether. Of course, if the packet has been replaced with another packet of the same type, the display will be updated immediately.

6.1.19 Captioning waveform is at the wrong voltage level when converted to analog video.

SDI to analog specifications state that there is to be no setup added to line 21. Regardless, some conversion equipment does add 7.5 IRE to line 21 when converting to analog. To correct for this, enable the CAPTION SHIFT feature of the encoder. Please refer to your manual under the heading CAPTION SHIFT or CAP'N SHIFT for more details.

6.1.20 When should I use "Reset to Factory Defaults"?

Factory Reset should not be used lightly. It is intended primarily for use when Evertz technical support personnel are assisting an operator with a problem. The Factory Reset could also be used when the encoder is placed in a particular undesirable mode of operation and the operator is highly unsure as to how to resolve the situation. Note that any special features that have been enabled by the operator, such as baud rate settings or the VBI bridge, will need to be reconfigured after a Factory Reset.

6.1.21 I cannot get the VBI Bridge or Port Passthrough feature to work correctly.

Use of the VBI Bridge or Port Passthrough features requires two 8074/8084/8084AD units. Make sure that the serial baud rate and parity of both is the same for the inter-connected ports.

VBI Bridge extracts **caption data** from the line 21 waveform and passes it directly to another caption encoder to re-encode.

Port Passthrough echoes **serial commands** sent into one port back out of another port (Port B specifically).

Using Port Passthrough, there is no feedback from the second encoder receiving the serial commands. If a serial command is not valid for the second encoder, no error message will be returned to the captioning computer.

The serial protocol used for the VBI Bridge is not compatible with the Port Passthrough modes. If one unit is configured for VBI Bridge operation and the other for Port Passthrough, unexpected and erroneous operation will result.

As a safety measure, the operator cannot place port B in **Funct CC recv** mode if any other port is supplying the unit with captions to place in the SDI video.

6.1.22 My Modem Connection Hangs-Up Unexpectedly

The following can cause unexplained hang-ups on a modem connection:

RAIN - If there has been any significant rainfall during this time, moisture can get into the lines and cause power hums and other sorts of nasty things to happen. This can cause the DC level of the phone line to vary, which then modems can interpret as loss of carrier.

DISTANCE - If the captioner is quite a distance from the CO (Central Office) where they are near the limit of transmission, dropouts can occur if there is not a line booster in place. If there is a line booster, this can also be a problem if there are grounding issues, etc.

CAPTIONERS MODEM - If the initialization string is setup incorrectly, this can cause the modem to not function correctly. They may want to check the modem manufacturer for the recommended set-up for they're particular modem so it is capable of operating in the 1200 to 2400 baud range. Some people that use US Robotics 56.6k modems have reported difficulties connecting at lower baud rates due to these setup strings.

OTHER SOFTWARE - If there is any other software on the system that uses the modem, it may have changed the initialization string or be interfering with the modem. On computers that use a COM-port mouse, the mouse may also interfere with the modem operation if it is configured incorrectly.

READ THE MANUAL - Be sure the captioner knows their system inside and out. They should at minimum, be able to supply what their system configuration is.

CALL WAITING - If this service is installed on the caption's phone line, it MUST be disabled before using the modem. If an outside caller tries to call the phone line that the modem is connected to, the tone that is generated will disrupt modem communications, resulting in loss of carrier.

ONLY CONNECT TO POTS (Plain Old Telephone System) - For a reliable telephone connection to the caption encoder a direct telephone line must be used. This line must not pass through a PBX or similar key device.

6.2   BEFORE YOU CALL EVERTZ TECHNICAL SUPPORT…

Check for any product upgrades that may address your problem at the Evertz web site (www.evertz.com) and with your software vendor.

After you have checked our web site and you call, you will be asked for specific technical information, which should be prepared in advance for speedy assistance:

- Firmware revision date of the caption encoder. This can be found by pressing SHIFT+SELECT on the front panel of the encoder.
- Which serial ports and modem ports (A through E) are being used on the encoder?
- What captioning or teleprompter software is being used to control the encoder? (manufacturer, product name, revision number)
- Is this a new installation, or was the unit functioning in your system previously?
- Did the problem occur after installing some new hardware or software?

6.3   CREATING A CAPTURE FILE

Sometimes during a tech support call, the customer will be asked to make a capture file that may be emailed to Evertz tech support personnel. We look at this file to see what the customer's captioning software is sending to the caption encoder. We can also send this capture file to one of our encoders to attempt to duplicate the customer's problem.

To create a capture file, connect the captioning/teleprompter computer to another computer instead of the Evertz 8074/8084/8084AD. If the captioning computer was connected to Port B or Port C on the encoder, one may simply disconnect the cable from the rear of the Evertz unit and connect to a computer's COM port. For Port A, some rewiring may be required depending on the system configuration.

Use a commercial "terminal" communications program to save a capture file of the data coming from the captioning computer. Note that some of the characters that are sent to the caption encoder are not standard printable ASCII characters. If your terminal program supports any of these features, turn them OFF before saving your capture file:

- Strip high-bit of incoming characters
- Mask non-ASCII characters
- Any translation tables (such as V T-100 or ANSI)
- Store only printable characters in capture file.

The following terminal programs are known to save useable capture files:
- Telix 3.21 for DOS

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A   APPLICATION NOTE 3: CONFIGURING EVERTZ CLOSED CAPTION ENCODERS TO BRIDGE CAPTION DATA AROUND A DVE DEVICE

A.1   OVERVIEW

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.

A.2   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.
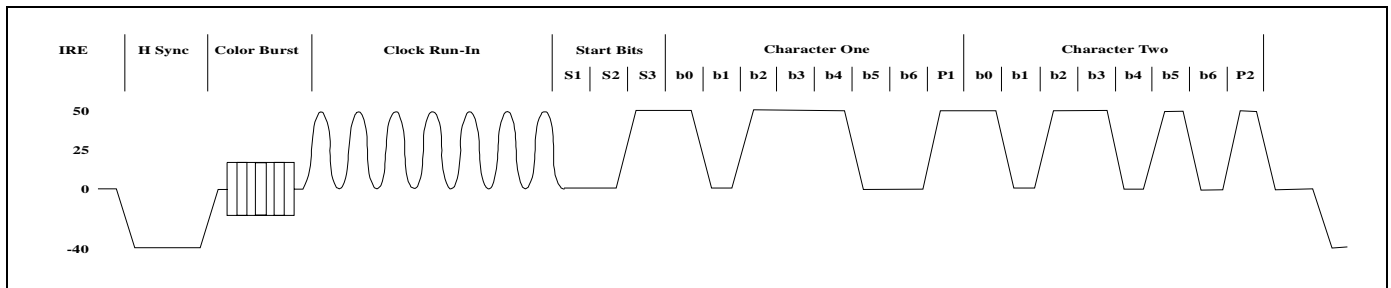

Figure A-1: Typical Line 21 Closed Caption Analog Waveform

Figure A-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.

A.3   IMPLEMENTING THE VBI BRIDGE

A.3.1   Method 1: Single Evertz 8084AD Encoder

Figure A-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.
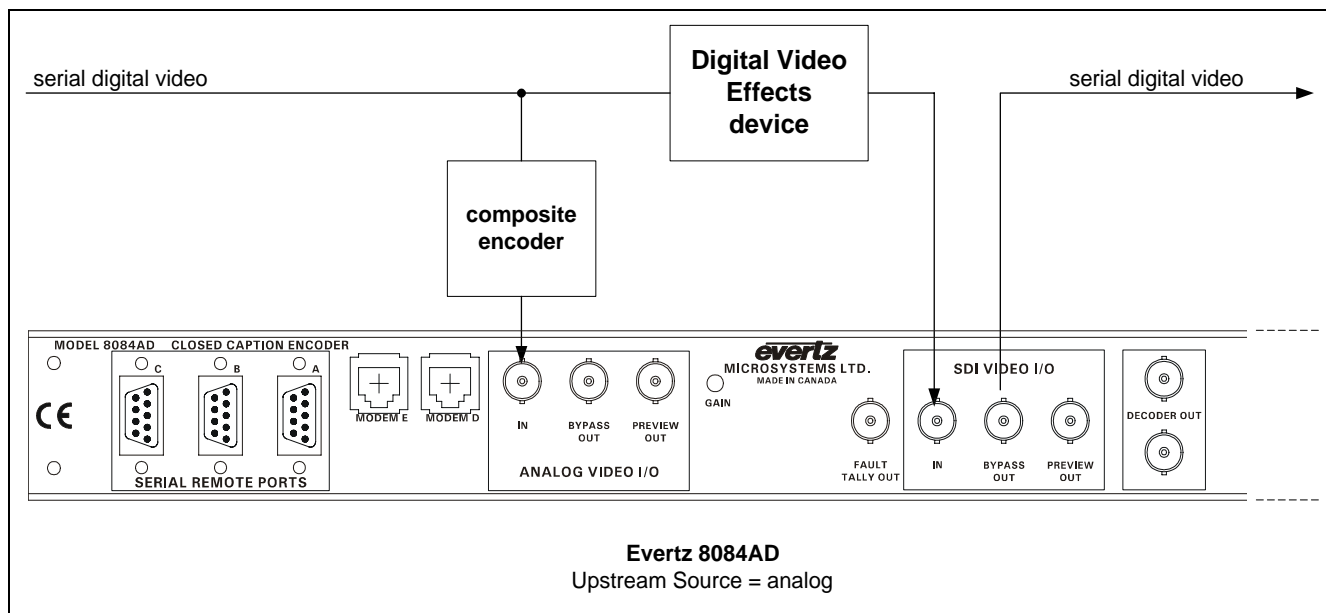

Figure A-2: VBI Bridge using a single Evertz 8084AD encoder

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

A.3.2 Method 2: Two Evertz Encoders

Figure A-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.
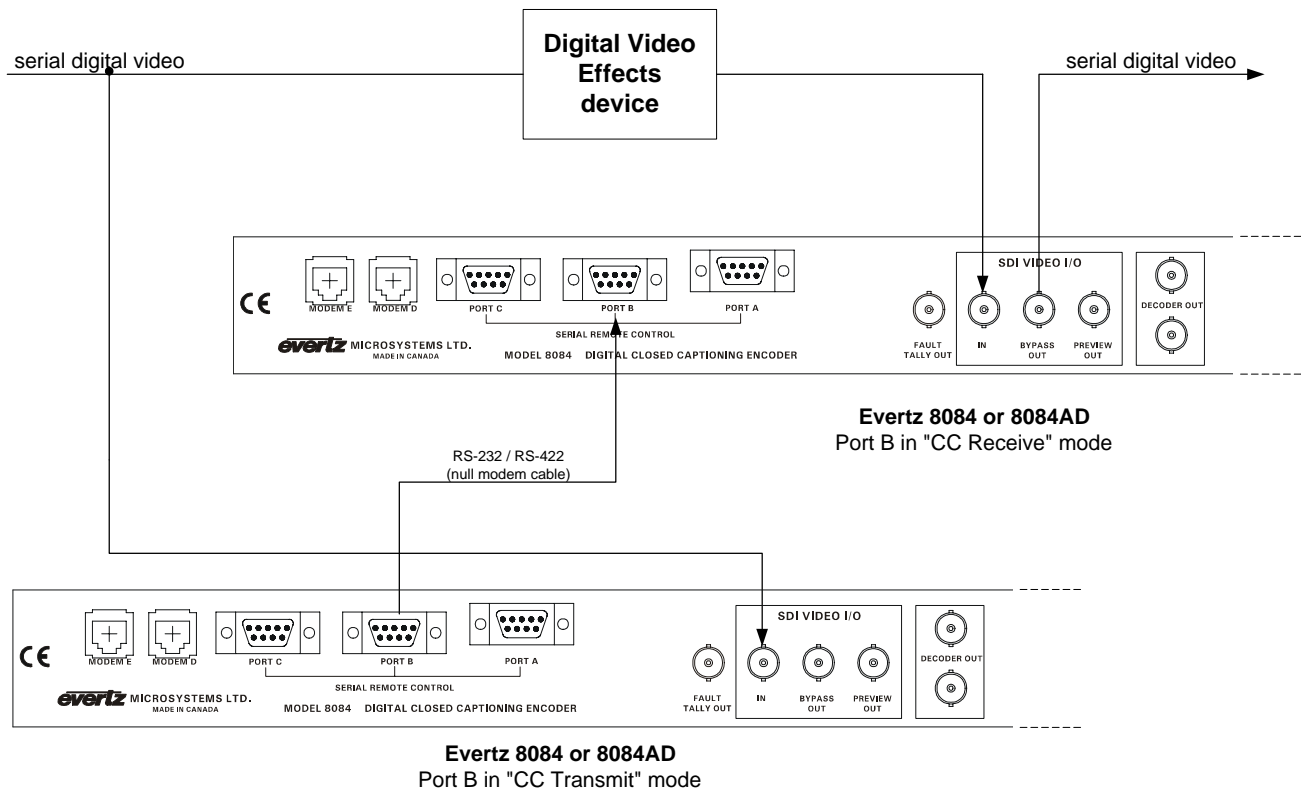

Figure A-3: VBI Bridge using two Evertz Encoders

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

A.3.3 Method 3: Evertz Encoder and SoftTouch Hubcap

Figure A-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.

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

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.

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.
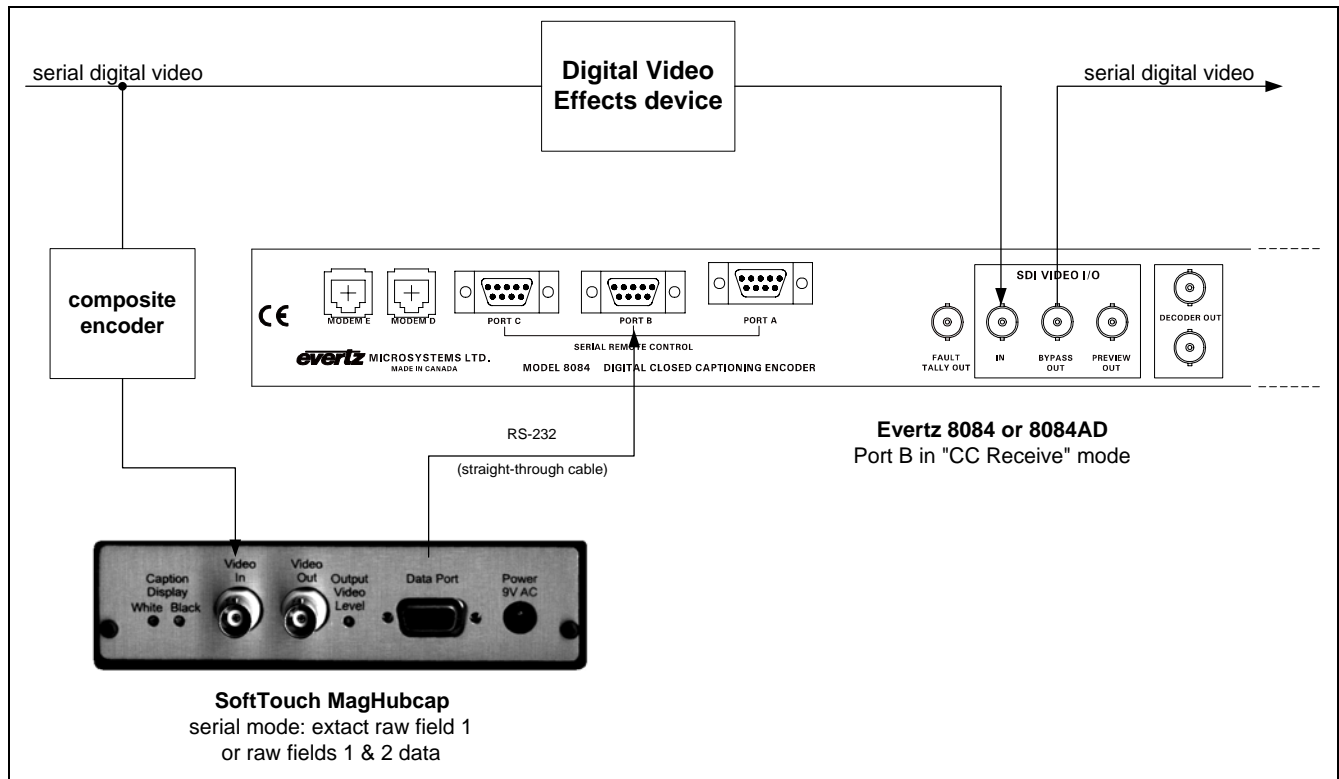

Figure A-4: VBI Bridge using Evertz encoder and SoftTouch MagHubcap decoder

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

B APPLICATION NOTE 3: TRANSMITTING TIME OF DAY USING XDS PACKETS

B.1 OVERVIEW

This application note describes how to properly encode Time of Day information using EIA-608-B Extended Data Services (XDS) packets. In the United States, the Public Broadcasting System (PBS) Television network and its affiliates have been providing this information to the viewing public since the mid 1990s. The application note is written in a tutorial format in order to give Engineering and Operations personnel an understanding of time, time zones and daylight saving time concepts, as well as how this information is encoded into the XDS packets. The application note also provides step by step procedures for setting up the Evertz 8084 and 8084AD Caption/XDS encoders (referred to generically as 8084AD throughout this document) and the Evertz MetaCast 2 software to accomplish this.

B.2 WHAT IS THE CORRECT TIME ANYWAY?

B.2.1 UTC AND TIMEZONES

Prior to the late nineteenth century, time keeping was a purely local phenomenon. However, once railroads began to operate and move people rapidly across great distances, time became much more critical. In the early years of the railroads, the schedules were very confusing because each stop was based on a different local time. The standardization of time was essential to efficient operation of railroads.

In 1878, Canadian Sir Sanford Fleming proposed the system of worldwide time zones that we use today. He recommended that the world be divided into twenty-four time zones, each spaced 15 degrees of longitude apart. Since the earth rotates once every 24 hours and there are 360 degrees of longitude, each hour the earth rotates one-twenty-fourth of a circle or 15° of longitude. Sir Fleming's time zones were heralded as a brilliant solution to a chaotic problem worldwide.

In 1884 an International Prime Meridian Conference was held in Washington D.C. to standardize time and select the Prime Meridian. The conference selected the longitude of Greenwich, England as zero degrees longitude and established the 24 time zones based on the Prime Meridian. Though most U.S. states began to adhere to the Pacific, Mountain, Central, and Eastern time zones by 1895, the U.S. Congress made the use of these time zones mandatory by the Standard Time Act of 1918.

There are six time zones in the fifty United States as shown in Table 1. The local time of day in a specific time zone is calculated with respect to Universal Time, Co-ordinated (UTC) sometimes also referred to as Greenwich Mean Time or (GMT). UTC is the world's time standard and is essentially the standard time at the Prime Meridian that runs through Greenwich, England. All other time zones have an offset with respect to UTC, which represents the number of hours (and sometimes minutes) that they are ahead or behind the UTC time.

Offset		Time Zone	Where Observed
Code	Hours		
05	UTC-05:00	Eastern	New York
06	UTC-06:00	Central	Chicago
07	UTC-07:00	Mountain	Denver
08	UTC-08:00	Pacific	Los Angeles
09	UTC-09:00	Alaska	Alaska
10	UTC-10:00	Hawaii-Aleutian	Hawaii

Table B-1: Time Zones in the United States

B.2.2   Daylight Saving Time

Daylight Saving Time (DST) was instituted to take advantage of the later hours of daylight between April and October. In 1966, the U.S. Congress passed the Uniform Time Act that standardized the length of Daylight Saving Time. For those parts of the United States that observe Daylight Saving Time, it begins at 2 a.m. local time on the first Sunday of April. Time reverts to standard time at 2 a.m. local time on the last Sunday of October. In the spring clocks *spring* forward by 1 hour to 3 a.m.; in the fall clocks *fall* back by 1 hour to 1 a.m. Arizona, Hawaii and most of Indiana have chosen not to observe Daylight Saving Time.

People often consider daylight saving time to be an "event" that happens twice a year, setting their clocks ahead or back by one hour. In reality, DST is *in effect* (ON) for six months of the year and *not in effect* (OFF) for the other six months, in regions that observe DST.

B.2.3   Calculating The Local Time

Local time can be calculated from UTC if we know the time zone we are in and whether daylight saving time is in effect or not. (This is how VCRs are designed to arrive at local time.) Similarly we can calculate UTC if we know the local time, the time zone and whether daylight saving time is in effect or not. The following formula can be used to calculate Local time or UTC.

TZ is the Time zone offset according to the code in Table B-1.
DST has a value of 0 hours when Daylight Saving time is not in effect and the value of 1 hour when it is in effect.

Local Time = UTC – TZ + DST
UTC = Local Time + TZ - DST

See section B.4.1 for information on how to set up the 8084AD correctly for either local time or UTC as the LTC input. The 8084AD always transmits UTC in its time of day packets (see section B.3).

B.3   HOW XDS TIME OF DAY WORKS

XDS stands for extended Data Service. This data is encoded on Line 21 of field 2, using the same format as closed caption information. It is intended to supply program related and other information to the viewer. This may include the name of the program, content rating, name of the network, current time of day, etc. EIA-608-B specifies that when there is caption or XDS information in field 2, then there must be at least a null caption signal present in field 1 as well. The 8084AD automatically inserts a null caption signal if there is no other caption signal present in field 1.

There are two XDS packets defined by EIA-608-B for encoding time and date information. The *Time of Day* packet (0701) encodes the **UTC time** and contains a flag bit (**DST Flag**) that is to be set when Daylight Saving Time is *in effect* (i.e. between the first Sunday of April and the Last Sunday of October). The *Time of Day* packet must be inserted locally at each affiliate station so that the correct time is encoded when programs are aired at different times across the network.

The *Time Zone* packet (0704) encodes the **time zone offset** from UTC time and contains a flag bit (**DSO Flag**) that is to be set when the entire area served by the signal observes Daylight Saving Time. When the DSO Flag bit is set to Off, it means that the DST Flag bit in the *Time Of Day* packet will be ignored by the VCR. The *Time Zone* packet must be inserted locally at each affiliate in order to encode the correct time zone offset for the region.

> **In areas where the TV signal will be received in more than one time zone or in a region where one part observes Daylight Saving Time and another does not, the *Time Zone* packet must <u>not</u> be transmitted. In regions where the *Time Zone packet* is not transmitted, viewers will have to manually program their VCRs with the correct time zone, and whether Daylight Saving Time is observed. Older VCRs may require the user to also set the local time.**

B.4 SETTING THE TIME AND DATE IN THE 8084AD

The 8084AD maintains an internal clock that is used to encode the time and date information into the XDS packets. The preferred way to set the clock in the 8084AD Caption Encoder is to connect Linear Time Code (LTC) with the date and time zone information encoded into the user bits (8084 LTC option required). This signal is connected to the 3-pin XLR connector on the rear panel marked *LTC In*. It can be derived from a network feed off the satellite, or from a local time code generator such as the Evertz Model 5010-GPS that is locked to an accurate time reference (e.g. GPS). Section B.4.1 gives information on how to configure the LTC input correctly.

In order for the 8084AD to accurately calculate UTC and Local Time, the user must set the Time zone offset and Daylight Saving information also. If the date information is encoded in the LTC user bits then the 8084AD can read this information. Otherwise, the preferred method of setting the date and time zone information is by using the MetaCast 2 software running on a computer connected to one of the 8084AD's serial ports.

B.4.1 Configuring The 8084AD LTC Input

The 8084AD can accept Linear Time Code with either UTC or local time. With either UTC or local time as the input, the 8084AD's daylight saving time setting will have to be changed twice a year by MetaCast 2, (see section B.5.6) but the transition is smoother if UTC is used. In addition the 8084 can read date and time zone information that has been encoded in the Leitch CSD5300 encoding format. The *LTC RDR CONFIG* item on the Engineering Setup Menu is used to configure the LTC reader in the 8084AD. (Press *SHIFT+SETUP* and then use the ↓ key to go to the >LTC RDR CONFIG menu item. Then press the ← or → keys to view the options available for that menu item. The currently selected setting will be flashing. Section 3.1 of the 8084AD manual gives more information about using the Engineering Setup Menu.) The front panel time display on the 8084AD displays the Local time. In order for the 8084AD to display the correct local time you must also set the time zone and DST Flag in the 8084AD. Section B.5 gives information on how to set the time zone and Daylight Saving Flag in the 8084AD using the MetaCast 2 software.

When you have properly configured the LTC reader, the time zone and DST Flag, and apply a valid time code signal and input video, the 8084AD will show a letter T at the right side of the front panel display when the time is being displayed. The time display will have a period (.) between the hours and minutes if DST is in effect, otherwise a colon (:) will be displayed. When the 8084AD arrives from the factory its daylight saving time and time zone settings may be different from yours, so the MetaCast 2 software must be used for the initial setup and also at each daylight saving time change. When the 8084AD is confident that the extracted time is stable it will update its internal clock and display the message TIME UPDATED on the front panel display. This should take approximately 8 to 10 seconds after time code is first applied.

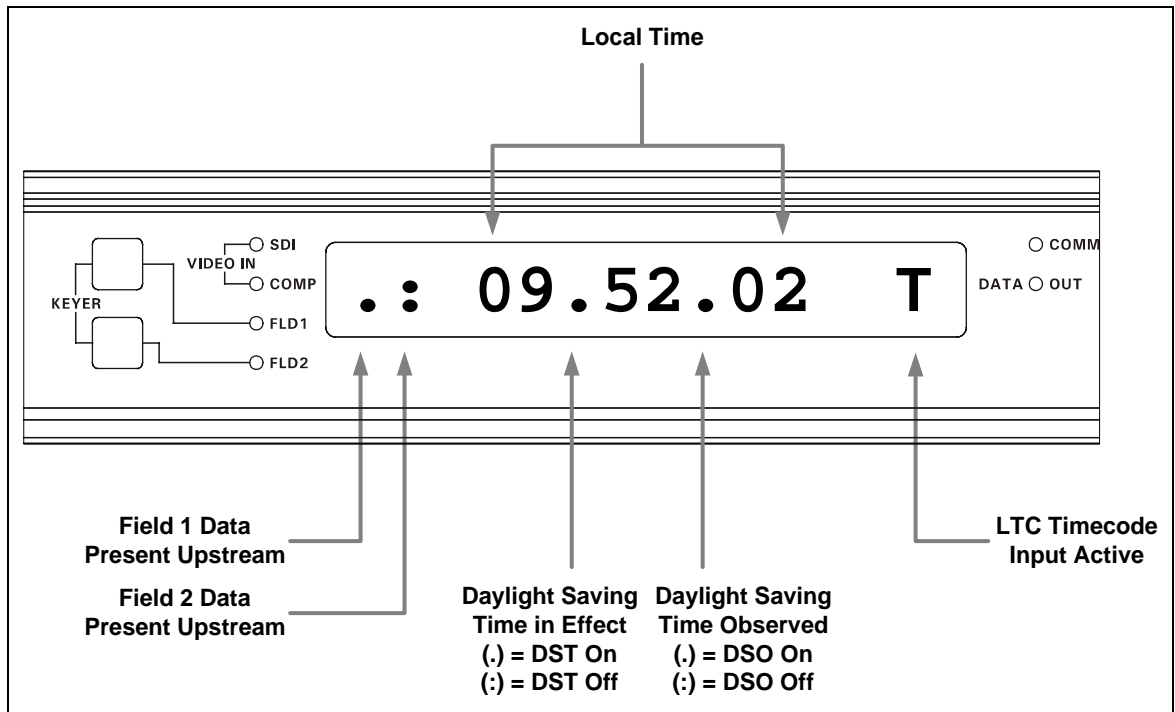Sections B.4.2 and B.4.3 give the settings for the 8084AD for both UTC and Local Time LTC sources.

Figure B-1: 8084AD Front Panel Time Indicators

B.4.2   Using LTC that contains UTC

If your time code source has UTC time with date information in the user bits select the *UTC Time + Date* menu choice in the LTC RDR CONFIG menu item. If your time code source has only UTC time with no encoded date information select the *UTC Time* menu choice. Make sure you press the *SELECT* key after you have selected the menu choice. (The selected menu choice will be flashing if it is active)

B.4.3   Using LTC that contains Local Time

If your time code source has Local time with date information in the user bits select the *Local Time + Date* menu choice in the LTC RDR CONFIG menu item. If your time code source has only Local time with no encoded date information select the *Local Time* menu choice. Make sure you press the *SELECT* key after you have selected the menu choice. (The selected menu choice will be flashing if it is active)
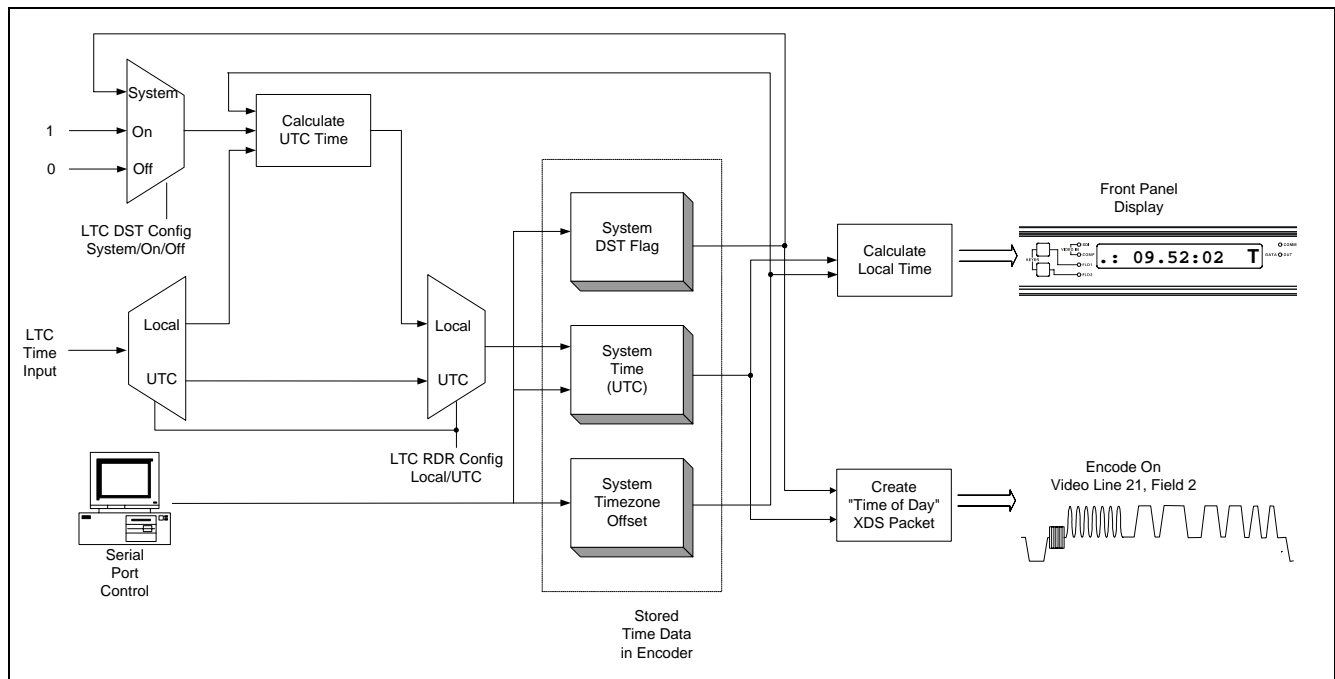
Figure B-2: 8084AD Time of Day Processing

B.5   USING METACAST 2 WITH THE 8084AD

MetaCast 2 is a Windows software application that schedules the XDS packets sent by the 8084AD Encoders according to the program schedule currently being aired. It allows the station operator to program XDS packets such as show name, duration, V-chip rating for each program segment. In order to accomplish this in sync with the programs being aired, MetaCast 2 needs to have a stable time reference. The preferred method is to have MetaCast 2 read the time from the 8084AD (which is in turn reading the time from the house time code reference). MetaCast 2 will maintain this time internally as the *Broadcast Time* and use it to control the scheduling of packets.

MetaCast 2 also provides tools to monitor and set the time, date and time zone offset of the encoder, to manage changes to and from Daylight Saving Time and to enable and disable the transmission of XDS *Time of Day* and *Time Zone* packets. These tools are available by opening the *Clocks* windows from MetaCast 2's tool bar.

B.5.1   Connecting MetaCast 2 to your 8084AD

You can connect one of the serial ports on your PC to any port on an 8084AD using an ordinary NULL modem cable that should have been supplied with the 8084AD encoder. The next step is to ensure that both devices are using the same communication settings. For the 8084AD Encoder, these can be selected from the front panel engineering menu. Check your encoder manual on how to change the port settings. It is recommended that the 8084AD be set at 9600 baud, 8 data bits and no parity.

The next step is to configure MetaCast 2 to the same settings. The encoder communication settings can be found under Comm Settings in the Encoder menu. On the dialog form, select the PC port to which the 8084AD is connected and choose the same settings in the designated combo boxes. For

handshaking, it is recommended that 'Hardware' be selected but this requires all pins to be connected in the serial cable.

If the response window is not visible on the right side of the screen, click Responses from the View menu. Select Connect from the Encoder menu and watch the All or Encoder tab for indication of a successful connection. Also, if the status bar is visible on the bottom of the screen, the left most panel should say 'Online' and turn green.

B.5.2 Overview of the Clocks Page

The first box on this page displays a full version of the current Broadcast Time; this time is also available in 24-hour format on the MetaCast 2 Status bar, located at the bottom of the screen. The format is composed of Windows' Long Date and Time format as defined under Regional Settings in the Windows Control Panel. The next control allows you to select the source of the broadcast clock. The Time Zone field is not directly editable but may be modified by clicking 'Set Clock' button on the toolbar. The time zone presented generally indicates whether Daylight Saving Time is active by including the word 'Daylight' or when inactive by using the word 'Standard'. The Daylight Saving Time in Effect checkbox allows you to set whether Daylight Saving Time is currently active or not. If this field is disabled, MetaCast 2 has been set to automatically adjust for Daylight Saving Time. A check in the box means that Daylight Saving Time is active (and the DST Flag will be set in the Time of Day XDS Packet). The comments 'Not observed in this time zone' mean that the selected time zone will ignore the DST flag when calculating local time (and the DSO Flag will be set in the Time Zone XDS packet). The bottom two buttons allow you to toggle whether Time/Date and Time Zone packets are being encoded. If the buttons are pressed then the associated packet is being encoded and should appear on the Encoder Status page.

Lights

The left light indicates the status of the Time/Date packet and right light indicates the status of the Time Zone packet respectively.

| ⬜ (gray)	🟢 (green)	🔴 (red)	🟡 (yellow)
The packet is not in the Encoder's memory according to MetaCast 2. This is the default situation when offline.	The packet is being encoded as expected.	The packet is not being encoded as expected. There is an error of some sort.	Transition between states.

Toolbar

Icon	Name	Description
	Set Clock	Open up the Date/Time Properties window so that you can edit the Date, Time and Time Zone. If your clock source is the PC, this button will open the standard dialog used to set the PC clock.
	Sync MetaCast and Encoder	If you are connected to a Caption Encoder, this button will ensure that MetaCast 2 is synchronized with the 8084AD Encoder. If your clock source is the Encoder, MetaCast 2 will update its own clock; otherwise MetaCast 2 will update the clock in the Encoder.
	Options	Shortcut to the General Options page when you can set various clock parameters.
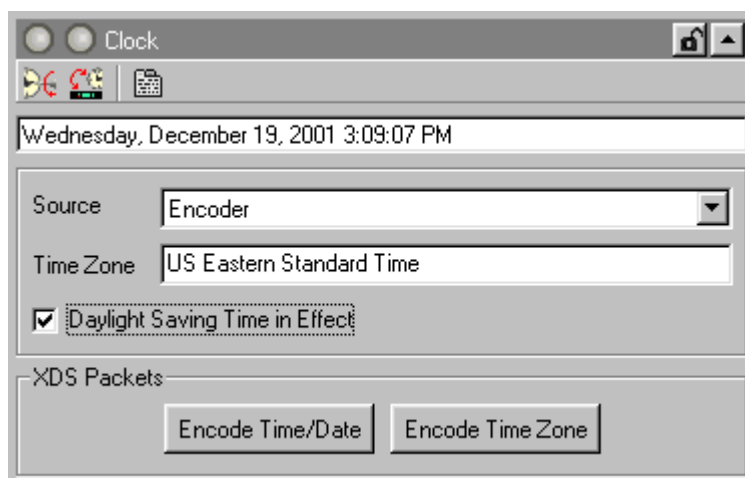
B.5.3 Setting the 8084AD Date from MetaCast 2

If your LTC input to the 8084AD contains date information you can go straight to section B.5.4, otherwise you will have to set the date in the 8084AD from MetaCast 2. To do this you will need to temporarily set the Time Source to *PC Clock*. Check the PC Clock's settings by clicking the 'Set Time' button on the Clock page toolbar. The *Date/Time Properties* screen will appear.
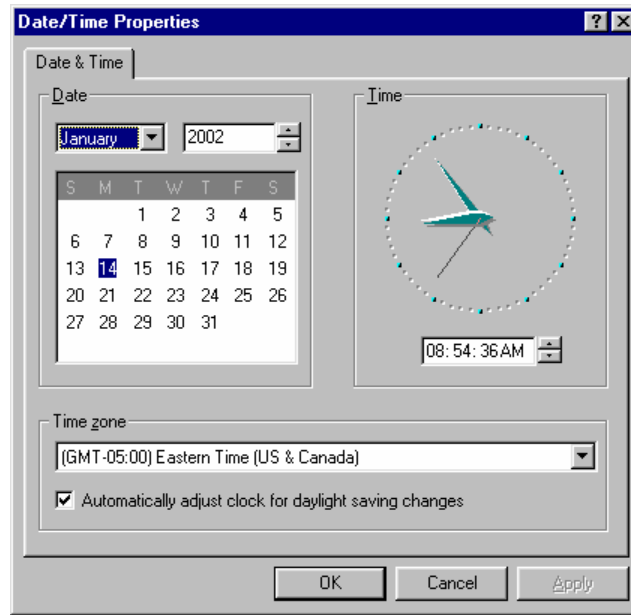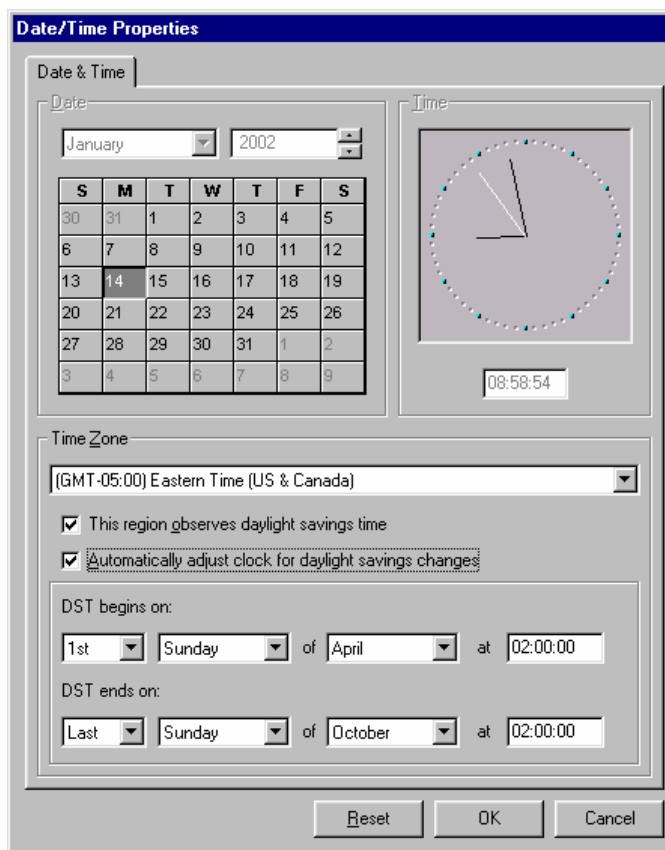

After making any changes press the Okay button to update the PC clock. After exiting the *Date/Time Properties* screen you will need to click the 'Sync MetaCast 2 and Encoder' button on the Clocks Toolbar to apply those new settings to MetaCast 2. Note that this will set the time, date and time zone into the 8084AD, however the time will be overwritten by the LTC connected to the 8084AD. Proceed to the next section to configure MetaCast 2 to update its time clock now from the 8084AD.

B.5.4 Configuring MetaCast 2 to Read the Time from the 8084AD

Set the Time Source on the Clocks page to *Encoder* to have MetaCast 2 synchronize its clock from the 8084AD (which is reading your house time code). Normally this will only synchronize MetaCast 2's *Broadcast Time,* but you can also use MetaCast 2 to set the PC Clock by checking the option on the General Options page. If you do this, additional instances of MetaCast 2 connected to other 8084AD's, can also be synchronized by selecting PC Clock as their time source.

B.5.5 Setting the Time Zone

Next you will need to set the time zone so that the 8084AD and MetaCast 2 can properly convert between UTC and local time. Click the 'Set Clock' button on the Clock page toolbar to open the *Set Time* page. To select a time zone, click the down arrow on the combobox and select your region from the dropdown list. The Date and Time options on this page are not available since this information will be taken from the Encoder; however, the Daylight Saving settings will need to be configured to match your house time source. See section B.5.6 for more information on setting the Daylight Saving Time options.

B.5.6 Configuring Daylight Saving Time

Two independent check boxes control Daylight Saving Time (DST) in MetaCast 2. The first check box is used to set the DST Flag in the 8084AD and is checked when Daylight Saving Time is currently being observed. It is located on the Clocks page and in most cases it should be updated by MetaCast 2's automatic DST adjustment controls. The second check box is used to set the DSO Flag in the 8084AD and needs to be checked if the current region you are broadcasting to observes Daylight Saving Time. MetaCast 2, and any televisions or VCRs receiving XDS *Time of Day* packets, use the DSO Flag to determine if they should adjust their time when the DST Flag is set.

> **Even in regions that do not observe Daylight Saving Time, you must still turn on the DST flag in accordance with surrounding regions so that they can properly calculate their local time.**

The status of both check boxes can be monitored on the Clocks page. When Daylight Saving Time is active, the box next to the text 'Daylight Saving Time in Effect' will become checked. For regions that do not observe Daylight Saving Time, the comment '(Not observed in this region)' will be added to the checkbox caption.

You can choose how MetaCast 2 adjusts for DST on the Date/Time Properties page. The check box immediately below the time zone list shows if DST is observed in your region. This value is updated from the Windows' Time Zone database whenever you select a new time zone. You should normally use the default Windows value for this check box. If this check box is checked incorrectly then you probably do not have the correct windows Time zone selected.

The check box immediately below that lets you choose whether MetaCast 2 should automatically adjust for DST or not. Normally you should check this box, even if your region does not observe DST. When the box is checked, the DST time controls below become available, allowing you to configure when MetaCast 2 will automatically adjust for DST. By default, the dates are taken from Windows' Time Zone database but you can adjust them to any time you wish.

> **If you are feeding Local Time to the 8084AD's LTC reader, it is important that both MetaCast 2 and your house clock are configured to switch to DST at the same time, otherwise inaccuracies could occur.**

The *Daylight Saving Time in Effect* check box on the Clock page will now be updated automatically based on the rules you have chosen. If you do not observe DST in your region then the comment '(Not observed in this region)' will be added.

> **If you do not check the *Automatic DST Adjustment* box then you will have to manually determine when DST is in effect or not. If you do not set the *DST in Effect* check box correctly, incorrect time settings may result on Televisions and VCR's that are receiving the XDS packets.**

B.5.7   Synchronizing Clocks

Once your clocks have been set, the final task is to ensure that everything remains synchronized. You can resync MetaCast 2 to your Encoder by clicking 'Resync MetaCast and Encoder' button on the Clock toolbar. MetaCast 2 will also automatically resynchronize to the Encoder time periodically according to your settings on the General Options page. The 'Set PC clock' check box on this screen instructs MetaCast 2 to set the PC clock in addition to its internal BroadCast time. This allows additional instances of MetaCast 2 running on the PC to be synced to one 8084AD Encoder with an LTC reader. Note: Set PC requires admin privileges on NT4, WIN 2000 and WINXP.

B.5.8   Configuring the 8084AD to Encode Time of Day and Time Zone XDS Packets

The bottom two buttons on the Clocks page allow you to control whether *Time of Day/Date* and *Time Zone* packets are being encoded. If the buttons are pressed then the associated packet is being encoded and should appear on the Encoder Status page. Normally both buttons should be depressed. However, if you are in a region that broadcasts to two different time zones you should not transmit the *Time Zone* packets. Also, if part of your broadcast region observes Daylight Saving Time and part of it does not then you should not transmit *Time Zone* packets. Viewers in your area will have to set their own VCRs and television sets for the correct time zone, and whether they observe Daylight Saving Time or not. **Note:** if you transmit *Time Zone* packets in either of these cases viewers' VCRs will not be set correctly.

When you exit MetaCast 2, you will be presented with the choice to continue encoding XDS packets or to remove them from the 8084AD packet stream. To continue sending the *Time of Day* and *Time Zone* packets after you exit MetaCast 2 you will need to check the appropriate boxes; otherwise they will be removed.
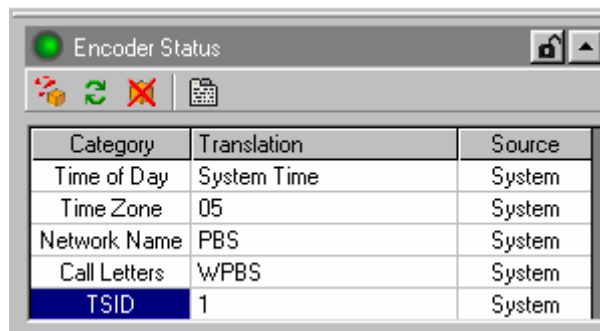
> **On firmware versions before R020816, XDS packets were NOT retained after a power loss to the 8084 even though the internal clock is battery backed up. On these earlier firmware versions, in order to guarantee that the packets will be sent continually you must either provide uninterruptable power to the 8084 or re-enable the packets using MetaCast 2 after a power failure. The preferred solution however is to update the firmware in the 8084 to R020816 or later where the XDS packers are retained after power loss.**
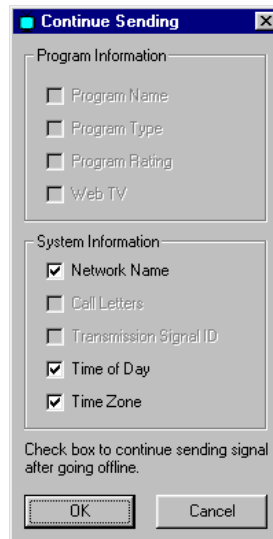
B.5.9 Monitoring the Time of Day and Time Zone Packets in MetaCast 2

The current time and date being read from the encoder is shown on the top text box of the Clocks page. The Current time is also shown on the Status window at the bottom of the screen.

The encoder Status window shows the XDS packets that are currently being transmitted by the 8084AD. You should see an entry for the *Time of Day*

## B.6   ISSUES WITH CONSUMER ELECTRONICS

B.6.1   Line 21 Field 1 Signal Must be Present when Encoding XDS

EIA-608 Specifies that Line 21 Field1 caption signal must also be present when XDS packets are being inserted. Some XDS decoders will not function if the caption signal is not present in both fields. When encoding XDS packets, the 8084AD will automatically insert a Line21 Field 1 caption signal if there is not one present already.

B.6.2   Issues with Panasonic and Quasar VCRs

The Matsushita chipset (used in Panasonic and Quasar VCRs) has some anomalies in the way they handle *Time of Day* and *Time Zone* XDS packets

- The Network Name XDS packet MUST be present, and its contents MUST be "PBS<sp>" or "<sp>PBS" where <sp> is a space character.
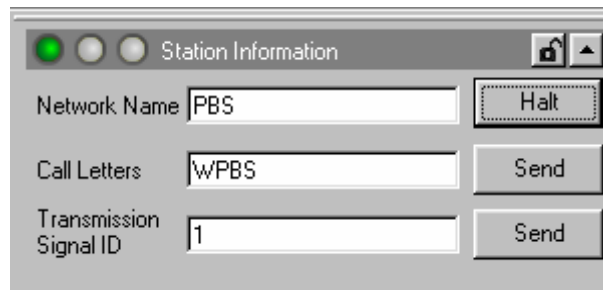
- The Station Call Letters and *Time Zone* packets MUST also be present for the AUTO CLOCK feature in these VCRs to work. In areas that do encode *Time Zone* packets, in accordance with EIA-608-B rules, the AUTO CLOCK function in these VCRs will not work.

- These VCRs ignore the state of the DST bit. They figure out whether DST is in effect based on the current date & time, using the typical rules for changing the clock. This means that these VCRs may not work properly in regions of the country that do not observe daylight saving time.

- If XDS is encoded at more than one location (e.g. Network and affiliate) it is possible for some locally inserted packets to be interrupted to allow upstream XDS packets to pass through. The locally inserted packet will then be resumed when the upstream packet is completed. These VCRs will ignore *Time of Day* packets that are paused and resumed. They only acknowledge uninterrupted XDS packets. To avoid this all XDS encoding should be done locally at the point of final transmission, and the 8084AD should block upstream XDS packets, if at all possible.

B.6.3 Notes about JVC VCRs

• The *Time Zone* packets MUST be present for the AUTO CLOCK feature in these VCRs to work. In areas that do not encode *Time Zone* packets, in accordance with EIA-608-B rules, the AUTO CLOCK function in these VCRs will not work.

• These VCRs ignore the state of the DSO bit. When they are set to DST AUTO they assume DST is always observed in the region and figure out whether DST is in effect based on the current date & time, using the typical rules for changing the clock. For regions that do not observe daylight saving time you must set them to DST OFF. If the DST AUTO setting is used in these regions, the VCR clock will be off by 1 hour for a period of time around the DST change in the spring and the fall.

• When they are in the AUTO CLOCK mode, they search for incoming signals with XDS time of day and time zone packets when they are first plugged in. They only update from the XDS packets at the beginning of the minute. If these VCRs do not have a valid RF signal present at the time the VCR is plugged in the AUTO CLOCK feature will not work.

• Once the clock has been initially set, it only updates from the XDS packets once per hour at the beginning of the minute except between 11:00 p.m. and 2:00 a.m. To force the clock to update at other times, you have to turn off the AUTO CLOCK mode then turn it back on, and then power down the VCR. The clock will then update at the beginning of the next minute if there are valid *Time of Day* and *Time Zone* packets present.

B.6.4 Notes about Sony VCRs

• When they are in the AUTO CLOCK mode, they search for incoming signals with XDS time of day and time zone packets when they are first plugged in. They only update from the XDS packets at the beginning of the minute. The VCR can also lock onto the time by simply powering the unit on and then off. When this happens, the time will only get updated at the beginning of a minute.

• The *Time Zone* packets MUST be present for the AUTO CLOCK feature in these VCRs to work. In areas that do not encode *Time Zone* packets, in accordance with EIA-608-B rules, the AUTO CLOCK function in these VCRs will not work.

• If the VCR is receiving *Time of* Day and Time *Zone* packets, its clock will be updated depending on its timezone and DST settings. If the timezone is set manually in the VCR, the clock will be updated with the VCR timezone setting rather than pulling it off the 8084 packets.

• VCR does not look for the DSO flag in the *Time Zone* packet. The VCR can be set for DST On/Off/Auto. When it is set to Auto the VCR follows the DST flag bit in the *Time of Day* packet as long as both packets are present. In regions that do not observe DST the VCR must be set to DST Off.

• VCR will not automatically do rollovers for Daylight Saving Time if *Time of Day* and *Time Zone* packets are not present. The VCR needs to be turned off and then on to adjust to the correct time again.

B.6.5   Time Zones East of Greenwich

EIA-608B specifies that time zones are always interpreted as a negative whole hour offset from UTC. This means that time zones east of Greenwich and west of the International Date Line will be encoded as −23 to −13 hour offsets. Some VCRs may not realize that these time zones are on the opposite side of the International Date line and hence may decode the date incorrectly. If this happens, the *Time Zone* packets should not be encoded. (See note in section 3)

B.6.6   Miscellaneous Issues

- Some VCRs will only update their clocks once per hour
- Some VCRs will only update their clocks accurate to the minute
- Some VCRs only update their clocks one time after power up.