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ENERDYNE
Technologies, Inc.

MODEL ENC1000R5-00

ADVS® COMPATIBLE COMPRESSED DIGITAL VIDEO ENCODER

User Manual

Manual Part No.
ENC1000R0500MAN

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Chapter 1 Introduction

About This Manual

This manual is a user guide for the ENC1000R5, a member of Enerdyne's family of ADVS® compatible video encoders. The ENC1000R5 is a standard 19-inch rack mounting unit requiring 115 VAC power. See Figure 1-1.

This manual contains the information needed to install, operate, and maintain the ENC1000R5 Encoder. If you have any questions or problems that cannot be resolved using this manual, feel free to call Customer Support any time at 619-438-6000 for help.

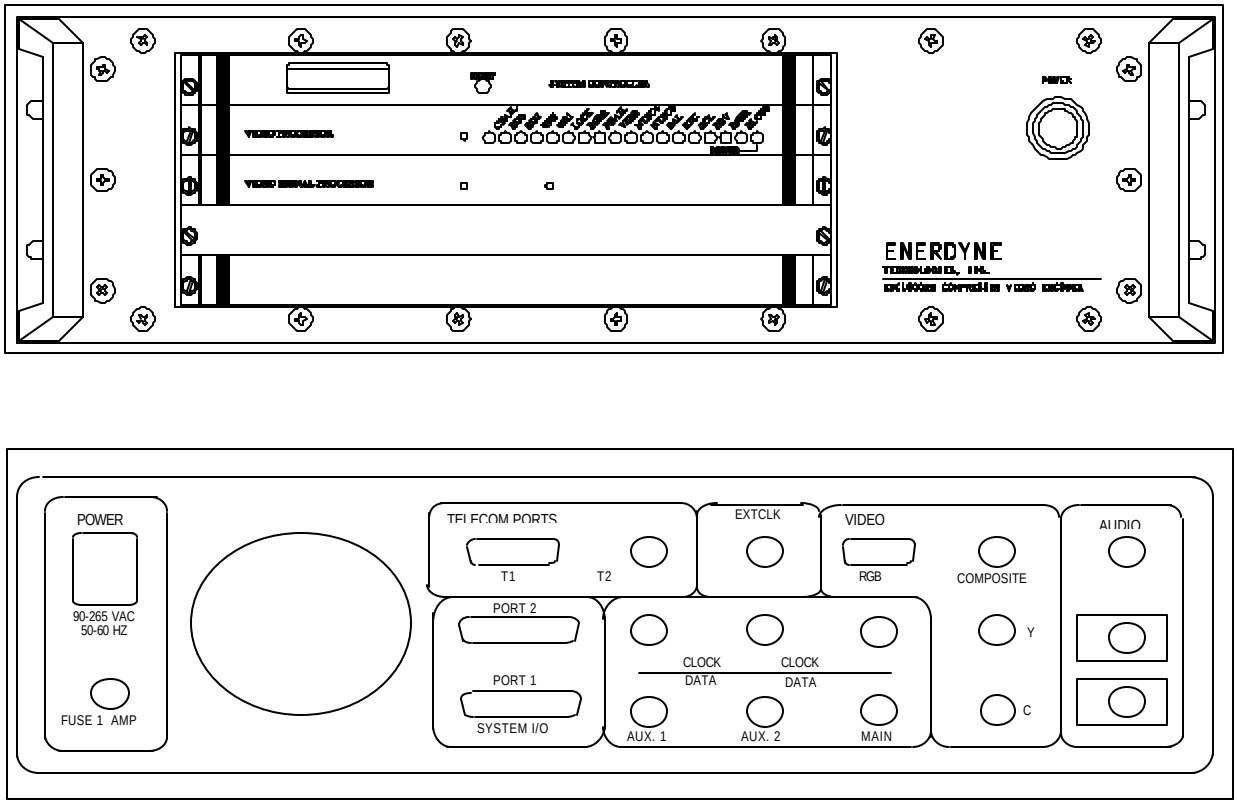


Figure 1-1 ENC1000R5 Encoder Front and Back Panels

Theory of Operation

ENC1000R5 Encoder Functional Description

The ENC1000R5 Encoder digitizes and compresses the analog video signal formats listed in Table 1-1. An optional multiplexer (EMUX1000) provides an interface for user supplied PCM data, audio or EIA232 data. The encoder and the optional multiplexer are controlled via the EIA232 control port using a dumb terminal or a PC with a terminal emulation program.

Table 1-1 Analog Video Input Formats

COLOR	Monochrome
NTSC Composite	EIA170
PAL Composite	CCIR
Y/C	

Up to three video sources may be connected to the video input at J1, J2, and J3 as shown in Figure 1-2. The A/D converter changes the selected input video signal to a digital format. The digital video is then compressed and routed to the Parallel/Serial converter. The compressed video is converted from parallel data to serial data, and routed to the optional EMUX1000 Data Multiplexer (if installed), where user data (PCM data, audio or EIA232 data) is multiplexed with the compressed video data stream. The interface adapter can be configured to clock the data out to the external data transmitter using the ENC1000R5 internal clock, or accept an externally supplied clock signal. When the EMUX option is not installed, the compressed video output, external clock output, and external clock input are factory selected as either TTL or EIA422. When the EMUX option is installed, the compressed video output, internal clock output, and external clock input are factory selected as either EIA422 or TTL/CMOS.

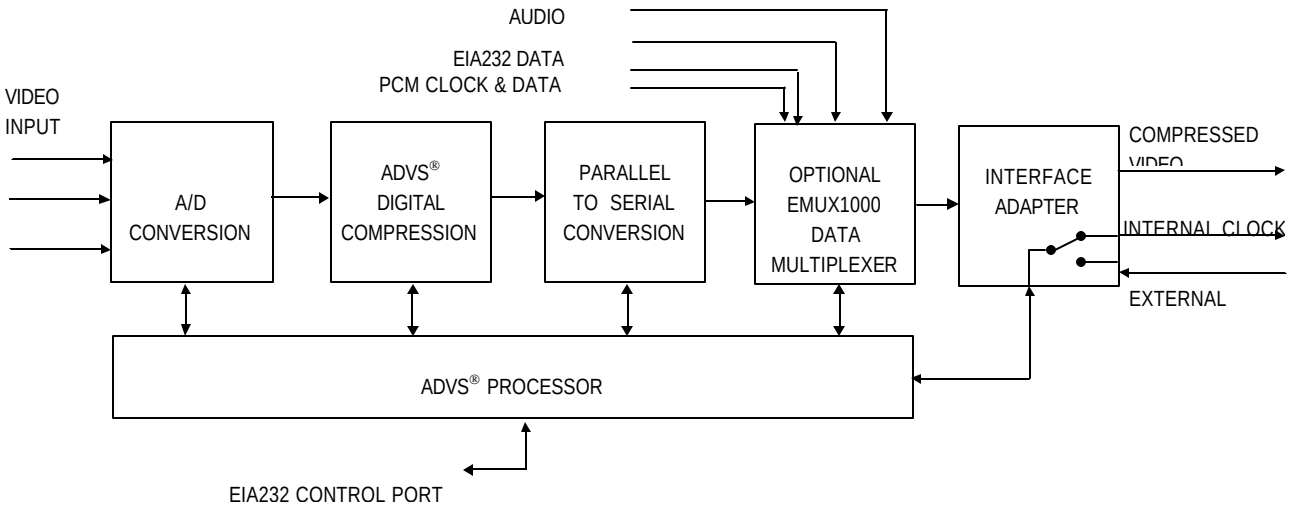


Figure 1-2 ENC1000R5 Encoder Functional Block

EMUX1000 Data Multiplexer Option

The EMUX1000 Data Multiplexer (Figure 1-3) allows the user to combine compressed video, audio, asynchronous digital, and synchronous digital data into one transmission over any digital transmission facility. The audio data channel accepts a 1 Vp-p, 600 ohm audio signal and provides a frequency response of 300 Hz to 3000 Hz. The simplex asynchronous data channel is an EIA232 interface and is user programmable from 300 baud to 9600 baud in five steps. The PCM synchronous data channel accepts PCM data and clock. The PCM data and clock inputs are factory selected as either EIA422 or TTL/CMOS. The corresponding input level must be user selected via the software. The user supplied PCM clock rate may be as high as 49% of the total transmission link frequency. Additionally, a Forward Error Correction (FEC) feature is available for systems using wireless transmission.

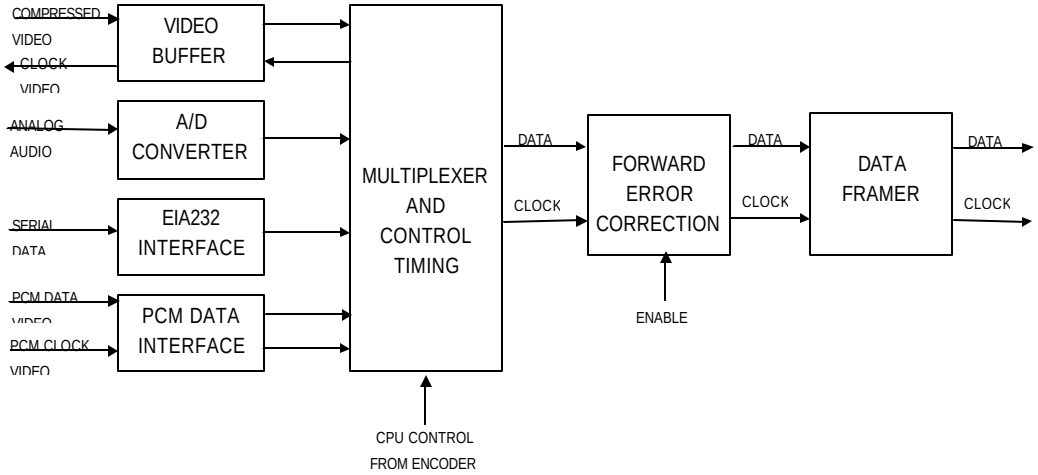


Figure 1-3 EMUX1000 Data Multiplexer Functional Block

FEC allows the user to transmit data in a noisy environment by correcting a number of bit errors received at the ground site. The scheme used by Enerdyne is a Reed-Solomon based algorithm. The encoder applies a Reed-Solomon algorithm that generates check bytes for a transmission message. The check bytes and message data form an error correcting code word that can be transmitted over noisy transmission media. The decoder at the receiving end of the line uses the check bytes to detect and correct any errors that are introduced by line noise into the transmitted code word. If used, FEC must be selected at both the encoder and decoder.

Typical Application

Figure 1-4 shows an example of a typical user installation for the ENC1000R5. Various configurations are possible and are dependent on user requirements and equipment. If you require assistance configuring your system, call Customer Support at 619-438-6000.

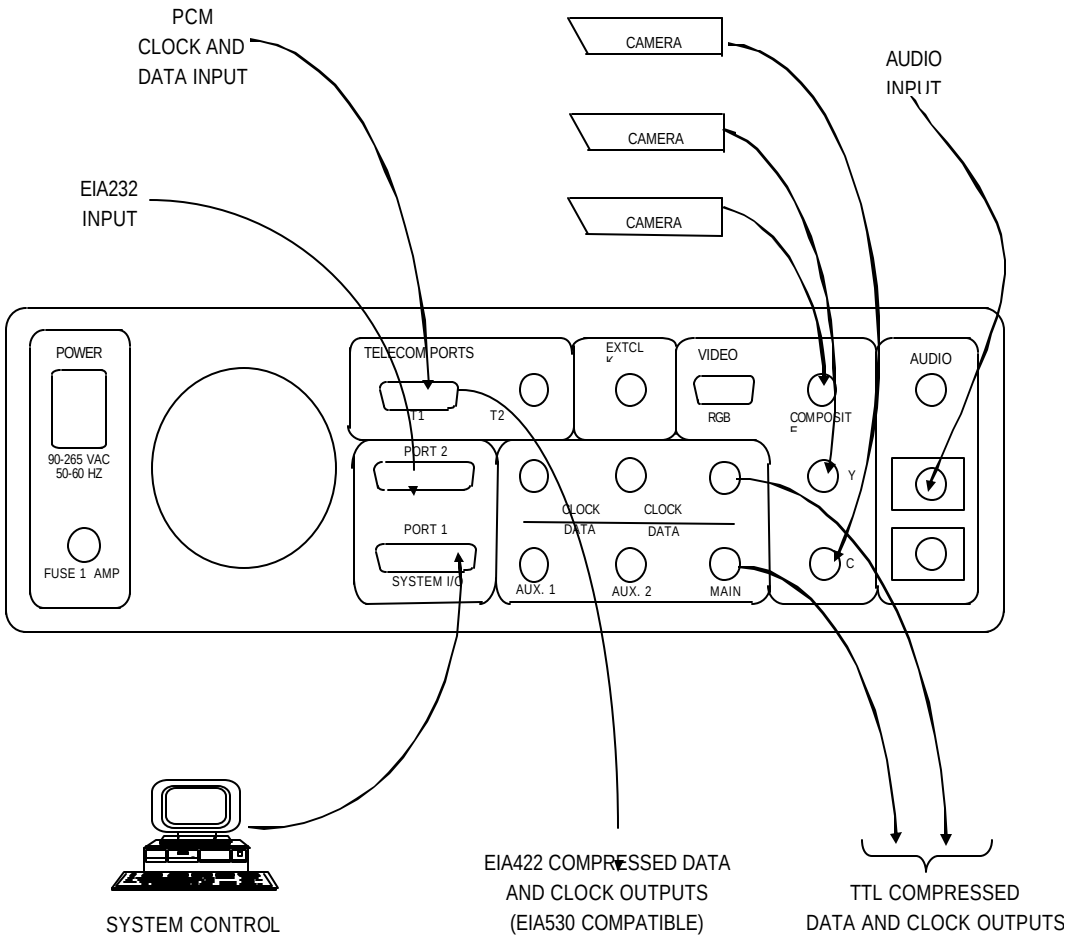


Figure 1-4. Typical Application for ENC1000R5 with EMUX1000 Option

ENC1000R5 Specifications

ELECTRICAL	
Video Inputs	NTSC Composite, 1 Vp-p, 75 Ohm, 60 Hz PAL Composite, 1 Vp-p, 75 Ohm, 50 Hz CCIR Monochrome, 1 Vp-p, 75 Ohm, 50 Hz EIA170 Monochrome, 1 Vp-p, 75 Ohm, 60 Hz
Video Input Connectors	BNC type isolated ground (3)
Horizontal Resolution	560, 280 or 140 pixels/line. User selectable
Vertical Resolution	240 lines/field digitized, 480 lines/frame 60 Hz 288 lines/field digitized, 576 lines/frame 50 Hz
Data & Clock Output Rates	External Source - any rate up to 20 Mbps* Internal source - 19 Kbps to 20 Mbps*
Data and Clock Output Connections	Standard or with EMUX option: BNC type isolated ground Differential output (EIA422): DB15(S)
Power	95 - 265 VAC, 50/60 Hz
MECHANICAL	
Dimensions	19” rack width, 5.25” (3U) high, 10” deep
Weight	15 lbs.
Enclosure Materials	5052 aluminum, stainless steel hardware
ENVIRONMENTAL	
Operational Temperature	0°C to +50°C normal range (opt. -20°C to +70°C)
Non-Operating Temperature	-40°C to +85°C
Humidity	95% maximum (non-condensing)

* 10 Mbps maximum with EMUX option installed

Chapter 2 Encoder Operation

Series 1000 Encoding Equipment

This chapter provides detailed explanations of each operating mode and option available for the ENC1000R5 ADVS® compatible color video compression encoder.

Software Interface

The encoder contains all communication software required to communicate with terminal hardware. All the user needs to provide is a dumb terminal operating at 9600 baud or a PC running terminal emulation software set for half duplex (local echo) mode.

Upon power-up, the encoder-to-terminal link will print the logon message followed by power-on test messages. This will be followed by the system prompt. A typical power-on (or reset) sequence on an encoder will display the following*:

```
ADVS®  Encoder Firmware Rev 6.4 970314-1322/Xcpu6u600.encr6
LCA configured from EPROM.
DCT is setup.
Formatter is setup.
We are configured as an Encoder.
The firmware checksum XXXX verified as correct.
```

* This is a typical power-on message sequence. The actual message varies depending upon your software revision and installed options.

The `checksum verified` message indicates that the EPROM and EEPROM checksums are correct. If an error message occurs here, execute the DEFAULT command to reset all parameters. If it still fails, contact the factory.

Following the power-up messages, the operating prompt is displayed as follows:

```
ADVS:\ENCODER>
```

The prompt can be changed through the use of the prompt command. Refer to Chapter 2 for details.

There is *no* battery in the system. All software configuration values are stored in an EEPROM, and are retained through power-off/power-on cycles.

Using the Software Interface.

Software interface commands consist of either a single word followed by carriage return (<CR>) or a single word followed by an argument string followed by a carriage return. Upper *or* lower case is accepted. A carriage return (<CR>) is required at the end of each line. Commands can be entered only on lines that display the system prompt. Typing ahead is not allowed. If no system prompt appears, press ENTER to display the prompt. If the prompt still fails to appear, check all connections and ensure that the terminal is set to 9600 baud.

The following commands are in alphabetical order. Some commands have alternate names and abbreviations (in parenthesis) for your convenience. A Hexadecimal to Decimal conversion table is included in Appendix B. Where applicable, the default settings are identified by the word 'default' next to the appropriate character string.

BAUD nn

This command selects the baud rate for the serial communications port. The baud rate will change after the next reset cycle. Baud rates supported are as follows:

nn	**rate**
00	300 baud
01	300 baud
02	300 baud
03	19200 baud
04	1200 baud
05	2400 baud
06	4800 baud
07	9600 baud (default)

CAUTION

Communication with the serial port will be lost if an invalid baud rate is selected.

It is recommended that the baud rate be set to the highest rate supported by the terminal.

BRIGHT nn

This parameter sets the picture brightness level. There are 256 steps of picture brightness, all values from 00 to FF HEX. 00 HEX is the normal setting. The following is a list of examples:

nn	**relative brightness**
80	Minimum
.	
.	
FE	
FF	
00	Normal (default)
01	
02	
.	
.	
7F	Maximum

CD nn

This command sets the serial link frequency. Valid frequencies are from 20 Mbps to 19 Kbps. Values of 00 to 7F select a fixed frequency. 'HELP 03' displays the list of valid entries. An external clock can be selected by entering a value of 0F. The available frequencies are as follows:

	0x	1x	2x	3x	4x	5x	6x	7x
x0	02.500	01.250	00.625	00.312	00.156	00.078	00.039	00.019
x1	02.666	01.333	00.666	00.333	00.166	00.083	00.041	00.020
x2	02.857	01.428	00.714	00.357	00.178	00.089	00.044	00.022
x3	03.076	01.538	00.769	00.384	00.192	00.096	00.048	00.024
x4	03.333	01.666	00.833	00.416	00.208	00.104	00.052	00.026
x5	03.636	01.818	00.909	00.454	00.227	00.113	00.056	00.028
x6	04.000	02.000	01.000	00.500	00.250	00.125	00.062	00.031
x7	04.444	02.222	01.111	00.555	00.277	00.138	00.069	00.034
x8	05.000	02.500	01.250	00.625	00.312	00.156	00.078	00.039
x9	05.714	02.857	01.428	00.714	00.357	00.178	00.089	00.044
xA	06.666	03.333	01.666	00.833	00.416	00.208	00.104	00.052
xB	08.000	04.000	02.000	01.000	00.500	00.250	00.125	00.062
xC	10.000	05.000	02.500	01.250	00.625	00.312	00.156	00.078
xD	13.333	06.666	03.333	01.666	00.833	00.416	00.208	00.104
xE	20.000	10.000	05.000	02.500	01.250	00.625	00.312	00.156
xF	-EXT-	UCM	10.000	05.000	02.500	01.250	00.625	00.312

CONTRAST nn

This parameter sets the picture contrast level. There are 256 valid steps, every value from 00 to FF HEX. The following is a list of examples:

nn	**contrast level**
FF	Maximum
FE	
.	
.	
6D	
6C	Normal (default)
6B	
.	
.	
01	
00	Minimum

CROP nn

This command sets the current screen cropping value. Cropping reduces the actual number of pixels per video frame that are included in the image that is compressed and transmitted. A value of 00 HEX processes the entire video area lines, plus the normally blanked data lines starting at line 10. A value of 01 HEX processes the entire video area, but excludes data lines below line 20. A value of 02 HEX processes the entire visible image area, excluding the overscanned areas around the edges of the picture (some monitors may display blanked video around the edges - this is normal). A value of 03 HEX digitizes and processes the center 'window' of the screen. **CROP 04** and **05** perform the same functions as **CROP 00** and **01** respectively, except that 6% more of the NTSC signal (3% at each end of a video line) is encoded to ensure that edge encoded data is consistently recovered. In **CROP 04** or **05**, each line of video will be 594 pixels (560 plus 6%) instead of the normal 560 pixels. The additional pixels on each end of a video line are outside the normal viewing area. **CROP 04** and **05** will require 6% more bandwidth to maintain the same frames per second yielded by **CROP 00** or **01**.

nn	**% of total**
00	104% standard video
01	100% standard video
02	85% standard video
03	63% standard video
04	104% standard video with edge encoded data
05	100% standard video with edge encoded data

NOTE

CROP 04 and **CROP 05** are available only in encoders and decoders equipped with Software Revisions that support these commands. **CROP 04** and **05** can only be decoded by decoders equipped with Software Revisions which support these commands. To determine the software revision installed in your equipment, consult the initial boot-up screen displayed when power is switched on, or enter the command **RESET** at the control terminal**.** The second text line appearing after the model number will reveal the software revision. Selecting **CROP 04** or **05** when using a decoder with an earlier software revision will result in loss of picture due to the difference in pixels per line. Decoders with Software Revisions that support these commands will function with all ADVS® encoders regardless of encoder Software Revision.

When the **INTERLACE** command is set to **INTERLACE ON**, only **CROP 00** and **CROP 04** are functional.

DATE mm/dd/yy

This command sets the default date used by the system. The date is entered in the month/day/year format and does not increment. When power is lost or a reset happens the system date is set to the last date entered.

DEFAULT nn (GET nn)

This command resets all of the internal EEPROM variables to one of the two factory default settings. After this command is executed, a reset (Z or RESET command) should be performed. Default values may be set to the following:

nn	**default variables**
00	Standard NTSC encoder with 560 pixels, 5 Mbps bit rate, quantization set to 18, tint, saturation, contrast, and brightness are set to default values..
01	Standard PAL encoder with 560 pixels, 5 Mbps bit rate, quantization set to 18 , tint, saturation, contrast, and brightness are set to default values.

To execute this command, the write protect mode must be disabled. Write protect is disabled by entering the PROTECT OFF command. NOTE: WHEN WRITE PROTECT IS DISABLED, CONFIGURATION DATA CAN BE CHANGED OR INVALID DATA CONDITIONS MAY BE ENTERED.

The PROTECT ON command is automatically executed after the reset command is entered. Consultation with the factory is recommended before any other changes are made with write-protect disabled.

ERROR nn

This command enables or disables the error handling hardware. This parameter *must* be the same for both encoder and decoder. A value of 00 disables the mode, a value of 01 enables the mode. If enabled, the unit will exhibit a much greater tolerance when decoding unrecoverable errors, but requires about 10% more bandwidth from the system as compared to the disabled mode. This command must be followed by a reset.

nn	**Status**
00	OFF
01	ON

HELP or ?

This command invokes the main help screen. Secondary help screens can be invoked via the HELP nn commands. *If video sync is lost and regained while viewing the help screen, video at the monitor will not be restored until you exit the help screen.*

HELP nn

These are the secondary help screens. Valid ranges for nn are 00 to 04 HEX.

nn	**screen**
00	Baud Rates
01	Factory Assistance
02	Mechanical Specifications
03	Clock Modes
04	Video Modes

ID nn

This command embeds a video channel identification code in the compressed video data packets output by the encoder. The normal default value is HEX 00. Ensure that the decoder is programmed to receive the channel I.D. selected. Encoder and decoders that do not have this command are fixed at code 00.

nn	**channel ID**
00	channel 1 ID on current video
01	channel 2 ID on current video
02	channel 3 ID on current video
03	channel 4 ID on current video

INTERLACE on/off

This command sets the system operation to either interlaced (on) or non-interlaced (off) operation. Normal operation is non-interlaced. Use with caution. Interlaced operation may cause the image to

jump and appear to vibrate. Interlaced operation is designed for use where sufficient bandwidth is available to maintain 30 frames per second (30 Hz).

JACK nn

This command allows the user to synchronously switch between the three inputs without reloading any other parameters. This results in almost instantaneous switching.

nn	**Input #**
00	J1
01	J2
02	J3

MODE nn

This command selects the system operating mode. The mode change requires several frames and remains in effect until you change it again. The table shows the currently supported modes (HELP 04 displays this list).

nn	**mode**
00	NTSC 3.58 MHz burst, 60 Hz composite input on J1
01	NTSC 3.58 MHz burst, 60 Hz composite input on J2
02	NTSC 3.58 MHz burst, 60 Hz composite input on J3
03	NTSC 3.58 MHz burst, 60 Hz YC inputs
04	RS-170 60 Hz monochrome input on J1
05	RS-170 60 Hz monochrome input on J2
06	RS-170 60 Hz monochrome input on J3
07	SPARE/INVALID
08	PAL 4.43 MHz burst, 50 Hz composite input on J1
09	PAL 4.43 MHz burst, 50 Hz composite input on J2
0A	PAL 4.43 MHz burst, 50 Hz composite input on J3
0B	PAL 4.43 MHz burst, 50 Hz YC inputs
0C	CCIR 50 Hz monochrome input on J1
0D	CCIR 50 Hz monochrome input on J2
0E	CCIR 50 Hz monochrome input on J3

NORMAL

This command sets the HUE, SATURATION, BRIGHTNESS and CONTRAST parameters to their default values, which are 00, 5A, 00, and 6C HEX respectively.

NTSC

This command forces the system to accept standard 525 line NTSC video. This is the same function as MODE 00. This command also performs the NORMAL command.

PAL

This command forces the system to accept standard 625 line PAL video. This is the same function as MODE 08. This command also performs the NORMAL command.

PROMPT aaaaaaaa

This command changes the system prompt. Up to eight characters can be accepted. Prompts entered using the PROMPT command will be retained through reset.

Q nn (QUANT nn) or (QUANTIZATION nn)

This command sets the relative quantization level for the system. The Q value has a direct relationship to the amount of compression achieved. As with all DCT based systems, the compression level cannot be specified. The resulting compression level depends on quantization, resolution, picture content, and other system parameters. Valid ranges for the variable are 10 to FF HEX, with 10 HEX being the best picture quality (minimum compression) and with FF HEX being very poor picture quality. As a rule of thumb, a Q value of 18 yields good quality, 28 yields average quality, and values greater than 50 yield poor quality. There is a direct correlation between quantization and the number of frames per second (frame rate or speed). As the Q value decreases, the number of video frames per second decreases, with each individual video frame represented at a higher quality. Conversely, as the Q value is increased, the system will throughput more video frames per second, but these frames will individually be at a lower pixel resolution. The quantization parameter is usually adjusted for every specific video situation, depending upon the video subject matter, overall data link speed (bit rate), and required resolution. If the Q value is adjusted too low (below 10) in relation to other system parameters, the input image can create an internal data file size that exceeds the amount of physical RAM, causing what appears to be system errors. Keeping the Q value above 10 HEX is recommended to avoid any overflow problems.

The decoder will automatically detect the Q value of the encoder and operate accordingly.

RES nn

High horizontal resolution roughly corresponds to laser disc quality, standard horizontal resolution to VHS quality, and low horizontal resolution to multimedia/adequate quality.

nn	**res**	**pixels**
00	low resolution	140
01	standard resolution	280
02	high resolution	560

Each time the resolution is lowered, the frame rate will almost double, and vice-versa.

RESET (Z)

This command reinitializes all parameters from EEPROM and resets all internal timing.

SP (SPEED)

This command displays the current motion processing speed of the system in average fields per second as follows: the average over the last two seconds, last 15 seconds, and last 60 seconds. This can be used as an aid to setting the resolution and Q values.

The speed is displayed as:

```
Average fields per second, last 2 seconds = 030
Average fields per second, last 15 seconds = 030
Average fields per second, last 60 seconds = 030
```

S (STATUS)

This command displays all of the current operating modes that are stored in EEPROM. It also displays other current status and errors, if any.

SAT nn (COLOR nn) or (SATURATION nn)

This parameter sets the color saturation level for the selected video source. There are 256 steps of saturation, all values from 00 to FF are valid. The normal value is 59. The following is a list of examples:

nn	**saturation level**
FF	Maximum
FE	
.	
.	
5A	
59	Normal (default)
58	
.	
.	
01	
00	Minimum (monochrome)

TEST nn

This command puts the system into VIDEO test modes. Solid colors are from the 00 to 1F HEX range. Entering the command TEST gives you the list of colors.

To return to normal operation after you are done with this test, a RESET or Z command *must* be entered.

TIME hh:mm:ss

This command sets the current system time. The time is entered in the 24 hour military format. When a reset or power failure occurs, system time is reset to 00:00:00. System time is also reset to 00:00:00 when system setup parameters such as Quantization and Resolution are changed.

TINT nn (HUE nn)

This command sets the hue/tint for the selected video source. There are 256 valid steps, from 00 to FF HEX. The following is a list of examples.

nn	**phase shift**
80	Maximum Green
81	
.	
.	
FE	
FF	
00	Normal (default)
01	
.	
.	
7F	Maximum Red

Note - In PAL mode, TINT must be = 00

Option Commands

The EMUX1000 Data Multiplexer is configured by enabling selected bits in four eight-bit option registers. This is done using the commands OPTION1, OPTION2, OPTION3, and OPTION4, described in Appendix A. However, in order to have a clear understanding of how to select the proper configuration, it is necessary to review the following rules and information.

Multiplexer Overview

The multiplexer frames the encoder serial data output in a series of eight recurring time slots as shown in Figure 2-1. Each time slot may be configured to contain compressed video data and PCM, EIA232 or audio data when FEC is not enabled. If FEC is enabled, time slot 8 is reserved for FEC. When the multiplexer is disabled, (**OPTION1 08**) all available transmission bandwidth is allocated to video. When the multiplexer is enabled, framing overhead consumes ≈7.7% of the transmission link bandwidth.

The maximum PCM rate is 50% of the transmission link bandwidth when audio, EIA232, and FEC are not enabled. When any combination of audio, EIA232 or FEC is enabled, the maximum PCM rate is 25% of the transmission link bandwidth. Refer to Table 2-1 for multiplexer bandwidth usage. Each group of eight time slots is 130 bits long regardless of link rate. Each time slot is 16 bits long with 2 framing bits at the start of time slot 1 (130 bits = (8 x 16) + 2). The allocation of time slots on the decoder must be identical to the allocation of time slots on the encoder. This allows the demultiplexer to synchronize time slots, and to identify the type of data contained in each time slot when a time slot is allocated for data. Rules for designating time slots are described in the following sections. These rules are identical for the encoder and the decoder.

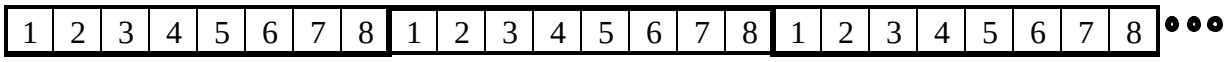


Figure 2-1 Encoder Serial Data Output Time Slot Sequencing

Audio Data Rules

Audio data will consume 64 Kbps of link bandwidth. Each time slot designated for audio will contain 8 bits of audio data if an audio packet is ready, otherwise compressed video will be inserted. If only audio data is being multiplexed with compressed video, all time slots should be designated audio slots. This will result in the highest audio quality at the decoder output. If audio and PCM or EIA232 data are being multiplexed with compressed video, slots should be assigned on an interleaved basis (Figure 2-2) to ensure maximum audio quality.

1	2	3	4	5	6	7	8
AUDIO	PCM	EIA232	AUDIO	PCM	EIA232	AUDIO	PCM

PCM	AUDIO	EIA232	PCM	AUDIO	EIA232	PCM	FEC

AUDIO	PCM	AUDIO	PCM	AUDIO	PCM	AUDIO	PCM

PCM	AUDIO	PCM	AUDIO	PCM	EIA232	PCM	FEC

Figure 2-2 Time Slot Interleaving Examples

Table 2-1 Multiplexer Bandwidth Usage

	Transmission Link Bandwidth Usage					
Configuration	PCM	AUDIO	RS232	FEC	VIDEO	MUX FREQUENCY
Video & PCM	≤50%	-	-	-	Remainder	7.7%
Video, PCM, Audio	≤25%	64Kbit	-	-	Remainder	7.7%
Video, PCM, Audio, RS232	≤25%	64Kbit	Baud Rate	-	Remainder	7.7%
Video+PCM+Audio+RS232 +FEC	≤25%	64Kbit	Baud Rate	11.5%	Remainder	7.7%
MUX Disabled (OPTION1 08)	-	-	-	-	100%	-

PCM Data Rules

Each time slot designated for PCM may contain up to 50% PCM data and the remaining bits will be compressed video. When FEC is not enabled, the PCM clock rate may be as high as 50% of the link rate, assuming the FEC, AUDIO, and EIA232 data channels are not enabled.

EIA232 Data Rules

As with PCM and Audio data time slots, time slots designated for EIA232 should be interleaved as shown in Figure 2-2. The baud rate (OPTION2 (bits 4-6) command) at the decoder must be set to one baud rate higher than at the encoder. The baud rate at the encoder and the decoder can be the same if there is at least one character delay between EIA232 characters. EIA232 data is fixed at eight bits with one start bit, one stop bit, and no parity. Each time slot designated as EIA232 will contain one eight bit character. The remaining bits will be compressed video.

Chapter 3 Installation and Maintenance Procedures

Introduction

This chapter provides the information required to install and configure the ENC1000R5. This chapter also covers configuration information for the ENC1000R5 when equipped with the optional EMUX data multiplexer.

System Software Setup

Initial system software setup is performed on the bench using the test setup configuration shown below (Figure 3-1). Refer to the equipment pinouts included in this chapter.

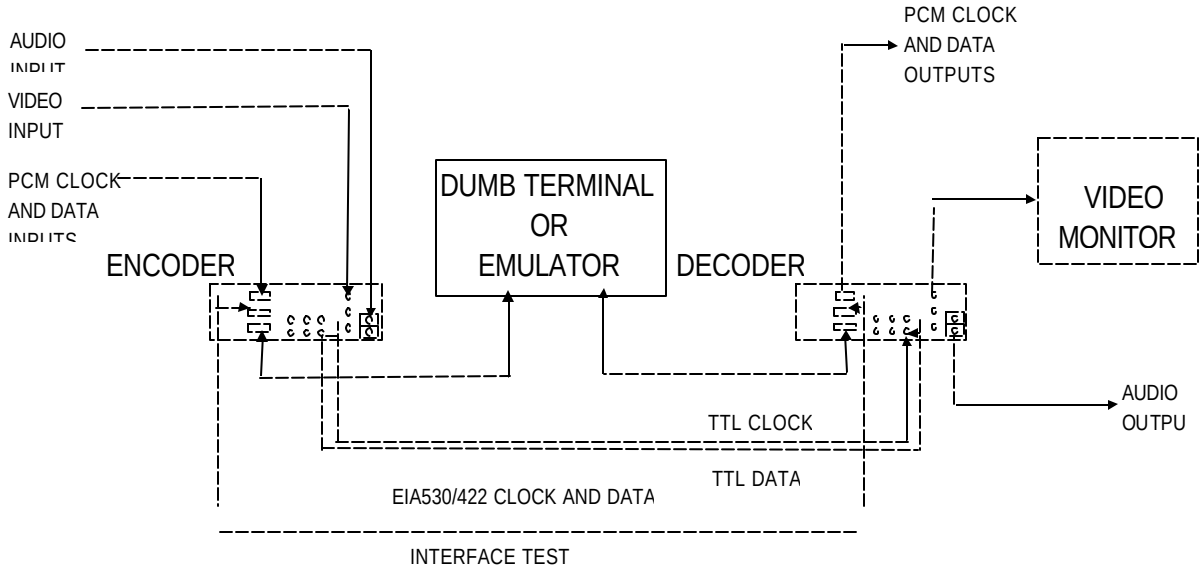


Figure 3-1. ENC1000R5 Test and Setup Configuration

An EIA530 interface test cable can be constructed as shown in Figure 3-2. Connector A as shown in Figure 3-2 must be attached to the encoder unit. An external clock source can be attached as shown. If an external clock is used, the encoder must be configured for external clock by means of the CD command with an argument of HEX 0F.

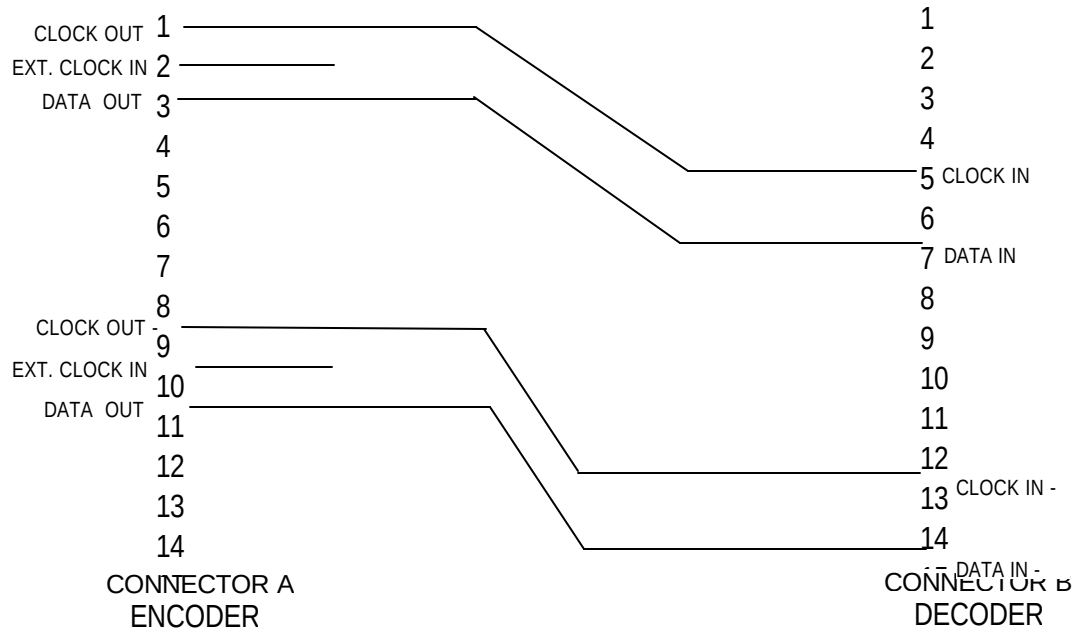


Figure 3-2: Interface Test Cable with EMUX Option

All commands are entered on a dumb terminal or PC with terminal emulator software as described in Chapter 2. It is recommended that initial setup commands be invoked in the order in which they are presented in this section. Refer to Chapter 2 for encoder operation and commands.

Step 1- Initial power up.

Configure the test system as shown in Figure 3-1. The encoder must be supplied with 115 VAC power through the line cord provided. Power up the unit and ensure that the logon messages conform to the description in Chapter 2.

Step 2 - Set clock rate.

STEP	***COMMAND***	***INPUTS***	***RANGE***
2	CD (CLOCK)	00 - 7F (HEXADECIMAL)	19 Kbps -20Mbps (10 MHz Max. if EMUX installed)

Use the CD command (described in Chapter 2) to set the clock rate to the data rate of the communications link. Typing HELP 03 will display a complete list of the possible inputs and their related link speeds. Turn off the system clock (0F) if the data link supplies the clock.

NOTE

Perform Step 3 only if EMUX1000 Data Multiplexer is installed.

Step 3 - Set EMUX option data and FEC commands.

Use the OPTION commands to configure data (audio, EIA232 or PCM) and FEC options as described in Chapter 2 and Appendix A.

NOTE

It is recommended that the decoder be configured for data transmission using the OPTION commands or the quick commands before it is connected to the encoder as shown in Figure 3-1.

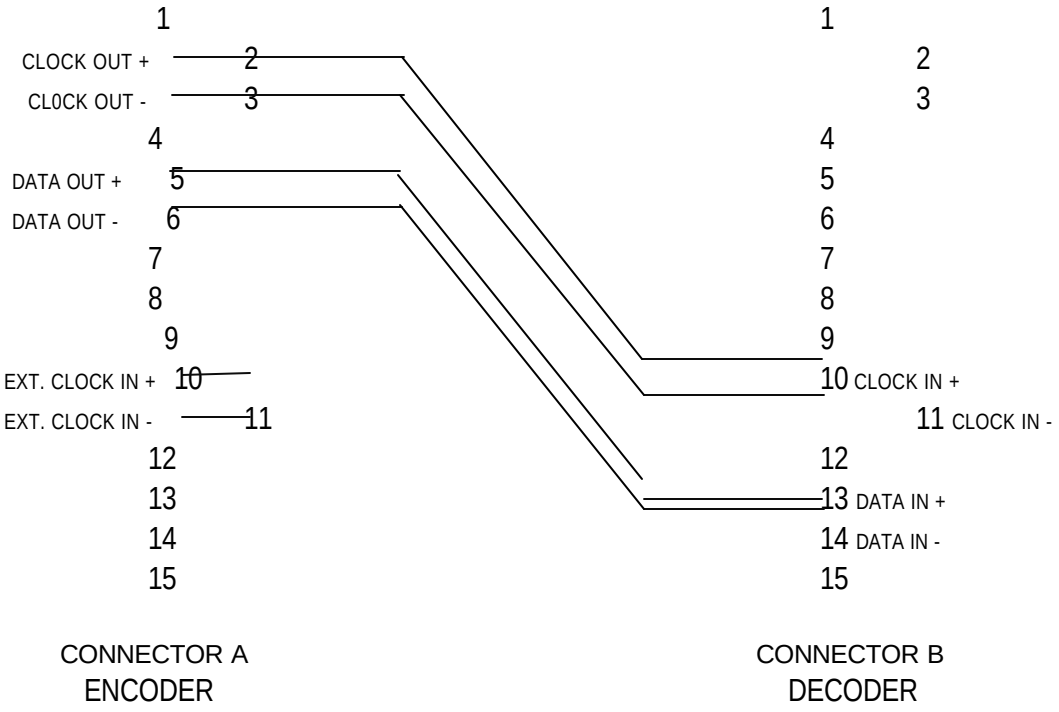


Figure 3-3: Interface Test Cable without EMUX Option.

ENC1000R5 Pinout Information

With EMUX Option

Video input:	J1, J2, J3	Connector: BNC
Data output:	MAIN	Connector: BNC
Clock output:	MAIN	Connector: BNC
TTL external clock input	EXT CLK (Encoder only)	Connector: BNC

System I/O:	PORT1	Connector: DB25(S)
Pin Number	**Signal**	**Description**
1	Ground	Shield ground
2	TXD	Transmit data out
3	RXD	Receive data in
7	Ground	Signal ground
4-6, 8-25	Not used	

System I/O:	PORT2	Connector: DB25(S)
Pin Number	**Signal**	**Description**
1	Ground	Shield ground
2	TXD	Transmit data in, Encoder
3	RXD	Receive data out, Decoder
7	Ground	Signal ground
4-6, 8-25	Not used	

Telecom Port	T-1	Connector: DB15(S)	
Pin Number	**Signal**	**Description***	
		Encoder	**Decoder**
1	Clock out+	KG194/EIA422 clock out+	PCM clock out+
2	TTL Out / Ext. clock in+	External data clock in+	PCM TTL Clock out**
3	Data out+	KG194/EIA422 data out+	PCM data out+
4	ground		
5	Clock in+	PCM clock in+	KG194/EIA422 clock in+
6	Ground		
7	Data in+	PCM data in+	KG194/EIA422 data in+
8	TTL Data Out		PCM TTL Data out**
9	Clock out-	KG194/EIA422 clock out-	PCM clock out-
10	Ext. clock in-	External data clock in-	Ground
11	Data out-	KG194/EIA422 data out-	PCM data out-
12	Ground		
13	Clock in-	PCM clock in-	KG194/EIA422 clock in-
14	Ground		
15	Data in-	PCM data in-	KG194/EIA422 data in-

*EIA422 or KG194 interface pinning, electrically compatible with EIA530 and V.35
** Active only when BTC1000 option is installed.

Without EMUX Option

Video output/input:		J1, J2, J3	Connector: BNC
TTL video output/input	MAIN		Connector: BNC
TTL clock output/input	MAIN		Connector: BNC
TTL external clock input		EXT CLK (Encoder only)	Connector: BNC

System I/O: PORT 1 Connector: DB25(S)

Pin Number	Signal	Description
1	Ground	Shield ground
2	TXD	Transmit data out
3	RXD	Receive data in
7	Ground	Signal ground
4-6, 8-25	Not used	

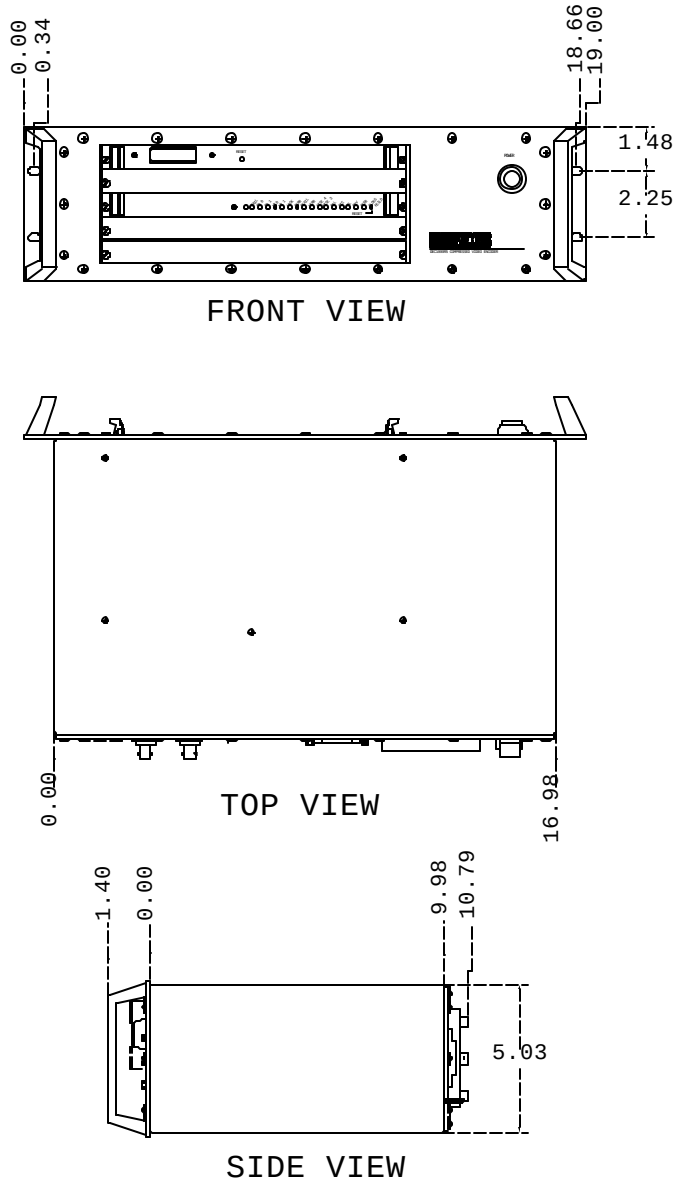
Telecom Port T-1 Connector: DB15(S)

Pin Number	Signal	Description*
2	Clock out+	Differential clock output+ (encoder)
3	Clock out-	Differential clock output - (encoder)
4	ground	
5	Data out+	Differential video output+ (encoder)
6	Data out-	Differential video output- (encoder)
7	ground	
10	Clock in+	Differential clock input+ (encoder and decoder)
11	Clock in-	Differential clock input- (encoder and decoder)
12	ground	
13	Data in+	Differential video input+ (decoder)
14	Data in-	Differential video input- (decoder)
15	ground	
1, 8-9	Not used	

*Electrically compatible with EIA530 and V.35

ENC1000R5 Encoder Installation

Installation footprint for the ENC1000R5 is shown below. Special shock mounting or vibration dampening is not required. Mounting bolts should be protected from vibrating loose. Proper grounding is required. The unit is 10 inches deep. An additional 2 inches of cabinet depth is recommended for cooling fan and cable clearance.



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ENC1000R5 Encoder Mounting Dimensions

Interconnecting Cable Installation

Ensure that all BNC connectors are fully seated. DB25 and DB15 connectors must be firmly seated and the locking screws secured.

Dress and secure all cables in accordance with local safety and EMI standards.
The Enerdyne ENC1000R5 ADVS® compatible color video compression encoder requires very little maintenance. Helpful hints on maintaining the equipment are provided in the following paragraphs.

Maintenance

Cleaning

A mild non-abrasive cleanser may be used to clean the unit. Care should be taken to prevent liquid from entering the connectors. The cooling fan filter located at the rear of the unit should be inspected periodically. If required, it should be removed, cleaned with fresh water, dried, and re-installed. To remove the filter, use a small flat-blade screwdriver to gently pry the fan filter cover from the fan housing, then remove the filter by hand.

NOTE

There are no user serviceable parts located within the unit. Opening the unit or removing a circuit card will void the warranty. Units requiring service during the warranty period must be returned to the factory.

Video Processor Indicator Lights

The decoder has 18 indicator LED's on the front of the video processor card. These indicators can be used for self test and to verify proper operation. The indicators, their names, and functions are described in the following paragraphs.

CFAIL

This RED LED is the video clock fail indicator. It is activated when there are no clock transitions over a 32 ms period. The video picture will be lost or frozen on the last frame.

RD0,RD1

These GREEN LED's display the most significant bits of the read memory field pointer. They can be used to verify that new fields of video information are being read out of memory. These indicators should follow the WR0,WR1 indicators with RD1 being the inverse of WR1. If they do not, then it is probable that the decoder is receiving corrupted video data. The RD0 LED will transition every time a new field is read. When these lights stop flashing steadily, the video picture will be lost or frozen.

WR0,WR1

These GREEN LED's display the most significant bits of the write memory field pointer. They are incremented every time a new field is decoded in the input data stream. The speed of the field update rate can be estimated by the flashing rate of WR0. If these LEDs flash very erratically, there is a problem with the data stream integrity. The video picture will be lost or frozen on the last frame.

LOCK

If this RED LED ever lights, it indicates that the system has experienced a semi-fatal lock-up state and is recovering. The Lock LED will only light under extreme conditions (very bad data). The video picture will be lost or frozen on the last frame.

BERR

This RED LED is active only when the Forward Error Correction (FEC) option is installed and active. The BERR LED will light when a block error has occurred

PFAIL

This RED LED indicates that the system has detected a parity failure in the encoder parameter passing data packet. The video picture will be lost or frozen on the last frame.

VERR

This RED LED indicates a video timing error. A system reset may be required to restore system operation. The video picture will be lost or frozen on the last frame.

NTSC4

This YELLOW LED indicates that the video output is currently set to NTSC 525 line operation with a 4.43 MHz burst. This is not a common mode for NTSC.

NTSC

This YELLOW LED indicates that the video output is currently set to NTSC 525 line operation with a 3.58 MHz burst. This is the standard NTSC setting.

PAL

This YELLOW LED indicates that the video output is currently set to PAL 625 line operation with 4.43 MHz burst. This is the standard PAL setting.

RTC

This GREEN LED is the real time clock indicator. It flashes at a one Hertz rate and is used to verify that the internal processor is functioning properly. If it stops flashing, the system must be reset. The video picture will be lost or frozen on the last frame.

RCL

This YELLOW LED is used to display the received clock status. This LED is active only when the T1 mode option is installed.

RBV

This YELLOW LED is used to indicate a receive bipolar violation. This will light in AMI mode when receiving B8ZS coding. This LED is active only when the T1 mode option is installed.

RFER

This RED LED indicates that a framing error has occurred. This LED is active only when the T1 mode option is installed.

RLOSS

This RED LED indicates a receiver loss of signal. This light usually lights when no T1 carrier is present. This LED is active only when the T1 mode option is installed.

POWER

This RED LED must always be on when power is applied.

APPENDIX A

OPTION Commands

The four OPTION commands provide control of the multiplexer through the setting of control bits that define multiplexer function. The bandwidth available for multiplexed data is divided into eight equal segments, or time slots. All eight time slots can be individually allocated to PCM, audio or EIA232. When FEC is enabled, the eighth time slot of every frame is reserved for FEC, the remaining seven are still available for audio, PCM or EIA232. A slot cannot be allocated to more than one data type. Slots may not be allocated through successive uses of an OPTION command; that is, the user cannot invoke OPTION3 to reserve slot #6 for EIA232 data, and then use OPTION3 again to reserve bit #3. There are other specific conditions governing the transmission of each of the data types, which are covered in Chapter 2, Option Commands.

The four OPTION commands all accept input arguments in the same format (see Figure A-1). Each of the two digits nn is a HEXADECIMAL number in the range 0-F. The right digit corresponds to the low order four bits, the left digit corresponds to the upper four bits.

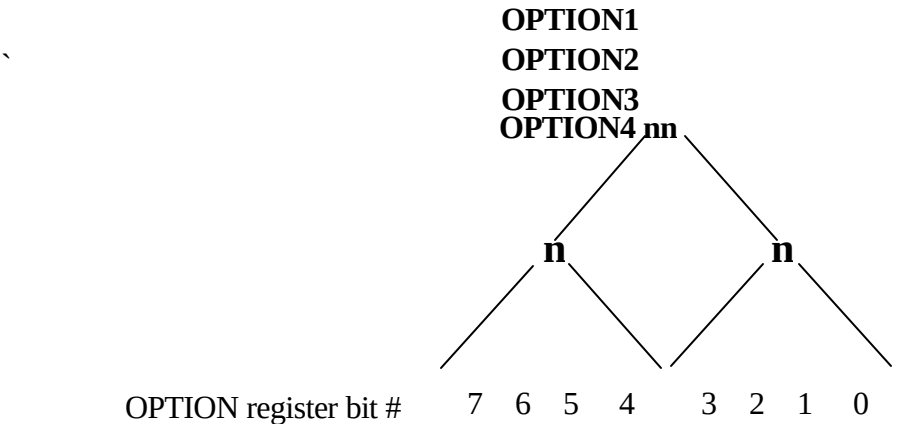

Figure A-1 OPTION Command Output Arguments

In other words, each argument **n** is a HEXADECIMAL representation of a 4 bit binary number. Table A-1 provides an easy way to select the appropriate digit. For example, if the proper configuration required that the high order bits be set to 1011, and the low order bits to 1110, a quick look at the table shows that the left digit should be HEXADECIMAL “B” and the right digit should be HEXADECIMAL “E”. The correct argument string is BE.

Table A-1 Option Register Hexadecimal Conversion Chart

LOW REGISTER BITS	3	2	1	0
HIGH REGISTER BITS	7	6	5	4
BIT VALUE	(8)	(4)	(2)	(1)
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
A	1	0	1	0
B	1	0	1	1
C	1	1	0	0
D	1	1	0	1
E	1	1	1	0
F	1	1	1	1

The following describes the function of each OPTION command. The ENC1000R5 encoder can function with any ADVS® compatible decoder. It is important that the encoder and the decoder configurations match or unpredictable transmission results will occur. Generally speaking, it is more convenient to set options on the decoder first, then proceed to the encoder. Refer to the decoder manual for decoder OPTION command settings.

CAUTION

It is important to ensure that a slot is not assigned to more than one function. For example, OPTION4 should not be used to assign slot #6 to audio after OPTION3 has been used to assign the same slot to EIA232. Unpredictable results may occur.

NOTE

Time slots are designated to PCM unless OPTION3 and OPTION4 commands are used to designate slots as audio, EIA232 or FEC.

OPTION1 NN

This command allows the user to enable or disable the various multiplexer functions controlled by each bit. Encoder OPTION1 bit settings are as follows:

		ENCODER FUNCTION WHEN BIT = 1		
Bit Number	**Default**	**Serial Number 0748 or LOWER**	**Serial Number 0846 and HIGHER**	**not used**
0	0	Must be = 0	Randomizer Enable	
1	0	PassLink® Enable	PassLink® Enable	
2	0	FEC Enable	FEC Enable	
3	0	Multiplexer Disable	Multiplexer Disable	
4	0	PCM Input Level Select 'A'	PCM Input Level Select 'A'	
5	0	PCM Input Level Select 'B'	PCM Input Level Select 'B'	
6	0	Data Output Invert	Data Output Invert	
7	0	Clock Output Invert	Clock Output Invert	

Note that bits 4 and 5 determine the PCM input level in accordance with the following table:

PCM Level	BIT A	BIT B
TTL	0	0
CMOS	1	0
422	0	1
422	1	1

NOTE

The PCM input level is factory selected as either EIA422 or TTL/CMOS. However, bits 4 and 5 must be set to the input level ordered. If TTL/CMOS was ordered, then EIA422 is not available, and vice-versa

OPTION 2 NN

This command allows the user to enable or disable the various multiplexer functions controlled by each bit. Encoder OPTION2 bit settings are as follows:

Bit Number	Default	ENCODER FUNCTION WHEN BIT = 1 All Serial Numbers
0	0	PCM Clock Input Invert
1	0	PCM Data Input Invert
2	0	External Clock Input Select 'A'
3	0	External Clock Input Select 'B'
4	0	Baud Rate Select 'X'
5	0	Baud Rate Select 'Y'
6	0	Baud Rate Select 'Z'
7	0	Must be = 0

Note that bits 2 and 3 determine the external clock input level in accordance with the following table:

External Clock Level	BIT A	BIT B
TTL	0	0
CMOS	1	0
422	0	1
422	1	1

NOTE

The External Clock input level is factory selected as either EIA422 or TTL/CMOS. However, bits 2 and 3 must be set to the input level ordered. If TTL/CMOS was ordered, then EIA422 is not available, and vice-versa.

Bits 4, 5, and 6 determine baud rate on the encoder in accordance with the following table:

Baud Rate	BIT X	BIT Y	BIT Z
38400	0	0	0
19200	1	0	0
9600	0	1	0
4800	1	1	0
2400	0	0	1
1200	1	0	1
600	0	1	1
300	1	1	1

OPTION3 NN

This command allows the user to enable or disable time slots 1-8 for EIA232 data. Encoder and decoder settings must be the same. Encoder OPTION3 bit settings are as follows:

Bit Number	Default	ENCODER FUNCTION WHEN BIT = 1 All Serial Numbers
0	0	Enable Time Slot #1 for EIA 232
1	0	Enable Time Slot #2 for EIA 232
2	0	Enable Time Slot #3 for EIA 232
3	0	Enable Time Slot #4 for EIA 232
4	0	Enable Time Slot #5 for EIA 232
5	0	Enable Time Slot #6 for EIA 232
6	0	Enable Time Slot #7 for EIA 232
7*	0	Enable Time Slot #8 for EIA 232

* Set this bit to '1' if FEC is enabled by OPTION1.
This slot will be used for the FEC check word.

OPTION4 NN

This command allows the user to enable or disable time slots 1-8 for Audio data. Encoder and decoder settings must be the same. Encoder OPTION4 bit settings are as follows:

Bit Number	Default	ENCODER FUNCTION WHEN BIT = 1 All Serial Numbers
0	0	Enable Time Slot #1 for Audio
1	0	Enable Time Slot #2 for Audio
2	0	Enable Time Slot #3 for Audio
3	0	Enable Time Slot #4 for Audio
4	0	Enable Time Slot #5 for Audio
5	0	Enable Time Slot #6 for Audio
6	0	Enable Time Slot #7 for Audio
7*	0	Enable Time Slot #8 for Audio

* Set this bit to '1' if FEC is enabled by OPTION1.
This slot will be used for the FEC check word.

OPTION Command Examples

Table A-2 lists 16 sets of encoder and decoder option command settings and the resulting multiplexer configuration.

Table A-2 Option Register Settings

SETTING	ENCODER REGISTERS				DECODER REGISTERS			
	OPTION1	OPTION 2	OPTION 3	OPTION 4	OPTION1	OPTION 2	OPTION 3	OPTION 4
1	08	XX	XX	XX	XX	XX	XX	XX
2	00	20	00	00	00	10	00	00
3	04	20	80	80	01	10	80	80
4	00	20	00	FF	00	10	00	FF
5	04	20	80	FF	01	10	80	FF
6	00	20	FF	00	04	10	FF	00
7	04	20	FF	80	05	10	FF	80
8	00	20	AA	00	04	10	AA	00
9	04	20	AA	80	05	10	AA	80
10	00	20	00	AA	00	10	00	AA
11	04	20	80	AA	01	10	80	AA
12	00	20	AA	55	04	10	AA	55
13	04	20	AA	05	05	10	AA	05
14	00	20	A4	09	04	10	A4	09
15	04	20	A4	89	05	10	A4	89
16	04	20	82	88	05	10	82	88

SETTING	MULTIPLEXER CONFIGURATION
1	Disable multiplexer
2	all slots PCM, FEC disabled
3	all slots PCM, FEC enabled
4	all slots Audio, FEC disabled
5	all slots Audio, FEC enabled
6	all slots EIA232, FEC disabled
7	all slots EIA232, FEC enabled
8	four slots PCM, four slots EIA232, FEC disabled
9	four slots PCM, three slots EIA232, FEC enabled
10	four slots PCM, four slots audio, FEC disabled
11	four slots PCM, three slots audio, FEC enabled
12	four slots EIA232, four slots audio, FEC disabled
13	four slots EIA232, three slots audio, FEC enabled
14	three slots PCM, three slots EIA232, two slots audio, FEC disabled
15	three slots PCM, two slots EIA232, two slots audio, FEC enabled
16	five slots PCM, one slot EIA232, one slot audio, FEC enabled (factory setting)

APPENDIX B

Hexadecimal to Decimal Conversion

Decimal	Hex	Decimal	Hex	Decimal	Hex	Decimal	Hex
0	00	32	20	64	40	96	60
1	01	33	21	65	41	97	61
2	02	34	22	66	42	98	62
3	03	35	23	67	43	99	63
4	04	36	24	68	44	100	64
5	05	37	25	69	45	101	65
6	06	38	26	70	46	102	66
7	07	39	27	71	47	103	67
8	08	40	28	72	48	104	68
9	09	41	29	73	49	105	69
10	A	42	2A	74	4A	106	6A
11	B	43	2B	75	4B	107	6B
12	C	44	2C	76	4C	108	6C
13	D	45	2D	77	4D	109	6D
14	E	46	2E	78	4E	110	6E
15	F	47	2F	79	4F	111	6F
16	10	48	30	80	50	112	70
17	11	49	31	81	51	113	71
18	12	50	32	82	52	114	72
19	13	51	33	83	53	115	73
20	14	52	34	84	54	116	74
21	15	53	35	85	55	117	75
22	16	54	36	86	56	118	76
23	17	55	37	87	57	119	77
24	18	56	38	88	58	120	78
25	19	57	39	89	59	121	79
26	1A	58	3A	90	5A	122	7A
27	1B	59	3B	91	5B	123	7B
28	1C	60	3C	92	5C	124	7C
29	1D	61	3D	93	5D	125	7D
30	1E	62	3E	94	5E	126	7E
31	1F	63	3F	95	5F	127	7F

Hexadecimal to Decimal Conversion (Continued)

Decimal	Hex	Decimal	Hex	Decimal	Hex	Decimal	Hex
128	80	160	A0	192	C0	224	E0
129	81	161	A1	193	C1	225	E1
130	82	162	A2	194	C2	226	E2
131	83	163	A3	195	C3	227	E3
132	84	164	A4	196	C4	228	E4
133	85	165	A5	197	C5	229	E5
134	86	166	A6	198	C6	230	E6
135	87	167	A7	199	C7	231	E7
136	88	168	A8	200	C8	232	E8
137	89	169	A9	201	C9	233	E9
138	8A	170	AA	202	CA	234	EA
139	8B	171	AB	203	CB	235	EB
140	8C	172	AC	204	CC	236	EC
141	8D	173	AD	205	CD	237	ED
142	8E	174	AE	206	CE	238	EE
143	8F	175	AF	207	CF	239	EF
144	90	176	B0	208	D0	240	F0
145	91	177	B1	209	D1	241	F1
146	92	178	B2	210	D2	242	F2
147	93	179	B3	211	D3	243	F3
148	94	180	B4	212	D4	244	F4
149	95	181	B5	213	D5	245	F5
150	96	182	B6	214	D6	246	F6
151	97	183	B7	215	D7	247	F7
152	98	184	B8	216	D8	248	F8
153	99	185	B9	217	D9	249	F9
154	9A	186	BA	218	DA	250	FA
155	9B	187	BB	219	DB	251	FB
156	9C	188	BC	220	DC	252	FC
157	9D	189	BD	221	DD	253	FD
158	9E	190	BE	222	DE	254	FE
159	9F	191	BF	223	DF	255	FF