

# ENERDYNE

Technologies, Inc.

*Quality You Can See*

**MODEL ENC2000R2-00**

**ADVS<sup>®</sup> COMPATIBLE COMPRESSED DIGITAL**

**VIDEO ENCODER**

**User Manual**

**Manual Part No.  
ENC2000R0200MAN**

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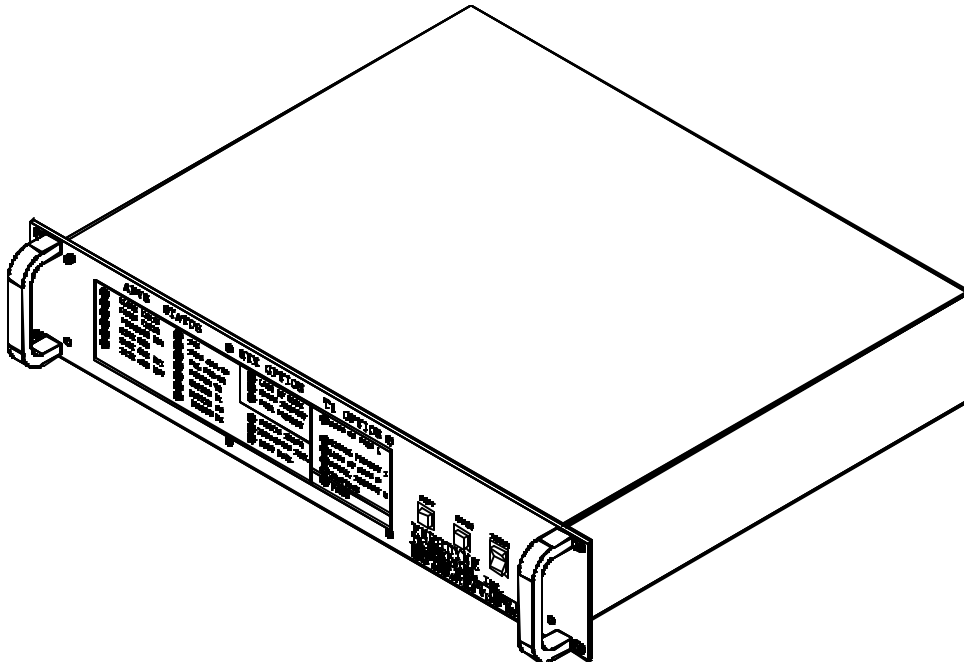
**Hexadecimal to Decimal Conversion.....1**

## Chapter 1 Introduction

### ***About This Manual***

This manual is a user's guide for the ENC2000R2, a member of Enerdyne's family of ADVS<sup>®</sup> compatible video encoders. The ENC2000R2 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 ENC2000R2 Encoder. If you have any questions or problems that cannot be resolved using this manual, feel free to call us any time at 619-438-6000 for help.



*Figure 1-1 ENC2000R2 Encoder*

## Theory of Operation

### ENC2000R2 Encoder Functional Description

The ENC2000R2 Encoder digitizes and compresses the analog video signal formats listed in Table 1-1. An optional multiplexer (EMUX2000) provides an interface for user supplied PCM data, audio or RS-232 data. The encoder and the optional multiplexer are controlled via the RS-232 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 | RS170      |
| PAL Composite  | CCIR       |

A video source may be connected to the video input 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 EMUX2000 Data Multiplexer (if installed), where user data (PCM data, audio or RS-232 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 ENC2000R2 internal clock, or accept an externally supplied clock signal. The compressed video output, internal clock output, and external clock input are available on the encoder back panel as either TTL or RS-422 signals.

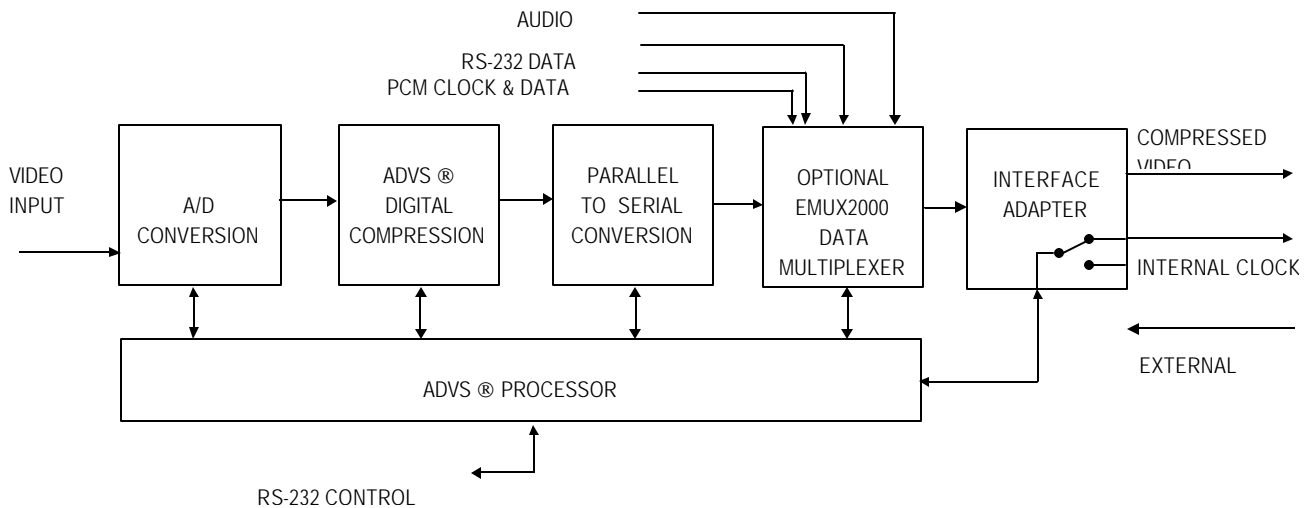


Figure 1-2 ENC2000R2 Encoder Functional Block

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## EMUX2000 Data Multiplexer Option

The EMUX2000 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 RS-232 interface and is user programmable from 300 baud to 38400 baud in eight steps. The PCM synchronous data channel accepts PCM data and clock. PCM input level is RS-422. 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.

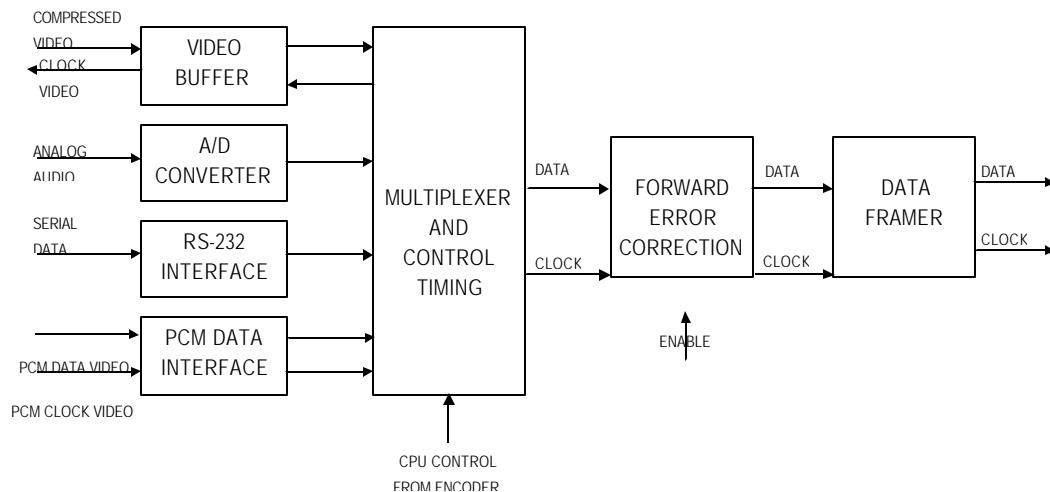


Figure 1-3 EMUX2000 Data Multiplexer Functional Block

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 ENC2000R2. Various configurations are possible and are dependent on user requirements and equipment. If you require assistance configuring your system, call us at 619/562-3061.

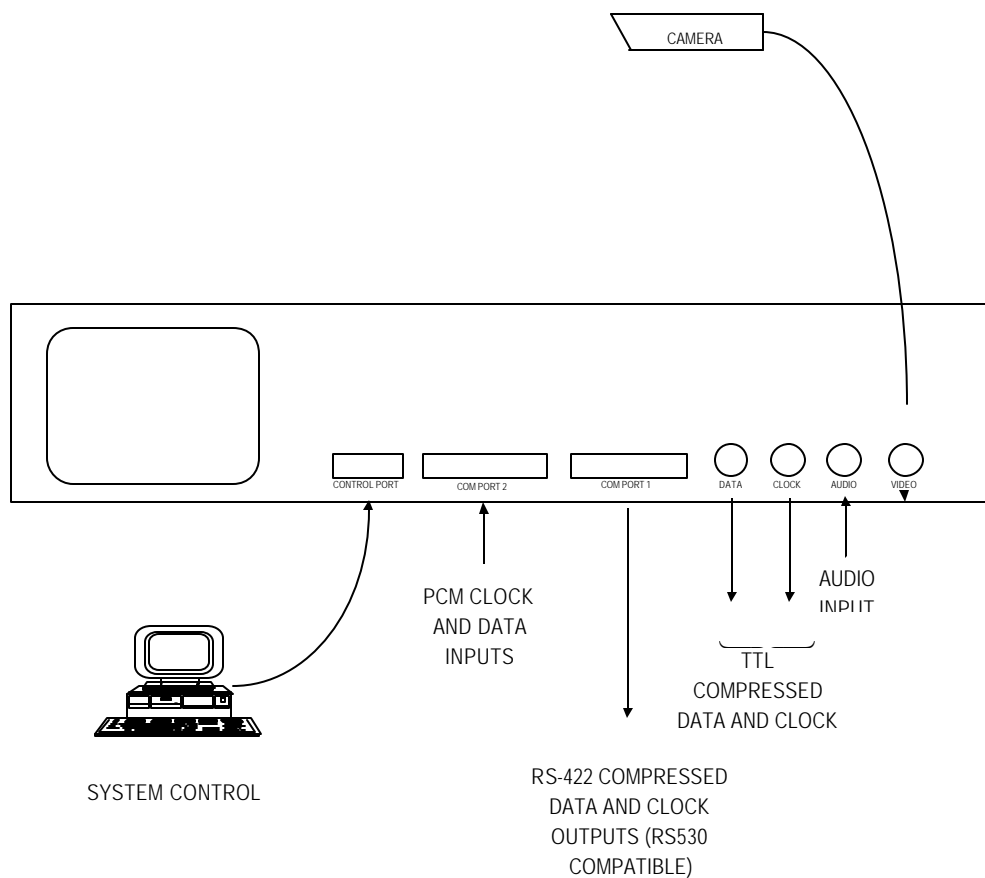


Figure 1-4. Typical Application for ENC2000R2 with EMUX2000 Option

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**ENC2000R2 Specifications**

| <b>ELECTRICAL</b>               |  |
|---------------------------------|--|
| Video Inputs                    | NTSC Composite, 1 Vp-p, 75 Ohm, 60 Hz<br>PAL Composite, 1 Vp-p, 75 Ohm, 50 Hz<br>CCIR Monochrome, 1 Vp-p, 75 Ohm, 50 Hz<br>RS170 Monochrome, 1 Vp-p, 75 Ohm, 60 Hz |
| Video Input Connector           | BNC type isolated ground (1)   |
| Horizontal Resolution           | 560, 280 or 140 pixels/line, user selectable   |
| Vertical Resolution             | 240 lines/field digitized, 480 lines/frame 60 Hz<br>288 lines/field digitized, 576 lines/frame 50 Hz   |
| Data & Clock Output Rates       | Internal source: 19 Kbps to 20 Mbps *<br>External Source - any rate up to 20 Mbps *  |
| Data & Clock Output Connections | Standard or with EMUX option: BNC type isolated ground   |
| Power                           | 115 VAC  |
| <b>MECHANICAL</b>               |  |
| Dimensions                      | 19-inch rack width, 3.5 in. (2U) high, 14" deep  |
| Weight                          | 15 lbs.  |
| Enclosure Materials             | 5052 aluminum, stainless steel hardware.   |
| <b>ENVIRONMENTAL</b>            |  |
| Operational Temperature         | 0°C to 50°C normal range (opt. -20°C to +70°C)   |
| Non-Operating Temperature       | -55°C to +85°C   |
| Humidity                        | 95% maximum (non-condensing)   |

\* 10 Mbps maximum with EMUX option installed

## Chapter 2 Encoder Operation

### *Series 2000 Encoding Equipment*

This chapter provides detailed explanations of each operating mode and option available for the ENC2000R2 ADVS<sup>®</sup> compatible Color Video Compression Encoder.

#### **NOTE**

With ENC2000R2 units packaged with the EMUX option see Appendix A of this document for all software information on configuring and using this option.

### **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@ 2000 Encoder Firmware Rev 2.8 990226-1315 . . .  
© 1993-1999 Enerdyne Technologies Inc. All rights  
reserved.
```

```
2000 series multiplexer option card found-  
Firmware version is 6.2
```

```
DCT is setup.  
Formatter is setup.  
We are configured as an Encoder.
```

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

Following the power-up messages, the operating prompt is displayed. This prompt can be changed through the use of the prompt command. Refer to Chapter 2 for details.

```
ADVS:\ENCODER>
```

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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 n . . . n**

This command selects the baud rate for the serial communications port. For the **n . . . n** argument, enter the actual number of the desired baud rate. The baud rate will change after the next reset cycle. Baud rates supported are as follows:

| <b>n . . . n</b> | <b>rate</b>         |
|------------------|---------------------|
| 300              | 300 baud            |
| 600              | 600 baud            |
| 1200             | 1200 baud           |
| 2400             | 2400 baud           |
| 4800             | 4800 baud           |
| 9600             | 9600 baud (default) |
| 19200            | 19200 baud          |
| 38400            | 38400 baud          |

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

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## BRIGHT mn

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:

| <b>mn</b> | <b>relative brightness</b> |
|-----------|----------------------------|
| 80        | Minimum                    |
| .         |                            |
| .         |                            |
| FE        |                            |
| FF        |                            |
| 00        | Normal (default)           |
| 01        |                            |
| 02        |                            |
| .         |                            |
| .         |                            |
| 7F        | Maximum                    |

## CD mn

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 |

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## 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:

| <b><i>nn</i></b> | <b>contrast level</b> |
|------------------|-----------------------|
| 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.

| <b><i>nn</i></b> | <b>% of total</b> |
|------------------|-------------------|
| 00               | 104%              |
| 01               | 100%              |
| 02               | 85%               |
| 03               | 63%               |

The savings in percent of active image area processed can be translated into increased picture motion without sacrificing quality.

## NOTE

The CROP command is not functional when the encoder is operating in interlaced mode.

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### **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:

| <b>nn</b> | <b>default variables</b>   |
|-----------|--|
| 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.

| <b>nn</b> | <b>Status</b> |
|-----------|---------------|
| 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 05 HEX.

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### **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.

| <b>nn</b> | <b>channel ID</b>             |
|-----------|-------------------------------|
| 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). Turning the interlace on changes the crop value to zero.

### **MODE nn**

This command selects the system operating mode. Four modes are valid. 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).

| <b>nn</b> | <b>mode</b>             |
|-----------|-------------------------|
| 00        | Color NTSC, 60 Hz comp. |
| 04        | RS-170, 60 Hz mono      |
| 08        | Color PAL, 50 Hz comp.  |
| 0C        | CCIR, 50 Hz mono        |

### **NORMAL**

This command sets the HUE, SATURATION, BRIGHTNESS, and CONTRAST parameters to their default values, which are 00, 59, 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.

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### **PROMPT aaaaaaaaa**

This command changes the system prompt. Up to eight alpha-numeric 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.

### **RAN on/off**

This command enables (on) or disables (off) a data randomizer that improves system performance, especially at low data rates. In decoders equipped with a DMUX2000 multiplexer or Bit Synchronizer, the decoder randomizer must be set to the same value.

### **NOTE**

If the decoder does not include a DMUX2000 or Bit Synchronizer option, the encoder **RAN** command must be set to **OFF**.

The Randomizer limits the maximum number of consecutive 1's or 0's in the encoder output data stream to 15. The Randomizer should be used when digital transmission equipment or bit synchronizers between the encoder and decoder require randomized data to prevent long strings of 1's or 0's. When the encoder Randomizer is enabled, the decoder Randomizer must also be enabled to derandomize the data for decoding and for proper display.

Errors introduced after the data is randomized are multiplied during the derandomization process. The decoder derandomizer has an error multiplication factor of 3 for isolated bit errors (separated from adjacent bit errors by at least 15 bits). An isolated bit error will produce 3 errors in the output data; the

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original bit error and 2 additional errors 14 and 15 bits later. In addition, a burst of errors occurring after the data has been randomized will produce a burst of errors in the derandomized output. The number of errors in the output depends on the distribution of errors in the burst and can be greater than, equal to or less than the number of errors in the input to the derandomizer. However, the derandomizer always increases the number of bits between the first and last error in the burst by 15.

### **RES mn**

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

| <b>mn</b> | <b>res</b>          | <b>pixels</b> |
|-----------|---------------------|---------------|
| 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.

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## **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:

| <b>nn</b> | <b>saturation level</b> |
|-----------|-------------------------|
| 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 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. **Note:** In PAL mode, TINT must be = 00. The following is a list of examples.

| <b>nn</b> | <b>phase shift</b> |
|-----------|--------------------|
| 80        | Maximum Green      |
| 81        |                    |
| .         |                    |
| .         |                    |
| FE        |                    |
| FF        |                    |
| 00        | Normal (default)   |
| 01        |                    |
| .         |                    |

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.  
7F    Maximum Red

## Chapter 3 Installation and Maintenance Procedures

### Introduction

This chapter provides the information required to install and configure the ENC2000R2. This chapter also covers configuration information for the ENC2000R2 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.

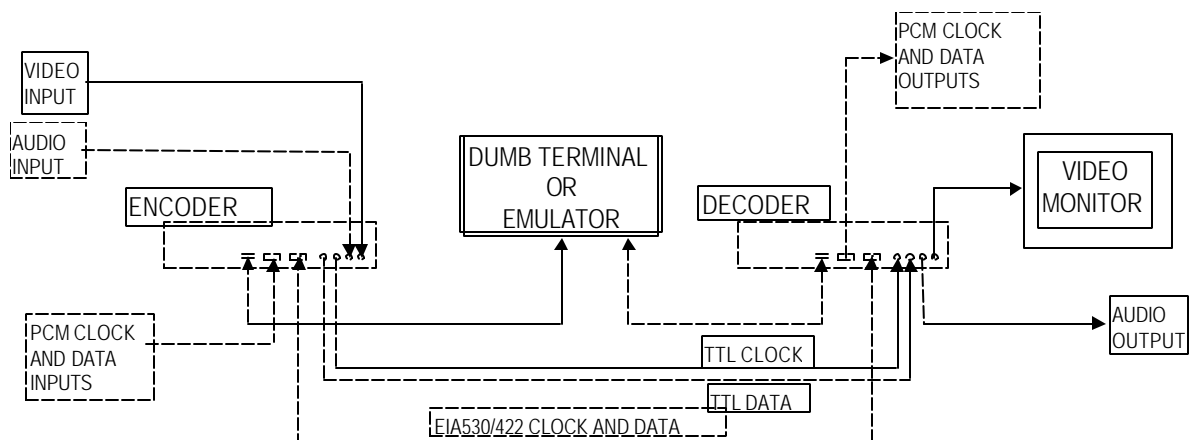
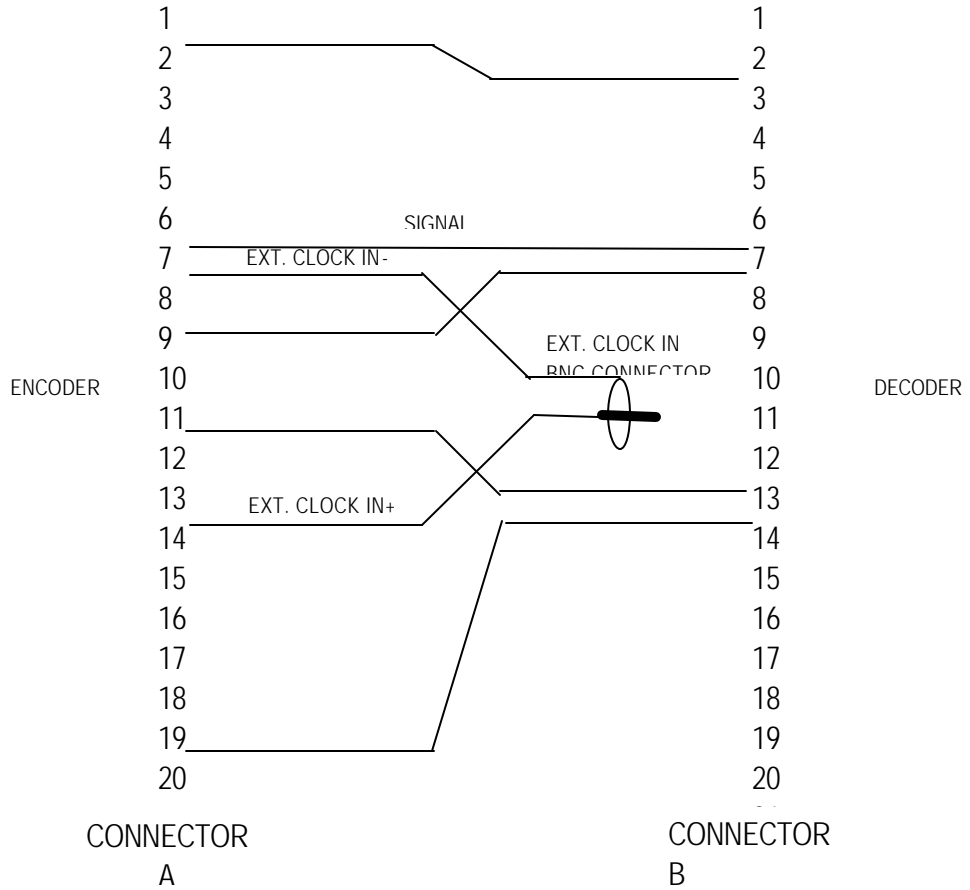


Figure 3-1. ENC2000R2 Test and Setup Configuration

An RS530 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.

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*Figure 3-2: RS530 Interface Test Cable*

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.

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Step 2 - Set clock rate.

| <i>STEP</i> | <i>COMMAND</i> | <i>INPUTS</i>            | <i>RANGE</i>     |
|-------------|----------------|--------------------------|------------------|
| <b>2</b>    | CD<br>(CLOCK)  | 00 - 7F<br>(HEXADECIMAL) | 20Mbps - 19 Kbps |

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 EMUX2000 Data Multiplexer is installed.

Step 3 - Set EMUX option data and FEC commands.

Use the **OPTION** and **FEC** multiplexer commands to configure data (audio, RS-232 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 before it is connected to the encoder as shown in Figure 3-1.

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***ENC2000R2 Pinout Information***

| Video input:                        |          | VIDEO                           | Connector: BNC               |
|-------------------------------------|----------|---------------------------------|------------------------------|
| Audio option input:                 |          | AUDIO                           | Connector: BNC               |
| Data output:                        |          | DATA                            | Connector: BNC               |
| Clock output:                       |          | CLOCK                           | Connector: BNC               |
| COMM PORT 1                         |          | Connector: DB25(S)              |                              |
| Pin Number                          | Signal   | Description                     |                              |
|                                     |          | RS530<br>ENCODER&DECODER        | RS-422                       |
| 1                                   | Ground   | Chassis ground                  |                              |
| 2                                   | SERDAT+  | Transmit data out               | Encoder data out+            |
| 3                                   | DATIN+   | Receive data in                 | Decoder data in+             |
| 4                                   | RTS+     | Request to send                 |                              |
| 7                                   | Ground   | Signal ground                   |                              |
| 9                                   | CLKIN-   | Receive clock in return         | Encoder or Decoder clock in- |
| 11                                  | SERCLK-  | Transmit clock out return       | Encoder clock out-           |
| 14                                  | SERDAT-  | Transmit data out return        | Encoder data out-            |
| 16                                  | DATIN-   | Receive data in return          | Decoder data in-             |
| 17                                  | CLKIN+   | Receive clock in                | Encoder or Decoder clock in+ |
| 19                                  | RTS-     | Request to send out return*     | Not used                     |
| 20                                  | DTR+     | Data Terminal ready out         | Not used                     |
| 23                                  | DTR-     | Data terminal ready out return* | Not used                     |
| 24                                  | SERCLK+  | Transmit clock out              | Encoder clock out+           |
| 5,6,8,10,12,13,15,18,<br>21, 22, 25 | not used |                                 |                              |

\* unbalanced-not used

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| COMM PORT 2 |            | Connector: DB25(S)          |
|-------------|------------|-----------------------------|
| Pin Number  | Signal     | Description                 |
| 1           | Gnd        | Ground                      |
| 2           | PCM out+   | PCM data out+, Decoder      |
| 3           | PCM in+    | PCM data in+, Encoder       |
| 4           | Gnd        | Ground                      |
| 7           | PCLK in-   | PCM clock in-, Encoder      |
| 9           | PCLK out-  | PCM clock out-, Decoder     |
| 11          | PCM out-   | PCM data out-, Decoder      |
| 12          | TXD        | RS-232 data output, Decoder |
| 13          | RXD        | RS-232 data input, Encoder  |
| 14          | PCM in-    | PCM data in-, Encoder       |
| 15          | Gnd        | Ground                      |
| 16          | PCLK in +  | PCM clock in +, Encoder     |
| 17          | PCLK out + | PCM clock out+, Decoder     |
| 4-6, 8, 10  | Not used   |                             |

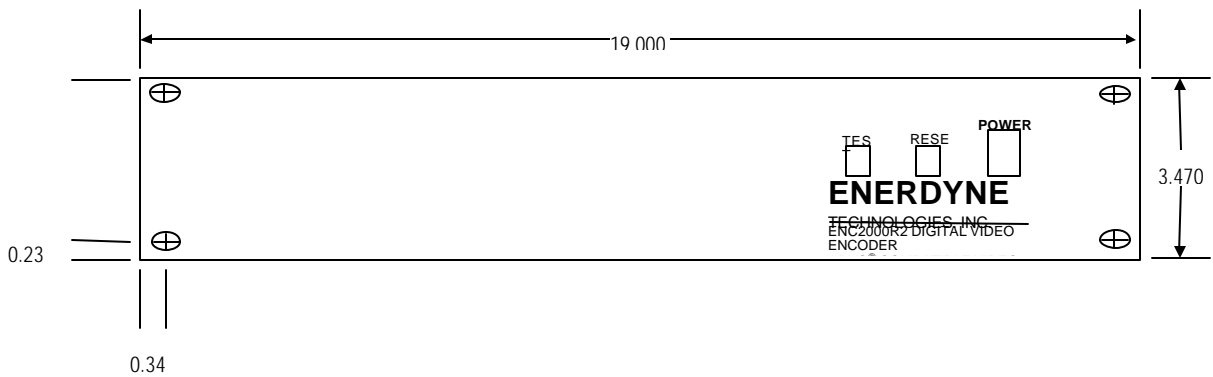
| System I/O: |          | CONTROL PORT      | Connector: DB9(S) |
|-------------|----------|-------------------|-------------------|
| Pin Number  | Signal   | Description       |                   |
| 2           | RXD      | Receive data in   |                   |
| 3           | TXD      | Transmit data out |                   |
| 5           | Ground   | Signal ground     |                   |
| 1, 4, 6-9   | Not used |                   |                   |

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***ENC2000R2 Encoder Installation***

Installation footprint for the ENC2000R2 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 14 inches deep. An additional 2 inches of cabinet depth is recommended for cooling fan and cable clearance.



ENC2000R2 Encoder Front Panel Mounting Dimensions

## ***Interconnecting Cable Installation***

Ensure that all BNC connectors are fully seated. DB25 and DB9 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 ENC2000R2 ADVS<sup>®</sup> 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 retainer insert 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.

## APPENDIX A DATA MULTIPLEXER CONFIGURATION

### *Data Multiplexer Overview*

#### **Introduction**

The Data Multiplexer frames the encoder serial data output in a series of eight recurring time slots as shown in Figure A-1. Each time slot may be configured to contain compressed video data and PCM, RS-232, or audio data, when FEC is not enabled. If FEC is enabled, time slot 8 is reserved for FEC. When the multiplexer is disabled, all available transmission is allocated to video.

When the multiplexer is enabled, framing overhead consumes  $\approx 7.7\%$  of the transmission link. The maximum PCM rate is 50% of the transmission link when audio, RS-232, and FEC are not enabled. When any combination of audio, RS-232 or FEC is enabled, the maximum PCM rate is 25% of the transmission link. Refer to Table A-1 for Data Multiplexer 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 ( $130 \text{ bits} = (8 \times 16) + 2$ ). ***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 other than video.*** Specific rules for designating time slots are described in the following sections. These rules are identical for both the encoder and the decoder.

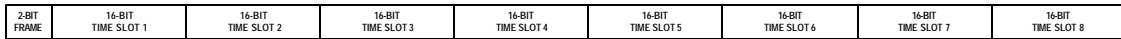


Figure A-1 Encoder Serial Data Output Time Slot Sequencing

Table A-1 Data Multiplexer Usage

| Configuration                  | Transmission Link Usage |        |           |       |           |          |
|--------------------------------|-------------------------|--------|-----------|-------|-----------|----------|
|                                | PCM                     | Audio  | RS-232    | FEC   | Video     | MUX Freq |
| Video & PCM                    | $\leq 50\%$             | -      | -         | -     | Remainder | 7.7%     |
| Video, PCM, Audio              | $\leq 25\%$             | 64Kbit | -         | -     | Remainder | 7.7%     |
| Video, PCM, Audio, RS-232      | $\leq 25\%$             | 64Kbit | Baud Rate | -     | Remainder | 7.7%     |
| Video+PCM+Audio+RS-232<br>+FEC | $\leq 25\%$             | 64Kbit | Baud Rate | 11.5% | Remainder | 7.7%     |
| MUX Disabled (OPTION1 08)      | -                       | -      | -         | -     | 100%      | -        |

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**Audio Data Rules**

Audio data will consume 64 Kbps of link . 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 RS-232 data are being multiplexed with compressed video, slots should be assigned on an interleaved basis (Table A-2) to ensure maximum audio quality.

Table A-2 Time Slot Interleaving Examples

| 1     | 2     | 3      | 4     | 5     | 6      | 7     | 8   |
|-------|-------|--------|-------|-------|--------|-------|-----|
| AUDIO | PCM   | RS-232 | AUDIO | PCM   | RS-232 | AUDIO | PCM |
| PCM   | AUDIO | RS-232 | PCM   | AUDIO | RS-232 | PCM   | FEC |
| AUDIO | PCM   | AUDIO  | PCM   | AUDIO | PCM    | AUDIO | PCM |
| PCM   | AUDIO | PCM    | AUDIO | PCM   | RS-232 | PCM   | FEC |

**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 RS-232 data channels are not enabled.

**RS-232 Data Rules**

As with PCM and Audio data time slots, time slots designated for RS-232 should be interleaved as shown in Table A-2. The baud rate 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 RS-232 characters. RS-232 data is fixed at eight bits with one start bit, one stop bit, and no parity. Each time slot designated as RS-232 will contain one eight bit character. The remaining bits will be compressed video.

## ***Data Multiplexer Commands***

### **CLOCK NORMAL/INVERT**

This command changes the clock phase to normal or invert.

### **DATA NORMAL/INVERT**

This command changes the data phase to normal or invert.

### **DBAUD *n . . . n***

This command adjusts the MUX RS-232 data rate. For the *n . . . n* argument, enter the actual number of the desired baud rate. The baud rate will change after the next reset cycle. Baud rates supported are as follows:

| <b><i>n . . . n</i></b> | <b>rate</b>         |
|-------------------------|---------------------|
| 300                     | 300 baud            |
| 600                     | 600 baud            |
| 1200                    | 1200 baud           |
| 2400                    | 2400 baud           |
| 4800                    | 4800 baud           |
| 9600                    | 9600 baud (default) |
| 19200                   | 19200 baud          |
| 38400                   | 38400 baud          |

EXAMPLE COMMAND: **DBAUD 9600**

### **ECLKIN TTL/CMOS**

This command sets external clock level to TTL or CMOS if it is not factory set to RS-422. If this level has been factory set to RS-422, the user cannot change the setting.

### **FEC ON/OFF**

This command turns FEC on or off. When FEC is enabled, the eighth time slot of every frame is reserved for FEC. This leaves the remaining seven time slots available for varying combinations of audio, PCM or RS-232 data.

### **MUX ON/OFF**

This command turns the multiplexer option on or off.

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**PCMIN TTL/CMOS**

This command sets the PCM input level to TTL or CMOS if it is not factory set to RS-422.

**PCMCLK NORMAL/INVERT**

This command changes the PCM clock phase to normal or invert.

**PCMDATA NORMAL/INVERT**

This command changes the PCM data phase to normal or invert.

**OPTION nnnnnnnn**

This command reserves the eight available time slots for PCM, RS-232, or AUDIO data, where each **n** in the command argument represents one of eight time slots, 7 through 0.

| <b>n value</b> | <b>data type</b> |
|----------------|------------------|
| P              | PCM              |
| A              | Audio            |
| R              | RS-232           |

Example: The command **OPTION RAPAPAPR** reserves 2 slots for RS-232, 3 slots for audio, and 3 slots for PCM.

**NOTE**

Any slots not identified by an **n** value in the command argument are automatically set to PCM. To view the current settings, enter the command **OPTION**, with no argument.

**NOTE**

If FEC is **ON**, slot 7, of slots 7 thru 0, is automatically reserved for FEC, and therefore only seven characters are required in the argument to set the remaining slots.

If, with FEC on, an eight character command argument is entered, the last character of the argument is ignored, and the first seven characters are assigned to slots 6 thru 0 respectively. Example: If the command argument **RPPPPARA** is entered, with FEC on, the last character in the argument, **A**, is ignored, and slots 6 thru 0 are assigned the values specified by the remaining characters.

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**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  |

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***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  |