ENERDYNE
Technologies, Inc.

Quality You Can See

MODEL DEC2000R2-00, -04, -05

ADVS®-COMPATIBLE, COMPRESSED DIGITAL VIDEO DECODER

User Manual

Manual Part No.
DEC2000R0200MAN

Enerdyne Technologies, Inc.
1935 Cordell Court
El Cajon, CA 92020
Tel: 619-438-6000, Fax 619-438-6068
Toll-Free: 877-363-7396
www.enerdyne.com

ENERDYNE TECHNOLOGIES, INC.
877-363-7396

Notice

The information contained in this document is subject to change without notice.

ENERDYNE TECHNOLOGIES, INC. MAKES NO WARRANTY OF ANY KIND WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Enerdyne Technologies, Inc. shall not be liable for errors contained herein or for consequential damages in connection with the furnishing, performance or use of this material.

- Printing History -

First Edition - **DEC2000R0200MAN**, September, 1996
Second Edition - **DEC2000R0200MAN** - April, 1997
Third Edition - **DEC2000R0200MAN** - July, 1997
Fourth Edition – **DEC2000R0200MAN** - January, 1998
Revised – **DEC2000R0200MAN**, December 20, 2004

CONTENTS

Chapter 1 Introduction

About This Manual

This manual is a user guide for the DEC2000R2, a member of Enerdyne's family of ADVS® compatible video decoders designed for a variety of surveillance applications. The DEC2000R2 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 DEC2000R2 Decoder. 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.

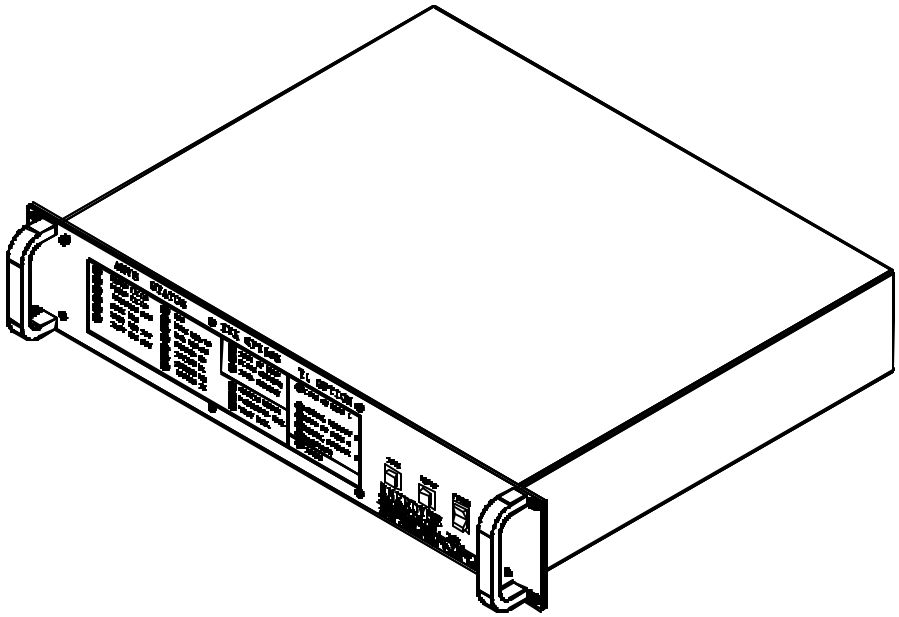


Figure 1-1 DEC2000R2 Decoder

Theory of Operation

DEC2000R2 Decoder Functional Description

The DEC2000R2 decoder decompresses digital video data and converts the digital video into an analog signal output in any of the formats listed in Table 1-1. The input data stream is the compressed video output from an ADVS® compatible video encoder (such as the ENC2000R2). An optional multiplexer (DMUX2000) strips away asynchronous data (PCM, audio, EIA232) that has been multiplexed into the data stream by the encoder and outputs these data separately from the video. The decoder 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

Compressed video and clock signals may be connected to the decoder inputs as shown in Figure 1-2. If the incoming data stream includes data packets other than video (PCM, audio or EIA232) that have been multiplexed in with the video, then the decoder must be equipped with the DMUX2000 multiplexer, which separates the non-video packets from the video and outputs the different data types on separate channels. The serial video data is then converted to parallel data and decompressed. Finally, the digital video is converted to an analog signal for display or recording.

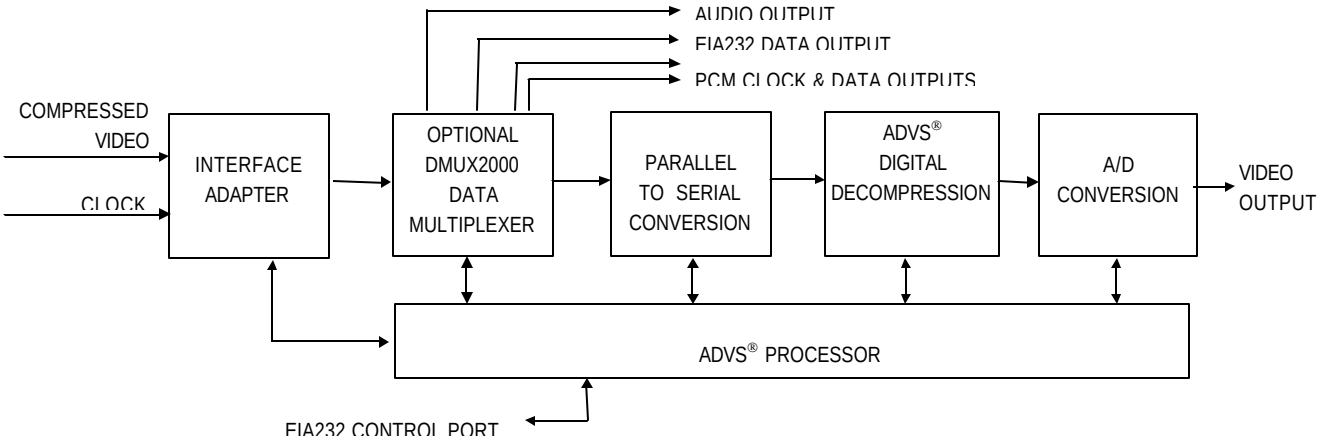


Figure 1-2 DEC2000R2 Decoder Functional Block Diagram

DMUX2000 Data Multiplexer Option

The DMUX2000 Data Multiplexer de-multiplexes the data that has been combined with the compressed video stream by the ADVS® encoder (Figure 1-3) and outputs the data on separate user accessible ports. The system can combine compressed video, audio, asynchronous digital and synchronous digital data into one transmission over any digital transmission facility. The audio data channel output is a 1 Vp-p, 600 ohm audio signal with 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 outputs burst PCM data and clock. PCM output level is EIA422. 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.

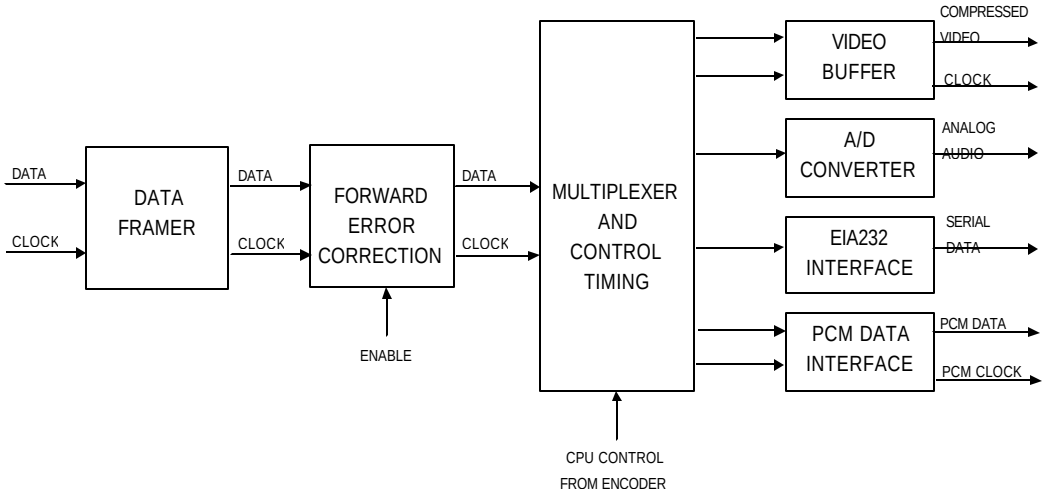


Figure 1-3 DMUX2000 Data Multiplexer Functional Block Diagram

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 DEC2000R2. 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.

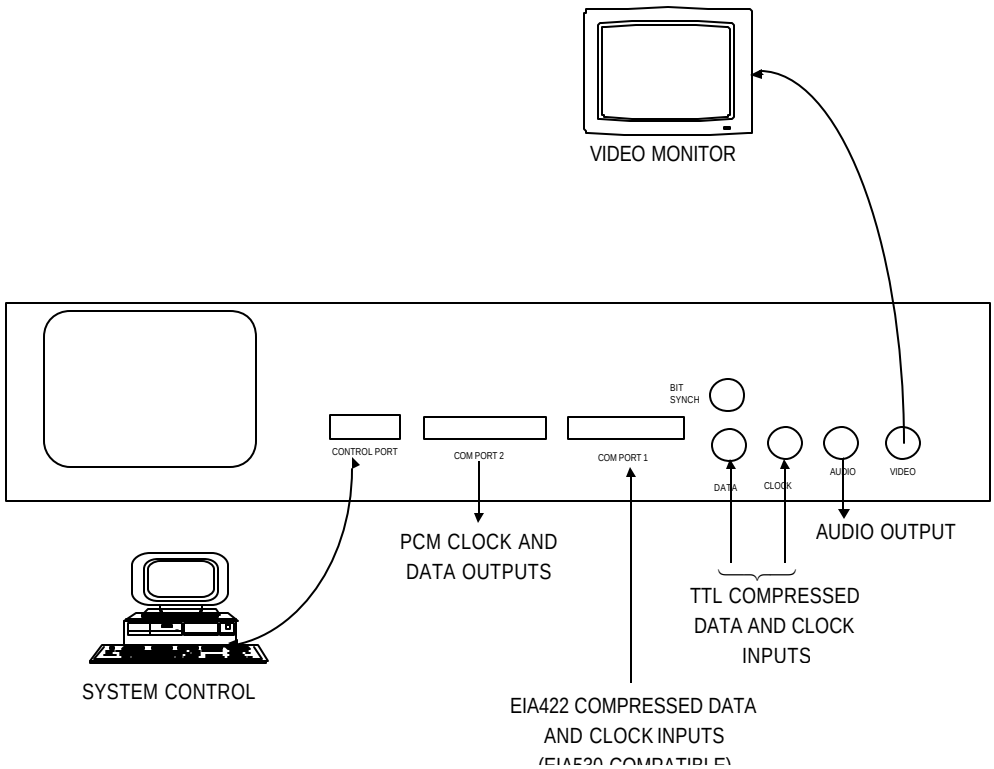


Figure 1-4. Typical Application for DEC2000R2 with DMUX1000 Option

ENC2000R2 Specifications

ELECTRICAL	
Video Outputs	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 Output 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 288 lines/field digitized, 576 lines/frame 50 Hz
Data & Clock Input Rates	Internal source: 19 Kbps to 20 Mbps* External Source - any rate up to 20 Mbps*
Data & Clock Input Connections	Standard or with EMUX/DMUX option: BNC type isolated ground
Power	115 VAC
MECHANICAL	
Dimensions	19-inch rack width, 3.5 in. (2U) high, 14” 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	-55°C to +85°C
Humidity	95% maximum (non-condensing)

* 10 Mbps maximum with DMUX option installed

Chapter 2 Decoder Operation

Series 2000 Decoding Equipment

This chapter provides detailed explanations of each operating mode and option available for the DEC2000R2 ADVS® compatible Color Video Compression Encoder.

Software Interface

The encoder contains all communication software required to communicate with terminal hardware. The user only needs to provide 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® Decoder Firmware Rev 1.3 112693-1411/Xencnov16+*
LCA configured from EPROM.
DCT is setup.
Formatter is setup.
We are configured as a Decoder.

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.

`Checksum verified` This 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:\DECODER>
```

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.

AUTO on/off

This command enables (on) or disables (off) the automatic parameter loading from the encoder operation. When AUTO is on (normal operation) the decoder operational parameters are updated automatically by input from the encoder bit stream when the equivalent parameter has changed on the encoder.

BAUD nn

This command selects the baud rate for the serial communications port. The baud rate changes 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.

CD nn

This command sets the bit synchronizer frequency. The "nn" value should be the same as the value used to set the encoder clock frequency. <CD> followed by <enter> will display a valid list of values, as shown below.

	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

NOTE

This command has no effect unless the Bit Synchronizer option is installed.

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

ES nn

This command displays encoder status.

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 range for nn is 00 to 04 HEX.

nn	**screen**
00	Baud rates
01	Factory Assistance
02	Clock and Data Input Settings (Polarity & Source)
03	Clock Divider Modes
04	Reserved

ID nn

This command enables the decoder to process received compressed video data packets with the selected video channel(s) identification code. The normal default value is 00. Ensure that both the encoder and the decoder are programmed to the same identification code (00 to 03)when processing a single video channel.

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

MINIBAR yx

This allows the user to overlay a miniature colorbar pattern onto the decoder screen. A value of 00 or FF disables this mode. A value of y=0 is the top of the screen, with a value of y=C the bottom of the screen. A value of x=0 is the left of the screen, a value of x=C the right of the screen.

POLARITY

This command inverts the clock and/or data signal input to the decoder.

nn	polarity
00	Inverted data signal, clocked on rising edge
01	Inverted data signal clocked on falling edge (inverted clock)
02	Data clocked on rising edge
03	Data clocked on falling edge (inverted clock)

RELOAD

This command forces the decoder to reload all parameters from the encoder.

RESET (Z)

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

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.

SAVESCREEN

This command copies the entire overlay text screen into EEPROM. This will make a permanent copy of all graphics and messages that are reloaded every power cycle. This command also copies the time, date, and minibar if they are enabled before the savescreen is entered.

SOURCE

This command selects the source for the data input to the decoder.

nn	Source
00	TTL clock and data – Backpanel BNC CLOCK & DATA Connectors
01	Internal DMUX – Valid only when DMUX2000 Demultiplexer option is installed
02	RS422 Port – Differential clock and data via backpanel COM PORT 1 Connector
03	Option Card – Valid only when DBS12 Bit Synchronizer Option is installed

TCOLOR rrggbb

This command is used to select the color of the overlay text. The format is in RGB mode. Each of the rrggbb bytes selects how much of each color is to be used. 00 HEX is the minimum and FF HEX is the maximum. Example colors are listed below:

rrggbbcolor	
C00000	Red (primary colors are at 75% intensity)
00C000	Green
0000C0	Blue
C0C0C0	White
C0C000	Yellow
C000C0	Violet
00C0C0	Cyan

TEST nn

This command puts the system into VIDEO test mode. The system will display solid colors in accordance with the following table:

100% saturation		75% saturation		50% saturation		25% saturation	
nn	**color**	**nn**	**color**	**nn**	**color**	**nn**	**color**
00	black	08	black	10	black	18	black
01	red	09	red	11	red	19	red
02	green	0A	green	12	green	1A	green
03	blue	0B	blue	13	blue	1B	blue
04	yellow	0C	yellow	14	yellow	1C	yellow
05	cyan	0D	cyan	15	cyan	1D	cyan
06	violet	0E	violet	16	violet	1E	violet
07	white	0F	white	17	white	1F	white

The decoder also provides the following test patterns

nn	**Test**
20	color bar
21	SMPTE color bar
22	grey bars

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.

TIMER nn

This command displays the system time at the location designated. The position is set by the 'y' argument in the vertical direction and the 'x' argument in the horizontal direction. A value of y=0 is the top of the screen and a value of y=C is the bottom of the screen. A value of x=0 is the left of the screen and a value of x=C is the right of the screen. Any HEX value between 0 and C is valid, however, one of the two parameters must be zero(0) to keep the timer display on the edge of the screen, and (0,0) is not displayed (use 0,1 or 1,0 to display the timer in the top left corner). A TIMER command must be preceded by a VCLR command to clear the display buffer.

NOTE

When operating in PAL format, the range is 0 to E in HEX.

TTEST

This command displays the overlay graphics plane character set on the screen. The screen is erased by entering the VCLR command.

V nn

This is the command used to display text as an overlay on the video screen. V 0n is used for left justified text and V 1n is used for centered text. For example, entering 'V 14 Mission #1' will display the words 'Mission #1' auto-centered on text line number 4. Entering V 14 with no text will erase that line. The text is displayed in the current color selected by the TCOLOR command. All of the text on the screen can be erased with the VCLR command. Upper and lower case is allowed. The character set can be viewed with the TTEST command. Overlay messages are lost during a power or reset sequence. The valid range of text line numbers is from 0 HEX to F HEX.

VCLR

This command erases all text from the text overlay plane. No other parameters are used.

Option Commands

The DMUX2000 Data Demultiplexer 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.

Demultiplexer 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.

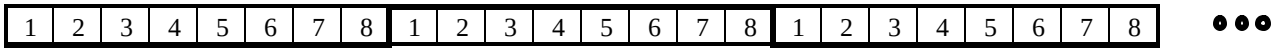


Figure 2-1 Encoder Serial Data Output Time Slot Sequencing

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	MULTIPLEXER OVERHEAD
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 DEC2000R2. This chapter also covers configuration information for the DEC2000R2 when equipped with the optional DMUX data demulitiplexer.

System Software Setup

Initial system software setup is performed on the bench using one of the test setup configuration shown below (Figures 3-1 and 3-2). Refer to the equipment pinout information at the end of this chapter.

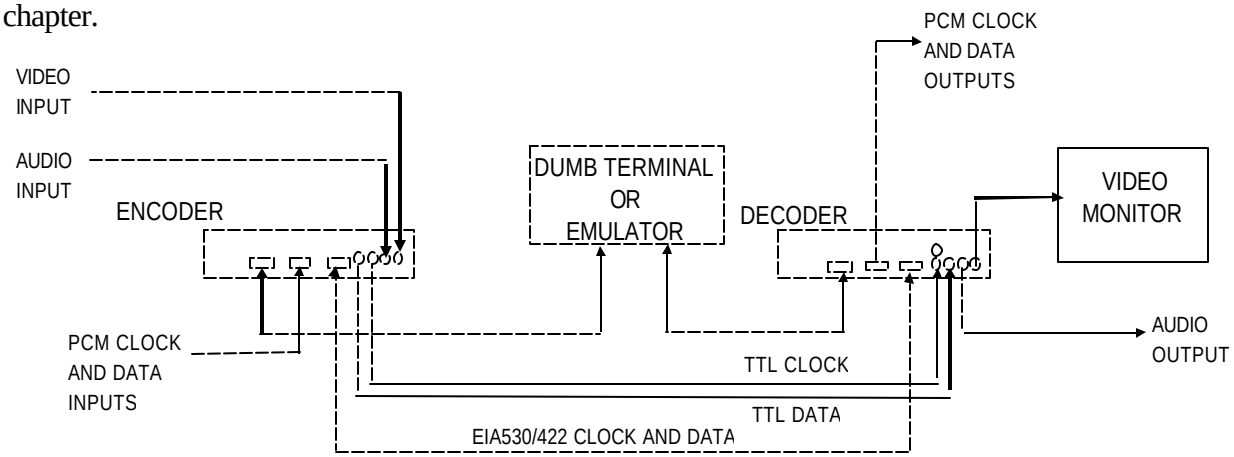


Figure 3-1 DEC2000R2 Test and Setup Configuration using Single-Ended (TTL), or Differential(EIA422) Clock and Data

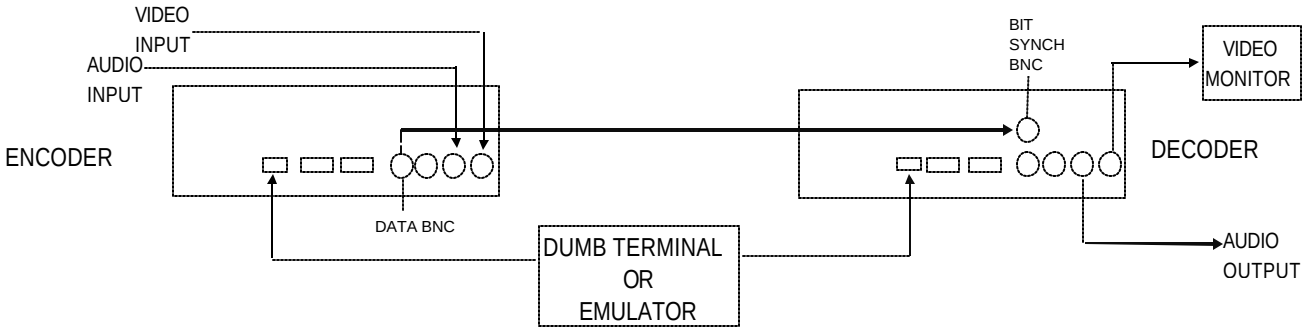


Figure 3-2 Test and Configuration Setup with Bit Synchronizer Installed

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

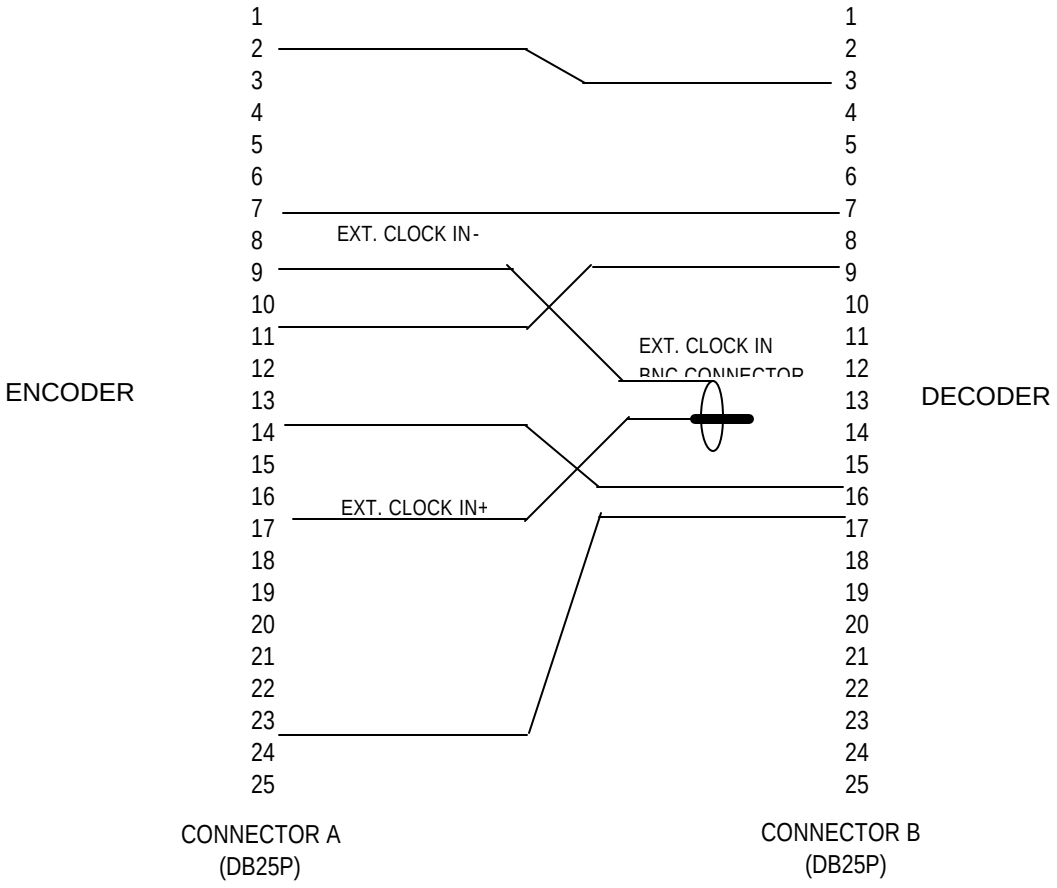


Figure 3-3 EIA530 Interface Test Cable

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 decoder 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 and data polarity.

STEP	*COMMAND*	*INPUTS*	*POLARITY*
2	POLARITY	00	Inverted data signal, clocked on rising edge
		01	Inverted data signal clocked on falling edge(inverted clock)
		02	Data clocked on rising edge
		03	Data clocked on falling edge (inverted clock)

Step 3 - Set data source.

STEP	*COMMAND*	*INPUTS*	*SOURCE*
3	SOURCE	00	TTL clock and data – Backpanel BNC CLOCK & DATA Connectors
		01	Internal DMUX – Valid only when DMUX2000 Demultiplexer option is installed
		02	RS422 Port – Differential clock & data via backpanel COM PORT 1 Connector
		03	Option Card – Valid only when DBS12 Bit Synchronizer Option is installed

NOTE

Perform Step 4 only if DMUX2000 Data Multiplexer is installed.

Step 4 - Set DMUX 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 before the data multiplexer is enabled via encoder OPTION1 command.

NOTE

Perform Step 5 only if Bit Synchronizer option is installed.

Step 5 – Enable and select bit synchronizer operating frequency.

SETUP	*COMMAND*	*INPUTS*	*FUNCTION*
5a	OPTION1	80*	Enables Bit Sync with normal phase.
5b	OPTION1	CO	Enables Bit Sync with inverted phase.
5c	CD	nn	Selects Bit Sync operating frequency. Must be set to the same nn value as the encoder.

*Preferred setting. Inverted phase may be required depending on cable length/impedance/delay.

DEC2000R2 Pinout Information

Video output:	VIDEO	Connector: BNC
Audio option output:	AUDIO	Connector: BNC
Data input:	DATA	Connector: BNC
Clock input:	CLOCK	Connector: BNC
Bit Synchronizer Input:	BIT SYNC	Connector: BNC
COMM PORT 1		Connector: DB25(S)

Pin Number	Signal	Description	
		EIA530 ENCODER&DECODER	EIA422
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, 21, 22, 25	Not used		

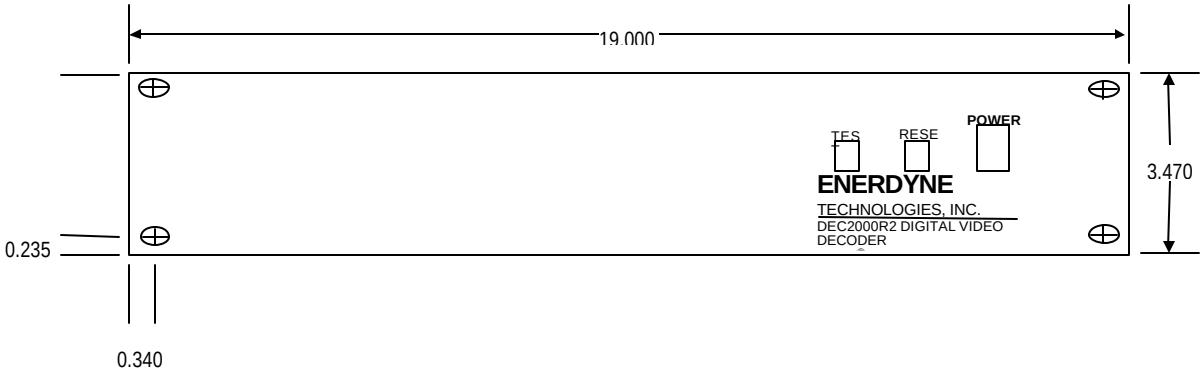
* unbalanced-not used

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
7	Gnd	Ground
9	PCLK in-	PCM clock in-, Encoder
11	PCLK out-	PCM clock out-, Decoder
14	PCM out-	PCM data out-, Decoder
12	TXD	EIA232 data output, Decoder
13	RXD	EIA232 Data Input, Encoder
16	PCM in-	PCM data in-, Encoder
15	Gnd	Ground
17	PCLK in +	PCM clock in+, Encoder
24	PCLK out +	PCM clock out+, Decoder
4-6, 8, 10, 18-23, 25	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	

DEC2000R2 Decoder Installation

Installation mounting for the DEC2000R2 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 cable and cooling fan clearance.



DEC2000R2 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 DEC2000R2 ADVS® compatible Color Video Compression Decoder 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, and 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

OPTION Commands

The four OPTION commands provide control of the demultiplexer through the setting of control bits that define demultiplexer 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.

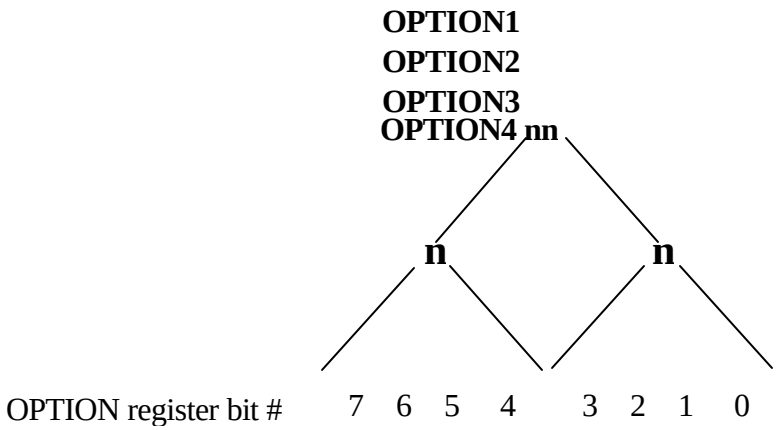


Figure A-1 OPTION Command Output Arguments

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 DEC2000R2 decoder can function with any ADVS® compatible encoder. For convenience, the appropriate encoder settings are included also. 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 encoder manual for encoder 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 demultiplexer functions controlled by each bit. The software revision and check word are available on the control terminal screen at power-up. Decoder OPTION1 bit settings are as follows:

		DECODER FUNCTION WHEN BIT = 1		
Bit Number	Default	Serial Number 0439 or LOWER	Serial Number 0431 through 0767	Serial Number 0683
0	0	FEC Enable	FEC Enable	FEC Enable
1	0	Baud Rate Select 'X'	Baud Rate Select 'X'	Baud Rate Select 'X'
2	0	Baud Rate Select 'Y'	Baud Rate Select 'Y'	Baud Rate Select 'Y'
3	0	Baud Rate Select 'Z'	Baud Rate Select 'Z'	Baud Rate Select 'Z'
4	0	Must be = 0	Must be = 0	Must be = 0
5	0	Main Clock Input Invert	Main Clock Input Invert	Main Clock Input Invert
6	0	Must be = 0	Must be = 0	Enable Bit Sync
7	0	Must be = 0	Must be = 0	Must be = 0

		DECODER FUNCTION WHEN BIT = 1		
Bit Number	Default	Serial Number 0843, 0844, 0870	Serial Number 0850 through 0853	Serial Number 0994 through 0998, 1001 through 1003, 1013
0	0	FEC Enable	FEC Enable	FEC Enable
1	0	Baud Rate Select 'X'	Baud Rate Select 'X'	Baud Rate Select 'X'
2	0	Baud Rate Select 'Y'	Baud Rate Select 'Y'	Baud Rate Select 'Y'
3	0	Baud Rate Select 'Z'	Baud Rate Select 'Z'	Baud Rate Select 'Z'
4	0	Enable Randomizer	Enable Randomizer	Enable Randomizer
5	0	Main Clock Input Invert	Main Clock Input Invert	Main Clock Input Invert
6	0	Must be = 0	Must be = 0	Must be = 0
7	0	Disable Auto Frame Detection	Disable Auto Frame Detection	Disable Auto Frame Detection

		DECODER FUNCTION WHEN BIT = 1		
Bit Number	Default	Serial Number 1012, 1028 through 1031	Serial Number 1055 and HIGHER	not used
0	0	FEC Enable	FEC Enable	
1	0	Baud Rate Select 'X'	Baud Rate Select 'X'	
2	0	Baud Rate Select 'Y'	Baud Rate Select 'Y'	
3	0	Baud Rate Select 'Z'	Baud Rate Select 'Z'	
4	0	Enable Randomizer	Enable Randomizer	
5	0	Main Clock Input Invert	Main Clock Input Invert	
6	0	Must be = 0	Bit Sync Phase 1=(-), 0=(+)	
7	0	Disable Auto Frame Detection	Enable Bit Sync	

OPTION2 nn

This command allows the user to enable or disable the various demultiplexer functions controlled by each bit. The software revision and check word are available on the control terminal screen at power-up. Decoder OPTION2 bit settings are as follows:

		DECODER FUNCTION WHEN BIT = 1		
Bit Number	Default	Serial Number 0430 or LOWER	Serial Number 0431 through 0767	Serial Number 0683
0	0	PCM Clock Output Invert	PCM Clock Output Invert	PCM Clock Output Invert
1	0	PCM Data Output Invert	PCM Data Output Invert	PCM Data Output Invert
2	0	Main Data Input Invert	Main Data Input Invert	Main Data Input Invert
3	0	Use RS422 for Main Interface	Decoder Source Select 'A'	Decoder Source Select 'A'
4	0	Must be = 0	Decoder Source Select 'B'	Decoder Source Select 'B'
5	0	Must be = 0	Multiplexer Source, 0=TTL, 1=422	Enable 3 MHZ Bit Sync
6	0	Must be = 0	Must be = 0	Must be = 0
7	0	Must be = 0	Must be = 0	Must be = 0

		DECODER FUNCTION WHEN BIT = 1		
Bit Number	Default	Serial Number 0843, 0844, 0870	Serial Number 0850 through 0853	Serial Number 0994 through 0998, 1001 through 1003, 1013
0	0	PCM Clock Output Invert	PCM Clock Output Invert	PCM Clock Output Invert
1	0	PCM Data Output Invert	PCM Data Output Invert	PCM Data Output Invert
2	0	Main Data Input Invert	Main Data Input Invert	Main Data Input Invert
3	0	Decoder Source Select 'A'	Decoder Source Select 'A'	Decoder Source Select 'A'
4	0	Decoder Source Select 'B'	Decoder Source Select 'B'	Decoder Source Select 'B'
5	0	Multiplexer Source, 0=TTL,1=422	Multiplexer Source, 0=TTL,1=422	Multiplexer Source, 0=TTL,1=422
6	0	Must be = 0	Must be = 0	Must be = 0
7	0	Must be = 0	Must be = 0	Must be = 0

		DECODER FUNCTION WHEN BIT = 1		
Bit Number	Default	Serial Number 1012, 1028 through 1031	Serial Number 1055 and HIGHER	not used
0	0	PCM Clock Output Invert	PCM Clock Output Invert	
1	0	PCM Data Output Invert	PCM Data Output Invert	
2	0	Main Data Input Invert	Main Data Input Invert	
3	0	Decoder Source Select 'A'	Decoder Source Select 'A'	
4	0	Decoder Source Select 'B'	Decoder Source Select 'B'	
5	0	Multiplexer Source, 0=TTL,1=422	Multiplexer Source, 0=TTL,1=422	
6	0	Must be = 0	Must be = 0	
7	0	Must be = 0	Must be = 0	

DECODER SOURCE SELECT					
Serial Number 0431 through 0767	Serial Number 0683	Serial Number 0843, 0844, 0870	Serial Number 0850 through 0853	BIT A	BIT B
TTL	TTL	TTL	NOT USED	0	0
422	422	422	NOT USED	1	0
TTL	MUX CARD	TTL	NOT USED	0	1
422	NOT USED	422	TTL/422	1	1

DECODER SOURCE SELECT					
Serial Number 0994 through 0998, 1001 through 1003,	Serial Number 1012, 1028 through 1031	Serial Number 1055 and HIGHER	not used	BIT A	BIT B
NOT USED	TTL/422	TTL/422		0	0

NOT USED	NOT USED	NOT USED		1	0
NOT USED	NOT USED	NOT USED		0	1
TTL/422	NOT USED	NOT USED		1	1

- If a DMUX1000 Multiplexer Option is installed, bits 3 and 4 should be set to "11" to select multiplexer. When multiplexer is selected, bit 5 selects the desired input level, TTL or RS422, into the multiplexer.
- When no options are installed, bits 3 and 4 may be set to "00" (RS422) or "10" (TTL) depending on the clock and data input levels desired. Bit 5 has no effect.

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. Decoder OPTION3 bit settings are as follows:

Bit Number	Default	DECODER FUNCTIO 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. Decoder OPTION4 bit settings are as follows:

Bit Number	Default	DECODER FUNCTIO 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

	ENCODER REGISTERS				DECODER REGISTERS			
SETTING	**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