Model 8010TM IRIG

SDI Time Code Master
With IRIG Reader
Instruction Manual

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INFORMATION TO USERS IN EUROPE

NOTE

CISPR 22 CLASS A DIGITAL DEVICE OR PERIPHERAL

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

INFORMATION TO USERS IN THE U.S.A.

NOTE

FCC CLASS A DIGITAL DEVICE OR PERIPHERAL

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

WARNING

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

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

REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	First version	Nov 02
1.2	Added information about 8010TM-IRIG version	Dec 03
1.3	Updated menus and features to January 2004 firmware release	Jan 04
1.4	Added info for IRIG CS-6 serial data output	Jun 05
1.4.1	Fixed minor typos	Dec 05

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CHAPTER 1: OVERVIEW

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1. OVERVIEW

The 8010TM-IRIG SDI Time Code Master is a full function time code reader/generator system for serial digital video. The 8010TM-IRIG is a combination generator for SMPTE Linear Time Code (LTC) and Digital Vertical Interval Time Code (D-VITC), reader for IRIG-B code and D-VITC (standard SMPTE time code and special IRIG encoded VITC), and contains a high resolution character inserter which can be burn the generator or reader numbers directly into the digital program output as well as an optional analog monitoring output.

The 8010TM-IRIG reads IRIG-B code commonly in use within the United States government agencies and supporting private industries and provides a display of days, hours, minutes, seconds and milliseconds in the character inserter. This IRIG information is inserted into a special line of vertical interval time code which is protected by a unique cyclic redundancy checkword (CRC) so that it is not confused with standard SMPTE 12M D-VITC by tape recorders and other devices. This special D-VITC can be decoded by the 8010TM-IRIG's D-VITC reader to allow you to encode the IRIG information onto a 'clean' video tape and then display the IRIG information later on playback.

The 8010TM-IRIG SMPTE Time code generator can also be slaved to incoming IRIG code. The millisecond count will be converted to the closest frame number and can also be stored in the generator user bits along with the IRIG day of the year. In the continuous jam sync mode, the generator is slaved to the reader, and will follow code any discontinuities of the reader. The generator may also be momentarily synchronized to the reader, and then it continues to increment normally regardless of the reader code. Momentary jam is the recommended mode when synchronizing to IRIG-B sources so that the resulting SMPTE time code does not contain discontinuities due to the different time bases of 29.97 frame per second video and real time of the IRIG code. In NTSC related video systems, the SMPTE generator should be operated in the Drop Frame counting mode when trying to synchronize the SMPTE generator to IRIG.

The 8010TM-IRIG will accept 525 or 625 line component digital video. The 8010TM-IRIG's SMPTE time code generator can be preset to lock to the digital program video either by simple frame locking, or where necessary it will colour lock to an analog Colour Reference in accordance with the 4 field NTSC or 8 field PAL colour sequence.

In NTSC related colour systems operation, with a frame rate of 29.97002618 Hz where the time of day is used for indexing, the generator may be operated in the drop frame mode. Special indicators in the front panel display and in the character inserter indicate that the unit is operating in the drop frame format.

Both the generator and reader are capable of working with the unassigned user bits. Several modes of operation are possible. The generator may be preset to insert hexadecimal values for each group in the generated code, and the reader will read hexadecimal values for each binary group. In addition, the user may select the transfer of either reader time or reader user bits into the generator user bits, thus, allowing pre-edit frame addresses to be preserved when new continuous time code is laid down.

The high-resolution character inserter provides six independently positionable windows to show time and user bits for the generator and readers simultaneously. When the IRIG or VITC readers are operating in the *IRIG DAY* mode, there are two independently positionable windows for each reader to show the IRIG time to millisecond precision and the IRIG day respectively. Three character sizes and the choice of white or black characters with or without contrasting background mask are selected from the front panel.

Features:

- Accepts 4:2:2 (525 and 625 line) digital video
- Serial digital video input provides automatic cable equalization on cable lengths up to 200 meters of low loss coax such as Belden 8281
- Optional Bypass relay for Serial digital video program output activates on power loss or from the front panel menu
- Auxiliary serial digital video output (not bypass protected)
- Passes embedded audio and other ancillary data signals
- LTC and D-VITC SMPTE Time Code generator
- IRIG data encoded to second line of VITC generator with special CRC
- SMPTE D-VITC Time Code or IRIG encoded D-VITC reader
- IRIG reader reads 1 kHz IRIG-B format sine wave amplitude modulated and pulse width modulated codes (formats B122 and B022)
- SMPTE Time Code LTC and D-VITC generators can be slaved momentarily or continuously to IRIG reader – converts milliseconds to closest video frame number. Milliseconds and days can be transferred to VITC user bits.
- Character Inserter displays IRIG day and time to millisecond resolution in the picture in IRIG modes
- Character Inserter displays time and user bits in the picture in SMPTE modes
- Separate positioning of each character window
- 16 digit Alpha-numeric display, with 16 pushbuttons
- Momentary and Continuous jam sync modes
- User bit transfer from reader time or user bits
- 25 ⇔ 30 Fps Time code converter
- Optional composite monitor output converts digital video to analog
- GPI Remote Control mode allows user to pass remote control contact closure information in VITC user bits
- Recalculates and inserts EDH on the SDI output
- Serial Remote Control of most functions - Broadcasts reader data or sends it on request.
- Rack mountable

1.1. HOW TO USE THIS MANUAL

This manual is organized into 3 chapters: Overview, Installation, Operation, and Serial Port Protocol.

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

1.2. DEFINITIONS

AES: (Audio Engineering Society): A professional organization that recommends standards for the audio industries.

AES/EBU: Informal name for a digital audio standard established jointly by the Audio Engineering Society and the European Broadcasting Union organizations.

ANALOG: An adjective describing any signal that varies continuously as opposed to a digital signal that contains discrete levels representing digits 0 and 1.

A-TO D CONVERTER (ANALOG-TO-DIGITAL): A circuit that uses digital sampling to convert an analog signal into a digital representation of that signal.

BIT: A binary representation of 0 or 1. One of the quantized levels of a pixel.

BIT PARALLEL: Byte-wise transmission of digital video down a multi-conductor cable where each pair of wires carries a single bit. This standard is covered under SMPTE 125M, EBU 3267-E and CCIR 656.

BIT SERIAL: Bit-wise transmission of digital video down a single conductor such as coaxial cable. May also be sent through fiber optics. This standard is covered under SMPTE 259M and CCIR 656.

BIT STREAM: A continuous series of bits transmitted on a line.

BNC: Abbreviation of "baby N connector". A cable connector used extensively in television systems.

BYTE: A complete set of quantized levels containing all the bits. Bytes consisting of 8 to 10 bits per sample are typical in digital video systems.

CABLE EQUALIZATION: The process of altering the frequency response of a video amplifier to compensate for high frequency losses in coaxial cable.

CCIR: (International Radio Consultative Committee) An international standards committee. (This organization is now known as ITU.)

CCIR-601: (This document now known as ITU-R601). An international standard for component digital television from which was derived SMPTE 125M and EBU 3246-E standards. CCIR-601 defines the sampling systems, matrix values and filter characteristics for both Y, B-Y, R-Y and RGB component digital television signals.

CCIR-656: (This document now known as ITU-R656). The physical parallel and serial interconnect scheme for CCIR-601. CCIR-656 defines the parallel connector pinouts as well as the blanking, sync and multiplexing schemes used in both parallel and serial interfaces. It reflects definitions found in EBU Tech 3267 (for 625 line systems) and SMPTE 125M (parallel 525 line systems) and SMPTE 259M (serial 525 line systems).

CLIFF EFFECT: (also referred to as the 'digital cliff') This is a phenomenon found in digital video systems that describes the sudden deterioration of picture quality due to excessive bit errors, often caused by excessive cable lengths. The digital signal will be perfect even though one of its signal parameters is approaching or passing the specified limits. At a given moment however, the parameter will reach a point where the data can no longer be interpreted correctly, and the picture will be totally unrecognizable.

COMPONENT ANALOG: The non-encoded output of a camera, video tape recorder, etc., consisting of the three primary colour signals: red, green, and blue (RGB) that together convey all necessary picture information. In some component video formats these three components have been translated into a luminance signal and two colour difference signals, for example Y, B-Y, R-Y.

COMPONENT DIGITAL: A digital representation of a component analog signal set, most often Y, B-Y, R-Y. The encoding parameters are specified by CCIR-601. CCIR-656 and SMPTE 125M specify the parallel interface.

COMPOSITE ANALOG: An encoded video signal such as NTSC or PAL video, that includes horizontal and vertical synchronizing information.

COMPOSITE DIGITAL: A digitally encoded video signal, such as NTSC or PAL video that includes horizontal and vertical synchronizing information.

D1: A component digital video recording format that uses data conforming to the CCIR-601 standard. Records on 19 mm magnetic tape. (Often used incorrectly to refer to component digital video.)

D2: A composite digital video recording format that uses data conforming to SMPTE 244M. Records on 19 mm magnetic tape. (Often used incorrectly to refer to composite digital video.)

D3: A composite digital video recording format that uses data conforming to SMPTE 244M. Records on 1/2" magnetic tape.

EBU (European Broadcasting Union): An organization of European broadcasters that among other activities provides technical recommendations for the 625/50 line television systems.

EBU TECH 3267-E: The EBU recommendation for the parallel interface of 625 line digital video signal. This is a revision of the earlier EBU Tech 3246-E standard, which was in turn derived from CCIR-601.

EDH Error Detection and Handling (EDH) is defined in SMPTE RP-165 as a method of determining when bit errors have occurred along the digital video path. According to RP-165, two error detection checkwords are used, one for active picture samples, and the other on a full field of samples. Three sets of flags are used to convey information regarding detected errors, to facilitate identification of faulty equipment or cabling. One set of flags is associated with each checkword, and the third is used to evaluate ancillary data integrity. The checkwords and flags are combined into a special error detection data packet that is included as ancillary data in the serial digital signal.

EMBEDDED AUDIO: Digital audio is multiplexed onto a serial digital video data stream.

IRIG 200-95   This standard defines the characteristics of six serial time codes presently used by U.S. Government agencies and private industry.

IRIG 205-875   This standard defines the characteristics of parallel time codes presently used by U.S. Government agencies and private industry.

IRIG B   One of six formats of serial time codes defined in the IRIG 200-95 standard. Within this format there are both pulse width modulated and sine wave amplitude modulated formats supported with many different variations. For the purpose of this manual the use of the term IRIG B shall refer only to the B122 (modulated sine wave 1 kHz carrier BCD) and B002 (Pulse width modulated BCD) formats within this standard.

ITU: The United Nations regulatory body governing all forms of communications. ITU-R (previously CCIR) regulates the radio frequency spectrum, while ITU-T (previously CCITT) deals with the telecommunications standards.

ITU-R601:   See CCIR601

PIXEL: The smallest distinguishable and resolvable area in a video image. A single point on the screen. In digital video, a single sample of the picture. Derived from the words *picture element*.

RESOLUTION: The number of bits (four, eight, ten, etc.) determines the resolution of the signal. Eight bits is the minimum resolution for broadcast television signals.

   4 bits = a resolution of 1 in 16.
   8 bits = a resolution of 1 in 256.
   10 bits = a resolution of 1 in 1024.

SERIAL DIGITAL: Digital information that is transmitted in serial form. Often used informally to refer to serial digital television signals.

SMPTE (Society of Motion Picture and Television Engineers): A professional organization that recommends standards for the film and television industries.

SMPTE 125M: The SMPTE standard for bit parallel digital interface for component video signals. SMPTE 125M defines the parameters required to generate and distribute component video signals on a parallel interface.

SMPTE 259M: The SMPTE standard for 525 line serial digital component and composite interfaces.

TRS: Timing reference signals used in composite digital systems. (It is four words long).

TRS-ID: Abbreviation for "Timing Reference Signal Identification". A reference signal used to maintain timing in composite digital systems. (It is four words long.)

4:2:2:   A commonly used term for a component digital video format. The details of the format are specified in the CCIR-601 standard. The numerals 4:2:2 denote the ratio of the sampling frequencies of the luminance channel to the two colour difference channels. For every four luminance samples, there are two samples of each colour difference channel.

CHAPTER 2: INSTALLATION

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2. INSTALLATION

2.1. REAR PANEL

Figure 2-1: 8010TM-IRIG Rear Panel

The following sections describe the purpose of the rear panel connectors of the 8010TM-IRIG. Sections 2.1.1 to 2.1.8 describe the specific signals that should be connected to the 8010TM-IRIG.

2.1.1. Digital Video Connections

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

SDI BYPASS: A BNC connector for output of 10 bit serial digital video signals compatible with the SMPTE 259M standard. This output will normally be the video input with VITC and characters inserted onto it. When the optional SDI bypass relay is activated (on power failure or from the front panel) the SDI BYPASS output will be a direct relay connection to the SDI IN.

SDI OUT: A BNC connector for output of 10 bit serial digital video signals compatible with the SMPTE 259M standard. This output will normally be the video input with VITC and characters inserted onto it. When the optional SDI bypass relay is activated (on power failure or from the front panel) the SDI OUT output will not have any video signal on it.

2.1.2. Analog Monitor Video Connections

The analog composite monitor output is optional and may not be fitted on your unit.

MONITOR OUT: Two BNC connectors for output of the optional composite analog encoder. This output will normally be an analog video copy of the video on the SDI OUT connector. When the optional SDI bypass relay is activated (on power failure or from the front panel) the MONITOR OUT outputs will not have any video signal on them.

2.1.3. Linear Time Code Connections

LTC OUT: A male XLR connector for output of SMPTE/ EBU linear time code from the generator. (Balanced)

2.1.4. IRIG Code Connections

IRIG IN: A female XLR connector for input of IRIG B serial time code for the reader (Balanced)

2.1.5. Tally Connections

FAULT TALLY OUT: A BNC connector for output of a SMPTE 269M fault tally. The output will be open circuit when the 8010TM-IRIG is processing video normally. The output will be grounded when the optional SDI bypass relay is active.

2.1.6. Serial Port Connections

SERIAL: A 9 pin female 'D' connector for connection to the RS-232/RS-422 serial communications. See section 5.2.2 for the information on configuring the port for various applications.

On the 8010TM-IRIG this port is configured at the factory for configured for a 'straight through RS-232 connection to a PC COM port. In this configuration it can be used for uploading firmware to the unit or serial remote control. Table 2-1 shows the pinout of the serial port in its default RS-232 DCE configuration.

Pin #	Name	Description
1	GND	Chassis ground
2	TxD	RS-232 Transmit Output
3	RxD	RS-232 Receive Input
4		
5	Sig Gnd	RS-232 Signal Ground
6		
7	RTS	RS-232 RTS Input
8	CTS	RS-232 CTS Output
9		

Table 2-1: Serial Control Pin Definitions - RS-232 DCE Configuration

This port can also be configured as an RS-422 tributary port for serial control applications. See section 5.2.2 for information on re-configuring the serial port. Table 2-2 shows the pinout of the serial port in its RS-422 Controller configuration.

Pin #	Name	Description
1	GND	Chassis ground
2	Tx-	Transmit A (Tx-) Output
3	Rx+	Receive B (Rx+) Input
4	Tx Gnd	Transmit Signal Ground
5	Spare	Not connected
6	Rx Gnd	Receive Signal Ground
7	Tx+	Transmit B (Tx+) Output
8	Rx-	Receive A (Rx-) Input
9	GND	Chassis ground

Table 2-2: Serial Control Pin Definitions - RS-422 Tributary Configuration

2.1.7. Parallel Remote Control Connections

PARALLEL: A 9 pin D connector located on the rear panel labeled **PARALLEL** provides control inputs and output for remote control of some of the model 8010TM-IRIG functions. There are also two open collector outputs that can be assigned to a variety of functions. When the 8010TM-IRIG is operating in the *time rctl* mode, the functions of these I/O pins is reassigned to provide a method of inputting Remote Control information and encoding it into the user bits. See section 2.6 for information on connecting the parallel inputs and outputs. See sections 3.7.9.2 to 3.7.9.5 for a complete description of the operation of the normal Parallel I/O functions. The pinout of the **PARALLEL** connector when the *GEN MODE* is **NOT** set to *time rctl* mode is as follows:

Pin #	Name	Description
1	GPO 1	General Purpose Output 1
2	GPO 2	General Purpose Output 2
3	GPI 1	General Purpose Input 1
4	GPI 2	General Purpose Input 2
5	JAM Ena	Jam Sync enable
6	Bypass	Enable Bypass Relay
7	VCG Ena	VCG On/Off
8	VITC Ena	VITC generator enable
9	GND	Frame ground

Table 2-3: Parallel Port Pin Definitions – Normal GPIO Functions

See section 3.7.9.1 for a complete description of the operation of the *time rctl* mode. The pinout of the **PARALLEL** connector when the *GEN MODE* is set to *time rctl* mode is as follows:

Pin #	Name	Description
1	RCTL 1	Controls UB GPI bit 1
2	RCTL 2	Controls UB GPI bit 2
3	RCTL 3	Controls UB GPI bit 3
4	RCTL 4	Controls UB GPI bit 4
5	RCTL 5	Controls UB GPI bit 5
6	Bypass	Enable Bypass Relay
7	RCTL 6	Controls UB GPI bit 6
8	VITC Ena	VITC generator enable
9	GND	Frame ground

Table 2-4: Parallel Port Pin Definitions – Time RCTL Mode

2.1.8. Power Connections

LINE: The 8010TM-IRIG has a universal power supply operating on 100 to 240v, 60 or 50 Hz AC. Dual supply versions have an identical redundant supply.

2.2. MOUNTING

The 8010TM-IRIG SDI Time Code Master is equipped with rack mounting angles and fits into a standard 19 inch by 1 3/4 inch (483 mm x 45 mm) rack space. The mounting angles may be removed if rack mounting is not desired.

2.3. POWER REQUIREMENTS

2.3.1. Selecting the Correct Mains Voltage

Power requirements are 100 to 240 volts AC at 50 or 60 Hz. The 8010TM-IRIG has a universal power supply that automatically senses the input voltage. Power should be applied by connecting a 3-wire grounding type power supply cord to the power entry module on the rear panel. The power cord should be minimum 18 AWG wire size; type SVT marked VW-1, maximum 2.5 m in length.

The power entry module combines a standard power inlet connector, two 5 x 20 mm fuse holders and an EMI line filter.

2.3.2. Changing the Fuse

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

✍	**Never replace with a fuse of greater value.**

2.4. CONNECTING THE DIGITAL VIDEO

2.4.1. Video Input

The 8010TM-IRIG requires that a digital video source be connected to the SDI IN video input. The 8010TM-IRIG may be configured to accept either 525 or 625 line digital video in the component (4:2:2) format. The VIDEO TYPE parameter on the front panel menu must be set correctly to match the video input. (See section 3.6.1 for information on changing the VIDEO TYPE setting). When the VIDEO TYPE parameter is set to *422 Auto* the 8010TM-IRIG will automatically detect the video standard of the input.

The Video LED indicator will be On when there is video present matching the selected video type. When it is blinking it indicates that there is video present but the VIDEO TYPE menu item does not match the input video format.

2.4.2. Video Output

The SDI BYPASS and SDI OUT outputs contain the input video with VITC and character data keyed in by the keyer. Connect one of these outputs to any input on your system that accepts 8 or 10 bit SERIAL digital video. The two outputs are identical except that the SDI BYPASS output is protected by the bypass relay. When the relay is active, the SDI BYPASS output is directly connected to the SDI input, and the SDI OUT output will have not video output.

2.5. LINEAR TIME CODE CONNECTIONS

The LTC generator code output is available on an XLR connector at the rear panel. Output level is adjustable from approximately 0.5 V to 4 V using the LTC LEVEL item on the Engineering setup menu system. (See section 3.4.1) The generator code output should be connected to the record input of the time code channel of your video recorder. Pin 1 of the XLR is ground, and pins 2 and 3 provide a balanced output.

2.6. IRIG TIME CODE CONNECTIONS

The IRIG reader input provides a means of bringing serial IRIG B time code into the 8010TM-IRIG. Pin 1 of the XLR is ground, and pins 2 and 3 provide a balanced input. When using an unbalanced input to the reader, the signal should be applied to pin 3 of the IRIG reader input connector. Normally, the unused input (pin 2) should be connected to ground (pin 1).

> **The reading performance of the IRIG reader may be degraded if the phases of a balanced signal are reversed. Therefore it is preferable to use an unbalanced input applied to pin 3 in order to eliminate this phase sensitivity. Pin 2 should be connected to ground in this case.**

2.7. CONNECTING THE GENERAL PURPOSE INPUTS AND OUTPUTS

The 9 pin PARALLEL I/O connector has 6 general purpose inputs and 2 tally outputs. The GPI inputs are active low. This means that if you leave an input floating (not connected) then it will not be activated. Lowering the GPI input to a voltage below 0.8 volts will activate the input. The user can activate GPIs simply by connecting the GPI input pins to Ground using a button, switch, relay or an open collector transistor.

The outputs are internally pulled up to 5 volts. Care must be taken to limit the load to 0.5W so there is no affect on the power supply source in the frame.

Each I/O pin is electrically wired so it can be used as either an input or output. When the pins are used as inputs, the software turns off the output driver transistor. Figure 2-2 shows the circuitry for each of the I/O pins.
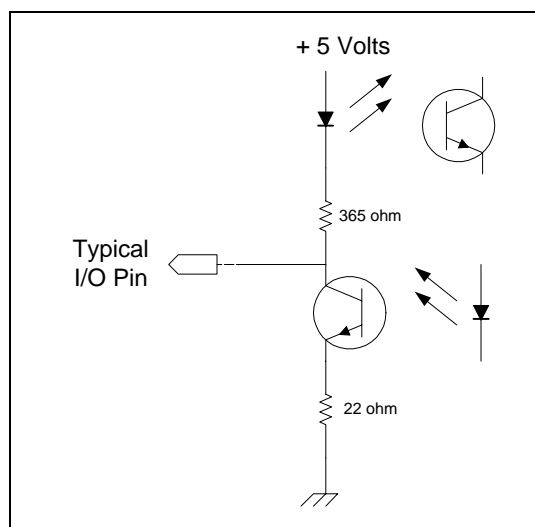
Figure 2-2: Typical GPIO Circuitry.

CHAPTER 3: OPERATION

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3. HOW TO OPERATE THE SDI TIME CODE MASTER

The 8010TM-IRIG is a special purpose time code generator/reader designed to read IRIG-B code commonly in use within the United States government agencies and supporting private industries. The model 8010TM-IRIG SDI Time Code Master combines the latest LSI technology with sophisticated microcontroller firmware to provide a powerful, flexible Serial Digital Video Time Code Master.

3.1. AN OVERVIEW OF KEY AND DISPLAY FUNCTIONS
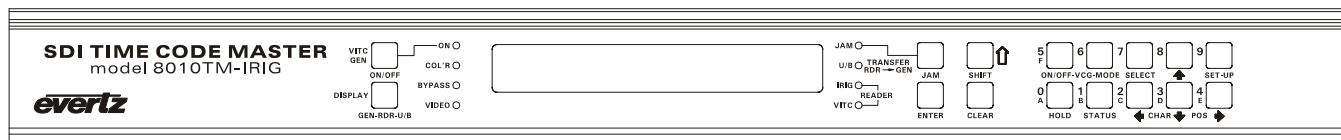
Figure 3-1: Model 8010TM-IRIG Front Panel Layout

The display area consists of a 16 digit alphanumeric display, 8 LED status indicators and a 16 pushbutton keypad.

The keypad is used to control the front panel menu system, to set the generator time and user bits, position the character display windows, and to provide control of the front panel display. When the **SHIFT** key is held down, the meanings of some of the keys are modified, gaining quick access to a wider variety of functions. (Throughout this manual **SHIFT +** indicates that you should hold down the **SHIFT** key while pressing the second key.)

A front panel programming menu provides a quick and simple method of configuring the 8010TM-IRIG for your application. Sections 3.2 to 3.7.16 give detailed information on the specific operations required to control the 8010TM-IRIG.

3.1.1. The Setup Pushbutton Group

The Setup key group consists of the **SELECT, SETUP** and ←, →, ↑, ↓ keys and is used to navigate the front panel programming menu system, and to position character windows.

SETUP   Enters the Setup mode that is used to set up various modes of operation. Pressing **SETUP** again while in this mode exits the Setup mode. (See also section 3.3)

SHIFT + SETUP Enters the Engineering Setup mode that is used to set up various items that are normally only required during installation.

SELECT   When in the Setup mode the SELECT key is used to activate/deactivate sub menus from the drop down menu

⬆ ⬇ ⬅ ➡   When in the Setup mode, the ⬆ ⬇ ⬅ ➡ arrow keys are used to move to various items in the menu system. (See also section 3.3)

When in the VCG window select mode, the arrow keys are used to position the individual character windows on the screen. (See also section 3.6.4.)

When not in the Setup mode or the VCG window select mode, the arrow keys are used to position all the character windows on the screen. (See also section 3.6.5.)

3.1.2. The Character Window Pushbutton Group

CHAR GEN WINDOW   Initiates VCG window select mode and highlights the LTC reader time VCG window. Use the arrow keys to move the window, use the CHAR GEN ON/OFF key to turn the window on or off. Press the WINDOW key again to select the LTC reader user bits VCG window. Press the WINDOW key again to select the next window and so on. The 8010TM-IRIG returns to the normal VCG display mode after the last window has been selected.

CHAR GEN ON/OFF   Turns the character generator ON and OFF. When in the VCG window select mode the CHAR GEN ON/OFF key is used to turn individual windows ON and OFF.

3.1.3. The Function Button Group

VITC GEN   Is used to turn the VITC generator on and off. The VITC indicator is ON when the VITC generator is enabled. The time and user bits of the VITC generator are the same as for the LTC generator.

DISPLAY   Selects what data is being displayed on the front panel. Each time it is pressed it cycles to the next display data. There are also some extended displays which are accessible by pressing the **SHIFT + DISPLAY** keys. See section 3.2 for more information about the front panel displays.

JAM   Is used to momentarily jam the active reader's time into the generator time. When the **SHIFT + JAM** keys are pressed the 8010TM-IRIG generator will be put into continuous jam sync mode. See section 3.5.1 for information about selecting the active reader.

HOLD   When the generator is displayed on the front panel, pressing the **HOLD** key stops the generator time from incrementing. A special character (H) appears to the left of the numeric display on the front panel, indicating that the display is in Hold mode. Pressing the **HOLD** key again starts the generator incrementing.

When the Reader is displayed on the front panel, pressing the **HOLD** key freezes the reader display data on the front panel and in the VCG. A special character (F) appears to the left of the numeric display on the front panel, indicating that the display is in Freeze mode. Press the **HOLD** key again to return to normal update mode.

STATUS   Displays the current operational modes of the 8010TM-IRIG.

3.1.4. An Overview of the SHIFT Key functions

When the **SHIFT** key is held down, the meanings of some of the keys are modified, gaining quick access to a wider variety of functions. Following is a summary of the shifted key functions

SHIFT+SETUP   Enters the Engineering Setup menu system

SHIFT+SELECT   Resets the 8010TM-IRIG to factory defaults when you are in the FACTORY RESET menu item of the Engineering Setup Menu.

SHIFT+DISPLAY   Displays the Jam Sync Offset, and Reader and Generator event registers

3.1.5. Panel Lock Key functions

When the **DISPLAY** and **SHIFT** keys are held down at the same time, pressing the **SELECT** key will lock the front panel. All front panel keys will be disabled and the front panel will display the message

<div align="center">Panel lock on</div>

When the front panel is locked, and the **DISPLAY** and **SHIFT** keys are held down at the same time, pressing the **SELECT** key will unlock the front panel. All front panel keys will be enabled to their normal functions and the front panel will display the message

<div align="center">Panel lock off</div>

3.1.6. An Overview of the Status Indicators

There are 8 status indicators located on the front panel that show operational status of the 8010TM-IRIG at a glance.

VITC GEN   Indicates that the VITC keyer is enabled.

COL'R   Indicates that the 8010TM-IRIG is receiving a valid colour frame reference and is operating in the colour frame mode.

BYPASS   Indicates that 8010TM-IRIG is operating in the Bypass Mode. The SDI video input is directly connected to the SDI Bypass output and the 8010TM-IRIG will have no effect on the video signal.

VIDEO   Indicates that input video is present. If it is blinking, it indicates a video signal is present but the video standard is different from the *VIDEO TYPE* menu setting. (See section 3.7.1 for information on selecting the video type).

JAM   Indicates that the generator is operating in the continuous Jam Sync Mode.

U/B TRANSFER Indicates that the Generator User Bits are being transferred from the active reader's time or user bits.

IRIG READER   Indicates that IRIG reader is reading valid code.

VITC READER Indicates that VITC reader is reading valid code.

3.2.   FRONT PANEL DISPLAY FUNCTIONS

3.2.1. Front Panel Displays

The **DISPLAY** key is used to select which data is being displayed in the alphanumeric display. Each time the **DISPLAY** key is pressed, the front panel display cycles to the next available display. The leftmost characters of the display indicate what is being displayed as follows:

```
GTM  12:34:56:00    Generator Time information
GUB  12 34 56 78    Generator User Bit information
ITM  12:34:56:00    IRIG Reader Time information
IUB  12 34 56 78    IRIG Reader User Bit information
VTM  12:34:56:00    VITC Reader Time information
VUB  12 34 56 78    VITC Reader User Bit information
```

When the reader time or user bits are being displayed the active reader will be indicated by an asterisk (e.g. `ITM*` indicates that the IRIG reader is active. `VTC*` indicates that the VITC reader is active) See section 3.5.1 for more information on selecting which reader is active.

There are also some extended displays which are accessible by pressing the **SHIFT + DISPLAY** keys. Press **SHIFT + DISPLAY** to return to the normal displays. At this time the extended displays are:

```
OFFS 00:00:00:00    Jam Sync Offset register
REVT 00:00:00:00    Time at which Reader Time Event GPO will occur
GEVT 00:00:00:00    Time at which Generator Time Event GPO will occur
JAM@ 00:00:00:00    Reader Time at which a momentarily jam will occur
```

3.2.2. Special Front Panel Indicators

The following special indicators are used between the seconds and frames digits of the front panel time display to identify non-drop frame and drop frame code (NTSC only)

Non Drop Frame   Colon (:)
Drop Frame (NTSC) Period (.)

The following special indicators are used between the hours and minutes digits of the front panel time display when the 8010TM-IRIG is in Time/Date mode generating local time and the time s being adjusted for Daylight Saving Time

DST Time Off	Colon (:)
DST Time On	Period (.)

3.3.   AN OVERVIEW OF THE FRONT PANEL PROGRAMMING MENU

The key to the operational flexibility of the 8010TM-IRIG lies in the front panel programming menu system. The programming menu system uses the 16 digit alphanumeric display and provides a quick, intuitive method of configuring 8010TM-IRIG, guiding you to the correct setup for your application. The six keys in the Setup key group (**SELECT**, **SETUP, ← → ↑ ↓**) are used to cycle through the various items on the programming menu.

The 8010TM-IRIG menu system consists of a main menu with two or more choices for each menu item. The sub menu items are shown in lower case to allow them to be easily distinguished from the main level items.

To enter the front panel programming menu, press the **SETUP** key. The two vertical arrow keys (↑, ↓) allow you to move vertically within the menu tree. When you have selected the desired menu item, press the → key to reveal the choices for that item. The choice that is currently selected will be blinking. When you have selected the desired sub menu choice press the **SELECT** key to save your choice. When you have made all the desired changes, press the **SETUP** key to return to the normal display mode.

Table 3-1 shows the different items in the main level of the 8010TM-IRIG menu tree. Sections 3.4 to 3.6 provide detailed descriptions of each of the sub menus. The tables in these sections are arranged in an indented structure to indicate the path taken to reach the control.

GEN MODE	Sets the operating mode of the LTC and VITC generators.
GEN VITC TC LINE	Sets the line number of the SMPTE VITC Generator
GEN IRIG LINE	Sets the line number of the IRIG VITC Generator
GEN DROP FRAME	Configures the generator drop frame mode
GEN COLOUR FRAME	Configures the generator colour frame mode
GEN LTC PARITY	Configures the parity of the LTC generator
GEN NO CODE JAM	Configures the action when input code is missing and the 8010TM-IRIG is in continuous JAM sync mode
GEN TM ZONE ADJ	Sets whether the 8010TM-IRIG is generating Local or UTC time
RDR ASSIGNMENT	Sets whether the primary reader will read IRIG or VITC
IRIG RDR MODE	Sets the operating mode of the IRIG reader.
IRIG RDR DISPLAY	Selects whether look-ahead processing is applied to the IRIG reader.
VITC RDR MODE	Sets the operating mode of the VITC reader.
VITC RDR START	Sets the first line number for the VITC Reader line range
VITC RDR END	Sets the second line number for the VITC Reader line range
VITC RDR DISPLAY	Selects whether look-ahead processing is applied to the VITC reader.
CHAR SIZE	Sets the Character generator character size
CHAR STYLE	Sets the Character generator character style
VCG FRAMES	Turns the Character generator Time code Frames display on or off
VCG FIELDS	Turns the Character generator Time code Fields display on or off
VCG SYMBOLS	Turns the Character generator Window Symbols on or off
BYPASS MODE	Activates the SDI Bypass relay

Table 3-1: Overview of the 8010TM-IRIG Main Programming Menu

3.4. PROGRAMMING THE GENERATOR MODES

The first eight items on the programming menu are used to program various generator modes such as selecting Drop Frame, Colour Frame, Jam Sync Modes, VITC Generator Line numbers, whether user bits contain static numbers or time information, etc. The following descriptions appear in the order they appear on the menu.

3.4.1. Configuring the Generator Mode

GEN MODE
> *Gmode time data*
> *Gmode time rtime*
> *Gmode time rub*
> *Gmode time date*
> *Gmode convert*
> *Gmode time rctl*

The *GEN MODE* menu item is used to select the type of information that is contained in the time and user bits of the generator. When the 8010TM-IRIG is not in the Jam sync mode, the generator Time bits contain time information entered from the front panel. When the 8010TM-IRIG is in the continuous Jam Sync mode, the time bits are slaved to the reader time.

Gmode time data configures the user bits for entering numeric data entered from the front panel.

Gmode time rtime transfers the active reader's time bits to the generator user bits. (See section 3.5.1 for information on selecting the active reader) The *U/B TRANSFER* LED will be on. Transferring reader time is useful when you want to record new continuous time code numbers and still retain the original time code numbers for future reference.

Gmode time rub transfers the reader's user bits to the generator time bits. (See section 3.5.1 for information on selecting the active reader) The *U/B TRANSFER* LED will be on. Transferring the reader user bits is used when reader time data previously transferred to user bits as above, or other user bit information must be retained when recording new code. When used in conjunction with the continuous Jam Sync mode, both the time and user bits will be transferred to the new tape.

Gmode convert sets the 8010TM-IRIG into a 25 ⇔ 30 time code conversion mode useful in standards converter applications. (often referred to as EBU and SMPTE time codes respectively) In convert mode incoming time code from the active reader in the input video standard is converted to time code in the output video standard. The generator time is compared to the active reader's time. When the two times disagree by more than the *JAM WINDOW* parameter, the Generator time is jammed from the reader time, taking into account the frame numbering differences of 30 Fps and 25 Fps time code. The frames run at the normal frame rate of the output video standard. The JAM LED will come on each time the Generator resynchronizes to the Reader. A jam sync offset can be set using the method outlined in section 3.3.4.

✎ **When translating from 30 Fps TO 25 Fps code, the input code <u>must</u> be in the Drop Frame format. When translating from 25 Fps to 30 Fps code, the Generator DROP FRAME mode <u>must</u> be set to DROP FRAME. (See section 3.4.13)**

Gmode time rctl sets the 8010TM-IRIG into a user bit remote control mode. In this mode six of the input pins on the parallel remote control port are used to control the setting of the six remote control user bits. When the 7721GPI-D GPI decoder module reads the VITC, these encoded user bits directly control six contact closure outputs. When the 8010TM-IRIG is placed into the *TIME RCTL* mode, special binary group flags are set, signaling the remote control mode to the decoder. This allows an extra level of security at the decoder and ensures that random user bit patterns do not inadvertently activate the contact closure outputs of the decoder.

When the user selects the remote control mode, the generator user bits will be set to

                    XX 80 80 93

Where the value of XX depends on the states of the remote control input pins. See Table 3-3.

3.4.2. Setting the Generator Time

When the 8010TM-IRIG generator is not operating in the *Convert 25 ⇔ 30* mode, the user can set the generator time using the following procedure. Press the **DISPLAY** key one or more times to display the generator time if it is not already displayed. The display prompt will show GTM when generator time is being displayed. Press **GEN HOLD** key (when the Generator is being displayed on the front panel) to start or stop the generator clock. In the continuous jam sync mode, the generator will be slaved to incoming code from the reader. The **ENTER** and **CLEAR** keys are used in conjunction with the numeric keys to set the generator time.

> ✍ **When entering time data make sure that the generator is not in the continuous JAM SYNC mode (indicated when the JAM LED is on). If it is, press SHIFT + JAM to return to free run mode.**

Press the **ENTER** key to recall the last time that you entered into the generator. The display prompt at the left of the display will blink while data entry mode is active, and the dual functioned keys are now changed to their numeric values. If you want to re-enter this time press the **ENTER** key to complete the data entry into the generator time
.
Pressing any numeric key will clear the previous value and place the new value into the numeric display, starting at the right. Unentered digits are assumed to be zero, hence leading zero digits are not required. When the required number of digits are entered, then press the **ENTER** key to complete the data entry into the generator time.

Attempts to enter too many digits, or make illegal entries, i.e. 65 minutes, will result in the display returning to the last valid time entry made. Re-enter the correct value and press the **ENTER** key. Pressing the **CLEAR** key will cancel the data entry mode without changing any data.

The numeric keys return to their normal display functions when the data entry has been completed by pressing **ENTER** or cancelled by pressing the **CLEAR** key. The display prompt will return to its steady On state when data entry mode has been completed.

✍ | **Numeric entry mode must be terminated (GTM will be On steady) before any of the front panel keys will resume normal operation.**

3.4.3. Setting the Generator User Bits

When the 8010TM-IRIG generator is operating in the t*ime data* mode, the user can set the generator user bits using the following procedure. Press the **DISPLAY** key one or more times to display the generator user bits if they are not already displayed. The display prompt will show GUB when user bits are displayed. When the 8010TM-IRIG is in the *time date* mode, the user can enter date information as described in section 3.4.7.

When the 8010TM-IRIG is in the *time rtime* or *time rub* modes, the user bits are being transferred from the active reader. When the 8010TM-IRIG is in the *time rctl* mode, the user bits are determined by the state of the parallel remote control inputs. When the Attempts to enter user bits manually from the front panel will not be allowed.

The **ENTER** and **CLEAR** keys are used in conjunction with the numeric keys to set the generator user bits.

Press the **ENTER** key to recall the last User Bits that you entered into the generator. The display prompt at the left of the display will blink while data entry mode is active, and the dual functioned keys are now changed to their numeric values. If you want to re-enter these User Bits press the **ENTER** key to complete the data entry into the generator.

Pressing any numeric key will clear the previous value and place the new value into the numeric display, starting at the right. Pressing the **SHIFT** key and the numeric keys 0 to 5 will enter the corresponding hexadecimal values A to F. Unentered digits are assumed to be zero. When the required number of digits are entered, press the **ENTER** key to complete the data entry into the generator User Bits.

Attempts to enter too many digits will result in the display being blanked. Re-enter the correct value and press the **ENTER** key. Pressing the **CLEAR** key will cancel the data entry mode without changing any data.

The numeric keys return to their normal functions when the data entry has been completed by pressing the **ENTER** key or cancelled by pressing the **CLEAR** key. The display prompt will return to its steady On state when data entry mode has been completed.

✍ | **Numeric entry mode must be terminated (GUB will be On steady) before any of the front panel keys will resume normal operation.**

3.4.4. Jam Syncing the Generator to the Reader

Pressing the **JAM** key transfers the active reader's time into the generator clock, then releases the clock to run on its own. This mode is known as 'momentary Jam sync'. (See section 3.5.1 for information about selecting the active reader.)

The generator time may be continuously slaved, or 'Jam synced' to data coming from the active reader by pressing the **SHIFT+JAM** keys. The JAM LED will be on when Jam sync is enabled. Pressing the **SHIFT+JAM** keys again terminates the Jam sync mode. An alternate method of controlling the jam sync mode is to close Jam Sync Enable remote control input to ground. (See section 3.7.9.1) for a full description of the parallel remote control inputs.

Jam sync mode should be used when you need to generate D-VITC that follows an LTC source time code. In this mode the 8010TM-IRIG will function as an LTC to D-VITC translator. (8010TM only)

Jam sync mode should be also used when dubbing longitudinal time code from one tape to another, as the quality of the time code signal deteriorates with each generation, and will become unusable after the third generation.

When the time information is being jammed the generator and active reader's times are compared with each other during each frame, automatically compensating for the value programmed into the *OFFSET* register. If for any reason they are not equal, the jam is bypassed, and the generator substitutes the next frame number. The *JAM* indicator will blink off when a jam error is encountered. If the number of consecutive jam bypass errors exceeds 5, the last valid active reader's time is jammed into the generator again with the programmed *OFFSET*. In the absence of valid reader data within the last 5 frames, the generator operates according to the programmed *NO CODE JAM* mode (*HOLD* = generator stops; *RUN* = generator increments normally; or *MUTE* = generator turns off) until valid reader code resumes. At this time it will be re-jammed to the reader, thus repairing large dropouts on the reader tape. (See section 3.4.12 for a full description of the *NO CODE JAM* modes.)

The drop frame and colour frame modes of the code being read are transferred to the generator during jam sync. The formatted modes return when the Jam sync mode is terminated.

The *OFFSET* register for the Continuous Jam Sync mode allows you to apply a continuous offset between the generator and reader numbers when you are in continuous Jam sync mode. The value entered into the Offset register will be added to the reader time before it is jammed into the generator. Offset values other than 00:00:00:00 usually indicate that the generator is leading the reader. In order for the generator to lag behind the reader, enter a value equal to 24:00:00:00 minus the lag offset desired.

3.4.5. Time Date Mode

In *time date* mode the 8010TM-IRIG puts date and time zone information into the user bits. It is capable of displaying time/date information in either the Universal Coordinated Time (UTC) or the local time that has been adjusted with the appropriate time zone offset from UTC. In local time mode, the generator encodes the time and date adjusted for the local time zone offset from UTC. In local time mode, the time is also adjusted for Daylight saving time when the *DST TIME* menu setting is set to *On*. In UTC mode, the generator encodes the UTC time and date.

3.4.6. Entering the Time in Time Date Mode

When the generator mode is in *time date* mode, the entered generator time is the UTC time not the Local time. Follow the procedure outlined in section 3.4.2 to enter the time.

3.4.7. Setting the Generator User Bits in Time Date Mode

When the generator mode is in *time date* mode, a special four-step process is used to enter the user bits. The date entered is the UTC date not the Local date. First you will enter the year, then the month, then the day, then a time zone offset.

Press the **DISPLAY** key one or more times to display the generator user bits if they are not already displayed. The display prompt will show GUB when user bits are displayed. The **ENTER** and **CLEAR** keys are used in conjunction with the numeric keys to set the generator user bits, in date format.

Press the **ENTER** key to recall the last year that you entered. The leftmost digits of the display will indicate YEAR. The display prompt at the left of the display will blink while data entry mode is active, and the dual functioned keys are now changed to their numeric values. If you want to re-enter this year press the **ENTER** key. Pressing any numeric key will clear the previous value and place the new value into the numeric display, starting at the right.

When you have entered the correct four digit year, press the **ENTER** key to proceed to month entry. The leftmost digits of the display will indicate MONTH. The last month you entered will be shown. If you want to re-enter this month, press **ENTER**, otherwise press the numeric keys to enter a valid month.

When you have entered the correct two digit code for the month, press the **ENTER** key to proceed to day entry. The leftmost digits of the display will indicate DAY. The last day you entered will be shown. If you want to re-enter this day, press **ENTER**, otherwise press the numeric keys to enter a valid day.

When you have entered the correct two digit code for the day, press the **ENTER** key to proceed to time zone entry. The time zone is used to adjust the UTC internal clock to allow the generator to output local time. It is also encoded into the user bits to allow reading devices to compensate for various time zones. Time zones are entered as an hour and minute offset, but are actually encoded in the user bits as a 2-digit code according to the table 1 in Appendix A.

The leftmost digits of the display will indicate TIME ZONE. The last time zone you entered will be shown as +/-HH:MM where HH represents the whole hour time offset and MM indicates the minutes offset for time zones where there are partial hours. The +/- sign indicates if the time is ahead or behind UTC. If you want to re-enter this time zone offset, press **ENTER.** To change the whole hour offset press the ⬆ or ⬇ keys. To change the partial hour offset press the ⬅ or ➡ keys. The 8010TM-IRIG will only allow valid time zone offsets to be selected. If daylight saving time is observed in your area, then you should enter the time zone offset for standard time. You can set up the daylight savings time adjustment using the procedure outlined in section 3.7.8.

When you have selected the correct time zone offset, press the **ENTER** key to complete the data entry process. The numeric keys return to their normal functions when the data entry has been completed by pressing the **ENTER** key or canceled by pressing the **CLEAR** key. The display prompt will return to GUB when data entry mode has been completed.

3.4.8. Daylight Saving Time Support

Daylight Saving Time (DST) or Summer Time as it is called in many countries, is a way of getting more out of the summer days by advancing the clocks by one hour during the summer. Then, the sun will appear to rise one hour later in the morning when people are usually asleep anyway, at the benefit of one hour longer evenings when awake: The sunset and sunrise are one hour later than during normal time.

To make DST work, the clocks have to be adjusted one hour ahead when DST begins, and adjusted back one hour to standard time when DST ends. There are many countries observing DST, and many who do not.

During the months March/April to September/October, the countries in the Northern Hemisphere are having their summer and may observe DST, while the countries in the Southern Hemisphere are having winter. During the rest of the year (September/October to March/April) the countries in the Southern Hemisphere are having their summer and may observe DST, while the countries in the Northern Hemisphere are having winter.

Daylight Saving Time is difficult to predict, as many countries change the transition days/principles every year because of special happenings or conditions that have happened or will happen.

How does the transition to DST start?
Let's say that DST starts at 2:00 am local time and DST is one hour:

DST start transition		
Local time HH:MM:SS	DST or normal?	Comments
01:59:58	normal	
01:59:59	normal	
03:00:00	DST	DST started, time advanced by one hour
03:00:01	DST	
03:00:02	DST	

Note that local time is never anything between 2:00:00 - 2:59:59 at the transition from standard time to DST, this hour is skipped and therefore this day has only 23 hours (instead of 24 hours).

How does the transition to DST end?
Let's say that DST ends at 2:00 am local time and DST is one hour ahead of normal time:

DST end transition		
Local time HH:MM:SS	DST or normal?	Comments
00:59:59	DST	
01:00:00	DST	
01:00:01	DST	
...3556 seconds from 01:00:02 to 01:59:57 daylight saving time not shown...		
01:59.58	DST	
01:59.59	DST	

01:00:00	Normal	Time is turned back to normal
01:00:01	Normal	
...3556 seconds from 01:00:02 to 01:59:57 standard time not shown...		
01:59.58	Normal	
01:59:59	Normal	
02:00:00	Normal	
02:00:01	Normal	

Note that local time between 1:00:00 and 1:59:59 actually is repeated twice this day, first during DST time, then clocks are turned back one hour to normal time, and the hour is repeated during standard time and therefore this day has 25 hours (instead of 24 hours). To avoid confusion when referring to time within this hour, it is important to tell whether it happened before of after the change back to normal time. For further information about daylight saving time in your area consult the web page http://www.timeanddate.com/time/aboutdst.html.

For information about enabling DST compensation see section 3.7.8

3.4.9. 25 ⇔ 30 Convert Mode

The 8010TM can be operated in a 25 ⇔ 30 time code conversion mode. (Often referred to as EBU and SMPTE time code respectively) This feature would normally be used to convert time code in standards conversion applications. In convert mode incoming active reader's time code in the input video standard is converted to time code in the output video standard. The 8010TM is connected to video in the output video standard. The hours, minutes and seconds of the output code are jam synced to the input code. The frames run at the normal frame rate of the output video standard.

The 8010TM *OFFSET* register can be used to enter a frame offset to account for frame delays in the standards converter.

The system configuration drawings below show how the system will be configured in the translate mode of operation.

✎ | **When converting from 30 Fps TO 25 Fps code, the input code must be in the Drop Frame format. When converting from 25 Fps to 30 Fps code, the Generator DROP FRAME mode must be set to DROP FRAME. (See section 3.4.13)**

The JAM WINDOW parameter has been added to the Engineering Setup menu. This parameter is used to ignore the natural differences between 30 Fps and 25 Fps frame numbers within the second. The frame counting rates of 25 Fps and 30 Fps along with the natural difference between the video rates of 29.97 and 30 Fps (taking into account the dropped frames) produce an acceptable difference between the 25 Fps and 30 Fps frame numbers during a given second. Any difference between the active reader's input and the generated time code output numbers (accounting for any programmed *OFFSET*) will cause the generator to resynchronize to the reader in translate mode. Under normal circumstances the factory default setting of "6" frames should be adequate.

Example 1:
```
Offset:          00:00:01:00
Reader:          01:00:00:00
Generator:       01:00:01:00
```

Example 2:
```
Offset:          23:59:59:00
Reader:          01:00:00:00
Generator:       00:59:59:00
```

> **In order to Jam sync the generator time to exactly to the reader time make sure the OFFSET is set 00:00:00:00**

To access the *OFFSET* register press the **SHIFT+DISPLAY** buttons one or more times. The display prompt will be `OFFS`. The **ENTER** and **CLEAR** keys are used in conjunction with the numeric keys to set the value stored in the OFFSET register.

3.4.10. Turning the VITC Generator On

The **VITC GEN ON/OFF** key is used to turn the VITC keyer on and off. (You must exit the Setup menu to turn the VITC generator on or off.) When the VITC generator is Off, the program video passes through the VITC keyer with nothing added. When the VITC generator is On, the VITC will be added to the program video.

3.4.11. Selecting the Lines to Record SMPTE VITC On.

```
GEN VITC TC LINE
  Gvitc vitc ln = 10
```

The *GEN VITC TC LINE* menu item is used to select the line on which the SMPTE VITC Time Code will be inserted. The 8010TM-IRIG keeps track of the lines for both the 525 and 625 video standards, you will have to set the line number separately for each video standard.

When the *GEN VITC TC LINE* sub menu is first selected, the current number will be shown. Press the left and right (←,→) keys to change line number. The user will have to determine by experience the most suitable line for recording VITC according to the following criteria.

In order to protect the VITC reading process against dropouts, the VITC is usually repeated on 2 non-adjacent lines of the video signal, not earlier than line 10 (6 for PAL) or later than line 32. The user should choose the line numbers so that the SMPTE VITC line and the IRIG VITC line are on non-adjacent line numbers. For certain recordings, the use of some of these lines may interfere with other signals inserted into the vertical interval.

3.4.12. Selecting the Lines to Record IRIG Encoded VITC On.

```
GEN IRIG LINE
    Gvitc irig In = 10
```

The *GEN IRIG LINE* menu item is used to select the line on which the IRIG encoded VITC will be inserted. The 8010TM-IRIG keeps track of the lines for both the 525 and 625 video standards, you will have to set the line number separately for each video standard.

When the *GEN IRIG LINE* sub menu is first selected, the current number will be shown. Press the left and right (←,→) keys to change line number. The user will have to determine by experience the most suitable line for recording VITC according to the following criteria.

In order to protect the VITC reading process against dropouts, the VITC is usually repeated on 2 non-adjacent lines of the video signal, not earlier than line 10 (6 for PAL) or later than line 32. The user should choose the line numbers so that the SMPTE VITC line and the IRIG VITC line are on non-adjacent line numbers. For certain recordings, the use of some of these lines may interfere with other signals inserted into the vertical interval.

3.4.13. Selecting the Generator Drop Frame Mode (NTSC only)

In the NTSC (525 line) video standard, the frame rate of approximately 29.97 frames per second causes an error between real time and 'colour time'. To overcome this problem, the drop frame mode was created. This mode compensates for the approximate 4 minute per day error by dropping the first two frame counts (0, 1) at the start of each minutes, except minutes 0, 10, 20, 30, 40, and 50. A drop frame flag bit is set in the code when the drop frame format is used. When the 8010TM-IRIG is operating in the NTSC (525 line) video standard, the generator may be programmed to operate in either the drop frame or non drop frame mode.

GEN DROP FRAME
Drop frame off
Drop frame on
Drop frame jam
No drop in 625

The *GEN DROP FRAME* menu item is used to the desired drop frame mode for the generator.

Select *Drop frame off* to configure the generator in the non-drop frame or 'full frame' mode.

Select *Drop frame on* to configure the generator in the drop frame mode.

When the 8010TM-IRIG is in the continuous Jam Sync mode, the generator drop frame mode is the same as the incoming time code data. The Drop Frame sub menu shows *Drop frame jam*.

When the 8010TM-IRIG is operating in the 625 line video standard, the Drop Frame sub menu shows *No drop in 625*.

When the 8010TM-IRIG is operating in *time date* or *Convert* mode in the 525 line video standard, it should be operated in the Drop Frame mode so that the time base is as close as possible to real time.

When the 8010TM-IRIG-IRIG is in the continuous Jam Sync mode in the 525 line video standard, and the active reader is set to *IRIG DAY* mode, the generator drop frame mode will be On so that the time base is as close as possible to real time. The Drop Frame sub menu shows *Drop frame jam*.

When the 8010TM-IRIG-IRIG is operating in momentary jam mode in the 525 line video standard and the active reader is set to *IRIG DAY* mode, it should be operated in the Drop Frame mode so that the time base is as close as possible to real time.

3.4.14. Selecting the Generator Colour Frame Mode

In most applications the 8010TM-IRIG will be gen-locked to the program video. It is also necessary to supply an external colour reference if you desire to apply colour frame synchronization to the generated time code. This reference is not required when the generator is operated in the 2 field mode.

When the video standard is 525:

GEN COLOUR FRAME
Col'r frame 2 fld
Col'r frame 4 fld

The *GEN COLOUR PHASE* menu item is used to adjust the colour phase relationship of the time code to the colour frame reference when the 8010TM-IRIG is operated in colour frame mode. This adjustment is necessary to compensate for frame delays in digital to analog encoders used in the system.

Select *Col'r frame 2 fld* to configure the generator in the non colour frame mode. This is the normal mode for component applications. It is not necessary to connect a colour reference in the 2 fld mode.

Select *Col'r frame 4 fld* to configure the generator in the colour frame mode. An RS-170A colour reference signal must be applied to the Col'r Ref BNC loop in the rear panel. The Front panel COL'R FRM indicator will be on and code generated will have the colour flag bit set indicating that the generator numbers are properly synchronized to the NTSC 4 field sequence.

When the video standard is 625:

When the video standard is 625 the 8010TM-IRIG must get its colour frame information from the External Colour frame reference input. The COL'R REF LED will be on.

GEN COLOUR FRAME
Col'r frame 2 fld
Col'r frame 4 fld
Col'r frame 8 fld

The *GEN COLOUR PHASE* menu item is used to adjust the colour phase relationship of the time code to the colour frame reference when the 8010TM-IRIG is operated in colour frame mode. This adjustment is necessary to compensate for frame delays in digital to analog encoders used in the system.

Select *Col'r frame 2 fld* to configure the generator in the non colour frame mode. This is the normal mode for component applications. It is not necessary to connect a colour reference in the 2 fld mode.

Select *Col'r frame 4 fld* to configure the generator in the 4 field PAL mode. A PAL 4 field reference signal must be applied to the Col'r Ref BNC loop in the rear panel. The Front panel COL'R FRM indicator will be on and code generated will have the colour flag bit set indicating that the generator numbers are properly synchronized to the PAL 4 field sequence.

Select *Col'r frame 8 fld* to configure the generator in the colour frame mode. A PAL 8 field colour reference signal must be applied to the Col'r Ref BNC loop in the rear panel. The Front panel COL'R indicator will be on and code generated will have the colour flag bit set indicating that the generator numbers are properly synchronized to the PAL 8 field sequence.

> **When the component video is encoded into NTSC or PAL video, there may be frame delays encountered. These will change the colour frame relationship of the time code with respect to the video. The colour frame phase can be adjusted by using**

| the *GEN COLOUR PHASE* item of the Engineering menu. |

✎ | **Special precautions should be taken when operating in the continuous jam sync mode.**

When the colour frame mode is selected, and the code from the reader does not have the colour flag set, the generator will maintain a 2 field lock only.

If the 8010TM-IRIG generator is being operated in the colour frame mode, and the reader code has the colour flag set, the jam sync process will compare the colour framing of the reader code against the generator. If the colour framing of the two do not agree, the JAM indicator will flash on and off at a regular rate. Therefore, if the playback VTR does not have a colour framer built in, the 2 field mode of operation should be selected. |

3.4.15. Generator Parity Mode Selection

The purpose of the phase correction parity bit (LTC bit 27 in NTSC, 59 in PAL) is to compensate for phase reversals in the LTC bi-phase mark modulation that could occur when code inserts are performed. Use of the bi-phase mark parity bit is optional as some readers may not recognize its presence.

| *GEN LTC PARITY*
Ltc parity off
Ltc parity on |

The *GEN LTC PARITY* item controls the parity mode of the generator.

Select *Ltc parity off* to configure the generator for the non parity mode. The bi-phase mark parity bit will be always set to zero.

Select *Ltc parity on* to configure the generator for the parity mode. The bi-phase mark parity bit will be put in a state where every 80 bit word will contain an even number of logic zeros, in order that the magnetization transient between bit cell 79 of one word and bit cell zero of the next shall always be in the same direction.

3.4.16. Configuring how the Continuous Jam Sync Mode Works when there is no Reader Code

GEN NO CODE JAM
No code jam run
No code jam hold
No code jam mute

The *GEN NO CODE JAM* item controls the operation of the continuous jam sync mode when there is no incoming code.

Select *No code jam run* when you want the generator to free run when there is no incoming Reader code. When the reader code resumes, the generator will re-jam to the incoming code. Using this mode will allow the user to repair large dropouts in the incoming code. The generated code will be continuous if the incoming code is also continuous.

Select *No code jam hold* when you want the generator to stop when there is no incoming Reader code. When the reader code resumes, the generator will re-jam to the incoming code. Use this mode if you want the output of the generator to stop on the last number read when you stop the tape machine supplying the incoming code to the reader.

Select *No code jam mute* when you want to turn off the generator when there is no incoming Reader code. The generator time will stop at the last number read. When the reader code resumes, the generator will turn on and re-jam to the incoming code. Use this mode if you want the output of the generator to turn off completely when you stop the tape machine supplying the incoming code to the reader.

3.4.17. Configuring Whether the Generator will Output Local Time or UTC Time in Time/Date Modes

GEN TIME ZONE ADJ
Gtm zone adj utc
Gtm zone adj loc

When the *GEN MODE* is set to *TIME DATE*, the generator internal time clock runs in Universal Coordinated Time (UTC).   The *GEN TIME ZONE ADJ* menu item is used to select whether the Generator will output UTC or UTC adjusted by the programmed Time Zone Offset (Local Time). The local time will also be adjusted by the daylight savings time adjustment if daylight savings time is in effect. See section 3.4.8 for a discussion of daylight saving time features of the 8010TM-IRIG.

Select *Gtm zone adj utc* to configure the generator to output its time as UTC

Select *Gtm zone adj loc* to configure the generator to output its time as UTC adjusted by the programmed Time Zone Offset and Daylight saving adjustment if *DST Time is On.*(Local Time)

3.5. READER FUNCTIONS

3.5.1. Setting the Active Reader – Reader Assignment

```
RDR ASSIGNMENT
    Rass auto (irig)
    Rass *irig* vitc
    Rass irig *vitc*
```

The *RDR ASSIGNMENT* menu is used to select whether the IRIG or VITC the reader will be used in the momentary and continuous Jam Sync modes. The reader that is active will have an asterisk (*) displayed beside its name on the front panel display. The reader data from the inactive reader will still be visible from the front panel and VCG windows but will have no effect on the generator time in the jam sync modes, or user bits in the user bit transfer modes.

Select *Rass auto* to configure the reader to automatically switch between IRIG serial time code and Vertical Interval Time Code (VITC) reading. The reader can be set to recover VITC from a specific range of video lines. The current active reader will be shown in brackets.

Select *Rass *irig* vitc* to configure the IRIG serial time code (LTC) as the active reader.

Select *Rass irig *vitc** to configure the Vertical Interval Time Code (VITC) as the active reader.

3.5.2. Configuring the Selecting the Format of the IRIG Reader Time and User Bit Data

```
IRIG RDR MODE
    IR mode irig day
    IR mode irig data
```

The *IRIG RDR MODE* menu item is used to select the type of information that is contained in the time and user bits of the IRIG reader.

Select *IR mode irig day* for normal operation. The IRIG time will be placed into the time buffers and shown as a time value including milliseconds. The day of the year information will be placed into the user bits reader buffer and shown as a day value.

Select *IR mode irig data* for debugging applications. The raw IRIG time and user bits will be both be displayed as numeric data.

3.5.3. Controlling the IRIG Reader 'Look ahead' Compensation

```
IRIG RDR DISPLAY
    IR disp process
    IR disp direct
```

The *IRIG RDR DISPLAY* menu item is used to select whether the normal 'look ahead' compensation for IRIG reader dropouts is active or not. Normally, the data is read in one frame and displayed with an 'add 1 frame' compensation.   In some operational modes it is desirable to disable this feature and to display exactly what is being read. The topmost positions of the character generator are not available when in the direct mode.

Select *IR disp direct* to enable *DIRECT* display mode.   Data is displayed exactly as it is read without 'look ahead' compensation. Displays from the IRIG reader will be 1 frame late and cannot be positioned at the very top of the raster. *DIRECT* mode is usually used for diagnostic purposes only.

Select *IR disp process* to enable normal 'look ahead' compensation. Displays from IRIG reader will be 'on time' but will **NOT** follow code discontinuities immediately. *PROCESSED* mode should be used for normal operations.

3.5.4. Configuring the Selecting the Format of the VITC Reader Time and User Bit Data

```
VITC RDR MODE
    VR mode time data
    VR mode data data
    VR mode irig day
    VR mode irig data
```

The *VITC RDR MODE* menu item is used to select the type of information that is contained in the time and user bits of the VITC reader. It also selected whether the VITC reader will read the normal SMPTE Time code VITC or the IRIG encoded VITC

Select *VR mode time data* to read the normal SMPTE time code. The time bits will be displayed as a time value and the user bits will be displayed as eight hexadecimal values.

Select *VR mode data data* to display the raw data from the normal SMPTE time code. The time bits and the user bits will both be displayed as eight hexadecimal values.

Select *VR mode irig day* for a normal display of the IRIG encoded VITC. The IRIG time will be placed into the time buffers and shown as a time value including milliseconds. The day of the year information will be placed into the user bits reader buffer and shown as a day value.

Select *VR mode irig data* to display the raw data from the IRIG encoded VITC. The time bits and the user bits will both be displayed as eight hexadecimal values.

3.5.5. Setting The VITC Reader Line Range

> *VITC RDR START*
> *Start line = xx*

The *VITC RDR START* and *VITC RDR END* menu items are used to select the lines that are enabled for VITC reading. VITC reading is enabled between the lower and higher line numbers shown (inclusive).

When the *VITC RDR START* menu item is first selected, the starting line number for the VITC reader will be shown. Press the left and right (←,→) keys to change the starting line. Press the down (↓) key to select the *VITC RDR END* menu item. Press the left and right (←,→) keys to change ending line.

3.5.6. Controlling the VITC Reader 'Look ahead' Compensation

> *VITC RDR DISPLAY*
> *VR disp process*
> *VR disp direct*

The *VITC RDR DISPLAY* menu item is used to select whether the normal 'look ahead' compensation for VITC reader dropouts is active or not. Normally, the data is read in one field and displayed with an 'add 1 field' compensation. In some operational modes it is desirable to disable this feature and to display exactly what is being read. The topmost positions of the character generator are not available when in the direct mode.

Select *VR disp direct* to enable *DIRECT* display mode. Data is displayed exactly as it is read without 'look ahead' compensation. Displays from the VITC reader will be 1 field late and cannot be positioned at the very top of the raster. *DIRECT* mode is usually used for diagnostic purposes only.

Select *VR disp process* to enable normal 'look ahead' compensation. Displays from VITC reader will be 'on time' but will **NOT** follow code discontinuities immediately. *PROCESSED* mode should be used for normal operations.

3.5.7. Configuring Whether the VITC Reader will Display Local Time or UTC Time in Time/Date Mode

VITC RDR TZ ADJ
Vtm zone adj utc
Vtm zone adj loc

When the *VITC RDR MODE* is set to *TIME DATE*, the *VITC RDR TZ ADJ* menu item is used to select whether the VITC Reader will display UTC or UTC adjusted by the programmed Time Zone Offset (Local Time). The local time will also be adjusted by the daylight savings time adjustment if daylight savings time is in effect. See section 3.4.8 for a discussion of daylight saving time features of the 8010TM.

Select *Vtm zone adj utc* to configure the generator to output its time as UTC

Select *Vtm zone adj loc* to configure the generator to output its time as UTC adjusted by the programmed Time Zone Offset and Daylight saving adjustment if *DST Time is On.*(Local Time)

3.6. CHARACTER GENERATOR FUNCTIONS

The 8010TM-IRIG has six independently positionable character windows to display the generator and LTC and VITC reader time and user bits. The four arrow keys (↑, ↓, ←, →) control the position of all the windows. The **CHAR GEN ON/OFF** key selects whether the video character generator (VCG) keyer is on or off. The use of these keys in combination with the **CHAR GEN WINDOW** key selects which windows are displayed and their position on the screen.

Five items on the programming menu are used to configure the character size, style, and whether frames, fields and symbols should be displayed in the character generator. The following descriptions appear in the order they appear on the menu.

3.6.1. Selecting the Character Size

CHAR SIZE
Char tiny
Char small
Char large

The *CHAR SIZE* menu item is used to select one of three sizes for the character generator's display.

The *Char tiny* character size occupies 8 lines per field for each character row. This permits 30 vertical positions on the raster in NTSC.

The *Char small* character size occupies 16 lines per field for each character row. This permits 15 vertical positions on the raster in NTSC.

The *Char large* character size occupies 32 lines per field for each character row. This permits 7 vertical positions on the raster in NTSC.

3.6.2. Selecting the Character Style

CHAR STYLE
Char white
Char white+black
Char white+bkgnd
Char black
Char black+white
Char black+bkgnd

The CHAR STYLE menu item is used to select whether the background mask will be used and whether the characters will be white or black. The on screen format menus are always white characters keyed into a black background mask.

Select *Char white* to disable the background and key white characters directly into the picture.

Select *Char white + black* to key white characters on a black background mask into the picture.

Select *Char white + bkgnd* to key white characters on a transparent gray background mask into the picture.

Select *Char black* to disable the background and key black characters directly into the picture.

Select *Char black + white* to key black characters on a white background mask into the picture.

Select Char *black + bkgnd* to key black characters on a transparent white background mask into the picture.

3.6.3. Selecting whether the Frames, Fields and Symbols will be displayed on the VCG

VCG FRAMES
Vcg frames off
Vcg frames on

The *VCG FRAMES* menu item is used to select whether the frames will be shown when the time is displayed in the character inserter. When the reader is set to *IRIG DAY* mode this menu item will control whether the milliseconds are displayed or not.

Select *Vcg frames off* to hide the time code frames.

Select *Vcg frames on* to show the time code frames.

VCG FIELDS
Vcg fields off
Vcg fields on

The *VCG FIELDS* menu item is used to select whether the fields will be shown when the time is displayed in the character inserter. When the reader is set to *IRIG DAY* mode this menu item will not have any effect on the IRIG time displays.

Select *Vcg fields off* to hide the time code fields.

Select *Vcg fields on* to show the time code fields.

VCG SYMBOLS
Vcg symbols off
Vcg symbols on

The *VCG SYMBOLS* menu item is used to select whether the symbols will be shown when the time is displayed in the character inserter.

Select *Vcg symbols off* to hide the symbols.

Select *Vcg symbols on* to show the symbols.

3.6.4. Selecting and Positioning the Individual Character Inserter Windows

Separately positionable character windows displaying generator time and user bits are available. There are also separate windows for the LTC and VITC reader time and user bits. The four arrow keys (↑, ↓, ←, →) control the position of all the windows. The **CHAR GEN ON/OFF** key selects whether the video character generator (VCG) keyer is on or off. The use of these keys in combination with the **CHAR GEN WINDOW** key selects which windows are displayed and their position on the screen.

Press **CHAR GEN WINDOW** to enable the window select mode. All the character windows will appear on the screen with the window for the Time highlighted. Use the arrow keys (↑, ↓, ←, →) to position the Time window on the screen. Use the **CHAR GEN ON/OFF** key to turn the Time window on or off. Press the **CHAR GEN WINDOW** key to highlight the Source ID window. Use the **CHAR GEN ON/OFF** key to turn the Source ID window on or off and the arrow keys to move it to the desired location. Press the **WINDOW** key again to select the next window and the arrow keys to move it to the desired location and so on. The 8010TM-IRIG returns to the normal VCG display mode after the last window has been selected.

3.6.5. Positioning the Overall Character Display

In the normal VCG display mode, when none of the windows are highlighted, the arrow keys (↑, ↓, ←, →) move all the displayed windows by the same relative amount. For example, to move the time and source ID/status windows both down by one line press the ↓ key.

3.6.6. Character Generator On/ Off Controls

There are several factors that control whether the character generator will be turned on or off. In order of priority these are:

- The **CHAR GEN ON/OFF** key on the front panel alternately turns the digital and analog characters on and off.

- The VCG Keyer On/Off remote control input on the rear panel alternately turns the digital and analog characters on and off. This input has equal priority with the front panel **CHAR GEN ON/OFF** key.

- The individual windows can be turned off using the **CHAR GEN ON/OFF** key in window select mode.

3.6.7. Special VCG Indicators

The following special indicators are used between the seconds and frames digits of the time window in the character inserter to identify non drop frame and drop frame code (NTSC only)

Non Drop Frame	Colon (:)
Drop Frame (NTSC)	Period (.)

The following special indicators are used between the hours and minutes digits of the generator time window in the character inserter when the generator is in the Time Date mode to identify when the local time is being adjusted for Daylight Saving Time

DST Time Off	Colon (:)
DST Time On	Period (.)

3.6.8. Turning on the SDI Video Bypass Relay

```
BYPASS MODE
    Bypass mode off
    Bypass mode on
```

The *BYPASS MODE* menu item is used to select whether the optional video bypass relay will be active or not. This allows the user to manually put the 8010TM-IRIG in Bypass mode. In this mode, the input video is directly connected to the output, and the encoder will no longer be active. Alternatively the Bypass relay can be activated by pressing **SHIFT + BYPASS.** The Front panel Bypass LED will be On when the unit is in bypass mode.

Select *Bypass mode off* to turn off the Bypass relay and process the incoming video through the SDI Time Code Master.

Select *Bypass mode on* to activate the optional video bypass relay and disable the encoder.

3.7. PROGRAMMING THE ENGINEERING SETUP FUNCTIONS

An engineering Setup menu is provided to set up items that are normally required only during installation.

> **This menu should be used by advanced users only, as improper use can overwrite user setups.**

To enter the front panel programming menu, press the **SHIFT + SETUP** keys. The two vertical arrow keys (↑, ↓) allow you to move vertically within the engineering menu tree. When you have selected the desired menu item, press the ➔ key to reveal the choices for that item. The choice that is currently selected will be blinking. When you have selected the desired sub menu choice press the **SELECT** key to save your choice. When you have made all the desired changes, press the **SETUP** key to return to the normal display mode.

VIDEO TYPE	Sets the Video standard for the encoder
LTC LEVEL	Sets the amplitude level of the LTC output
VITC DEL START	Sets the first line that will be blanked by the VITC deleter
VITC DEL END	Sets the last line that will be blanked by the VITC deleter
GEN DATE FORMAT	Selects the date encoding format for the generator TIME DATE mode
GEN COLOUR PHASE	Sets an offset from the Colour reference input
JAM WINDOW	Sets a Jam sync window for the generator Convert 25 ⇔ 30 mode
REFERENCE MODE	Selects the generator framing reference
DAYLIGHT SAVING	Sets whether the Generator time will be adjusted for DST or not
GPI1 ASSIGNMENT	Assigns the function for General Purpose Input 1
GPI2 ASSIGNMENT	Assigns the function for General Purpose Input 2
GPO1 ASSIGNMENT	Assigns the function for General Purpose Output 1
GPO2 ASSIGNMENT	Assigns the function for General Purpose Output 2
GPO DURATION	Sets the duration of the momentary general purpose outputs
SERIAL BAUD RATE	Sets the baud rate of the serial port
SERIAL TEST	Turns on a Serial Port output test
XRAM TEST	Turns on a RAM hardware test
DISPLAY LEVEL	Sets the brightness level of the Front panel display
SDI VBLANK END	Sets the last line that will have the SDI V bit set to zero
NTSC SETUP	Selects if Setup will be applied on the optional analog NTSC output.
FONT DOWNLOAD	Used to Download new character fonts
SOFTWARE VERSION	Displays the current firmware version of the encoder
FACTORY RESET	Resets the encoder to its Factory default condition

Table 3-2: Overview of the 8010TM-IRIG Engineering Menu

Table 3-2 shows the items in the main level of the engineering menu tree. Sections 3.7.1 to 3.7.16 provide detailed descriptions of each of the sub menus. The tables in these sections are arranged in an indented structure to indicate the path taken to reach the control. Menu items or parameters that are underlined indicate the factory default values.

3.7.1. Selecting the Video Type

```
VIDEO TYPE
    Video auto (525)
    Video 525
    Video 625
```

The *VIDEO TYPE* menu item is used to program the 8010TM-IRIG for the digital video format.

When you select *auto* the 8010TM-IRIG will auto detect the line rate and automatically reconfigure itself. The current video standard will be shown in brackets.

Select *525* for operation with 525 line video conforming to SMPTE 125M.

Select *625* for operation with 625 line video conforming to EBU Tech 3267-E (1992) or the 4:2:2 level of IUT-R 601.

3.7.2. Adjusting the Output Level of the LTC Generator

```
LTC OUT LEVEL
    Ltc level xx
```

The *LTC OUT LEVEL* menu item is used to adjust amplitude of the LTC output. Use the ← and → keys to adjust. The recommended output level setting is 35, which is approximately 1 volt peak to peak.

3.7.3. Setting The VITC Deleter Line Range

```
VITC DEL START
    Delete Start = xx
```

The *VITC DEL START* and *VITC DEL END* menu items are used to select the lines will be erased by the VITC deleter. This function allows existing VITC on the incoming program video to be removed prior to inserting new VITC on the output. VITC deletion is enabled between the lower and higher line numbers shown (inclusive).

When the *VITC DEL START* menu item is first selected, the starting line number for the VITC deleter will be shown. Press the left and right (←,→) keys to change the starting line. When either the start or end line number is set to –- the VITC delete function is disabled. Press the down (↓) key to select the *VITC DEL END* menu item. Press the left and right (←,→) keys to change ending line.

3.7.4. Selecting the Generator Date Format for Time Date Mode

GEN DATE FORMAT
   Gen date yymmdd
   Gen date mjd
   Gen date leitch

The *GEN DATE FORMAT* menu item is used to set the encoding format when date information is being placed into the user bits.

Selecting *yymmdd* configures the user bits for BCD date encoding in TT YY MM DD format according to SMPTE 309M. This mode is designed so that simple time code readers can display the BCD encoded date information in numeric format.

   TT is a time zone offset to be applied to the Hours of the time
   YY is the year in BCD format.
- When *YY* is less than 50 the year will be displayed as 20YY (i.e.: when *YY*=01 the year will be displayed as 2001).
- When *YY* is greater than 50 the year will be displayed as 19YY (i.e.: when *YY*=95 the year will be displayed as 1995).

   MM is the month of the year.
   DD is the day of the month.

   For example: the date August 15, 1994 (no time zone offset) will be encoded in the user bits as 00 94 08 15.

Selecting *mjd* configures the user bits for modified Julian date encoding in TT dddddd format according to SMPTE 309M. This mode should be used when the complete date including century is required. Simple readers will not be able to decode this format.

   TT is a time zone offset to be applied to the Hours of the time
   ddddd is a 24 bit binary number representing the modified Julian date.

Selecting *leitch* configures the user bits for date encoding in Leitch Master Clock format. This mode should be used when driving Leitch compatible display devices. Simple readers will not be able to decode this date format.

3.7.5. Selecting the Colour Frame Phase

GEN COLOUR PHASE
Colour phase 01

The *GEN COLOUR PHASE* menu item is used to adjust the colour phase relationship of the time code to the colour frame reference when the 8010TM-IRIG is operated in colour frame mode. This adjustment is necessary to compensate for frame delays in digital to analog encoders used in the system.

When the *Colour Phase* is set to 01 the outgoing time code will be in time with the 8010TM-IRIG colour reference. The colour phase may be adjusted by up to 4 frames in PAL and 2 frames in NTSC applications. This menu item should be adjusted so that the time code colour phase is in time with the video output of an analog encoder. If the MON analog output option is installed the colour sequence of the analog video will be the adjusted by the colour phase offset so that it is in time with the time code being generated. A time code analyzer such as the Evertz Model 5300 may be used to verify the correct timing relationship is being maintained.

3.7.6. Setting the 25 ⇔ 30 Convert Jam Window

JAM WINDOW
Jam window = xx
Convert only

The *JAM WINDOW* menu item is used to ignore the natural differences between 30 Fps and 25 Fps frames numbers within the second when the generator is operating in the *Convert* mode. The frame counting rates of 25 FPS and 30FPS along with the natural difference between the video rates of 29.97 and 30 fps (taking into account the dropped frames) produce an acceptable difference between the 25 Fps and 30 Fps frame numbers during a given second. Any difference between the active reader input and the generated time code output numbers (accounting for any programmed *OFFSET*) will cause the generator to resynchronize to the reader when the generator is in *Convert* mode.

Use the ← and → keys to adjust. Under normal circumstances the factory default setting of "6" frames should be adequate.

3.7.7. Selecting the Generator Framing Reference

```
REFERENCE MODE
    Ref auto
    Ref input
    Ref external
```

The *REFERENCE MODE* menu item is used to set whether the internal timing of the 8010TM-IRIG will be locked to the input video or the External Colour Reference input. The updating of the generator clock, character displays and LTC phasing are in turn locked to the input timing of the 8010TM-IRIG.

Select *auto* to allow the 8010TM-IRIG to select its reference automatically. If both a reference video and SDI input video are present the 8010TM-IRIG will lock to the SDI input video.

Select *input* to reference the 8010TM-IRIG to the input video.

Select *external* to reference the 8010TM-IRIG to the colour reference input. This setting will allow the LTC phase output of the 8010TM-IRIG to remain locked to the reference when an SDI input signal is not present.

> ✎ **For proper operation the SDI input video and the external colour reference must be vertically in phase.**

3.7.8. Turning on the Daylight Saving Time Compensation

```
DAYLIGHT SAVING
    Dst time off
    Dst time on
```

When the generator is operating in the *Time date* mode, the *DAYLIGHT SAVING* menu item is used to select whether the time will be compensated for Daylight Saving time or not.

Select *Dst time on* to compensate for Daylight saving time. This setting should be used during the period when daylight saving time is in effect. When this setting is used 1 hour will be subtracted from the Time zone offset value when the 8010TM-IRIG converts between UTC and local time.

Select *Dst time off* to turn off compensation for Daylight saving time. This setting should be used during the period when daylight saving time is not in effect.

3.7.9. Configuring The General Purpose Inputs and Outputs

A 9 pin D connector located on the rear panel labeled **PARALLEL** provides control inputs and output for remote control of some of the model 8010TM-IRIG functions. There are also two open collector outputs that can be assigned to a variety of functions. The pinout of the D connector when the 8010TM-IRIG is not in the *time rctl* mode is shown in Table 2-3.

The general purpose outputs can be assigned to several different functions. The outputs will be active low when the specified condition occurs. The duration of the outputs is user programmable except where noted. There are two user programmable general purpose inputs and four dedicated GPI inputs. Sections 3.7.9.2 to 3.7.9.5 describe the operation of the GPIO functions when the 8010TM-IRIG is not operating the *time rctl* mode

When the 8010TM-IRIG is operating in the *time rctl* mode, the functions of these **PARALLEL** port pins is reassigned to provide a method of inputting Remote Control contact closure information for encoding into the user bits. The pinout of the D connector when the 8010TM-IRIG is in the *Time RCTL* mode is shown in Table 2-4. Section 3.7.9.1 describes the operation of the *time rctl* mode.

3.7.9.1. Remote Control Mode

When the *GEN MODE* is set to *time rctl* the 8010TM-IRIG allows the user to encode remote control contact closure information in the VITC user bits. This feature allows the user to use the six parallel remote control inputs to set one of the six remote control user bit patterns. At the decoder end the 7721GPI-D D-VITC GPI Decoder module decodes the remote control user bits and outputs them on six open collector outputs. When the 8010TM-IRIG is operated in this mode the normal functions of all the parallel remote control inputs except *VITC enable* and *Bypass* are disabled.

In the *time rctl* mode, the inputs on the Parallel remote control port are used to control the remote control user bits. When the *GEN MODE* is set to any of the other modes, then the inputs revert to their normal functions as described in section 3.7.9.2. The parallel port pin designations in remote control mode are shown in Table 3-3 below. Table 3-3 also shows the corresponding output pins of the 7721GPI-D decoder and the user bits that control them.

The parallel port is the default input source for *time rctl* mode. It will automatically be selected as the input source whenever a rising or falling edge is detected on any of the five pins monitored by the system. The remote control user bits may also be set from the serial port using command 8A. (See section 4.9 below) When the user bits have been set from the serial port, the present state of all parallel port pins except *VITC enable* and *Bypass* will be ignored. The parallel port will only become the input source again if **any one** of the port pins changes state.

GPI	8010TM PIN (IN)	7721GPI-D PIN (OUT)	GUB Data byte 1
1	1	4	81
2	2	8	82
3	3	3	84
4	4	1	88
5	5	13	90
6	7	14**	A0

Table 3-3: Remote Control Mode GPI I/O Mapping

**Note: Some early versions of the 7721GPI-D only support outputs 1 to 5. These units can be upgraded to support all six outputs. Contact Evertz customer service for information on how to upgrade these units.

3.7.9.2. Assigning the Functions of the General Purpose Inputs

When the *GEN MODE* is **NOT** set to *time rctl* there are four dedicated remote control input pins and two user programmable inputs. The dedicated input functions are as follows:

VCG ON/OFF Provides an alternate method of turning the character inserter generator On and Off. The character inserter is toggled On or Off by a high to low transition on this input. This input has equal priority with the front panel CHAR GEN ON/OFF key.

VITC ENABLE Provides an alternate method of turning the VITC generator On and Off. The VITC generator is turned On by a high to low transition on this input, and turned Off by a low to high transition.

BYPASS When closed to ground this input activates the SDI bypass relay.

JAM SYNC Provides an alternate method of syncing the generator time of the active reader time when the unit is not in the *convert* mode. Momentarily closing this input to ground and releasing it will perform a synchronization to the reader time.

The *GPI1 ASSIGNMENT* and *GPI2 ASSIGNMENT* menu items are used to select the functions of the other two general purpose inputs (GPI 1 and GPI 2). The operation of both menus is identical so only the GPI1 Assignment menu will be shown.

GPI1 ASSIGNMENT
Gpi1 = ltc active
Gpi1 = vitc active
Gpi1 = gen hold
Gpi1 = gen set

The following descriptions indicate the how the GPI will function with each setting. (8010TM models only)

Ltc active Provides an alternate method of selecting the LTC reader as the active reader. The LTC reader is selected by a high to low transition on this input, and deselected by a low to high transition. This menu item is available only on the 8010TM

Vitc active Provides an alternate method of selecting the VITC reader as the active reader. The VITC reader is selected by a high to low transition on this input, and deselected by a low to high transition.

Gen hold Provides an alternate method of selecting the Generator Hold function. The generator Hold function is selected by a high to low transition on this input, and deselected by a low to high transition.

Gen set Provides an alternate method of selecting the Generator Set function. The generator Set function is selected by a high to low transition on this input, and deselected by a low to high transition. When this input is closed to ground the last entered time value is entered into the Generator again.

```
GPI1 ASSIGNMENT
   Gpi1 = irig active
   Gpi1 = vitc active
   Gpi1 = gen hold
   Gpi1 = gen set
```

On the 8010TM-IRIG models the Irig active function replaces the LTC active function on the8010TM model.

Irig active   Provides an alternate method of selecting the IRIG reader as the active reader. The IRIG reader is selected by a high to low transition on this input, and deselected by a low to high transition. This menu item is available only on the 8010TM-IRIG

3.7.9.3. Assigning the Functions of the General Purpose Outputs

When the *GEN MODE* is <u>not</u> set to *time rctl* there are two general purpose outputs. The functions of these outputs is set using the *GPO1 ASSIGNMENT* and *GPO2 ASSIGNMENT* menu items. The operation of both menus is identical so only the GPO1 Assignment menu will be shown.

```
GPO1 ASSIGNMENT
   Gpo1 = rdr event
   Gpo1 = gen event
   Gpo1 = 1 pulse/sec
   Gpo1 = 1 pulse/min
   Gpo1 = ref failure
```

The following descriptions indicate the how the GPO will function with each setting.

Rdr event   The output will activate for the *GPO Duration* when the reader time matches the REVT register and the event register is armed. See section 3.7.9.4 for information about setting the REVT register and arming it.

Gen event   The output will activate for the *GPO Duration* when the generator time matches the GEVT register and the event register is armed. See section 3.7.9.4 for information about setting the GEVT register and arming it.

1 pulse/sec   The output will activate for the *GPO Duration* at the beginning of each second of the generator time. The *GPO Duration* value such that the pulse is less than one half a second long.

1 pulse/min   The output will activate for the *GPO Duration* at the beginning of each minute of the generator time.

Ref failure   The output will activate when a proper Gen Lock video reference is missing. The output will remain active until the Gen Lock video returns.

3.7.9.4. Adjusting the General Purpose Output Duration

```
GPO DURATION
   Gpo duration 01
```

The *GPO DURATION* menu item is used to adjust the duration (in frames) of both of the general purpose outputs. Use the ↑ OR ↓ keys to change the duration. Note that when the *GPO ASSIGNMENT* is set to *Ref failure* the respective output will remain low until the Gen Lock video returns.

3.7.9.5. Setting the Time of the Event Registers

When one of the GPO assignments is set to *GEN EVENT* the output activates based on the time entered into the GEVT register. When one of the GPO assignments is set to *RDR EVENT* the output activates based on the time entered into the REVT register.

To access the GEVT and REVT registers press the **SHIFT+DISPLAY** buttons one or more times until the display prompt is GEVT or REVT. The **ENTER** and **CLEAR** keys are used in conjunction with the numeric keys to set the value stored in the event registers. Enter a valid time into the desired register following the same method used to enter the generator time.

When the GEVT or REVT register is being displayed, press the **SELECT** key to 'arm' the respective event register for a single event. Press the **SELECT** key again to 'disarm' the event register. A lower case 's' will be shown to the left of the hours digits of the display when the register is armed for a single event. Press the **SHIFT+SELECT** keys to 'arm' the respective event register for continuous events. Press the **SHIFT+SELECT** keys again to 'disarm' the event register. A lower case 'c' will be shown to the left of the hours digits of the display when the register is armed for continuous events.   When the time code being generated matches the value entered into the GEVT register, the event output will be activated for the duration set in the *GPO DURATION* menu. When the time code being read by the Reader matches the value entered into the REVT register, the event output will be activated for the duration set in the *GPO DURATION* menu. When the event register is armed for single event mode, the output will occur the *first time* the comparison matches. The event must be re-armed for the event to occur again. When the event register is armed for continuous event mode, the output will occur *each* time the comparison matches.

3.7.10. Configuring The Serial Port

3.7.10.1. Selecting the Serial Port Baud Rate

SERIAL BAUD RATE
Baud rate 2400
Baud rate 9600
Baud rate 19200
Baud rate 38400

The *SERIAL BAUD RATE* menu item is used to set the baud rate of the remote control serial port. The 8010TM-IRIG supports four different baud rates from 2400 to 38400 baud. Select the highest baud rate that you computer can use for best results.

3.7.10.2. Testing the Serial Port

SERIAL TEST
Serial test off
Serial test on

The SERIAL TEST menu item is used to turn on a serial port test message. When the serial test is on, the 8010TM-IRIG outputs a message similar to:

```
EVERTZ   DTCG   8010TM   SOFTWARE   VERSION   DG86D1.M
R020822
```

3.7.11. Testing the RAM

XRAM TEST
Xram test on ?

The *XRAM TEST* menu item is used to initiate a test of the Character RAM.

3.7.12. Adjusting the Front Panel Display Brightness

DISPLAY LEVEL
Display level xx

The *DISPLAY LEVEL* menu item is used to adjust brightness of the front panel display. Use the ← and →keys to adjust.

3.7.12.1. Setting the SDI Vertical Interval Blanking

SDI VBLANK END
Vbl end line 06
Vbl end line 22
Vbl end line 10
Vbl end line 20

The *SDI VBLANK END* menu item is used determine where the V bit in the SDI TRS will be set to zero (indicating vertical blanking). If the V blank bit is zero on a higher line number than the VITC is placed on, some devices may discard the VITC.

For 525 systems the normal setting is for the vertical blanking to end at line 10. If this causes problems with downstream devices, it can be set to end at line 20, however some devices may blank the VITC if it is placed prior to line 20.

For 625 systems, the normal setting is for the vertical interval to end at line 6. If this causes problems with downstream devices, it can be set to end at line 23, however some devices may blank the VITC if it is placed prior to line 20.

3.7.13. Setting the NTSC Setup Pedestal on the Monitor Analog Output

NTSC SETUP
NTSC setup on
NTSC setup off
No setup in PAL

The *NTSC SETUP* menu item is used to determine how the NTSC Setup Pedestal will be applied on the Monitor Analog Output. The NTSC setup pedestal should not be present when operating in Japan.

Select *NTSC setup on* to apply the Setup pedestal to all lines of the active picture.

Select *NTSC setup off to remove* the NTSC Setup Pedestal from all lines.

3.7.14. Downloading New Character Fonts

FONT DOWNLOAD
Shift+sel=start

The *FONT DOWNLOAD* menu item is used to change the character inserter font. For more information about uploading new font files see section 5.4.

3.7.15. Resetting the 8010TM-IRIG to Factory Defaults

FACTORY RESET
Shift+sel=reset

The *FACTORY RESET* menu item is used to return the 8010TM-IRIG to its factory defaults. When you press the ← or → keys, the display shows Shift+sel=reset. When you press **SHIFT + SELECT** the 8010TM-IRIG will reload its factory defaults and show the message

```
Reset done
```

3.7.16. Displaying the 8010TM-IRIG Software version

SOFTWARE VERSION
DG86D2.M R040109

The SOFTWARE VERSION menu item is used to display the 8010TM-IRIG's software version. When you press the ← or → keys, the display shows the software version.

The version will be something like:

```
DG86D2.M R040109
```

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CHAPTER 4: SERIAL PROTOCOL

TABLE OF CONTENTS

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4.   SERIAL REMOTE CONTROL PROTOCOL

4.1.   OVERVIEW

- Two wire interface using RS-232C levels or alternate four wire communications channel using RS-422 levels.
- Data transmitted asynchronously, bit serial, word serial with data exchange between the devices being digital.
- Transmission rate is selectable 38.4 K, 19.2K, 9600 Baud supported
- Data words utilized by the interface shall be as follows:

  1 START bit + 8 DATA bits +1 PARITY bit + 1 STOP bit.
  The parity bit shall denote EVEN parity

4.1.1.   Connector Pin Assignment

Interface Connector: 9 pin D-subminiature female (DB-9S)

The pin assignment for the serial port when it is configured as RS-232 is:

Pin #	Name	Description
1	GND	Chassis ground
2	TxD	RS-232 Transmit Output
3	RxD	RS-232 Receive Input
4		
5	Sig Gnd	RS-232 Signal Ground
6		
7	RTS	RS-232 RTS Input
8	CTS	RS-232 CTS Output
9		

Table 4-1: Serial Control Pin Definitions - RS-232 DCE Configuration

The pin assignment for the serial port when it is configured as an RS-422 Tributary is:

Pin #	Name	Description
1	GND	Chassis ground
2	Tx-	Transmit A (Tx-) Output
3	Rx+	Receive B (Rx+) Input
4	Tx Gnd	Transmit Signal Ground
5	Spare	Not connected
6	Rx Gnd	Receive Signal Ground
7	Tx+	Transmit B (Tx+) Output
8	Rx-	Receive A (Rx-) Input
9	GND	Chassis ground

Table 4-2: Serial Control Pin Definitions - RS-422 Tributary Configuration

A and B are defined as follows:

A < B -------> "1" (Mark)

A > B -------> "0" (Space)

B

T

A

R
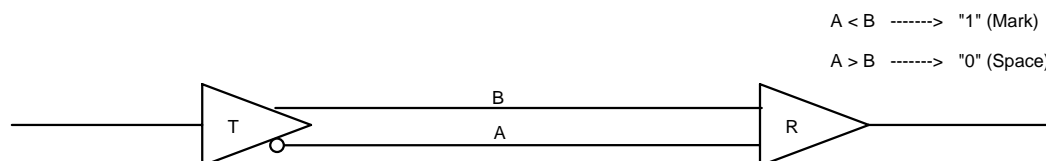
4.1.2.   Data Format

The serial port provides drivers which allow communications in either RS-232C or RS-422 electrical standards. The composition of the bit serial data format is as follows:

1 START + 8 DATA + 1 PARITY + 1 STOP

START BIT	D0 (LSB)	D1	D2	D3	D4	D5	D6	D7 (MSB)	PARITY (EVEN)	STOP BIT

"1" (MARK)

"0" (SPACE)
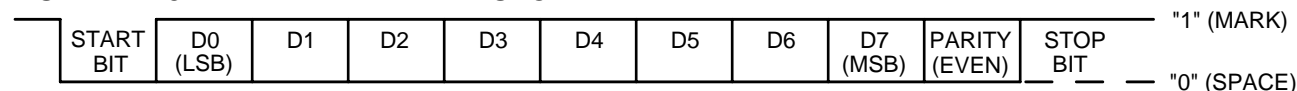
EVEN PARITY: The total of logic 1's in D0 to D7 and PARITY equals an even number

One of four baud rates is selected using the Engineering SETUP menu. When using the RS-422 standard the preferred baud rate is 38.4 KBaud. When using the RS-232 standard the preferred baud rate is 19.2ÜKBaud.

4.2. COMMUNICATIONS PROTOCOL

The Controller shall be denoted as the normal sender of a command (usually a computer). The Device shall be denoted as the normal sender of a Response (the 8010TM-IRIG).

> ✍ **All command values, arguments and data values shown in this document are expressed in hexadecimal format unless otherwise noted.**
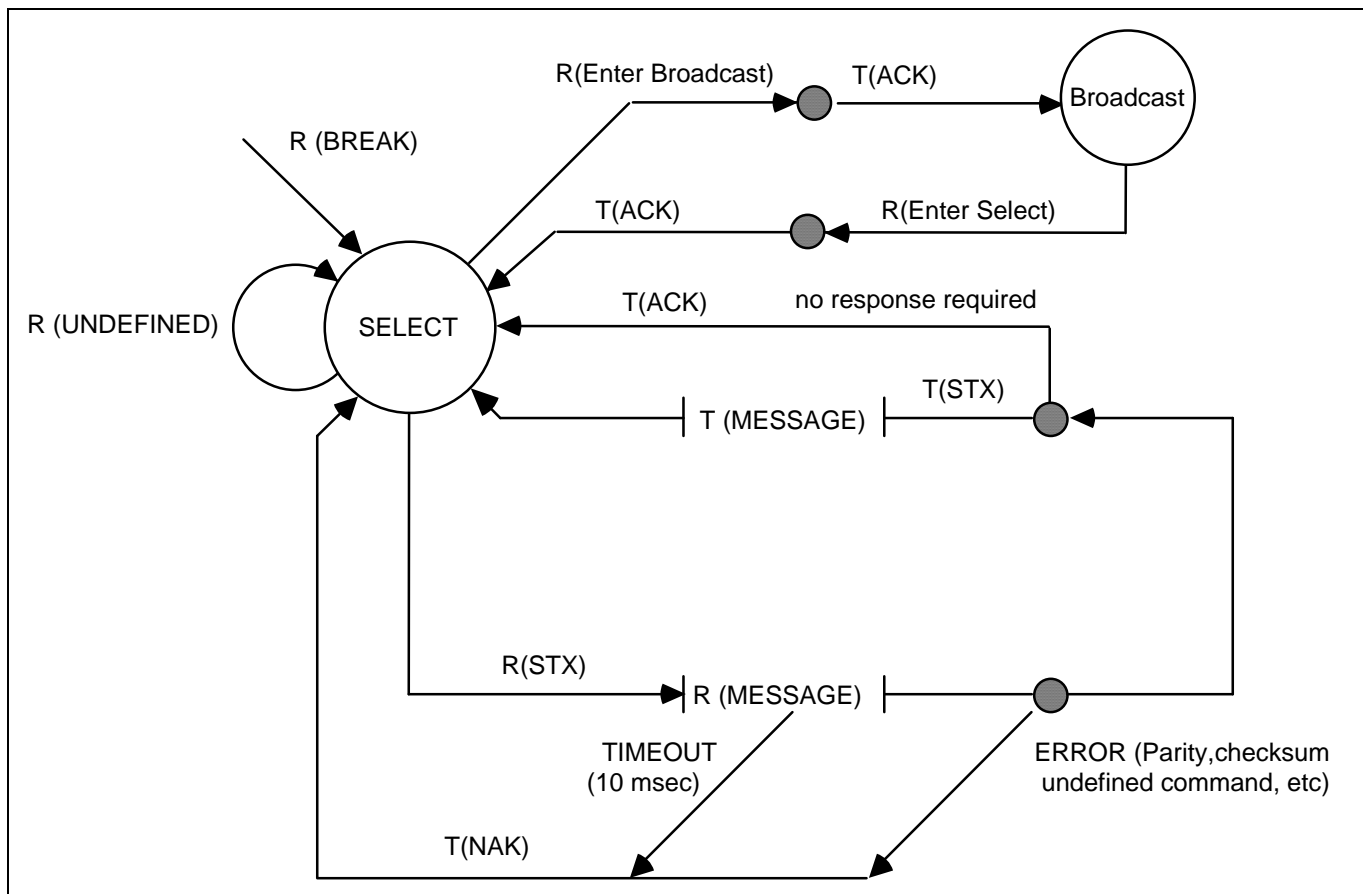
Figure 4-1: Communications Protocol State Diagram

The communications protocol is described in Figure 4-1. The Evertz unit (Device) immediately enters the select state upon power-up and remains there unless directed by an Enter Broadcast Cmd (02 hex) to the broadcast communications state. The diagram shows the various states of the device. The designation R( ) indicates the data received from the controller, while the designation T( ) indicates the data transmitted by the Device.

4.3. MESSAGE BLOCK FORMAT

Once communications have been established command messages may be sent to the Device.

Each control message starts with the STX character and ends with a checksum. The message blocks are structured as follows:

Once communications have been established command messages may be sent to the Device.

Each control message starts with the STX character and ends with a checksum. The message blocks are structured as follows:

STX	BYTE COUNT	MESSAGE	CHECKSUM
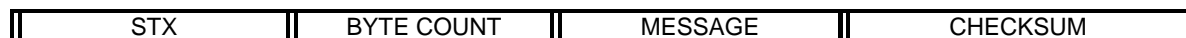
STX   start of message character (02 hex)
BYTE COUNT count of command message not including the STX, BYTE COUNT or CHECKSUM.
MESSAGE   variable length command message.
CHECKSUM   the two's complement of the one byte sum of the MESSAGE and the BYTE COUNT.

The purpose of the checksum is to verify that all the bytes in the message that contain variable data have been received properly. The STX is the only byte that has a fixed value, so it is the only byte not included in the checksum calculation. The checksum is calculated by adding all the variable bytes together. The least significant byte of this sum is then subtracted from 100 hex to compute the checksum. To verify that the checksum is computed correctly, add all the bytes including the checksum but excluding the STX together. The least significant byte of the sum should be zero if the checksum is computed correctly.

The MESSAGE consists of a command and optional bytes of data and is structured as follows:

COMMAND	DATA 1	.....	DATA n
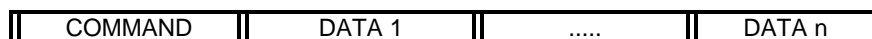
COMMAND   single byte command directed to device.
DATA 1...DATA n variable length, any arguments required by COMMAND.

If the command message was not accepted by the Device due to a checksum error, parity error or an invalid command the Device will respond with an **NAK** (05 hex) character and re-enter the SELECT state.

If the command message is accepted by the Device and there is no data response required, it will respond with an **ACK** (04 hex) character and re-enter the SELECT state.

If the command message requires a data response, the Device will transmit a response message structured as follows:

STX   start of message character (02 hex)
BYTE COUNT count of response message not including STX, BYTE COUNT or CHECKSUM.
COMMAND ECHO   Command message echoed
MESSAGE   variable length response message consisting of the data requested by the command message.
CHECKSUM The two's complement of the one byte sum of the COMMAND ECHO, MESSAGE and the BYTE COUNT.

For example, to request the current time code data in BCD format from the reader, the command message would be transmitted as follows:

02	02	66	01	97
STX	BYTE COUNT	SENSE RDR	BLOCKS	CHECKSUM

If the current LTC reader time code was 12:45:30:00 Drop Frame the response message would be received as follows:

02	07	66	01	00	30	45	12	01	0A
STX	BYTE COUNT	CMD (SENSE RDR)	CMD DATA (BLOCKS)	DATA 1 (FRMS)	DATA 2 (SECS)	DATA 3 (MINS)	DATA 4 (HRS)	DATA 5 (FLAGS)	CHKSUM

4.4.   COMMANDS

Command from Controlling Device			**Return to Controlling Device**		
CMD	**DATA BYTES**	**DESCRIPTION**	**CMD ECHO BYTES**	**DATA BYTES**	**NAME**
00		Sense Current Mode	1	1	Current Mode
01		Enter Select Mode			ACK
02		Enter Broadcast Mode			ACK
05		Enter Remote Ctl Panel Mode			ACK
0B	1	Select Video Standard			ACK
0C	01	Preset Key Scan Code			ACK
11	1	PROM Version request	2	20	PROM Name & Version
1B		Sense Video Standard	1	1	Video Standard
1C		Sense Display	1	11	Display Data Block

Table 4-3: Systems Commands and their Valid Responses

Command from Controlling Device			Return to Controlling Device		
CMD	DATA BYTES	DESCRIPTION	CMD ECHO BYTES	DATA BYTES	NAME
20	1	Select Char Gen Size			ACK
21	3	Preset Char Gen Window Pos'n			ACK
22	2	Select Char Gen Window On/Off			ACK
23	1	Select Char Gen Global On/Off			ACK
24	1	Select Char Gen Style			ACK
25	1	Select Char Gen Frames			ACK
26	1	Select Char Gen Fields			ACK
27	1	Select Char Gen Symbols			ACK
28	2	Preset Char Gen Raster Pos'n			ACK
30		Sense Char Gen Size	1	1	Char Size
31	1	Sense Char Gen Window Pos'n	2	3	Char Gen Window Pos'n & Len
32	1	Sense Char Gen Window On/Off	2	1	Char Gen Window On/Off
33		Sense Char Gen Global On/Off	1	1	Char Gen Global On/Off
34		Sense Char Gen Style	1	1	Char Gen Style
35		Sense Char Gen Frames	1	1	Char Gen Frames
36		Sense Char Gen Fields	1	1	Char Gen Fields
37		Sense Char Gen Symbols	1	1	Char Gen Symbols

Table 4-4: Character Generator Commands and their Valid Responses

Command from Controlling Device			Return to Controlling Device		
CMD	DATA BYTES	DESCRIPTION	CMD ECHO BYTES	DATA BYTES	NAME
41	2	Select Reader Mode			ACK
44	2	Select Reader Display			ACK
45	1	Define Broadcast Mode			ACK
61	1	Sense Reader Mode	2	1	Reader Mode
64	1	Sense Reader Display	2	1	Reader Display
65		Sense Reader Broadcast Mode	1	1	Reader Broadcast Mode
66	1	Sense Reader	2	x	Reader Data
67		Sense Reader Broadcast Block	1	x	Reader Broadcast Block

Table 4-5: Reader Commands and their Valid Responses

Command from Controlling Device			Return to Controlling Device		

CMD	DATA BYTES	DESCRIPTION	CMD ECHO BYTES	DATA BYTES	NAME
80	1	Select Generator Mode			ACK
81	2	Preset VITC Generator Lines			ACK
82	1	Select Generator Drop Frame			ACK
83	1	Select Generator Colour Frame			ACK
84	1	Select LTC Generator Parity			ACK
85	1	Select VITC Generator On/Off			ACK
86	1	Select Generator Run/Hold			ACK
87	1	Select Gen Jam Sync Mode			ACK
88	1	Select Gen No Code Jam			ACK
89	4	Preset Generator Time			ACK
8A	4	Preset Generator User Bits			ACK
A0		Sense Generator Mode	1	1	Sense Generator Mode
A1		Sense VITC Generator Lines	1	2	VITC Generator Lines
A2		Sense Generator Drop Frame	1	1	Generator Drop Frame
A3		Sense Generator Colour Frame	1	1	Generator Colour Frame
A4		Sense LTC Generator Parity	1	1	LTC Generator Parity
A5		Sense VITC Generator On/off	1	1	VITC Generator On/Off
A6		Sense Generator Run/Hold	1	1	Generator Run/Hold
A7		Sense Gen Jam Sync Mode	1	1	Generator Jam Sync Mode
A8		Sense Generator No Code Jam	1	1	Generator No Code Jam
A9	1	Sense Generator	2	x	Generator data

Table 4-6: Generator Commands and their Valid Responses

4.5.   DATA FORMATS

4.5.1.   Time Format Block

10 Frm	1 Frm	10 Sec	1 Sec	10 Min	1 Min	10 Hr	1 Hr	Flags

The Flags byte is a bitmapped byte of the time code flag bits as follows:

Bit	Name	Meaning When Set to 0	Meaning When set to 1
0	Drop Frame Flag	Non Drop Frame	Drop Frame
1	Colour Frame Flag	Non Colour Frame	Colour Frame
2	VITC Field Flag	Field 1	Field 2
3	Binary Group Flag 0		
4	Binary Group Flag 1	See table below	
5	Binary Group Flag 2		
6	LTC Flag	LTC is not active	LTC is active
7	VITC Flag	VITC is not active	VITC is active

The Binary group flag bits are defined as follows:

Time Address	User Bits	BGF 2	BGF1	BGF0
Unspecified	Unspecified	0	0	0
Unspecified	Eight bit ISO Character set	0	0	1
Unspecified	Date/Time Zone (SMPTE 309M)	1	0	0
Unspecified	Page/Line (SMPTE 262M)	1	0	1
Clock Time	Unspecified	0	1	0
Reserved	Reserved	0	1	1
Clock Time	Date/Time Zone (SMPTE 309M)	1	1	0
Clock Time	Page/Line (SMPTE 262M)	1	1	1

4.5.2. Data Format Block

UB grp 2	UB grp 1	UB grp 4	UB grp 3	UB grp 6	UB grp 5	UB grp 8	UB grp 7

4.5.3. Display Data Block

Digit 1	Digit2	Digit 3	...	Digit14	Digit 15	Digit 16	LED

The LED byte is a bitmapped byte as follows:

Bit 0	VITC GEN	Bit 4	JAM
Bit 1	COL'R	Bit 5	UB TRANSFER
Bit 2	BYPASS	Bit 6	LTC RDR
Bit 3	VIDEO	Bit 7	VITC RDR

4.6. COMMAND AND RESPONSE DESCRIPTIONS

4.6.1. System Commands

00   Sense Current Mode   Returns 2 bytes as follows

01 = Select
02 = Broadcast
03 = RCU

01   Enter Select Mode

02   Enter Broadcast Mode

| 11 | **Sense PROM Version** | 1 byte | 00 = PROM version |

Returns the control byte from the command +10 bytes (hex) PROM name + 10 bytes (hex) PROM version.

1B	**Sense Video Standard**		Returns 1 bytes as described below
0B	**Select Video Standard**	1 byte	Presets the Video Standard that is being used
			00 = 4:2:2 Auto
			01 = 4:2:2 525
			02 = 4:2:2 625

| 0C | **Preset Key Scan Code** | 1 byte | Presets a key scan code to the 8010TM-IRIG. Key Scan codes are shown in section 5.3 of this manual. |
| 1C | **Sense Display Data** | | Returns 17 bytes as described in Display Data Block. |

4.7. VIDEO CHARACTER INSERTER COMMANDS

Several of the VCG commands need to specify which VCG window they apply to. The following table defines the VCG window numbers.

WINDOW NUMBER	DESCRIPTION
01	LTC Reader Time
02	LTC Reader User Bits
03	VITC Reader Time
04	VITC Reader User Bits
05	Generator Time
06	Generator User Bits

Table 4-7: VCG Window Numbers

30	**Sense Char Gen Size**		Returns 1 byte as defined below.
20	**Select Char Gen Size**	1 byte	Selects the size of the VCG Character Font
			00 = Tiny
			01 = Small
			02 = Large

31   **Sense Char Gen Window Position**   Window No   Returns 3 bytes of window position
                                                                            as follows.

Vertical Position	Horizontal Position	Window Length

21   **Preset Char Gen Window Position**   Window No +1 byte Vertical Position
                                                                   +1 Byte Horizontal Position

Sets the starting position of a VCG window on the raster.

SIZE	VERT POSITION	HORIZ POSITION
Tiny	0 to 29 are valid for NTSC 0 to 29 are valid for PAL	0 to 32 depending on window length
Small	0 to 14 are valid for NTSC 0 to 16 are valid for PAL	0 to 32 depending on window length
Large	0 to 7 are valid for NTSC 0 to 8 are valid for PAL	0 to 32 depending on window length

Table 4-8: VCG Sizes

32   **Sense Char Gen Window On/Off**   Window No   Returns 1 byte as defined below.

22   **Select Char Gen Window On/Off**   Window No + 1 byte Turns individual windows on and off.
                                                                            00 = Off
                                                                            01 = On

33   **Sense Char Gen Global On/Off**   Returns 1 byte as defined below.

23   **Select Char Gen Global On/Off**   1 byte   Turns all windows on and off.
                                                                            00 = Off
                                                                            01 = On

34   **Sense Char Gen Style**   Returns 1 byte as defined below.

24   **Select Char Gen Style**   1 byte   Selects the Style of the VCG
                                                                            windows.
                                                                            00 = White
                                                                            01 = White on Black
                                                                            02 = Black
                                                                            03 = Black on White
                                                                            04 = White on Background
                                                                            05 = Black on Background

35	**Sense Char Gen Frames**		Returns 1 byte as defined below.
25	**Select Char Gen Frames**	1 byte	Selects whether the frames digits will be shown on the character inserter. 00 = Blanked 01 = Displayed
36	**Sense Char Gen Fields**		Returns 1 byte as defined below.
26	**Select Char Gen Fields**	1 byte	Selects whether the fields digits (for VITC tme windows only) will be shown on the character inserter 00 = Blanked 01 = Displayed
37	**Sense Char Gen Symbols**		Returns 1 byte as defined below.
27	**Select Char Gen Symbols**	1 byte	Selects whether the symbols which identify the Character inserter windows will be shown 00 = Blanked 01 = Displayed

4.8.   READER COMMANDS

Several of the Reader commands need to specify which Reader they apply to. This parameter is called the Reader Number.

RDR NO	DESCRIPTION
00	LTC Reader
01	VITC Reader

Table 4-9: Reader Numbers

61	**Sense RDR Mode**	Rdr No	Returns 1 byte as defined below
41	**Select RDR Mode**	Rdr No + 1 byte	Selects the mode of the reader.

Reader modes set according to the following values.

	DESCRIPTION	
MODE	**TIME**	**UB**
1	TIME	DATA
2	TIME	TIME
3	TIME	DATE
4	DATA	DATA

Table 4-10: Reader Modes

64	**Sense RDR Display**	Rdr No.	Returns 1 byte as defined below
44	**Select RDR Display**	Rdr No. + 1 byte	Selects whether the look ahead processing will be applied to the reader display. 00 = Processed 01 = Direct
65	**Sense Broadcast Mode**		Returns 1 byte as defined below
45	**Define Broadcast Mode**	1 byte	Defines a block of data which will be sent in broadcast mode, and in response to a Sense Broadcast Block command.

GT	---	VTRU	LTRU	GU	---	VTRT	LTRT

Each bit represents a variable length block of data that is requested. Time and User Bits are formatted according to the Select RDR Mode command above. The broadcast data blocks are assembled in the following order:

LTRT   LTRU   VTRT   VTRU   GT   GU

66	**Sense Reader**	1 byte	Returns Reader data as defined by the following byte:

	---	VTRU	LTRU		---	VTRT	LTRT

Each bit represents a variable length block of data that is requested. Time and data are formatted according to the Select RDR Mode command above. The bits are polled and return blocks are assembled in the following order:

LTRT   LTRU   VTRT   VTRU

67	**Sense Broadcast Block**		Returns the broadcast block as defined by the Define Broadcast Mode command above.
6C	**Sense Reader Time Zone Adjust**	Rdr No.	Returns 1 byte as defined below.
4C	**Select Reader Time Zone Adjust**	Rdr No. +1 byte	Sets the Time Zone Adjust parameter for the specified Reader

TIME ZONE ADJUST	DESCRIPTION
00	Display UTC Reader time
01	Display Local Reader time

4.9.   GENERATOR COMMANDS

A0	**Sense Generator Mode**		Returns 1 byte as defined below.
80	**Select Generator Mode**	1 byte	Selects the mode of the generator.

	DESCRIPTION	
MODE	TIME	UB
00	TIME	DATA
01	TIME	RDR TIME
02	TIME	RDR UB
03	TIME	DATE
04	CONVERT 25 ⇔ 30	
05	TIME	RCTL

Table 4-11: Generator Modes

A1	**Sense VITC Generator Lines**		Returns 2 bytes as defined below.
81	**Preset VITC Generator Lines**	2 bytes	Presets the line numbers of the VITC generator

To generate VITC on only one line set Line 1 and Line 2 equal. Line numbers are packed BCD format. Valid lines at 6 to 21 for PAL and 10 to 20 for NTSC.

A2	**Sense Generator Drop Frame**		Returns 1 byte as defined below.
82	**Select Generator Drop Frame**	1 byte	Selects whether the Generator will operate in the NTSC Drop Frame or Non Drop Frame mode. 00 = Non Drop Frame 01 = Drop Frame

> **This command is ignored in PAL.**

A3	**Sense Generator Colour Frame**		Returns 1 byte as defined below.
83	**Select Generator Colour Frame**	1 byte	Selects whether the Generator will operate in Colour or Non colour frame mode. 00 = 2 field 01 = 4 field 02 = 8 field (PAL Only)

> **The drop frame and colour frame operating modes selected by the above commands are used only when the generator is free running. When the generator is jam synced to the Reader these operating modes are determined by the Reader Time code.**

A4	**Sense Generator Parity**		Returns 1 byte as defined below.
84	**Select Generator Parity**	1 byte	Selects whether the Generator will operate with PARITY On or Off. 00 = Parity Off 01 = Parity On
A5	**Sense VITC Generator On/Off**		Returns 1 byte as defined below.
85	**Select VITC Generator On/Off**	1 byte	Turns the VITC Generator On and Off. 00 = VITC Generator Off 01 = VITC Generator On
A6	**Sense Generator Run/Hold**		Returns 1 byte as defined below.
86	**Select Generator Run/Hold**	1 byte	Turns the Generator Hold On and Off. 00 = Generator Hold 01 = Generator Run

A7	**Sense Generator Jam Sync Mode**		Returns 1 byte as defined below.
87	**Select Generator Jam Sync Mode**	1 byte	Selects the Generator Jam Sync mode 00 = Generator Free Run (Jam Off) 01 = Continuous Jam Sync 02 = Momentary Jam Sync.

> **When Continuous Jam Sync mode is enabled, then generator time will be slaved to the time code from the Reader. The Run/Hold, Drop Frame, and Colour Frame modes of the generator are determined by the Reader time code. When Continuous Jam Sync mode is terminated, the formatted Run/Hold, Drop Frame and Colour Frame modes of the generator are resumed.**

A8	**Sense Generator No Code Jam**		Returns 1 byte as defined below.
88	**Select Generator No Code Jam**	1 byte	Determines the behavior of the Generator when it is in continuous jam sync mode and there is no incoming code to the reader. 00 = Hold 01 = Run 02 = Mute
89	**Preset Generator Time**	4 bytes	Presets the time code generator. This command has no effect when the generator is in continuous Jam Sync mode. Expects four bytes of time data in BCD format as shown below.

10 Fr	1 Fr	10 Sec	1 sec	10 Min	1 Min	10 Hr	1 Hr

8A	**Preset Generator User Bit Data**	4 bytes	Presets the generator user bits. This command has no effect when the generator user bits are being transferred from either the Reader Time or User Bits. Expects four bytes of user bit data in DATA Format as shown below.

UB grp 2	UB grp 1	UB grp 4	UB grp 3	UB grp 6	UB grp 5	UB grp 8	UB grp 7

A9	**Sense Generator**	1 byte	Defines a block of data that will be sent in response to a Sense Generator command.

GU	---	---	---	GT	---	---	---

Each bit represents a 4 byte block of which is requested. Time and user bit formats are determined by the Select Generator Mode command. The bits are polled and blocks are assembled in the following order:

GT   GU

AB   **Sense Generator Date Format**   Returns 1 byte as defined below.

8B   **Select Generator Date Format**   1 byte   Sets the Date Format for the Generator.

DATE FORMAT	DESCRIPTION
00	YYMMDD
01	Modified Julian Date
02	Leitch

AC   **Sense Generator Zone Adjust**   Returns 1 byte as defined below.

8C   **Select Generator Zone Adjust**   1 byte   Sets the Time Zone Adjust parameter for the Generator.

TIME ZONE ADJUST	DESCRIPTION
00	Display UTC Generator time
01	Display Local Generator time

4.10. MISCELLANEOUS COMMANDS

E0   **Sense Auxiliary Register**   Reg No   Returns 4 bytes of the specified Auxiliary register.

C0   **Preset Auxiliary Register**   Reg No + 4 bytes   Sets the specified Auxiliary register.

REG NO	DESCRIPTION
00	Gen jam sync offset (OFFS)
01	Gen time event (GEVT)
02	Rdr time event (REVT)
03	Jam register (JAM@)

The four bytes of time data is in BCD format as shown below.

10 Fr	1 Fr	10 Sec	1 sec	10 Min	1 Min	10 Hr	1Hr

CHAPTER 5: TECHNICAL DESCRIPTION

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5. TECHNICAL DESCRIPTION

5.1. SPECIFICATIONS

5.1.1. Serial Digital Video Input

Standards: SMPTE 259M (270 Mb/s)
Connector: 1 BNC input per IEC 169-8
Equalization: Automatic 200m @ 270 Mb/s with Belden 8281 or equivalent cable
                      150m @ 270 Mb/s when bypass relay is active
Return Loss: > 15 dB up to 540 Mb/s

5.1.2. Serial Digital Video Outputs

Number of Outputs: 1 with relay bypass, 1 additional output.
Connector: BNC per IEC 169-8
Signal Level: 800 mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 900 ps nominal
Overshoot: <10% of amplitude
Return Loss: > 15 dB up to 540 Mb/s
Wide Band Jitter: < 0.2 UI

5.1.3. Analog Monitor Video Outputs (optional)

Standards: Analog composite NTSC if input is 525i/59.94 video
                      Analog composite PAL if input is 625i/50 video
Connectors: 2 BNC per IEC 169-8
Signal Level: 1 V p-p nominal, internally adjustable
DC Offset: 0V ±0.1V
Return Loss: >35dB up to 5 MHz
Frequency Response: 0.8dB to 4 MHz
Differential Phase: <0.9°(<0.6° typical)
Differential Gain: <0.9% (<0.5 % typical)
SNR: >56dB to 5 MHz (shallow ramp)
Impedance: 75 ohm

5.1.4. LTC Generator

Standard: SMPTE 12M
Frame Rate: 25 or 30 Fps nominal
Connector: 3 pin male XLR type connector.
Level: Adjustable, 0.5V to 4V p-p

5.1.5. IRIG Reader

Standard: IRIG 200-95 Formats B002 and B122
Connector: 3 pin female XLR type connector
Level: 0.2 to 4V p-p, balanced or unbalanced

5.1.6. General Purpose Inputs and Outputs

Inputs: 6, programmable control functions
Outputs: 2, programmable tally functions
Connector: 9 pin female "D"
Type: opto-isolated, active low
Signal Level: Pulled up to +5 volts. 3.3V DC provided

5.1.7. Serial Remote Control

Standard: RS-232 or RS422, programmable baud rate
Connector: 9 pin female "D"
Control: firmware upgrade, serial remote control of all functions

5.1.8. Electrical

Voltage: autoranging 100 - 240 Volts AC, 50/60 Hz
Power: 30 VA
Fuse Rating: 250 V, 1 amp, time delay
Safety: ETL Listed, complies with EU safety directives
EMI/RFI: Complies with FCC Part 15 Class A regulations
Complies with EU EMC directive

5.1.9. Physical

Single Power Supply version:
    Dimensions: 19" W x 1.75" H x 7.75" D.
        (483mm W x 45mm H x 196mm D)
    Weight: 7 lbs. (3.2 Kg)

Dual Power Supply version:
    Dimensions: 19" W x 1.75" H x 18.75" D.
        (483mm W x 45mm H x 477mm D)
    Weight: 8 lbs. (3.5 Kg)

5.2. JUMPERS AND SWITCHES

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

> ⚠️ **Before removing the top cover of the unit make sure that the power cord is disconnected from the mains.**

5.2.1. DIP Switch Functions

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

Switch	Name	Normal	Function when Open	Function when Closed
1	Not used	Open		
2	Broadcast Mode	Open	Normal Operation	Unit powers up in *"Broadcast Mode"*; IRIG Reader time data is sent out the serial DB-9 port.
3	Not used	Open		
4	Factory Reset	Open		Reset to factory defaults on power up
5	Not used	Open		
6	Quick Boot	Closed	Display boot messages	Faster boot up
7	Not used	Open		
8	Engineering Mode	Open		Special Engineering functions such as calibration of the Colour frame circuitry

Table 5-1: DIP Switch Functions

5.2.1.1. Enabling the IRIG CS-6 compatible Broadcast Data Output.

When you set DIP switch 2 to the closed (down) position the 8010TM-IRIG SERIAL port will output a IRIG CS-6 compatible serial data stream output with the following specifications.

Baud Rate: Selectable using the *SERIAL BAUD RATE* control
Word Size: 8 bits, no parity, 1 stop bit

Once per field the 8010TM-IRIG will send the IRIG time most recently read from the VITC data in the following formatted ASCII message:

<STX>002<$D_{100}D_{10}D_1$>:$H_{10}H_1$:$M_{10}M_1$:$S_{10}S_1$.$S_{1/10}S_{1/100}S_{1/1000}$<ETX>

5.2.2. Configuring the Serial Port

The Serial port can be configured for various pinouts, as described in Chapter 2. During manufacture, the serial port is configured for RS-232 DCE.

To reconfigure the serial port it is necessary to unplug the SDI Time Code Master and remove the top cover. Figure 5-1 shows the settings of jumper block J9 on the main circuit board for the various configurations available. The pinouts corresponding to RS-232 DCE and RS-422 controller configurations are given in Chapter 2. It is impossible to tell whether the serial port pinout has been altered without opening the unit for inspection.
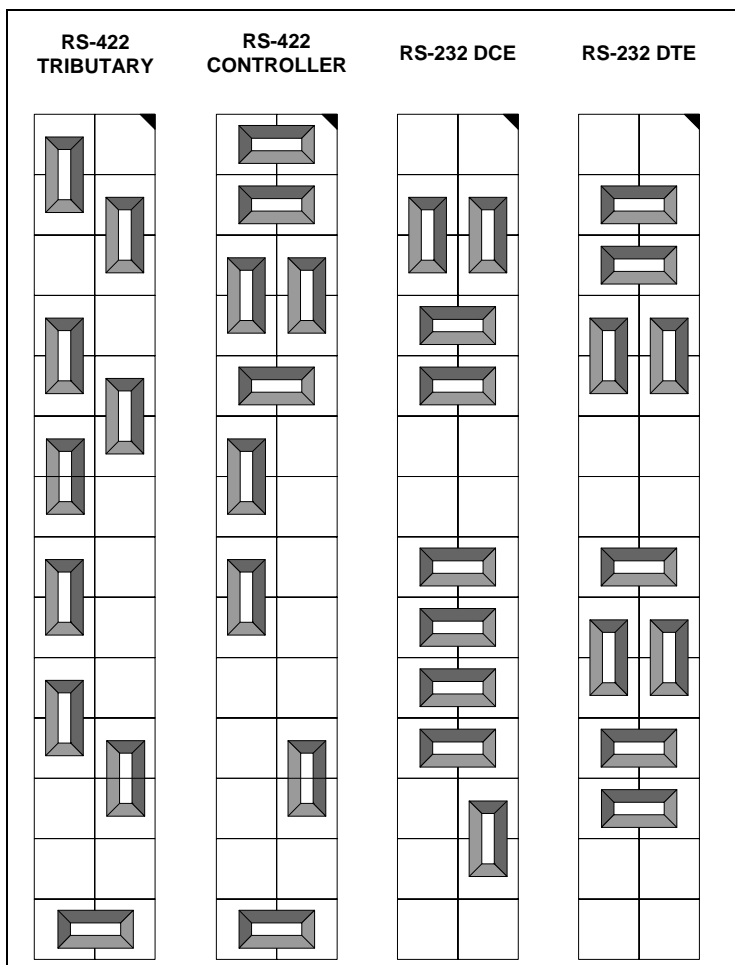
Figure 5-1: Jumper Settings for Serial Port Configurations

5.3. UPGRADING THE FIRMWARE

5.3.1. Overview

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

You will need the following equipment in order to update the Firmware:

- PC with available communications port. The communication speed is 19200 baud. A 486 PC or better with a 16550 UART based communications port is recommended.

- "Straight-thru" serial extension cable (DB9 female to DB9 male) or (DB25 female to DB9 male)
- Terminal program that is capable of Xmodem file transfer protocol. (such as HyperTerminal)
- New firmware supplied by Evertz.

5.3.2. Procedure for Firmware Upgrades

1. If you have changed the Serial port wiring from the factory default you will need to remove the top cover and set the jumpers on jumper block J9 to the RS-232 DCE settings.

To avoid risk of shock, place the top cover on the unit before applying power.

---

2. Carefully place the top cover back on the unit before applying power to the unit.

3. With power disconnected, connect the straight through cable between the SDI Time Code Master serial port and the PC.

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

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

Baud	**19200**
Parity	**None**
Data bits	**8**
Stop bits	**1**
Flow Control	**NONE**

6. To invoke the bootloader, hold the ⬆ key on the front panel and apply power to the SDI Time Code Master.

7. The front panel will display the word **PROGRAMMER-19200**. You should also see a menu appear in the terminal window on the PC.

For example:

```
-------------------------------------------
8045 Flash ROM Programming Utility Ver 1.3
COPYRIGHT 2000 EVERTZ MICROSYSTEMS LTD.
-------------------------------------------
Code Bank: 0 1 2 3 4 5 6 7
BLANK?     N N N N N N N N
Flash ROM is valid

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

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

- Defective Serial cable.
- Wrong communications port selected in the terminal program.
- Improper port settings in the terminal program. (Refer to step 3 for settings).
- Arrow key (↑) not being pressed correctly during power-up.

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

8. The boot code will prompt you to confirm that you want to erase the Flash ROM memory. Press 'Y' to proceed, 'N' to cancel.

       The Flash ROM must be erased first. Proceed (Y/N)

9. The boot code will indicate when the Flash memory is erased

       Flash ROM is now BLANK. You may proceed.

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

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

       Download Complete!

12. The following is a list of possible reasons for a failed file transfer:

- The supplied "*.HEX" file is corrupt.
- Wrong file specified to be uploaded.
- The PCs' RS-232 communications port can't handle a port speed of 19200 baud.

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

14. If you changed jumpers at the beginning of this procedure return the jumpers to their original positions.

5.3.3. Viewing Firmware Revision Levels

The 8950-SID SDI Time Code Master does not need to be taken out of service to check the firmware revision levels. These can be checked from the front panel display. To view the firmware revision, use the *FIRMWARE VERSION* menu item on the Engineering menu. To access the menu item press the **SHIFT + SETUP** key and use the up or down arrows (↑, ↓) to move to the *FIRMWARE VERSION* menu item. Press the **SELECT** key to display the firmware version. The front panel display will show the firmware version as follows (or similar):

DG86D2   This is the name of the HEX file that was downloaded to the SDI Time Code Master.

R040109   This is the actual firmware revision for the SDI Time Code Master. If the first character is a 'U' instead of an 'R' then the SDI Time Code Master contains unreleased beta firmware. (Evertz does not ship unreleased SDI Time Code Master firmware, except where customers have requested special features.)

5.4. UPGLOADING NEW FONTS

5.4.1. Overview

The SDI Time Code Master contains character font information in a FLASH ROM device. From time to time font updates may be provided. The following procedure will allow you to upload new fonts from your computer.

You will need the following equipment in order to update the Firmware:

- PC with available communications port. The communication speed is 19200 baud. A 486 PC or better with a 16550 UART based communications port is recommended.
- "Straight-thru" serial extension cable (DB9 female to DB9 male) or (DB25 female to DB9 male)
- Terminal program that is capable of Xmodem file transfer protocol. (such as HyperTerminal)
- New font file supplied by Evertz.

5.4.2. Procedure for Font Upgrades

1. If you have changed the Serial port wiring from the factory default you will need to remove the top cover and set the jumpers on jumper block J9 to the RS-232 DCE settings.

> ✎ **To avoid risk of shock, place the top cover on the unit before applying power.**

2. Carefully place the top cover back on the unit before applying power to the unit.

3. With power disconnected, connect the straight through cable between the SDI Time Code Master serial port and the PC.

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

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

Baud	**19200**
Parity	**None**
Data bits	**8**
Stop bits	**1**
Flow Control	**NONE**

6. Power up the unit. To upload new font information, use the *FONT DOWNLOAD* menu item on the menu. To access the menu item press the **SETUP** key and use the up or down arrows (↑, ↓) to move to the *FONT DOWNLOAD* menu item.   Press the **SELECT** key.   Then press the **SHIFT+SELECT** keys to start the Font downlaoder

7. The front panel will display the word `PROGRAMMER-19200`. You should also see a menu appear in the terminal window on the PC.

For example:

```
***** Unknown Main Flash Memory Chip *****
*****          Cannot Program         *****
Code Bank: 0 1 2 3 4 5 6 7
BLANK?     N N N N N N N
Flash ROM is NOT valid

***** Intel Char Flash Memory Chip Detected *****
Code Bank: 0 1 2 3 4 5 6 7
BLANK?     N N N Y Y Y Y Y
Flash ROM is valid



-- MENU --------------------------------
 <X>Modem download HEX file to Flash
 <A>SCII download HEX file to Flash
 <1> XModem download of font to Flash
 <2> ASCII download of font to Flash
 production <T>est (not implemented)
 <Q>uit Programmer (Jump into Flash)
----------------------------------------
COMMAND:
```

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

- Defective Serial cable.
- Wrong communications port selected in the terminal program.
- Improper port settings in the terminal program. (Refer to step 3 for settings).
- Arrow key (↑) not being pressed correctly during power-up.

16. Press '1' to initiate X-modem file transfer of the font information.

17. The boot code will prompt you to confirm that you want to erase the Flash ROM memory. Press 'Y' to proceed, 'N' to cancel.

   The Flash ROM must be erased first.   Proceed (Y/N)

18. The boot code will indicate when the Flash memory is erased

   Flash ROM is now BLANK. You may proceed.

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

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

> **Download Complete!**

21. The following is a list of possible reasons for a failed file transfer:

- The supplied "*.HEX" file is corrupt.
- You pressed 'X' to upload a Firmware file instead of '1' to upload a font file
- Wrong file specified to be uploaded.
- The PCs' RS-232 communications port can't handle a port speed of 19200 baud.

22. To complete the font upgrade power-down the unit and reapply power without pressing any keys to resume normal operation. If the Flash ROM contains valid code, the unit will resume normal operations. If there is a problem in the new font file, you will be prompted with an error message and remain in the bootloader.

23. If you changed jumpers at the beginning of this procedure return the jumpers to their original positions.

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