Models 5010 & 5010-VITC
5010-24 & 5010-VITC-24
Timecode Master

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	Original issue	Aug. 94
1.1	Incorporated Change sheet 1.0-1 into body of manual	Nov. 94
1.2	Incorporated Serial Remote Control Protocol chapter	Nov. 95
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2.3	Added info for 5010-VITC-24	Apr 02

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1. INTRODUCTION

The model 5010 Time Code Master is a full function time code reader/generator system The model 5010 Time Code Master is available in three versions. The basic 5010 is a dual standard (NTSC/PAL) combination generator, high speed reader for Linear Time Code (LTC), and contains a high resolution character inserter which can be delegated to either the generator or reader. The model 5010-VITC adds Vertical Interval Time Code (VITC) reading and generating capabilities to the basic 5010. The 5010-24 is a special purpose time code generator designed to work 24 FPS time code commonly in use with the high definition 1080P/24 video format. The model 5010-VITC-24 adds Vertical Interval Time Code (VITC) reading and generating capabilities to the 5010-24. Throughout this manual, references to the 5010 apply to all versions unless otherwise indicated.

A 16 digit alphanumeric display can be quickly delegated to show the required data. Thus, the generator will produce uninterrupted time code while the reader may be used to recover time code from another tape without interfering with the generator function.

The 5010's time code generator can be preset to lock to its REF VIDEO input source either by simple frame locking as per EIA standard RS-170, or where a stable RS-170-A source is available, it will colour lock in accordance with the 4 field NTSC colour sequence. In the PAL standard, either the 4 field or 8 field sequence may be observed.

When 5010-24 is operating in the 24 FPS standard, it gen locks to a 23.98 FPS reference signal. Where an external 6Hz reference is available, it will lock such that the 00 frame of each second is coincident with the 6Hz signal. When the 5010-24 is operating in the NTSC standard it gen locks to a NTSC reference signal.

In NTSC 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.

A frame rate convert mode allows the user to convert between EBU and SMPTE drop frame code for standards converter applications. In the 5010-24 version, the rate convert allows the user to convert between 23.98 FPS and 29.97 non drop frame code for high definition 1080p/24 applications. Numeric offsets may be applied to the converted numbers to accommodate standards converter delays.

The 5010 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 UTC mode, the generator encodes the UTC time and date

received from the receiver antenna. The reader can be independently set to display either the local time or UTC. When the generator is set to local time mode, it can be set to automatically adjust for 'daylight saving' or 'summer time' time offsets from UTC.

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 decimal values for each group in the generated code, and the reader will read decimal 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.

In the time/date mode, the date information will be encoded into the user bits in one of three formats. The SMPTE 309M standard defines two methods of encoding date information into the user bits. The YYMMDD format is designed for compatibility with simple time code readers and places the year, month and day as BCD digits, along with a time zone offset code in the user bits. The YYMMDD format does not contain any century information, but the 5010 assumes that year less than 50 are interpreted as being in the range 2000 to 2049, while years greater than or equal are in the range 1950 to 1999. The Modified Julian Date format should be used where century information is required. In this format the Modified Julian Date is encoded as a 24 bit binary number in the user bits, along with the time zone offset code. A third format; compatible with Leitch master clocks is also supported.

Two jam sync modes allow regeneration of poor, frequently interrupted or discontinuous time code. In the continuous jam sync mode, the generator is slaved to the reader, and will follow code 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.

The 5010-VITC reader can be configured to operate in one of three modes:

- Full speed (1/30 to 70 times play) LTC reader.
- 0 to 40X speed VITC reader
- Auto LTC/VITC reader automatically switches between LTC and VITC inputs reading whichever is valid.

The 5010-VITC-24 reader can be configured to operate in one of three modes:

- Full speed LTC reader. (24 and 30 FPS nominal)
- 0 to 40X speed VITC reader (30 FPS only)
- Auto LTC/VITC reader automatically switches between LTC and VITC inputs reading whichever is valid. (30 FPS only)

The recovery of recorded LTC time code at other than play speed has always presented some degree of difficulty, particularly with low end 3/4" and 1/2" recorders lacking a separate address track. The high speed reader in the model 5010 employs sophisticated input conditioning and clock and data separator circuits to reliably recover LTC over the full shuttle and wind speed ranges of most VTR's.

The VITC reader is designed for use with non time base corrected video signals. Although the use of time base correctors will enhance the recovery range of the VITC reader, the amount of improvement is dependent on the type of TBC and transport being used. The model 5010 contains all the necessary video processing circuits and therefore, requires no external signals other than the video signal itself. The VITC reader's line range can be easily programmed from the front panel, thus permitting recovery of specific VITC data where multiple sets have been recorded.

The high-resolution character inserter provides four independently positionable windows to show the generator or reader time and user bits simultaneously. Three character sizes and the choice of white or black characters with or without contrasting background mask are selected from the front panel.

When displaying data recovered from a VITC source, the 'look ahead' compensation can be turned off, allowing field accurate burn-ins of edited material. The field number sequence will be displayed to the right of the frames display. When the data being read was recorded in the non colour frame mode, the field number sequence will be 1,2,1, etc. (1,2,3,4,1, etc. for PAL). When the reader data was recorded in the colour frame mode, the field number sequence will be 1,2,3,4,1, etc. (1,2,3,4,5,6,7,8,1, etc. for PAL).

The Character inserter provides an on screen programming menu system, which is used to configure the various operating modes. The use of drop down menus, and dedicated programming keys, allows the model 5010 to be conveniently configured for particular customer requirements.

The 5010 has two general purpose outputs that can be set to activate at a specific time code value of the generator or reader, to output a one pulse per second pulse or act as a warning tally when the unit loses its GPS reference. The duration of the output is user programmable.

Remote control of the commonly used functions may be accomplished using the parallel remote control interface. Full computer control, including alpha-numeric user bit entry and reading is possible using the RS-232/RS-422 serial port. Two general purpose TTL outputs can be programmed for a variety of functions such as reader or generator triggered time events, and a loss of genlock alarm.

1.1. HOW TO USE THIS MANUAL

This manual is organized into 5 chapters: Introduction, Installation, Operation, Serial Remote Control and Technical Description. There is also an appendix showing the time zone encoding for SMPTE 309M dates.

Certain sections of the manual pertain only to the model 5010-VITC or 5010-24 models. These sections are noted clearly. Throughout the

remainder of the manual references to the model 5010 are applicable to all versions of the unit.

Items of special note for all users are marked with a double box like this.

1.2. DEFINITIONS

LINEAR TIME CODE: A digital code used for timing and control purposes on video tape and associated audio tape machines. It is recorded on a longitudinal track with audio characteristics and is referred to as LTC (Sometimes this code is also referred to as longitudinal code or SMPTE). Each 80 bit code word is associated with one television frame, and consists of 26 time bits, 6 flag bits, 32 user bits and 16 sync bits.

VERTICAL INTERVAL TIME CODE: A digital code used for timing and control purposes on video tape recorded in the vertical blanking interval of the video picture, and is referred to as VITC. Each 90 bit code word is associated with one television field, and consists of 26 time bits, 6 flag bits, 32 user bits, 18 sync bits, and an 8 bit error check (CRC) code.

USER BITS: 32 bits in the time code are user assignable. They typically are used to contain reel numbers, scene and take numbers, or other user-oriented data.

DROP FRAME: In NTSC systems, where the frame rate is 29.97002618 frames per second, the drop frame mode permits time of day indexing of the frame numbers by dropping certain frame numbers. Specifically, frames 0, and 1 at the beginning of each minute except minutes 0,10,20,30,40, & 50, are omitted, to compensate for an approximate timing error of 108 frames (3 seconds 18 frames) per hour. A flag bit is set in the time code to signal when the drop frame mode is in effect.

COLOUR FRAME: If the generator is locked to an RS-170A or 8 field PAL video signal, and an intentional relationship between the video colour frame sequence and the time code is desired, the code is said to be colour framed. A flag bit is set in the code to indicate this mode. The COLOUR FRAME item on the Generator menu selects this mode of operation for the generator.

JAM SYNC: Refers to the operation of slaving the generator to data coming from the reader. Jam sync should be used when dubbing 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. Several jam sync modes can be invoked in the 5010.

In the **continuous jam sync mode**, the generator and reader times are compared with each other during each frame, automatically compensating for the decoding offsets. If for any reason they are not equal, the jam is bypassed, and the generator substitutes the next frame number. If the number of consecutive jam bypass errors exceeds 5, the last valid reader time is jammed into the generator again. In the absence of valid reader data within the last 5 frames, the generator continues to increment normally until valid reader code resumes. At this time it will be re-jammed to the reader, thus repairing large dropouts on the reader tape. The generator can also be configured to stop when there is no incoming code. The continuous Jam sync mode is selected by pressing the SHIFT + JAM keys, and is indicated when the JAM LED is On.

In the **momentary jam sync mode**, the reader time is 'jammed' into the generator for one frame only. The generator continues to increment normally from that point on, without regard to the reader frame numbers. The momentary jam sync mode is selected by pressing the JAM key.

USER BIT TRANSFER: In some applications it may be desirable to transfer the user bit data from the reader tape, and generate new time information. In other applications, both the time and user bit information should be transferred. Both of these options are available in addition to the normal jam sync and non jam sync modes.

JULIAN DATE: The Julian day number is a count of days elapsed since Greenwich mean noon on January 1, 4713B.C. January 1st, 1993, was JD 2448989; January 1st, 2000 will be JD 2451545.

MODIFIED JULIAN DATE (MJD): The Modified Julian Date is a continuous count of the number of days elapsed since 17 November 1858. It is often more useful than conventional calendar dates for record keeping over long periods of time, since the MJD's of two events can easily be subtracted to determine the time difference in days. Usually, the MJD is specified as a number with 5 significant digits. As an example, the MJD for 1 January 1995 is 49718, meaning that this many days have elapsed between 17 November 1858 and 1 January 1995. The Modified Julian date is calculated by subtracting 2400000.5 days from the Julian Date. Thus the Modified Julian Day 1 begins at Greenwich midnight.

UNIVERSAL COORDINATED TIME

UNIVERSAL TIME, COORDINATED (UTC): Universal Coordinated Time (UTC) is an international time standard that defines a time that doesn't depend on where we are on Earth. Universal Time (UTC), Greenwich Mean Time (GMT), and Zulu Time (Z), are based at the prime meridian (0° longitude) of Earth and are used to avoid confusion of time zones.

STANDARD TIME: The civil time adopted for a country or region.

DAYLIGHT SAVING TIME: The civil time observed when daylight saving time is adopted in a country or region. It is usually standard time + 1 hour.

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2. INSTALLATION

2.1. REAR PANEL CONNECTIONS

There are two different versions of the 5010 hardware. Earlier versions have the rear panel layout shown in Figure 2-1 and later versions have the rear panel layout shown in Figure 2-2. The labels on the connectors are mostly the same, but many of the connectors have been relocated to better suit the layout of the new circuit board. The 5010-VITC and 5010-VITC-24 will have all the connections, the 5010 and 5010-24 will be missing the VITC input and output BNCs. Installation and operation of the two versions is similar except where specifically noted.

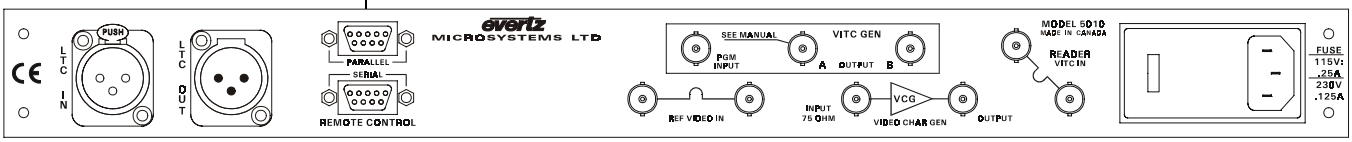


Figure 2-1: Rear Panel Layout – Earlier versions or 5010

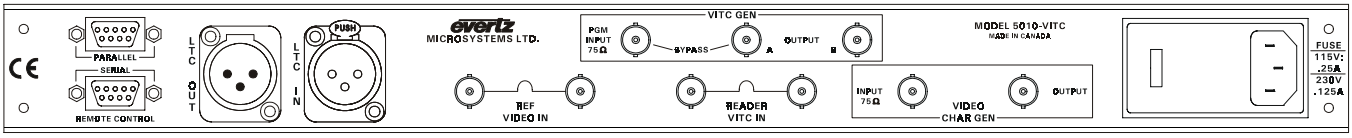


Figure 2-2: Rear Panel Layout – Later Versions of 5010

The following sections describe the purpose of the rear panel connectors of the model 5010. Figure 2.1 above shows the rear panel connectors provided on the model 5010. Sections 2.1.1 to 2.1.6 describe the specific signals that should be connected to the model 5010.

2.1.1. Linear Time Code Connections

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

LTC IN: A female XLR connector for input of SMPTE/ EBU linear timecode for the reader (Balanced)

2.1.2. Vertical Interval Timecode Video Connections (models 5010-VITC and 5010-VITC-24 only)

READER VITC IN: A BNC loop used to input video containing vertical interval time code for the VITC reader.

PGM INPUT: A 75 ohm terminated BNC for input of program video onto which vertical interval time code is to be inserted.

VITC OUT A: A BNC connector that contains the PGM INPUT video with vertical interval timecode inserted. This output is identical to the VITC OUT B output on older style units. On newer style units when the Bypass relay option is fitted, this output is bypass protected by a relay in the case of power loss to the unit.

VITC OUT B: A BNC connector that contains the PGM INPUT video with vertical interval timecode inserted. On newer style units when the Bypass relay option is fitted, this output will not be active when the bypass relay is closed (in the case of power loss to the unit.)

2.1.3. Character Generator Connections

VIDEO CHAR GEN INPUT: A 75 ohm terminated input of program video onto which characters are to be inserted.

VIDEO CHAR GEN OUTPUT: A BNC connector which outputs the VIDEO CHAR GEN INPUT video with characters inserted. This output is also used to display the on screen programming menu and is normally connected to a video monitor.

2.1.4. Gen Lock Connections

REF VIDEO IN: A BNC loop used to provide a gen-lock reference for the 5010's generator.

2.1.5. Remote Control Connections

PARALLEL: A 9 pin female 'D' connector used for parallel remote control inputs. On the 5010-24 and 5010-VITC-24 the 6 Hz reference signal is also connected to this connector.

SERIAL: A 9 pin female 'D' connector used for uploading new firmware and for remote control of the 5010 from a computer.

2.1.6. Power Connections

LINE: The model 5010 may be set for either 115v/60 Hz or 230v/50 Hz AC operation. The voltage selector switch is accessible on the rear panel. The line voltage connector contains an integral slow blow fuse (and a spare one).

2.2. MOUNTING

The model 5010 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 115 or 230 volts AC at 50 or 60 Hz, switch selectable on the rear panel. 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.

Before connecting the line power, be sure to select the proper line voltage. Also, check that the line fuse is rated for the correct value marked on the rear panel.

The power entry module combines a standard IEC 320 power inlet connector, voltage selector switch, two 5 x 20 mm fuse holders (one active, one spare) and an EMI line filter.

To change the mains voltage setting, open the cover of the power entry module using a small screwdriver. Remove the drum selector switch, and re-insert it so that the desired voltage is visible through the opening on the mains connector cover. Check that the correct fuse is in use as shown in section below.

2.3.2. Changing the Fuse

The fuse holder is located inside the power entry module. To change the fuse, open the cover of the power entry module using a small screwdriver. The fuse holder on the bottom contains the active fuse. The one at the top contains a spare fuse. Pull the bottom fuse holder out and place a fuse of the correct value in it. Use slo blo (time delay) 5 x 20 mm fuses rated for 250 Volts with the following current ratings:

For 115 Volt operation	250 mA
For 230 Volt operation	125 mA

Never replace with a fuse of greater value.

Make sure that the arrow is pointing down when you replace the fuse holder. Close the door on the power entry module and connect the mains voltage.

2.4. VIDEO CONNECTIONS

2.4.1. Generator Sync Lock – Model 5010 and 5010-VITC

For proper frame/address synchronization in videotape applications, the generator must be locked to a stable 1 volt p-p composite video or colour black source, applied to the generator REF VIDEO IN video loop. The internal sync separator has a high impedance input tapped off the loop through; therefore, the video signal must be properly terminated at the end of the line.

When colour frame synchronization is desired, the sync to subcarrier (Sc-H) phase relationship of the video source must conform to the NTSC RS-170-A or the PAL 8 field specification. Selection of the colour framed or non colour framed mode is accomplished from the front panel. (See Section 3.5.11) When the video source does not meet the colour frame specifications, the non colour frame mode must be selected to ensure a proper generator lock condition.

2.4.2. Generator Sync Lock – Model 5010-24 and 5010-VITC-24

When the 5010-24 is operating in the 24FPS mode, it will gen lock to a 23.98 FPS 625 line sync reference (sometimes referred to as ‘slow PAL’). The LED labeled 23.98 on the front panel is used to indicate that the 5010-24 is properly genlocked to the 23.98 FPS sync source. When it operates in the NTSC mode it genlocks to a standard NTSC colour black reference.

In addition to a normal frame lock to the reference video, the 5010-24’s time code output can be synchronized to a 6 Hz reference input connected to pin 7 of the PARALLEL I/O connector. See section 3.for information about connecting and using the 6 Hz reference.

Both the 23.98 FPS sync and the 6 Hz reference signal are generated by the Evertz 7750SRG-HD Sync generator Card. See the Evertz web site (www.evertz.com) for more information.

2.4.3. Character Inserter Video

The input video on which the characters are to be displayed is connected to the VIDEO CHAR GEN INPUT connector. The video input has an internal 75 ohm termination.

The program video with characters inserted is available on the VIDEO CHAR GEN OUTPUT connector and may be used to drive a preview monitor or a video recorder. Characters are keyed into the video connected to the VIDEO CHAR GEN INPUT connector. Size, position, and style of the character displays are controlled from the on screen programming menu.

In order to use the on screen programming menu system, video must be applied to the VIDEO CHAR GEN INPUT connector and the VIDEO CHAR GEN OUTPUT must be connected to a video monitor.

2.4.4. VITC Generator Video In/Out (model 5010-VITC and 5010-VITC-24 only)

The program video source for the VITC generator is applied to the PGM Video Input. The video input has an internal 75 ohm termination. Program video with VITC is available on two separate video outputs. On newer style units, when the bypass relay option is fitted, the A output is bypass protected by a relay in the case of power loss to the unit abd the B output will not be active when the bypass relay is closed.

2.4.5. VITC Reader Video Input (model 5010-VITC and 5010-VITC-24 only)

Video associated with the LTC code or video with VITC recorded on it is connected to the READER VITC IN loop. The video input has a high impedance input tapped off the loop through; therefore the input must be terminated with 75 ohms at the end of the line.

2.5. LINEAR TIME CODE IN/OUT

The LTC reader input connects to your head pre-amplifier output. When using an unbalanced input to the reader, the signal should be applied to pin 3 of the LTC reader input connector. Normally, the unused input, (pin 2) should be connected to ground (pin 1).

The 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 OUT item on the CONFIG menu of 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 or audio track 2 of your video recorder (audio track 3 for 1" VTR's). Pin 1 of the XLR is ground, and pins 2 and 3 provide a balanced output.

2.6. REMOTE CONTROL CONNECTOR PIN ASSIGNMENTS

2.6.1. Parallel Remote Control

A 9 pin D connector located on the rear panel labeled REMOTE CTL provides 6 parallel control inputs for remote control of some of the model 5010 functions. There are also two open collector outputs that can be assigned to a variety of functions. See section 3.10 for a complete description of the operation of the Parallel I/O functions. The pinout of the D connector is as follows:

Pin #	Name	Description
1	GND	Frame ground
2	VCG Ena	VCG On/Off
3	JAM Ena	Jam Sync enable
4	UBUB Ena	UB - UB Transfer enable
5	OUT 2	Output 2
6	LTC Ena	LTC reader enable
7	VITC Ena	VITC reader enable
	6 Hz	6 Hz input (model 5010-24 only)
8	TMUB Ena	Time - UB Transfer enable
9	OUT 1	Output 1

Table 2-1: Parallel Remote Control Pin Definitions

2.6.2. Serial Remote Control

The 5010 is fitted with a 9 pin subminiature 'D' connector labeled Serial I/O. This port is configured at the factory for configured for a ‘straight through RS-232 connection to a PC COM port. This port can also be configured as an RS-422 port. See section 4.4 for the information on configuring the port for RS-422 applications.

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 2-2: Serial Control RS-232 Pin Definitions

Figures

3. OPERATING INSTRUCTIONS

The model 5010 Time Code Master is a full function time code reader/generator system. The model 5010 Time Code Master is available in three versions. The basic 5010 is a dual standard (NTSC/PAL) combination generator, high speed reader for Linear Time Code (LTC), and contains a high resolution character inserter which can be delegated to either the generator or reader. The model 5010-VITC adds Vertical Interval Time Code (VITC) reading and generating capabilities to the basic 5010. The 5010-24 is a special purpose time code generator designed to work 24 FPS time code commonly in use with the high definition 1080P/24 video format. The model 5010-VITC-24 adds Vertical Interval Time Code (VITC) reading and generating capabilities to the 5010-24. A 16 digit alphanumeric display can be quickly delegated to show the required data. Thus, the generator will produce uninterrupted time code while the reader may be used to recover time code from another tape without interfering with the generator function.

The model 5010-VITC's reader can be configured in one of three modes:

- Full speed (1/30 to 70 times play) LTC reader
- 0 to 15X speed VITC reader
- Auto LTC/VITC reader automatically switches between LTC and VITC inputs reading whichever is valid.

The 5010-VITC-24 reader can be configured to operate in one of three modes:

- Full speed LTC reader. (24 and 30 FPS nominal)
- 0 to 40X speed VITC reader (30 FPS only)
- Auto LTC/VITC reader automatically switches between LTC and VITC inputs reading whichever is valid. (30 FPS only)

The character inserter provides an on screen programming menu system, which is used to configure the various operating modes. The use of drop down menus and dedicated programming keys allows the model 5010 to be conveniently configured for particular customer requirements.

3.1. FRONT PANEL OVERVIEW

16 front panel keys handle operational control. Eight LED's provide operational status at a glance.

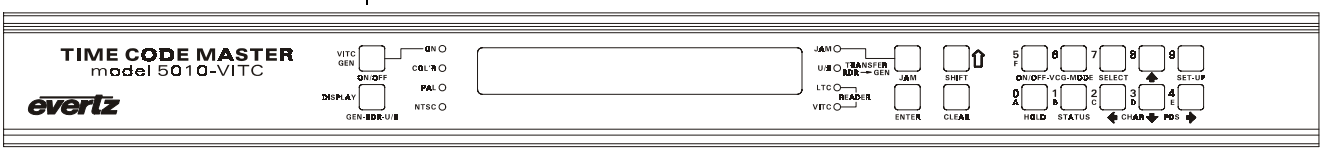


Figure 3-1: 5010 and 5010-VITC Front Panel Layout

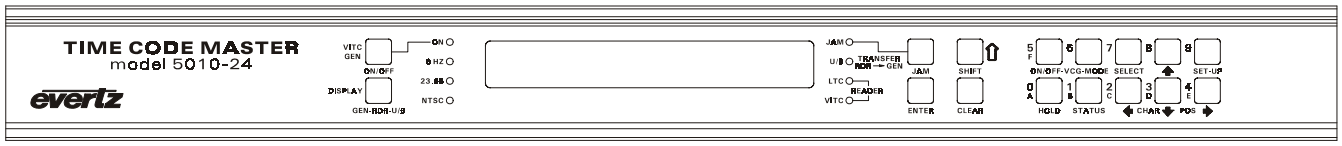


Figure 3-2: 5010-24 and 5010-VITC-24 Front Panel Layout

3.1.1. Overview of the Pushbuttons

Sixteen front panel pushbuttons are used to control the operation of the 5010.

VITC GEN ON/OFF Is used to turn the VITC generator on and off. (Model 5010-VITC and 5010-VITC-24 only) 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 Is used to select whether the generator or reader time or user bits is being displayed on the front panel alphanumeric display. The leftmost 3 characters of the front panel display whether time or user bits is being displayed, and whether the generator reader is the data is coming from. (E.g.: `LTM 12:34:56:10` indicates that time from the reader is being displayed.)

JAM Is used to momentarily jam the reader time into the generator time. When the **SHIFT + JAM** keys are pressed the 5010 generator will be put into continuous jam sync mode.

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 a status screen on the VCG that summarizes the current operational modes of the 5010. Pressing **SHIFT + STATUS** displays the firmware version on the character generator screen.

In GPS TIME DATE mode, the left and right arrows allow the user to move between the standard status screen and a GPS specific status screen. The GPS status screen shows the last time the 5010 synchronized to the GPS Receiver and other information pertaining to the GPS operation.

VCG MODE Initiates VCG window select mode and highlights the selected window. Use the arrow keys to move the window, use the **VCG ON/OFF** key to turn the window on or off. Press the **VCG MODE** key again to select the next VCG window. Press the **CLEAR** key to return to the normal VCG display mode.

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

SETUP Initiates SETUP mode and displays the on screen programming menu. Pressing the **SETUP** key again exits the SETUP mode.

SELECT When in the SETUP mode the **SELECT** key is used to choose items from within a drop down menu or sub menu.

← → ↑ ↓ When in the SETUP mode, the arrow keys are used to move between various items in the menu system.

When in the VCG window select mode, the arrow keys are used to position individual windows on the screen. See also section 3.3.1.

When not in either the SETUP or VCG window select modes, the arrow keys are used to position all the windows on the screen. (See also section 3.3.2.)

3.1.2. Overview of the Shifted Key Functions

When the **SHIFT** key is held down the standard meanings of many of the keys are modified. Throughout this manual shifted keys are referred to as **SHIFT + STATUS** for example. When you see this it means to hold the SHIFT key while pressing the other key. Following is an overview of the main shifted functions.

SHIFT + SETUP: Pressing the **SETUP** key while holding down the **SHIFT** key will cause the unit to enter Engineering Setup menu.

SHIFT + STATUS Displays firmware revisions on the character generator and the front panel. Pressing the **CLEAR** key or **SHIFT + STATUS** will remove this screen.

SHIFT + JAM Initiates or cancels the Continuous Jam sync mode of the generator.

SHIFT + DISPLAY Shows the extended displays on the front panel.

3.1.3. Status Indicators

There are eight status indicators that show operational status at a glance.

VITC GEN ON Indicates that VITC generator is active (Model 5010-VITC only)

COL'R Indicates that the generator is operating in the Colour Frame Mode and that the generator numbers are properly synchronized to the NTSC 4 field or PAL 8 field colour frame sequence. (Models 5010 and 5010-VITC)

6 Hz Indicates that the generator is operating in the 6 Hz Lock mode and that the generator numbers are properly synchronized to an externally supplied 6 Hz reference pulse. The 00 frame of each second will be coincident with the 6 Hz pulse. (Model 5010-24 and 5010-VITC-24 only)

PAL Indicates that the 5010 is properly genlocked to a PAL video reference. If it is blinking, it indicates that the PAL video standard is selected, but a valid PAL video reference is not present. (Models 5010 and 5010-VITC)

23.98 Indicates that the 5010-24 or 5010-VITC-24 is properly genlocked to a 23.98 FPS 625 line sync reference. If it is blinking, it indicates that the 24 FPS video standard is selected, but a valid 23.98 FPS sync reference is not present. (Models 5010-24 and 5010-VITC-24 only)

NTSC Indicates that the 5010 is properly genlocked to a NTSC video reference. If it is blinking, it indicates that the NTSC video standard is selected, but a valid NTSC video reference is not present.

JAM Indicates that the generator is operating in the continuous Jam Sync Mode. When the generator is operating in the GPS TIME mode, the JAM indicator will come on momentarily when the time is being resynchronized to the GPS reference time.

U/B TRANSFER Indicates that the Generator User Bits are being transferred from the Reader time or user bits.

LTC Indicates that LTC reader is reading valid code.

VITC Indicates that VITC reader is reading valid code. (Model 5010-VITC only)

3.2. FRONT PANEL DISPLAY FUNCTIONS

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 3 characters of the display indicate what is being displayed as follows:

GTM	Generator Time
GUB	Generator User Bits
LTM	LTC Reader Time
LUB	LTC Reader User Bits
VTM	VITC Reader Time
VUB	VITC Reader User Bits.

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

OFS	Jam Sync Offset register
JAM@	Reader Time at which Jam sync will occur
REVT	Time at which Reader Time Event GPO will occur
GEVT	Time at which Generator Time Event GPO will occur
DSTBEG	Date on which Daylight Saving time begins
DSTEND	Date on which Daylight Saving time ends

On the model 5010-VITC and 5010-VITC-24, when the Reader Assignment is set to LTC, the VTM and VUB will not be shown. When the reader assignment is set to VITC, the LTM and LUB will not be shown. When the reader assignment is set to LTC/VITC only the reader that is currently active will be shown. (For example when the LTC reader is reading, LTM or LUB will be shown)

The **HOLD** key performs different functions depending on whether the Generator or Reader is being displayed on the front panel. When the Generator is displayed, the **HOLD** key is used to stop the generator clock from incrementing. When in the HOLD mode, a special character (**H**) is displayed in the leftmost character of the front panel display. Press the **HOLD** key again to release the HOLD mode and begin updating of the data. When the generator is in the continuous Jam Sync Mode, the HOLD key has no effect on the generator time.

When the Reader is being displayed, the **HOLD** key is used to freeze the VCG reader display and the front panel displays at a particular point in time. When in the FREEZE mode, a special character (**F**) is displayed in the leftmost character of the front panel display. Press the **HOLD** key again to release the FREEZE mode and begin updating of the data.

3.2.1. 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 (.)**

When the Generator Assignment set to TIME DATE mode, the following special indicators are used between the hours and minutes digits of the front panel time display to identify daylight saving or standard time

Standard Time	**Colon (:)**
Daylight Saving Time	**Period (.)**

3.3. CHARACTER GENERATOR FUNCTIONS

Four separately positionable character windows displaying time or user bits from the generator or reader are available. The four arrow keys (↑, ↓, ←, →) control the position of all the windows. The **VCG ON/OFF** key selects whether the VCG keyer is on or off. The use of these keys in combination with the **VCG MODE** key selects which windows are displayed and their position on the screen. The VCG drop down menu of the on screen programming menu is used to select character size and style.

3.3.1. Selecting and Positioning the Individual Character Inserter Windows

Press **VCG MODE** to enable the window select mode. All four windows will appear on the character screen with the window for the generator Time highlighted. Use the arrow keys (↑, ↓, ←, →) to position the generator Time window on the screen. Press the **VCG ON/OFF** key to turn the window on or off. Press the **VCG MODE** key to highlight the generator User Bits window. Use the **VCG ON/OFF** key to turn it on or off and the arrow keys to move it to the desired location. Press the **VCG MODE** key to select the next window, etc.

Example: To move only the generator Time window down one line, leaving the generator user bit window in the same place, press **VCG MODE** three times and press the ↓ key. Press the **CLEAR** key to return to the normal display mode.

3.3.2. Positioning the Overall Character Display

In the normal VCG display mode, when neither of the windows is highlighted, the arrow keys (↑, ↓, ←, →) move all the displayed windows by the same relative amount.

Example: To move the time and user bits windows down by one line press the ↓ key.

3.3.3. Special VCG Indicators

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

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

When the Generator Assignment set to TIME DATE mode, the following special indicators are used between the hours and minutes digits of the time windows in the character inserter to identify daylight saving or standard time

Standard Time	**Colon (:)**
Daylight Saving Time	**Period (.)**

3.3.4. Field Identification

When displaying time from the VITC generator or reader, (model 5010-VITC only) the field number sequence will be displayed to the right of the time frames display. When the data is in the non colour frame mode the field number sequence will be 1, 2, 1, etc. (1, 2, 3, 4, 1, etc. for PAL). When the reader data was recorded in the colour frame mode, the field number sequence will be 1, 2, 3, 4, 1, etc. (1, 2, 3, 4, 5, 6, 7, 8, 1, etc. for PAL) The field number display may be disabled using the VCG FIELDS item in the VCG menu.

3.4. ON SCREEN PROGRAMMING MENU – OVERVIEW

The key to the operational flexibility of the model 5010 lies in the powerful on screen programming menu system that uses the built in character generator. This method of configuring the model 5010 is quick, and simple, guiding you to the correct setup for your application. Six front panel push buttons (🡐, 🡒, 🡑, 🡓, and **SELECT** and **SETUP**) are used to cycle through the various items on the programming menu.

The 5010 menu system consists of a main menu with three drop down menus. The titles of each of the drop down menus are shown on the top line of the character display. Selecting an item on one of the drop down menus reveals a sub-menu showing the choices for that item. Figure 3.2 is an overview of the on screen menu system and shows all the menu choices and where you will find the menu items. Note that some menu choices will be hidden or show the message **NOT APPLICABLE IN CURRENT MODE** depending on the programmed mode of operation.

Abbreviated menu descriptions are also shown on the front panel display, allowing the menu system to be used without a video monitor.

Figure 3-4 shows an overview of the front panel menu descriptions for the SETUP menu. When the drop down menu items are selected, they are shown in UPPERCASE. When the sub menus are selected, they are shown in lower case.

GENERATOR
- **GEN MODE**
  - TIME / USERBITS
  - TIME / DATA
  - TIME / RDR TIME
  - TIME / RDR UB
  - TIME / DATE
  - CONVERT 25 ⇔ 30
- **GEN VITC LINES**
  - LINE 1 / LINE 2
  - 10 / 20
- **DROP FRAME**
  - NON DROP FRAME
  - DROP FRAME
  - NOT APPLICABLE IN JAM
  - NOT APPLICABLE IN PAL
- **COLOUR FRAME**
  - 2 FIELD
  - 4 FIELD
  - 8 FIELD
- **LTC PARITY**
  - OFF
  - ON
- **NO CODE JAM**
  - RUN
  - HOLD
  - MUTE
- **DATE FORMAT**
  - YY MM DD
  - MODIFIED JULIAN
  - OTHER
- **TIME ZONE ADJUST**
  - UTC
  - LOCAL TIME

READER
- **ASSIGNMENT**
  - LTC
  - VITC
  - LTC/VITC
- **RDR MODE**
  - TIME / USER
  - TIME / DATA
  - TIME / TIME
  - DATA / DATA
  - TIME / DATE
- **RDR VITC LINES**
  - LINE RANGE:
  - START / END
  - 10 / 20
- **RDR VITC CRC**
  - NORMAL
  - SPECIAL
- **DISPLAY**
  - PROCESSED
  - DIRECT
- **TIME ZONE ADJUST**
  - UTC
  - LOCAL TIME

VCG
- **CHAR SIZE**
  - TINY
  - SMALL
  - LARGE
- **CHAR STYLE**
  - WHITE
  - WHITE ON BLACK
  - BLACK
  - BLACK ON WHITE
- **VCG FRAMES**
  - DISPLAY
  - BLANK
- **VCG FIELDS**
  - DISPLAY
  - BLANK
- **VCG SYMBOLS**
  - DISPLAY
  - BLANK

Figure 3-3: On Screen Programming Menu Overvie

GEN MODE
- Gmode time data
- Gmode time rtime
- Gmode time rub
- Gmode time date
- Gmode convert

GEN VITC LINES
- Gvitc line1 = 10
- Gvitc line2 = 12

GEN DROP FRAME
- Drop frame off
- Drop frame on
- Drop frame jam
- No drop in pal

GEN COLOUR FRAME
- Col'r frame off
- Col'r frame on

GEN LTC PARITY
- Ltc parity off
- Ltc parity on

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

GEN DATE FORMAT
- Date fmt yymmdd
- Date fmt mjd
- Date fmt other

GEN TM ZONE ADJ
- Gtm zone adj utc
- Gtm zone adj loc

RDR ASSIGNMENT
- Assign ltc
- Assign vitc
- Assign ltc/vitc

RDR MODE
- Rmode time data
- Rmode time time
- Rmode data data
- Rmode time date

RDR VITC LINES
- Rvitc line1 = 10
- Rvitc line2 = 12

RDR VITC CRC
- Rdr crc normal
- Rdr crc special

RDR DISPLAY
- Disp processed
- Disp direct

RDR TM ZONE ADJ
- Rtm zone adj utc
- Rtm zone adj loc

VCG CHAR SIZE
- Size tiny
- Size small
- Size large

VCG CHAR STYLE
- Style white
- Style wht on blk
- Style black
- Style blk on wht

VCG FRAMES
- Frames display
- Frames blank

VCG FIELDS
- Fields display
- Fields blank

VCG SYMBOLS
- Symbols display
- Symbols blank

Figure 3-4: Overview of Front Panel Menu

To enter the on screen programming menus, press the **SETUP** key. The character generator will show the last format screen that was used with the currently selected item highlighted. The two horizontal arrow keys (🡐, 🡒) allow you to move horizontally to another drop down menu when the sub menu is hidden. Using these two keys you can quickly scan the entire menu system for the item you wish to change.

The two vertical arrow keys (🡑, 🡓) allow you to move vertically within the drop down menus. When you have selected the desired menu item, press the **SELECT** key to reveal the sub menu choices for that item. Use the two vertical arrow keys (🡑, 🡓) to move vertically within the sub menu. When you have selected the desired sub menu choice press the **SELECT** key to save your choice and return to the drop down menu.

When you have made all the desired changes, press the **SETUP** key or **CLEAR** key to return to the normal display mode.

Changes made using the SETUP menu are only activated when you exit the SETUP menu and return to normal display mode.

The GENERATOR drop down menu is 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. (See section 3.5.) The READER drop down menu is used to program various reader modes such as selecting LTC or VITC operation, VITC Reader Line numbers, whether user bits contain static numbers or time information, etc. (See section 3.6.) The VCG drop down menu is used to program the size and style of the character generator, and whether the time code frames will be displayed or not (See section 3.7).

ASSIGNMENT
LTC
VITC
LTC/VITC

To aid in finding the descriptions of the various menu items in sections 3.5 to 3.8, the drop down menu items and its sub menu items are shown in the margin of the manual, next to the description as shown.

3.4.1. Engineering Setup Menu

The Engineering Setup menu allows the advanced user to change various internal parameters of the 5010, or to invoke several advanced diagnostic modes.

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

The Engineering Setup menu system consists of three drop down menus. The titles of each of the drop down menus are shown on the top line of the character display. Selecting an item on one of the drop down menus reveals a sub-menu showing the choices for that item

Figure 3-5 is an overview of the Engineering Setup menu and shows all the menu choices and where you will find the menu items. Figure 3-6 shows an overview of the front panel descriptions for the Engineering Setup Menu. Note that some menu choices will be hidden or show the message **NOT APPLICABLE IN CURRENT MODE** depending on the programmed mode of operation.

CONFIGURATION
- **VIDEO TYPE**
  - AUTO
  - NTSC
  - PAL
- **HORZ CHAR SIZE**
  - HORIZONTAL
  - CHAR SIZE = 10
  - ← OR → TO ADJUST
- **DISPLAY LEVEL**
  - FRONT PANEL
  - BRIGHTNESS = 2
  - ↑ ↓ TO ADJUST
- **LTC OUT LEVEL**
  - LTC OUTPUT
  - LEVEL = 35
  - ↑ ↓ TO ADJUST
- **CONVERT WINDOW**
  - RATE CONVERT
  - WINDOW = 07 FRMS
  - ↑ ↓ TO ADJUST
- **GPO1 ASSIGN**
  - GEN TIME EVENT
  - RDR TIME EVENT
  - 1 PULSE/SEC
  - 1 PULSE/MIN
  - REF FAIL ALARM
- **GPO2 ASSIGN**
  - GEN TIME EVENT
  - RDR TIME EVENT
  - 1 PULSE/SEC
  - 1 PULSE/MIN
  - REF FAIL ALARM
- **GPO DURATION**
  - GPO DURATION
  - LENGTH = 01 FRMS
  - ↑ ↓ TO ADJUST
- **FACTORY RESET**
  - ** WARNING **
  - THIS COMPLETELY
    RESETS UNIT

  - PRESS THE SHIFT + ENTER KEYS
  - TO PROCEED

SERIAL PORT
- **BAUD RATE**
  - 38400
  - 19200
  - 9600
  - 2400
- **PARITY**
  - FIXED TO EVEN
- **WORD SIZE**
  - FIXED TO 8 BITS
  - 1 STOP
- **SERIAL TEST**
  - OFF
  - ON

DEBUG
- **RDR DIAGS**
  - OFF
  - ON
- **RAM VIEW**
  - NOT AVAILABLE
- **NOVRAM VIEW**
  - NOT AVAILABLE
- **RAM TEST**
  - NOT AVAILABLE

Figure 3-5: Overview of Engineering Setup Menu

VIDEO TYPE
- Video type Auto
- Video type Ntsc
- Video type Pal

HORZ CHAR SIZE
- Horz size = 02

DISPLAY LEVEL
- Disp level = 1

LTC OUT LEVEL
- LTC level = 00

CONVERT WINDOW
- Conv window = 07

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

GPO2 ASSIGNMENT
- Gpo2 gen event
- Gpo2 rdr event
- Gpo2 1 pulse/sec
- Gpo2 1 pulse/min
- Gpo2 ref failure

FACTORY RESET
- Use shift+enter

SERIAL BAUD RATE
- Baud Rate 38400
- Baud Rate 19200
- Baud Rate 9600
- Baud Rate 2400

SERIAL PARITY
- Fixed to even

SERIAL WORD
- Fixed to 8 bits

SERIAL TEST
- Serial test off
- Serial test on

READER DIAGS
- Not applicable

RAM VIEWER
- Not applicable

NOVRAM VIEWER
- Not applicable

RAM TEST
- Not applicable

Figure 3-6: Engineering Toolbox Front Panel Menus

To enter the Engineering Setup Menu press the **SHIFT + SETUP** keys. The character generator will show the last drop down menu that was used with the currently selected item highlighted. The two horizontal arrow keys (←, →) allow you to move horizontally to another drop down menu when the sub-menu is hidden. Using these two keys you can quickly scan the entire menu system for the item you wish to change.

When you have made all the desired changes, press the **SHIFT + SETUP** keys to return to the normal display mode.

Changes made using the Engineering setup menu are only activated when you exit the menu and return to normal display mode.

The CONFIGURATION drop down menu is used to select the video standard, set the mode and output level of the translator output and configure the operation of the general purpose outputs (See section 3.8). The CONFIGURATION menu items are normally only used during installation. The SERIAL PORT menu is used to set up parameters relating to the serial remote control port. The DEBUG drop down menu is to turn on various diagnostics displays on the VCG.

3.5. PROGRAMMING THE GENERATOR SETUP FUNCTIONS

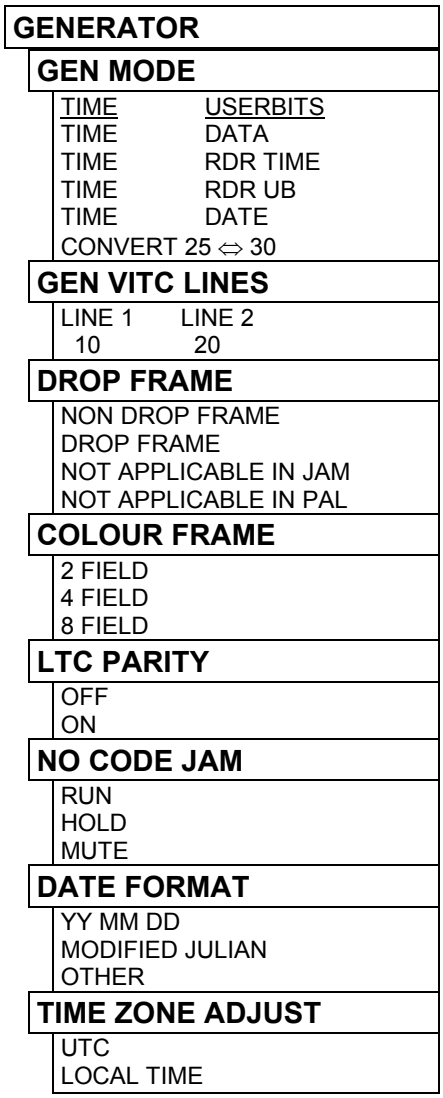


Figure 3-7: GENERATOR Drop Down Menu

The GENERATOR drop down menu is 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. Figure 3-7 shows the items on the GENERATOR drop down menu. The following descriptions appear in the order they appear on the menu.

3.5.1. Configuring the Generator Operating Modes

GEN MODE	
TIME	USER
TIME	DATA
TIME	RDRTIME
TIME	RDR UB
TIME	DATE
CONVERT 25 ⇔ 30	

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 5010 is not in the Jam sync mode, the generator Time bits contain time information entered from the front panel. When the 5010 is in the continuous Jam Sync mode, the time bits are slaved to the reader time.

TIME DATA configures the user bits for entering numeric data entered from the front panel.

TIME RDR TIME transfers the reader's time bits to the generator user bits. 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. When synchronizing audio tape machines to video recorders, the audio tape time code may be transferred to the user bits in the new video time code. An alternate method of enabling the Rdr time to Gen UB transfer is to close the TIME-UB TRANSFER remote control input to ground. (See section 0)

TIME RDR UB transfers the reader's user bits to the generator time bits. 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. An alternate method of enabling the Rdr UB to Gen UB transfer is to close the UB-UB TRANSFER remote control input to ground. (See section 0)

TIME DATE configures the user bits for entry of date information from the front panel. The internal time clock of the 5010 runs in UTC (Universal coordinated time) in this mode, and an optional time zone offset from UTC can be programmed using the Generator user bit entry procedure. (See section 3.5.6) The Generator can be programmed to output either the UTC or Local Time using the **GEN TIME ZONE ADJ** menu item. Each time the UTC time numbers roll through midnight, the date in the user bits advances by 1 day. The **DATE FORMAT** menu setting controls the format used to store the date information in the user bits.

CONVERT 25 ⇔ 30 sets the 5010 or 5010-VITC into a SMPTE ⇔ EBU timecode translator mode. This mode is used to convert timecode in standards converter applications. In translate mode incoming LTC of the input video standard is converted to timecode of the output video standard. The generator time is compared to the LTC reader time. When the two times disagree by more than the CONVERT WINDOW parameter, the Generator time is jammed from the reader time, taking into account the frame numbering differences of SMPTE and EBU

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 3.5.5. For information about using the Convert mode with models 5010-24 and 5010-VITC-24 see section 3.10.2.

When translating from SMPTE to EBU code, the input code must be in the Drop Frame format. When translating from EBU to SMPTE code, the Generator DROP FRAME mode must be set to DROP FRAME. (See section 3.5.11.)

3.5.2. Configuring the Date Format

DATE FORMAT
YY MM DD
MODIFIED JULIAN
OTHER

The **DATE FORMAT** menu item is used to select the format of the date information in the user bits of the generator and reader.

YY MM DD configures the user bits for date encoding in TT YY MM DD format. 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.

MODIFIED JULIAN configures the user bits for date encoding in TT ddddd format. 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.

OTHER 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.

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

TIME ZONE ADJ
UTC LOCAL TIME

When the GEN MODE is set to TIME DATE, the generator internal time clock runs in Universal Coordinated Time (UTC). The **TIME ZONE ADJ** menu item of the GENERATOR menu 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 saving time adjustment if daylight saving time is in effect. See section 3.5.7 for a discussion of daylight saving time features of the 5010.

UTC configures the generator to output its time as UTC

LOCAL TIME configures the generator to output its time as UTC adjusted by the programmed Time Zone Offset

3.5.4. Setting the Generator Time

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. 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 canceled 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.

When the 5010 is in the Free run mode, 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.

3.5.5. Setting the Generator User Bits

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.

When entering user bits data make sure that the generator is programmed for TIME DATA mode. (See section 3.5.1)

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 canceled 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.

3.5.6. Setting the Generator User Bits in Date Format

When the generator user bits are in date format a special four-step process is used to enter the user bits. 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.

When entering user bits in date mode make sure that the generator is programmed for TIME DATE mode. See section 3.5.1. The date entered is the UTC date not the Local date.

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 5010 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 saving time adjustment using the procedure outlined in section 3.5.7.

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.

3.5.7. 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.

Because of the variation of daylight saving time rules throughout the world the 5010 has two registers to allow the user to set the beginning and ending DST rules. The 5010 makes the following assumptions about DST:

DST changeovers occur at 02:00:00 (2 o'clock AM) on Sunday morning.
The time advances by 1 hour for DST

3.5.7.1. Setting the Beginning and End of Daylight Saving Time

The DSTBEG and DSTEND registers allow the user to set the Sunday where the changeover to DST occurs. When the time is later than 02:00:00 standard time on the Sunday set in the DSTBEG register and earlier than the 02:00:00 Daylight time on the Sunday set in the DSTEND register the 5010-GPS will automatically add one additional hour to the time. This adjustment is only made to the time when the GEN TIME ADJUST menu item is set to *Local Time.* To disable automatic changeovers to DST set the DST BEG and DSTEND registers to the same week.

If DST changeovers occur at other times then the user will have to disable DST changeovers and manually adjust for the DST change by modifying the time zone offset at the required time and date.

To access the DSTBEG and DSTEND registers press the **SHIFT+DISPLAY** buttons one or more times until the display prompt is `DSTBEG` or `DSTEND`. The **ENTER** and **CLEAR** keys are used in conjunction with the arrow (↑ and ↓) keys to set the value stored in the registers.

When the DSTBEG or DSTEND register is being displayed, press the **ENTER** key to begin the entry process for the register. Use the up or down arrow keys to select the Sunday that daylight saving time begins or ends. You can choose Sunday 1, 2, 3, 4 or L (the last Sunday of the month). When you choose the last Sunday of the month it will be the 4th or 5th Sunday depending on whether there are 4 or 5 Sundays in the month for a particular year. Press the **ENTER** key again to set the value into the register.

When the 5010 is displaying daylight saving time on the front panel or character inserter, the colon (:) that normally occurs between the hours and minutes digits of the time will be replaced by a period (.). For example:

`10:00:00:00` standard time
`10.00:00:00` daylight saving time

3.5.8. Jam Syncing the Generator to the Reader

Pressing the **JAM** key transfers the current reader time into the generator clock, then releases the clock to run on its own. This mode is known as 'momentary Jam sync'.

The generator time may be continuously slaved, or 'Jam synced' to data coming from the 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 3.9.1 for a full description of the parallel remote control inputs)

Jam sync mode should be 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. In applications where the 5010 is used to encode VITC during insert editing, the jam sync mode enables continuous VITC to be recorded on the edit master tape.

When the time information is being jammed the generator and reader 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 reader 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 0 for a full description of the NO CODE JAM modes.)

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.

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. 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.

Press the **ENTER** key to recall the last value that you entered into the OFFSET register. 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 value press the **ENTER** key to complete the data entry.

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.

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 canceled by pressing the **CLEAR** key. The display prompt will return to its steady On state when data entry mode has been completed.

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.

3.5.9. Selecting the Lines to Record VITC On. (models 5010-VITC and 5010-VITC-24 only)

GEN VITC LINES	
LINE 1	LINE 2
10	20

The **GEN VITC LINES** menu item is used to select the lines on which the VITC will be inserted.

When the **GEN VITC LINE** sub menu is first selected, the LINE1 number will be in reverse video indicating it can be changed. Press the up and down (↑, ↓) keys to change LINE 1. Press the right (→) key to highlight LINE 2, indicating that it can be changed. Press the up and down (↑, ↓) keys to change LINE 2.

The user will have to determine by experience the most suitable lines 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 in the vertical interval of the video signal, not earlier than line 10 (6 for PAL) or later than line 20 (21 for PAL). For certain recordings, the use of some of these lines may interfere with other signals inserted into the vertical interval.

To avoid decoding errors, an adequate margin should be allowed between the video head switching points and the recorded VITC word. Also note that type C VTRs with a sync head have a head switching point in the middle of the permitted lines. Type C VTRs without a sync head do not reproduce some of the permitted lines at all; therefore these lines should not be used for recording VITC. (See your VTR manual for further information).

It is recommended that two non-adjacent lines be used, however adjacent lines and a single line (selected when both lines are the same) are permitted.

3.5.10. Turning the VITC Generator On (models 5010-VITC and 5010-VITC-24 only)

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.

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

In NTSC, the video 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 minute, 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 5010 is operating in the NTSC video standard, the generator may be programmed to operate in either the drop frame or non drop frame mode.

DROP FRAME
NON DROP FRAME DROP FRAME

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

Select **NON DROP FRAME** to configure the generator in the non-drop frame or ‘full frame’ mode.

Select **DROP FRAME** to configure the generator in the drop frame mode.

When the 5010 is operating in the TIME DATE mode in the NTSC video standard, it should be set to the Drop Frame mode so that it's time base is as close as possible to real time.

DROP FRAME
NOT APPLICABLE

When the generator is operated in the continuous Jam Sync mode, the generator drop frame mode is the same as the incoming Reader data. The Drop Frame sub menu shows **NOT APPLICABLE IN A JAM MODE**.

When the 5010 is operating in the PAL video standard, the Drop Frame sub menu shows **NOT APPLICABLE IN PAL**.

3.5.12. Selecting the Generator Colour Frame Mode

For proper operation of the 5010 generator, a stable video reference must be applied to the REF VIDEO input loop on the rear panel. The VIDEO STANDARD item on the CONFIG menu of the Engineering Setup menu selects the video standard (NTSC or PAL) that is being used. (See section 0.) The **COLOUR FRAME** item on the GENERATOR menu is used to select whether the 5010 will apply colour frame synchronization to the code it generates.

COLOUR FRAME
2 FIELD
4 FIELD

When the video standard is NTSC:
Select **2 FIELD** to configure the generator in the non colour frame mode. Use this mode when an NTSC RS-170 source is used as the video reference signal or when you are recording code on a tape recorder which does not have colour frame circuitry. (E.g. U matic or VHS.)

Select **4 FIELD** to configure the generator in the colour frame mode. The Front panel COL'R indicator will be on and code generated will have the colour flag bit set. Use this mode when a stable NTSC RS-170A source is used as the video reference.

When colour frame synchronization is desired, the sync to subcarrier (Sc-H) phase relationship of the video source must conform to RS-170-A specification.

COLOUR FRAME
4 FIELD
8 FIELD

When the video standard is PAL:
Select **4 FIELD** to configure the generator in the non colour frame mode of operation. Use this mode when an PAL 4 field source is used as the video reference signal or when you are recording code on a tape recorder which does not have colour frame circuitry. (E.g. U matic or VHS).

Select **8 FIELD** to configure the generator in the colour frame mode of operation. The Front panel COL'R indicator will be on and code generated will have the colour flag bit set. Use this mode when a stable PAL 8 field source is used as the video reference.

When colour frame synchronization is desired, the sync to subcarrier (Sc-H) phase relationship of the video source must conform to PAL 8 field specification.

Special precautions should be taken when operating in the Jam sync mode.

When the colour frame mode is selected, and the code from the reader is not in colour frame mode, the generator will maintain a frame lock only in the jam sync mode. When the jam sync mode is turned off, the formatted colour frame mode will be restored.

If the 5010 generator is being operated in the colour frame mode, and the reader code is in the colour frame mode, 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 Non colour frame mode of operation should be selected.

3.5.13. 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 biphase mark modulation that could occur when code inserts are performed. Use of the biphase mark parity bit is optional, as some readers may not recognize its presence.

The **LTC PARITY** item on the GENERATOR menu controls the parity mode of the generator.

LTC PARITY
OFF
ON

Select **OFF** to configure the generator for the non parity mode. The biphase mark parity bit will be always set to zero.

Select **ON** to configure the generator for the parity mode. The biphase 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.

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

NO CODE JAM
RUN
HOLD
MUTE

The **NO CODE JAM** item on the GENERATOR menu controls the operation of the Continuous Jam Sync Mode when there is no incoming code.

Select **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 **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 **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.

3.6. PROGRAMMING THE READER SETUP FUNCTIONS

The READER drop down menu is used to program various reader modes such as selecting LTC or VITC operation for the reader, VITC Line numbers, whether user bits contain static numbers or time information, etc. Figure 3-8 shows the items on the READER drop down menu. The following descriptions appear in the order they appear on the menu.

READER	
ASSIGNMENT	
LTC	
VITC	
LTC/VITC	
RDR MODE	
TIME	USER
TIME	DATA
TIME	TIME
DATA	DATA
TIME	DATE
RDR VITC LINES	
LINE RANGE:	
START	END
10	20
RDR VITC CRC	
NORMAL	
SPECIAL	
DISPLAY	
PROCESSED	
DIRECT	
TIME ZONE ADJ	
UTC	
LOCAL TIME	

Figure 3-8: READER Drop Down Menu

3.6.1. Selecting the Reader Hardware Configuration

ASSIGNMENT
LTC
VITC
LTC/VITC

The **ASSIGNMENT** menu is used to select how the reader hardware is configured. The model 5010 and 5010-24 have only an LTC reader so the reader configuration is fixed at LTC. The model 5010-VITC and 5010-VITC-24 can be configured in three different ways.

Select **LTC** to configure the reader for Linear Time Code (LTC) reading only.

Select **VITC** to configure the reader for Vertical Interval Time Code (VITC) reading only. The reader can be set to recover VITC from different ranges of video lines.

Select **LTC/VITC** to configure the reader to automatically switch between Linear Time Code (LTC) and Vertical Interval Time Code (VITC) reading. The reader can be set to recover VITC from a specific range of video lines.

3.6.2. Selecting the Format of the Time and User Bit Data

MODE	
TIME	USER
TIME	DATA
TIME	TIME
DATA	DATA
TIME	DATE

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

Select **TIME DATA** when the time contains normal time information and the user bits contain numeric data.

Select **TIME TIME** when both the time and the user bits contain time information.

Select **DATA DATA** when both the time and the user bits contain numeric data.

Select **TIME DATE** when both the time contains normal time information and the user bits contain date information (recorded in the TIME DATE format of the generator).

3.6.3. Setting The VITC Reader Line Range (model 5010-VITC only)

RDR VITC LINE	
LINE RANGE:	
START	END
10	20

The **RDR VITC LINES** menu item is used to select the lines that are enabled for VITC reading. VITC reading is enabled between the lower and higher line numbers shown (inclusive). If the reader is not assigned as a VITC reader then this menu item is not available.

When the **VITC LINE** sub menu is first selected, the START line number will be in reverse video indicating it can be changed. Press the up and down (↑, ↓) keys to change the starting line. Press the right (→) key to highlight the END line, indicating that it can be changed. Press the up and down (↑, ↓) keys to change the ending line.

3.6.4. Selecting the VITC CRC (models 5010-VITC and 5010-VITC-24 only)

RDR VITC CRC
NORMAL
SPECIAL

The **RDR VITC CRC** menu item is used to select whether the VITC data being read has a normal CRC or the special CRCs used by the ***Evertz*** Film Footage Encoders.

Select **NORMAL** to read VITC data with standard SMPTE/EBU CRC encoding.

Select **SPECIAL** to read VITC data which was encoded with special KEYKODE CRC encoding by a 4025 set to one of its 'full KeyKode' modes. Normally this mode is only used when the reader mode is set to DATA DATA.

3.6.5. Controlling the Reader 'Look ahead' Compensation

DISPLAY
PROCESSED
DIRECT

The **DISPLAY** menu item is used to select whether the normal 'look ahead' compensation for reader dropouts is active or not. Normally, the data is read in one frame and displayed with an 'add 1 frame' compensation. This method guarantees an 'on time' character display for LTC and also helps to cover any minor reader disturbances. In some operational modes it is desirable to disable this feature and to display exactly what is being read. When reading VITC, it is possible to read and display the information in the same video field, thus maintaining field accuracy even in DIRECT mode. The topmost positions of the character generator are not available when in the direct mode.

Select **PROCESSED** to enable normal 'look ahead' compensation. Displays from either the LTC or VITC readers will be 'on time' but will **NOT** follow code discontinuities immediately.

Select **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 'on time' but cannot be positioned at the very top of the raster. Displays from the LTC reader will be behind by two frames.

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

TIME ZONE ADJ
UTC
LOCAL TIME

When the RDR MODE is set to TIME DATE, the **TIME ZONE ADJ** menu item of the READER menu is used to select whether the Reader will display the time as UTC or UTC adjusted by the programmed Time Zone Offset (Local Time).

UTC configures the reader to display the time as UTC. The Reader will display the time and date information exactly as it is encoded.

LOCAL TIME configures the reader to display the time as UTC. The Reader will display the time and date information adjusted for the time zone that is encoded into the user bits.

3.7. PROGRAMMING THE CHARACTER GENERATOR FUNCTIONS

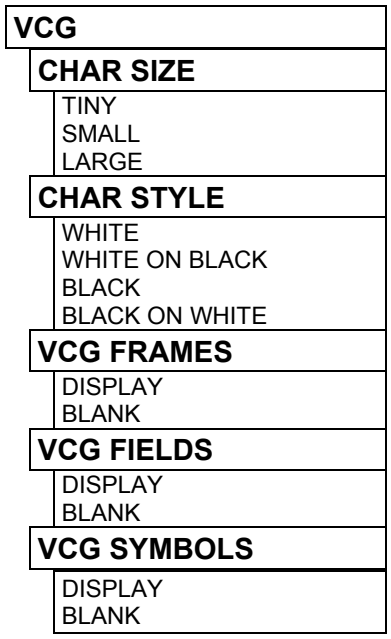
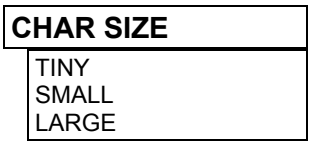


Figure 3-9: VCG Drop Down Menu

The VCG drop down menu is used to select various characteristics of the VCG display. Figure 3-9 shows the items on the VCG drop down menu. The following descriptions appear in the order they appear on the menu.

3.7.1. Selecting the Character Size



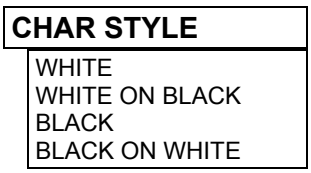
The **CHAR SIZE** menu item is used to select one of three sizes for the character generator's display. The on screen format menus always use the small character size.

The **TINY** character size occupies 8 lines per field for each character row. This permits 28 vertical positions on the raster in NTSC or 32 in PAL.

The **SMALL** character size occupies 16 lines per field for each character row. This permits 14 vertical positions on the raster in NTSC or 16 in PAL.

The **LARGE** character size occupies 32 lines per field for each character row. This permits 7 vertical positions on the raster in NTSC or 8 in PAL.

3.7.2. Selecting the Character Style



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

Select **WHITE ON BLACK** to key white characters on a black background mask into the picture.

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

Select **BLACK ON WHITE** to key black characters on a white background mask into the picture.

3.7.3. Blanking the Frames Display

VCG FRAMES
DISPLAY
BLANK

The **VCG FRAMES** menu item is used to select whether the frames will be shown when the time is displayed.

Select **DISPLAY** to display the frames of the time displays.

Select **BLANK** to blank the frames of the time displays. When Frames are blanked, fields will also be blanked.

3.7.4. Blanking the Fields Display

VCG FIELDS
DISPLAY
BLANK

The **VCG FIELDS** menu item is used to select whether the fields will be shown when the time is displayed.

Select **DISPLAY** to display the fields of the time displays.
Select **BLANK** to blank the fields of the time displays.

3.7.5. Blanking the Window Symbols

VCG SYMBOLS
DISPLAY
BLANK

The **VCG SYMBOLS** menu item is used to select whether the **T** and **U** symbols will be shown in front of the time and user bit displays of the VCG. When one of the readers is set to the KEYINFO + EDGE mode the symbols are not shown for that reader.

Select **DISPLAY** to display the VCG symbols.

Select **BLANK** to blank the VCG symbols.

3.8. PROGRAMMING THE OVERALL CONFIGURATION FUNCTIONS

The CONFIGURATION drop down menu located on the Engineering Setup menu is used to select the video standard, set the mode and output level of the translator output, etc. The CONFIGURATION menu items are normally required only during installation. See section 3.4.1 for information on using the Engineering Setup menu system. Figure shows the items on the CONFIGURATION drop down menu. The following descriptions appear in the order they appear on the menu.

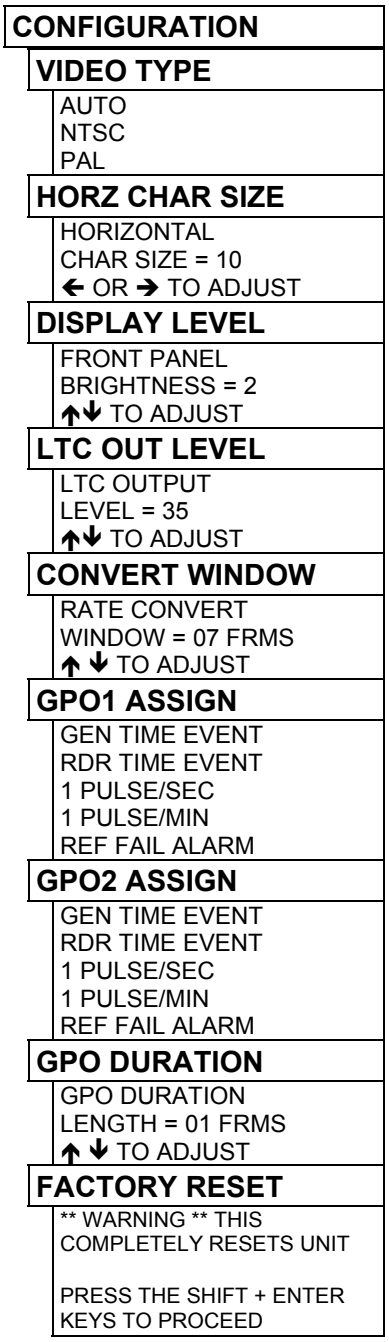
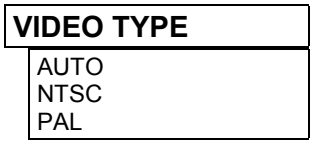


Figure 3-10: CONFIGURATION Drop Down Menu

3.8.1. Selecting the Video Standard



The **VIDEO TYPE** menu item is used to select the video standard of the program video. Changing the video standard will affect the settings of the VITC LINE RANGE menu setting. Make sure that you re-check this setting when you change the video standard.

Select **AUTO** if you want the 5010 to auto-detect the video standard.

Select **NTSC** if you are using NTSC video.

Select **PAL** if you are using PAL video.

3.8.2. Adjusting The Horizontal Character Size

HORZ CHAR SIZE
HORIZONTAL
CHAR SIZE = 10
← → TO ADJUST

The **HORZ CHAR SIZE** menu item is used to adjust the character width. Use the ← and → keys to adjust the right side of the raster.

3.8.3. Adjusting the Front Panel Display Brightness

DISPLAY LEVEL
DISPLAY LEVEL = 2
↑ ↓ TO ADJUST

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

3.8.4. Adjusting the LTC Generator Output Level

LTC OUT LEVEL
LEVEL = 35
↑ ↓ TO ADJUST

The **LTC OUT LEVEL** menu item is used to adjust the LTC generator output levels. Use the ↑ OR ↓ keys to change the level. The recommended output level setting is 35, which is approximately 1 volt peak to peak.

3.8.5. Configuring The General Purpose Outputs

GPO1 ASSIGN
GEN TIME EVENT
RDR TIME EVENT
1 PULSE/SEC
1 PULSE/MIN
REF FAIL ALARM

The 5010 has two general purpose outputs that can be assigned to several different functions. These outputs will be active low when the specified condition occurs. 5010 units with serial numbers before 06990000 may have driver integrated circuits that invert the sense of the general purpose outputs. If your unit has active high outputs and you desire active low outputs, contact the factory. The duration of the output is user programmable.

The **GPO1 ASSIGN and GPO2 ASSIGN** menu items on the CONFIGURATION Engineering Setup menu are used to select the functions of the general purpose outputs.

GEN TIME EVENT The output will activate when the generator time matches the GEVT register and the event register is armed. See section 3.8.6 for information about setting the GEVT register and arming it.

RDR TIME EVENT The output will activate when the reader time matches the REVT register and the event register is armed. See section 3.8.6 for information about setting the REVT register and arming it.

1 PULSE/SEC The output will activate at the beginning of each second of the generator time.

1 PULSE/MIN The output will activate at the beginning of each minute of the generator time.

REF FAIL ALARM The output will activate when a proper Gen Lock video reference is missing.

3.8.6. Setting the Time of the Event Registers

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

3.8.7. Adjusting the General Purpose Output Duration

GPO DURATION

GPO DURATION
LENGTH = 01 FRMS
↑ ↓ TO ADJUST

The GPO DURATION menu item on the CONFIGURATION Engineering Setup menu is used to adjust the duration of the general purpose outputs. Use the ↑ OR ↓ keys to change the duration.

3.8.8. Resetting the 5010 to its Factory Defaults

FACTORY RESET
** WARNING ** THIS COMPLETELY RESETS UNIT PRESS THE SHIFT + ENTER KEYS TO PROCEED PRESS THE SELECT KEY TO CANCEL

The **FACTORY RESET** menu item is used to reset the 5010 to the factory default parameters. Press the **SHIFT + ENTER** keys when the sub menu screen is displayed to reset the 5010 to factory defaults. The 5010 will perform a power-on configuration before returning to the normal operating mode.

3.9. PARALLEL REMOTE CONTROL FUNCTIONS

A 9 pin D connector located on the rear panel labeled REMOTE CTL provides 6 parallel control inputs for remote control of some of the model 5010 functions. The pinout of the D connector is as follows:

Pin		Description
1		Frame Ground
	6	LTC reader enable
2		VCG On/Off
	7	VITC reader enable
3		Jam Sync enable
	8	Time - UB Transfer enable
4		UB - UB Transfer enable
	9	Output 1
5		Output 2

3.9.1. Parallel Remote Control Input Functions

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

VITC RDR Provides an alternate method of selecting the VITC reader on the 5010-VITC and 5010-VITC-24. The VITC reader is selected by a high to low transition on this input, and deselected by a low to high transition.

When both the LTC RDR and VITC RDR inputs are the same, (either both grounded, or both open), the AUTO mode of the reader is selected.

VCG ENABLE Provides an alternate method of turning the character inserter generator On and Off. The character inserter is turned

On by a high to low transition on this input, and turned Off by a low to high transition.

JAM SYNC ENABLE Provides an alternate method of turning the Continuous Jam Sync mode On and Off. Jam Sync is turned On by a high to low transition on this input, and turned Off by a low to high transition. Momentarily closing this input to ground and releasing it will perform a momentary jam sync.

TIME-UB TRANSFER ENABLE Provides an alternate method of turning the Reader Time to Generator User Bit transfer function On and Off. Time to User Bit transfer is turned On by a high to low transition on this input, and turned Off by a low to high transition.

UB-UB TRANSFER ENABLE Provides an alternate method of turning the Reader User Bit to Generator User Bit transfer function On and Off. User Bit to User Bit transfer is turned On by a high to low transition on this input, and turned Off by a low to high transition.

3.9.2. General Purpose Outputs

The 5010 has two general purpose outputs that can be assigned to several different functions. These outputs will be active low when the specified condition occurs. 5010 units with serial numbers before 06990000 may have driver integrated circuits that invert the sense of the general purpose outputs. If your unit has active high outputs and you desire active low outputs, contact the factory. The duration of the output is user programmable. See sections 3.8.5 to 3.8.7 for more information on setting up the general purpose outputs.

3.10. OPERATIONS CHANGES FOR THE MODEL 5010-24 and 5010-VITC-24

The 5010-24 and 5010-VITC-24 models are special purpose time code generators designed to work 24 FPS time code commonly in use with the high definition 1080P/24 video format. They have all of the features of the standard 5010 LTC or 5010-VITC VITC Time Code Master except as noted below.

- Support for 23.98 and 29.97 FPS time code. PAL Time code is not available in the 5010-24 model
- Genlocks to 23.98 FPS 625 line sync when operating in the 23.98 mode
- 6 Hz pulse input to synchronize the Generator time code to 6 Hz coincidence point.
- 24 FPS ⇔ 30 FPS time code translator mode
- 5010-VITC-24 reads and generates when gen-locked to NTSC

3.10.1. Generating 23.98 FPS time code

VIDEO TYPE
AUTO
NTSC
24 FPS

To configure the 5010-24 for operation in the 24 FPS mode set the VIDEO STANDARD item on the CONFIG menu to 24FPS. The 5010-24 will also support normal NTSC genlocking and time code rates when the VIDEO STANDARD menu item is set to NTSC.

When the 5010-24 is operating in the 24FPS mode, it will genlock to a 23.98 FPS 625 line video or sync reference. The LED labeled 23.98 on the front panel is used to indicate that the 5010-24 is properly genlocked to the 23.98 FPS sync source. The timecode generated will be non-drop frame. The reader will read 24 fps time code and can be used to jam sync the generator.

3.10.2. Selecting the Generator 6 Hz Lock Mode

The **6 HZ LOCK** item on the GENERATOR menu is used to select whether the 5010-24 will apply 6 Hz synchronization to the code it generates.

6 HZ LOCK
OFF
ON

Select **OFF** to configure the generator in the frame lock mode. In this mode the generator will only be frame locked to the reference vide input.

Select **ON** to configure the generator in the 6 Hz Lock mode. You must supply a 6 Hz coincidence pulse to pin 7 of the PARALLEL REMOTE connector. This pulse must be a 1/30th second wide active high (TTL level) pulse occurring 6 times per second and will normally identify the begging of the field where 23.98 and 29.97 FPS video coincide. This 6 Hz pulse must be coincident with the start of an input frame and can be generated using the Evertz 7700SRG-HD Slave Reference Generator module. The Front panel 6 Hz indicator will be On and code generated will have frame zero of each second occurring at the same time as the 6 Hz pulse.

The 23.98 FPS suync and 6 HZ pulses can be generated by the Evertz 7750SRG-HD sync generator module. See the Evertz web site (www.evertz.com) for more information.

3.10.3. 24 ⇔ 30 Timecode Translator Mode

The 5010-24 can be operated in a 24 ⇔ 30 timecode translator mode. In translator mode incoming LTC in the input video standard is converted to timecode in the output video standard. The 5010-VITC-24 can also translate from NTSC VITC to 23.93 FPS time code. The 5010-24 must be gen locked to a video signal in the output video standard. The hours, minutes and seconds of the output code are jam synced to the input code. The generator frames run at the normal frame rate of the output video standard.

The 5010-24 OFFSET register can be used to enter a frame offset to account for frame delays in the standards converter.

GEN MODE	
TIME	USER
TIME	DATA
TIME	RDRTIME
TIME	RDR UB
TIME	DATE
CONVERT 24 ⇔ 30	

CONVERT 24 ⇔ 30 sets the 5010-24 into a 24 ⇔ 30 timecode translator mode. This mode is used to convert timecode in standards converter applications. In translate mode incoming LTC of the input video standard is converted to timecode of the output video standard. The generator time is compared to the LTC reader time. When the two times disagree by more than the CONVERT WINDOW parameter, the Generator time is jammed from the reader time, taking into account the frame numbering differences of 24 FPS and 30 FPS 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 3.5.5 of the 5010 manual

When translating from 30 to 24 FPS code, the input code must be in the Non Drop Frame format. When translating from 24 to 30 FPS code, the Generator DROP FRAME mode must be set to NON DROP FRAME. (See section 3.5.11.)

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4. SERIAL REMOTE CONTROL PROTOCOL

4.1. OVERVIEW

- Four wire communications channel utilized - RS-422 levels. Alternate 2 wire interface using RS-232C 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

The serial port on the 5010 is configured at the factory for RS-232 communications. The serial port can also be used with Rs-422 communictions by configuring internal jumpers as shown in Figure 5-7 for the older style 5010s or Figure 5-9 for the newer style 5010s..The pin assignment for the serial port when configured for RS-232 is shown in Table 2-2 and the pinout for RS-422 is shown in

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		

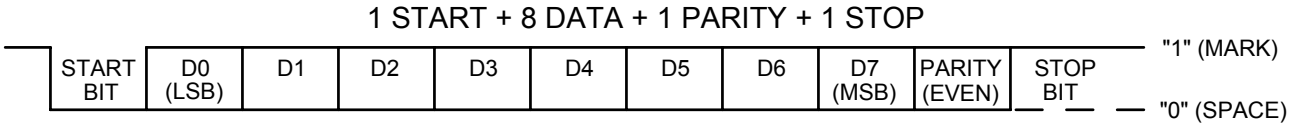
Table 4-1: Serial Control RS-232 Pin Definitions

Pin #	Name	Description
1	GND	Chassis ground
2	Tx -	RS-422 Transmit - Output
3	Rx+	RS-422 Receive + Input
4	GND	Ground
5		No connection
6	GND	Ground
7	Tx +	RS-422 Transmit + Output
8	Rx -	RS-422 Receive - Input
9	GND	Chassis Ground

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

4.1.2. Data Format

The composition of the bit serial data format is as follows:



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 is denoted as the normal sender of a command (usually a computer). The Device is denoted as the normal sender of a Response (the 5010 unit).

All command values, arguments and data values shown in this document are expressed in hexadecimal format unless otherwise noted.

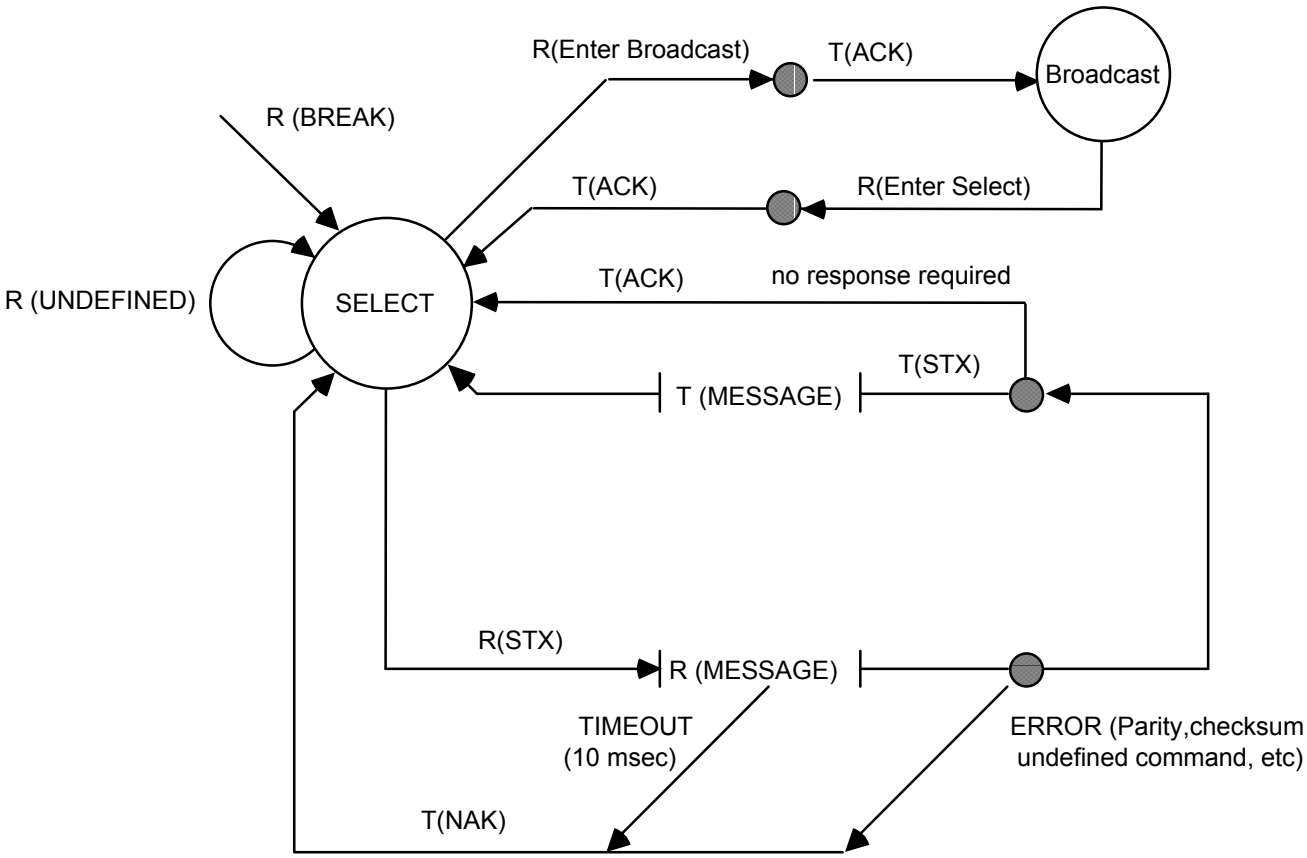


Figure 4-1: Communications Protocol State Diagram

The communications protocol is described in Figure 4-1. The 5010 (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:

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
03		Enter Programming Mode			ACK
0B	1	Select Video Standard			ACK
0C	2	Select GPO Assignment			ACK
0D	2	Preset GPO Duration			ACK
0E	1	Preset Convert Window			ACK
0F	1	Preset Event ARM Register			ACK
10		Sense Error Number	1	2	Error Number
11	1	PROM Version request	2	20	PROM Name & Version
1B		Sense Video Standard	1	1	Video Standard
1C	1	Sense GPO Assignment	2	1	GPO Assignment
1D		Sense GPO Duration	1	1	GPO Duration
1E		Sense Convert Window	1	1	Convert Window
1F		Sense Event ARM Register	1	1	Event ARM Register

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
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
40	1	Select Reader Assignment			ACK
41	2	Select Reader Mode			ACK
42	3	Select VITC Reader Lines			ACK
43	2	Select VITC Reader CRC			ACK
44	2	Select Reader Display			ACK
45	1	Define Broadcast Mode			ACK
4C	1	Select Reader Time Zone Adj.			ACK
60		Sense Reader Assignment	1	1	Reader Assignment
61	1	Sense Reader Mode	2	1	Reader Mode
62	1	Sense VITC Reader Lines	2	2	VITC Reader Lines
63	1	Sense VITC Reader CRC	2	1	VITC Reader CRC
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
6C		Sense Reader Time Zone Adj.	1	1	Reader Time Zone

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 Color 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
8B	1	Select Generator Date Format			ACK
8C	1	Select Generator Time Zone Adjust			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 Jan Sync Mode
A8		Sense Generator No Code Jam	1	1	Generator No Code Jam
A9	1	Sense Generator	2	x	Generator data
AB		Sense Generator Date Format	1	1	Gen Date Format
AC		Sense Generator Time Zone Adj.	1	1	Gen Time Zone Adj.

Table 4-6: Generator Commands and their Valid Responses

Command from Controlling Device			Return to Controlling Device		
CMD	**DATA BYTES**	**DESCRIPTION**	**CMD ECHO BYTES**	**DATA BYTES**	**NAME**
C0	5	Preset Auxilliary Register			ACK
E0	1	Sense Auxilliary Register	2	4	Auxilliary Register

Table 4-7: Auxilliary Commands and their Valid Responses

4.5. DATA FORMATS

4.5.1. Time Format Block

10 Fr	1 Fr	10 Sec	1 Sec	10 Min	1 Min	10 Hr	1 Hr	Flags

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

Bit 0	Drop Frame Flag	0 = Non Drop Frame, 1 = Drop Frame
Bit 1	Colour Frame Flag	0 = Non Colour Frame, 1 = Colour Frame
Bit 2	VITC Field Flag	0 = Field 1, 1 = Field 2
Bit 3	User Bit Group Flag 0	
Bit 4	User Bit Group Flag 1	
Bit 5	User Bit Group Flag 2	
Bit 6	LTC Flag	1 = LTC Active
Bit 7	VITC Flag	1 = VITC Active

The Binary group flag bits are defined as follows:

	Bin Grp Flag 2	Bin Grp Flag 1	Bin Grp Flag 0
Character set unspecified	0	0	0
Eight bit Alpha-numeric Character set	0	0	1
Unassigned	0	1	0
Unassigned	0	1	1
Unassigned	1	0	0
Page/Line (SMPTE 262M)	1	0	0
Unassigned	1	1	0
Unassigned	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. Date Format Block

10 Day	1 Day	10 Month	1 Month	10 Yr	1 Yr	10T Zone	1T Zone

4.6. COMMAND AND RESPONSE DESCRIPTIONS

4.6.1. System Commands

01 Enter Select Mode

02 Enter Broadcast Mode

03 Enter Programming Mode

04 Reserved

10	**Sense Error Number**		Returns 2 bytes
11	**Sense PROM Version**	1 byte	00 = Boot PROM version 01 = Flash PROM version

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

0B	**Select Video Standard**	1 byte	Presets the Video Standard that is being used 00 = Auto 01 = NTSC 02 = PAL
1B	**Sense Video Standard**		Returns 2 bytes as described in the Select Video Standard Command.
1C	**Sense GPO Assignment**	GPO No	Returns 1 byte of GPO assignment as defined below.
0C	**Select GPO Assignment**	GPO No +1 byte	Presets the Function of the General Purpose Outputs. The first byte indicates which general purpose output is being assigned:

GPO No	
1	GPO1
2	GPO2

The second byte specifies the function.

ASSIGNMENT	DESCRIPTION
00	GEN TIME EVENT
01	RDR TIME EVENT
02	1 PULSE/SEC
03	1 PULSE/MIN
04	REF FAIL ALARM

1D	**Sense GPO Duration**		Returns 1 byte of GPO duration as defined below.
0D	**Preset GPO Duration**	1 byte	Presets the Duration in video frames of the General Purpose Outputs. Durations are expressed as BCD values from 0 to 60 frames max.
1E	**Sense Convert Window**		Returns a 1 byte of convert window value as defined below.
0E	**Preset Convert Window**	1 byte	Presets the value of the standards conversion jam window. The convert

window is expressed as a BCD value from 0 to 24 frames max.

1F Sense Event Arm Register — Returns a 1 byte event arm register value as defined below.

0F Preset Event Arm Register — 1 byte — Presets the event arm register which is a bit mapped value controlling how the Time events are armed.

---	---	---	---	RDR CONT	RDR SINGLE	GEN CONT	GEN SINGLE

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	Reader Time
02	Reader User Bits
03	reserved
04	reserved
05	Generator Time
06	Generator User Bits

Table 4-8: 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 30 are valid for NTSC 0 to 33 are valid for PAL	0 to 32 depending on window length
Small	0 to 14 are valid for NTSC 0 to 17 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 4-9: 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

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 windows time 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.

For the 5010 this parameter is always set to 01.

60	**Sense RDR Assignment**		Returns 1 byte as defined below
40	**Select RDR Assignment**	1 byte	Selects the Reader assignment 01 = LTC 02 = VITC 03 = LTC / VITC
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	DATA	DATA
4	TIME	DATE

Table 4-10: Reader Modes

62	**Sense VITC RDR Lines**	Rdr No	Returns 2 byte as defined below
42	**Preset VITC RDR Lines**	Rdr No + 2 bytes	Selects the VITC lines of the reader.

The VITC reader will read starting at the first line number and ending at the second line numbers. Line numbers are packed BCD format. Valid lines at 6 to 21 for PAL and 10 to 20 for NTSC.

63	**Sense VITC RDR CRC**	Rdr No	Returns 1 byte as defined below
43	**Select VITC RDR CRC**	Rdr No + 1 byte	Selects the which type of CRC the VITC Reader is looking for. 00 = Normal CRC 01 = Special CRC
64	**Sense RDR Display**	Rdr No.	Returns 1 byte as defined below
44	**Select RDR Display**	Rdr No. + 1 byte	Selects the whether 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	---	---	RU	GU	---	---	RT

Each bit represents a variable length block of data which 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:

RT	RU	GT	GU

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

---	---	---	RU1	---	---	---	RT1

Each bit represents a variable length block of data which 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:

RT1 RU1

67	**Sense Broadcast Block**		Returns the broadcast block as defined by the Define Broadcast Mode command above.
6C	**Sense Reader Time Zone Adjust**		Returns 1 byte as defined below.
4C	**Select Reader Time Zone Adjust**	1 byte	Sets the Time Zone Adjust parameter for the Reader

ASSIGNMENT	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**
0	TIME	DATA
01	TIME	RDR TIME
02	TIME	RDR UB
03	TIME	DATE
04	CONVERT RATE	

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.

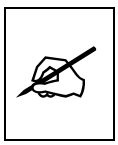
A2	**Sense Generator Drop Frame**		Returns 1 byte as defined below.
82	**Select Generator Drop Frame**	1 byte	Selects whether the Generator will operate in the NTSC Drop Frame or Non Drop Frame mode. 00 = Non Drop Frame 01 = Drop Frame

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 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	Turns Generator Jam Sync mode. 00 = Generator Free Run (Jam Off) 01 = Continuous Jam Sync 02 = Momentary Jam Sync



When Continuous Jam Sync mode is enables, 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	1Hr

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 which will be sent in response to a Sense Generator command.

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

Each bit represents a block of data that is requested. Time and user bit data blocks are defined in section 4.5 of this manual. 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.

ASSIGNMENT	DESCRIPTION
00	YYMMDD
01	Modified Julian Date
02	Other (Leitch Master Clock)

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.

ASSIGNMENT	DESCRIPTION
00	Display UTC Reader time
01	Display Local Reader time

4.10. MISCELLANEOUS COMMANDS

Commands C0 and E0 have been added to allow entry to the Offset, GEVT and REVT registers.

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)

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

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Figures

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5. TECHNICAL DESCRIPTION

5.1. OVERVIEW

The Model 5010 LTC/VITC Timecode Generator/Reader combines the latest LSI technology with sophisticated microcontroller firmware to provide a powerful, flexible time code reader system. The model 5010 Time Code Master is available in three versions. The basic 5010 is a dual standard (NTSC/PAL) combination generator, high speed reader for Linear Time Code (LTC), and contains a high resolution character inserter which can be delegated to either the generator or reader. The model 5010-VITC adds Vertical Interval Time Code (VITC) reading and generating capabilities to the basic 5010. The 5010-24 is a special purpose time code generator designed to work 24 FPS time code commonly in use with the high definition 1080P/24 video format. The model 5010-VITC-24 adds Vertical Interval Time Code (VITC) reading and generating capabilities to the 5010-24. A 16 digit alphanumeric display can be quickly delegated to show the required data. Thus, the generator will produce uninterrupted time code while the reader may be used to recover time code from another tape without interfering with the generator function.

The model 5010-VITC's reader can be configured in one of three modes:

- Full speed (1/30 to 70 times play) LTC reader
- 0 to 15X speed VITC reader
- Auto LTC/VITC reader automatically switches between LTC and VITC inputs reading whichever is valid.

The character inserter provides an on screen programming menu system, which is used to configure the various operating modes. The use of drop down menus and dedicated programming keys allows the model 5010 to be conveniently configured for particular customer requirements.

There are two different versions of the 5010 hardware. Earlier versions have the rear panel layout shown in Figure 2-1 and have a 5200 main circuit card inside and an optional 5235 submodule for the 5010-VITC model. Later versions have the rear panel layout shown in Figure 2-2 and have a 7700STM circuit card inside. The labels on the connectors are mostly the same, but many of the connectors have been relocated to better suit the layout of the new circuit board. The operation of the two versions is similar except where specifically notes in chapter 3. Section 5.2 describes the DIP switch functions, section 5.3 described the user calibrations and section 5.4 describes the method of updating to a new firmware version.

5.2. DIP SWITCH FUNCTIONS

The main circuit board of the model 5010 contains an 8 position DIP switch which is used to invoke various diagnostic and calibration functions. On The 5200 main circuit card the DIP switch is closed when it is pressed down on the right side. On the 7700STM main circuit card the switch is closed when it is pressed down closest to the circuit card. The functions of each switch are described below.

Switch	Name	Normal	Function when Open	Function when Closed
1	Colour Frame Calibrate	Open	Normal operation	Special calibration of the Colour frame circuitry
2	Code Rate	Open	Normal operation Code rate at 29.97 FPS for NTSC or 25 FPS for Pal. **Switch must be Open when using NTSC or PAL Gen-lock video reference.**	For operation at real time Code rate at 30 FPS for NTSC or 25 FPS for PAL. **Do not connect video reference when switch is closed**.
3	GPS Auto Sync	Open	Normal Operation GPS Time will be resynced to the GPS antenna when it is > ½ sec different from the antenna.	Disable. GPS Time will be synced to antenna once on power up and then once per day at time specified by GPS@ register.
4	Not used	Open		
5	Not Used	Open		
6	Factory Reset	Open	Normal operation	Resets 5010 to factory defaults on power up
7	Reserved	Open	Normal operation	N/A
8	Reserved	Open	Normal operation	N/A

Figure 5-1: DIP Switch Functions

5.3. USER ADJUSTMENTS AND DIAGNOSTICS

5.3.1. Front Panel Diagnostics

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

LED and Keyboard diagnostics can be invoked by holding down any key except ↓ or ↑ on power up. In diagnostic mode, all the front panel LED's should come on and the front panel display will show the message SCAN CODE and the keyboard scan code. When no keys are depressed, the key scan code is ??. Pressing a key will show the corresponding key scan codes, as shown in the table below. To exit the LED/keyboard test, remove and re-apply power to the unit.

Key	Scan Code	Key	Scan Code
VITC GEN	41	DISPLAY	01
ENTER	02	CLEAR	03
VCG MODE	45	VCG ON/OFF	44
FREEZE	04	STATUS	05
JAM	42	SHIFT	43
SELECT	46	SETUP	48
↕	47	←	06
	07	→	08

Figure 5-2: Keyboard Scan Codes

5.3.2. Calibrating the VITC Generator Keyer (models 5010-VITC and 5010-VITC-24 only)

To calibrate the VITC Generator's video keyer, connect colour bars from your sync generator to the VITC Gen Video input the 5010-VITC or 5010-VITC-24 and to channel A of your oscilloscope. Connect the video output to channel B of your scope and terminate it. Adjust the **VGAIN** trimpot R122 on 7700STM board (GAIN trimpot VR2 on 5235 sub board) so that the output amplitude matches the input. Adjust the **VTC LVL** trimpot R117 on the 7700STM board (LEVEL trimpot VR1 on 5235 sub board) so that the inserted VITC/characters are approximately 550 millivolts above video black level.

5.3.3. Calibrating the Character Generator

To calibrate the video keyer, connect colour bars from your sync generator to the Reader Video input loop of the model 5010 and to channel A of your oscilloscope and terminate it. Connect the character generator video output of the model 5010 to channel B of your scope and terminate it. Adjust the **GAIN A** trimpot R120 for VITC output A or **GAIN B** trimpot R173 for VITC output B (GAIN trimpot VR3 on 5200 board) so that the output amplitude matches the input. Adjust the **CHR LVL** trimpot R211 on the 7700STM board (CHAR LEVEL trimpot VR2 on 5200 board) so that the inserted characters are approximately at the peak white video level.

The starting position of the characters at the left of the screen is adjusted by trimpot R105 on the 7700STM board (VR1 on the 5200 board). The horizontal character size is set in software using the HORIZONTAL SIZE menu item on the Engineering Setup menu.

5.3.4. Calibrating the Colour Frame Detection Circuit

Calibration of the colour frame detector is accomplished in software. Separate calibration values are maintained in the 5010's nonvolatile memory for PAL and NTSC. The colour frame circuitry is calibrated at the factory and should not require any field calibration. If you do need to calibrate the colour frame detector, use the following procedure. To enable

adjustment of the NOVPOT, you need set DIP switch 1 on the main circuit board to the On (Closed) position. The front panel display will show a display similar to:

`COLFRM POT N : 10` for **NTSC** or `COLFRM POT P : 10` for **PAL**

When this message is displayed, the rightmost digits of the display indicate the value of the digital potentiometer (NOVPOT) used to calibrate the colour framer. The numbers do not have any absolute meaning, but are only a reference used in calibration. Use the ↑ key to adjust the NOVPOT value up and the ↓ key to adjust the NOVPOT value down.

The generator REF VIDEO input must be connected to an RS-170-A NTSC or an 8 field PAL video source and properly terminated. The unit must also be set up to operate in the colour frame mode. This is accomplished by using the **COLOUR FRAME** menu item of the Setup menus. Select **4 FIELD** for NTSC or **8 FIELD** for PAL.

Your will need a sync pulse generator with a colour field #1 identification pulse output and a dual channel oscilloscope to perform the calibration.

1. Display the colour field #1 ID pulse from your sync generator on channel A of your oscilloscope. Set up the time base to show two pulses (usually 20 msec / div.). Set up your oscilloscope to trigger from channel A.

2. Connect channel B of your scope to test point ALM located near integrated circuit U9 on the 7700STM board (test point ALARM located near integrated circuit U25 on the 5200 board).

3. Use the ↓ key on the 5010 to adjust the NOVPOT down to its lowest value. Gradually increase the NOVPOT value using the ↑ key until a pulse appears on channel B of your scope. This pulse should be approximately one video field in length and should occur in field 7 for PAL and field 3 for NTSC. The pulse on channel B should be two fields before the second pulse of channel A. See Figure 5-6 for PAL and Figure 5-7 for NTSC. Write down the NOVPOT value where the pulse first appears correctly.

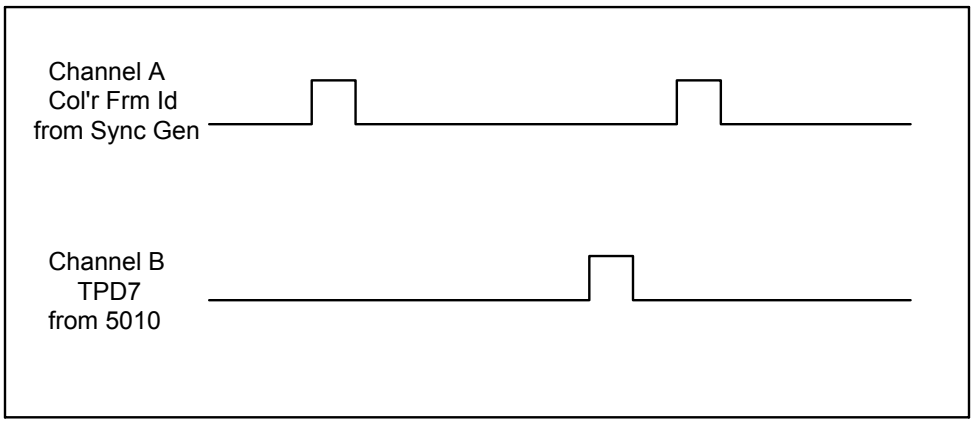

Figure 5-3: PAL Colour Frame Calibration

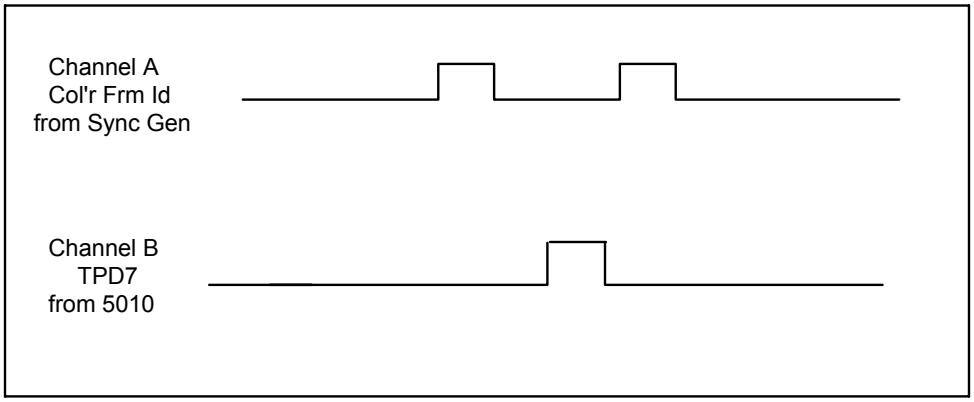

Figure 5-4: NTSC Colour Frame Calibration

4. Continue adjusting the NOVPOT value up until the pulse on channel B disappears. Write down the NOVPOT value where the pulse first disappears.

5. Using the ↓ key adjust the NOVPOT value down until it is at the mid point between the upper and lower values. For example: If the upper value is 15 and the lower value is 8, set the NOVPOT to 11. The COL'R LED should be On.

6. Repeat the procedure for the other video standard as required.

7. Set DIP switch #1 to the Off (open) position to return the 5010 to its normal operating mode.

5.4. UPDATING TO A NEW FIRMWARE VERSION

The 5010 is equipped with an electrically erasable and re-programmable program memory device called a FLASH PROM. We will supply the software upgrade to you on floppy disk, or you may download the current version from our ftp site (http://www.evertz.com/ftp). This device may be reprogrammed by downloading the new firmware to the 5010 using a computer. This facilitates firmware upgrades in the field.

The 5010 serial port is configured at the factory as an RS-232 port. If you have changed the internal jumpers to configure it as an RS-422 port, these must be changed back to the RS-232 position before connecting it to a standard PC COM port. When you are done programming you must return the jumpers to the original position for RS-422 operation.

The internal jumpers inside the unit are different depending on the version of the 5010 hardware that you have. Section 5.4.1 gives instructions for setting the jumpers for the earlier version of the 5010 units with the rear panel shown in figure 2-1. Section 5.4.2 gives instructions for setting the jumpers for the newer version of the 5010 with the rear panel shown in figure 2-2.

5.4.1. Configuring the Serial Port Jumpers - Original 5010

Disconnect the power from the 5010. Disconnect the antenna cable from the Serial I/O connector and remove the top cover or the unit. On the 5200 main circuit card, jumpers JP12 and JP5 are used to configure the serial port. Set the jumpers as shown in Figure 5-5 to configure the 5010 for firmware upgrading.

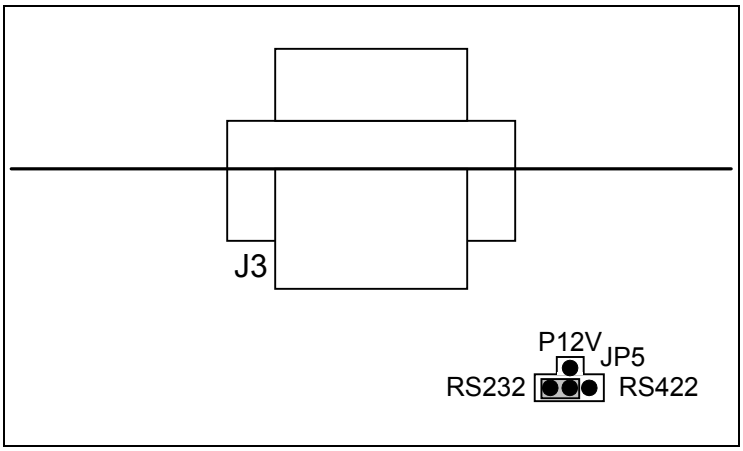

Figure 5-5: Jumper Positions For RS-232 Communications On Rev H & J 5200 Boards.

You will have to make the following cable in order to connect your 5010 to the computer.

5010 Original Version Serial I/O (Male) Description	DB-9		DB-9	Computer End (Female) Description
Shield Ground	Shield	----------	Shield	Shield Ground
RS 232 Transmit	5	----------	2	RS 232 Receive
Ground	1	----------	5	Signal Ground
RS 232 Receive	8	----------	3	RS 232 Transmit

Follow the procedure outlined in section 5.4.3 to upgrade the firmware. When the unit is successfully upgraded disconnect power from the unit. If you need to use RS-422 levels for serial remote control of the 5010 you will need to return the jumpers to the positions shown in Figure 5-6 for normal operation. Reinstall the top cover of the unit and reconnect the antenna cable to the SERIAL I/O connector.

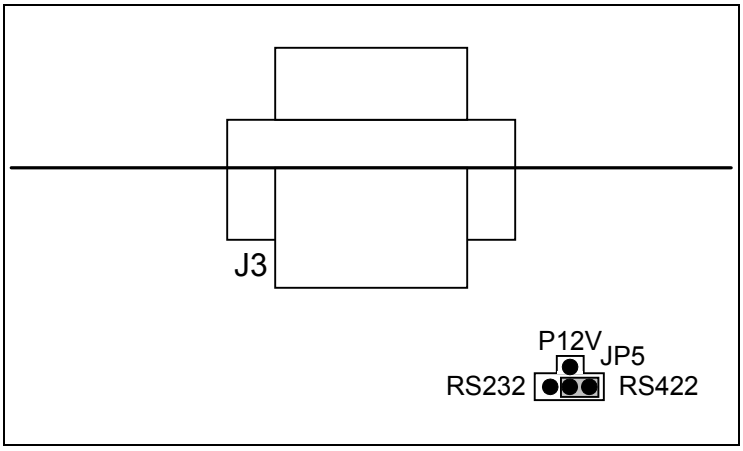

Figure 5-6: Jumper Positions For RS-422 Communications On Rev H & J 5200 Boards.

5.4.2. Configuring the Serial Port Jumpers - Newer 5010

Disconnect the power from the 5010. Disconnect the antenna cable from the Serial I/O connector and remove the top cover or the unit. On the 7700STM main circuit card, jumpers J14, J15 and J16 are used to configure the serial port. Set the jumpers as shown in Figure 5-7 to configure the 5010 for firmware upgrading.

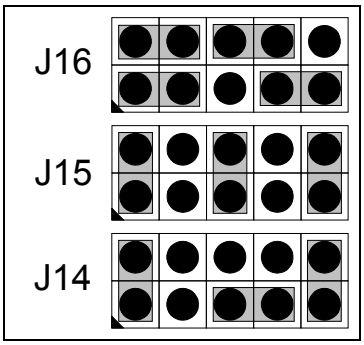

Figure 5-7: Jumper Positions For RS-232 Communications On 7700STM Boards.

You can use a straight thru PC 9 pin cable serial extension cable or make the following cable in order to connect your 5010 to the computer.

5010 New Version Serial I/O (Male) Description	DB-9		DB-9	Computer End (Female) Description
Shield Ground	Shield	----------	Shield	Shield Ground
RS 232 Transmit	2	----------	2	RS 232 Receive
Ground	5	----------	5	Signal Ground
RS 232 Receive	3	----------	3	RS 232 Transmit

Follow the procedure outlined in section 5.4.3 to upgrade the firmware. When the unit is successfully upgraded disconnect power from the unit. If you need to use RS-422 levels for serial remote control of the 5010 you will need to return the jumpers to the positions shown in Figure 5-8. Reinstall the top cover of the unit and reconnect the antenna cable to the SERIAL I/O connector.

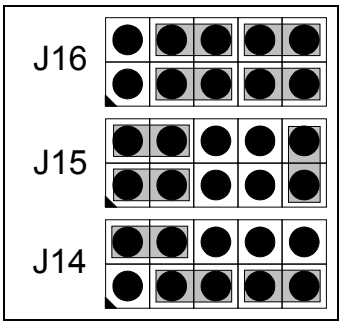

Figure 5-8: Jumper Positions For RS-422 Communications On 7700STM Boards.

5.4.3. Upgrading The Firmware

1. Connect the 5010 to the computer's serial port using the cable described in section 5.4.1 or 5.4.2. Most computers have two serial communications ports (known as COM1 and COM2). If you have both serial ports available, connect the 5010 to COM1.

2. If you received the firmware update on floppy disk, insert the reprogramming diskette in the drive of the computer. Change directories to the root of the reprogramming diskette's drive (A: or B:)

   If you downloaded the firmware from our Firmware FTP site, change to the directory of your hard disk where you have the upgrade files located. The upgrade files you downloaded have been compressed in the Zip format and will need to be expanded before you can proceed. Expand the upgrade files into this directory by running the WinZip utility (available from our FTP site)

3. To set up the 5010 for programming at 38400 baud hold down the ↑ key while you apply power to the 5010. When the 5010 completes its boot-up sequence, the front panel will display `LOAD FLASH - 38400`. The default baud rate for reprogramming is 38400.

   To set up the 5010 for programming at 9600 baud hold down the ↓ key while you apply power to the 5010. When the 5010 completes its boot-up sequence, the front panel will display `LOAD FLASH - 9600`

4. The 5010 firmware is contained in an Intel HEX format file. The chart below shows the correct HEX file to load for the 5010 version you have.

	Firmware	
Model	**Old Style**	**New Style**
5010	AG52A1.HEX	AG57A1.HEX
5010-VITC	AG52A1.HEX	AG57A1.HEX
5010-24	AG52A6.HEX	AG57A6.HEX
5010-VITC-24	AG52A6.HEX	AG57A6.HEX

5. A Flash Loader software utility (called FL.EXE) was provided along with the upgrade files you received. This utility uploads the HEX file to the 5010. Run FL.EXE, with the appropriate '.hex' file as the first argument. For example:

   FL AG57A1.HEX

   This will run the Flash loader program in its default configuration: COM1, 38400 baud, software flow control.

If you connected the computer using COM2 you will need to use additional command line parameter to specify the COM port as follows:

FL AG57A1.HEX /p2

If you set up the 5010 for programming at 9600 baud you will need to use additional command line parameter to specify the baud rate as follows:

FL AG57A1.HEX /b9600

Entering the FL with no file name will generate a usage message to show you all the available options for the Flash Loader program.

5. The Flash Loader will announce that it is erasing the FLASH PROM. The 5010 front panel display will show `FLASH ERASING...`

6. When the Flash PROM is erased, the Flash loader will start to send the new firmware to the 5010. The Flash loader will give a status report as it sends each line of the HEX file to the 5010. During programming the 5010 front panel display will show `LOADING - XXXXX`. The XXXXX will be the actual PROM address currently being programmed.

7. If there are programming errors an appropriate message will be shown on the 5010 front panel. You will need to abort the Flash loader program by pressing the ALT+x keys on your computer keyboard. (Hold the ALT key down while pressing the x key.) Repeat steps 3 to 6 to try to correct the problem. If you still have trouble, try programming at 9600 baud.

8. The reprogramming will be complete when the Flash Loader announces "Hex file transmitted successfully" and returns you to the DOS prompt. The 5010 will automatically switch to its FLASH program memory if programming is successful. As a part of the 5010 boot-up cycle it will say `SWITCH TO FLASH` to indicate that it is running on the FLASH EPROM now.

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A. TIME ZONE OFFSETS

The following table shows the time zone offset condes that will be encoded into the user bits in one of the time/date modes. It shows typical places where this time zone offset is in effect for both standard and daylight time. The locations shown are for informative to aid the reader in determining the correct time zone.

Offset		Standard Time	Daylight Saving time
Code	Hours		
00	UTC	Greenwich	
01	UTC-01:00	Azores	
02	UTC-02:00	Mid-Atlantic	
03	UTC-03:00	Buenos Aires	Halifax
04	UTC-04:00	Halifax	New York
05	UTC-05:00	New York	Chicago
06	UTC-06:00	Chicago	Denver
07	UTC-07:00	Denver	Los Angeles
08	UTC-08:00	Los Angeles	
09	UTC-09:00	Alaska	
10	UTC-10:00	Hawaii	
11	UTC-11:00	Midway Islands	
12	UTC-12:00	Kwaialein	
13	UTC+13:00		New Zealand
14	UTC+12:00	New Zealand	
15	UTC+11:00	Solomon Islands	
16	UTC+10:00	Guam	
17	UTC+09:00	Tokyo	
18	UTC+08:00	Beijing	
19	UTC+07:00	Bangkok	
20	UTC+06:00	Dhaka	
21	UTC+05:00:	Islamabad	
22	UTC+04:00	Abu Dhabi	
23	UTC+03:00	Moscow	
24	UTC+02:00	Eastern Europe	
25	UTC+01:00	Central Europe	
26	Undefined	Reserved - do not use	
27	Undefined	Reserved - do not use	
28	Undefined	Reserved - do not use	
29	Undefined	Reserved - do not use	
30	Undefined	Reserved - do not use	
31	Undefined	Reserved - do not use	

Table A-1: Whole Hour Time Zone Offsets

Offset		Standard Time	Daylight Saving time
Code	Hours		
0A	UTC-00:30		
0B	UTC-01:30		
0C	UTC-02:30		Newfoundland
0D	UTC-03:30	Newfoundland	
0E	UTC-04:30		
0F	UTC-05:30		
1A	UTC-06:30		
1B	UTC-07:30		
1C	UTC-08:30		
1D	UTC-09:30	Marquesa Island	
1E	UTC-10:30		
1F	UTC-11:30		
2A	UTC+11:30	Norfolk Island	
2B	UTC+10:30	Lord Howe Island	
2C	UTC+09:30	Darwin	
2D	UTC+08:30		
2E	UTC+07:30		
2F	UTC+06:30	Rangoon	
3A	UTC+05:30	Bombay	
3B	UTC+04:30	Kabul	
3C	UTC+03:30	Tehran	
3D	UTC+02:30		
3E	UTC+01:30		
3F	UTC+00:30		
32	UTC+12:45	Chatham Island	
33	Undefined	Reserved - do not use	
34	Undefined	Reserved - do not use	
35	Undefined	Reserved - do not use	
36	Undefined	Reserved - do not use	
37	Undefined	Reserved - do not use	
38	User defined		
39	Undefined	Reserved - do not use	

Table A-2: Partial Hour Time Zone Offsets